CEU Quiz

The CEU quiz for the December 2002 supplement (Volume 37, Number 4 supplement) of the *Journal of Athletic Training* will be located in the January 2003 *NATA News*.

25th Annual Student Writing Contest

Entries must be received at the following address by March 3, 2003:

**NATA Student Writing Contest**

Deloss Brubaker, EdD, ATC  
Life College  
1269 Barclay Circle  
Marietta, GA 30060

For a detailed description of the contest rules, please visit www.journalofathletictraining.org/.

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2003 NATA Athletic Training Educators Conference

"**Clinical Education in Athletic Training**"

*Presented by the Education Council Continuing Education Committee*

*Funded by the NATA Research and Education Foundation*

**January 10—12, 2003**

- Del Lago Resort (Montgomery, TX)  
  (Del Lago is located 45 minutes north of George Bush International Airport in Houston, TX.)

Announcing the return of this highly rated conference designed especially for athletic training educators. Included in the registration fee is transportation from/to George Bush International Airport, proceedings book, welcome reception, keynote and breakout sessions, exhibits, poster presentations, accommodations for three days and two nights and all meals starting with lunch on Friday, Jan. 10, and ending with breakfast on Sunday, Jan. 12.

**PARTICIPATION WILL BE LIMITED TO THE FIRST 400 EDUCATORS.**

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The 2003 Athletic Training Educators Conference registration brochure was included in the June 2002 issue of the *NATA News*. Online registration opens May 20, 2002, on the NATA Continuing Education Committee Web site at www.cewl.com. Be sure to visit the site for continuing information on the conference.
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The Changing Face of Athletic Training Education

Gary L. Harrelson; Denise L. Wiksten

It has been a pleasure for us to serve as Guest Editors for this supplement pertaining to athletic training education. The changes that have occurred and are occurring in our athletic training education programs affect each member of the National Athletic Trainers’ Association (NATA), whether your role is to deliver health care for athletes or to educate athletic training students or a combination of the two. These changes can be exciting, frightening, and frustrating as we struggle with what the future of athletic training education will bring to our students and to the profession. The purpose of this supplement is to provide a resource for those involved in educating athletic training students as they navigate through this murky new era and implement the revised educational standards.

The supplement is divided into 4 sections: learning theory, educational research, curriculum development, and clinical education. Additionally, each of the sections is preceded by a commentary that is intended to help frame the articles contained within that section and to provoke questions and discussion. Our goal was to include articles offering new ideas and research-based evidence for athletic training education techniques that can be incorporated into athletic training curricula.

A supplement such as this does not occur through happenstance but rather through the commitment of many individuals who are willing to put forth a great deal of time and effort to see it to its completion. We thank Dave Perrin and the rest of the Journal of Athletic Training Associate Editors for their input in formulating the table of contents and for their support during this project. Additionally, this supplement would never have come to fruition if not for the authors who committed themselves to writing and revising manuscripts (sometimes several times) and the reviewers who committed themselves to reviewing those manuscripts (also several times), and moreover, to do all of this on a very tight schedule in order to meet the publication time frame. We are equally grateful to the Journal of Athletic Training editorial staff for coordinating and facilitating the many aspects of this project. Finally, we thank the NATA, the NATA Research and Education Foundation, and the NATA College/University Athletic Trainers’ Committee, for without their support, this supplement would not have been possible.

We hope this supplement will be valuable in promoting understanding and insight among the membership and in creating dialogue on some of the challenges faced by new and established athletic training education programs. We join with the NATA College/University Athletic Trainers’ Committee in recommending that all athletic trainers share this information with their administrators and athletic directors.

Editor’s Note: Gary L. Harrelson, EdD, ATC, and Denise L. Wiksten, PhD, ATC, are Journal of Athletic Training Associate Editors. Dr Harrelson is Manager, Educational Services & Technology for the DCH Health System, and Adjunct Assistant Professor at The University of Alabama, Tuscaloosa, AL. Dr Wiksten is Athletic Training Program Director at San Diego State University, San Diego, CA.
Gary L. Harrelson

As I try to collect my thoughts and create an outline of what I want to communicate in this commentary on the learning theory section, I am sitting in the coffee shop of a national bookstore chain at which I am a frequent visitor. When I walked in, the line to get a cup of my favorite coffee was somewhat long, so I chose to sit down and begin work. After several minutes of contemplation about this commentary, I noticed that the line was no shorter; as a matter of fact, it was longer. After scanning the situation, I noticed that the manager was apparently in the process of training a new employee in the art (and maybe the science) of proper drink preparation. As I observed the instruction that was occurring, it dawned on me how familiar this scenario looked, not unlike the scenarios that I believe unfold daily in academic classrooms, clinical settings, and corporate classrooms around the country. The parallels are clear: (1) a subject-matter expert (SME) was responsible for the instruction of this new (novice) employee, (2) the experience was unstructured—one moment he was showing the new employee how to run the cash register, and the next he was telling her how to make a latte, and (3) the information spewing from the SME’s mouth was relentless, as he effortlessly, and probably unconsciously, moved from one task to the next. The notion of actually allowing the new hire to practice a task before moving on to the next never seemed to occur to him. Over the course of an hour, I never observed the new employee attempting to make a drink, and from the blank look on her face, she had reached cognitive overload some time earlier.

This was obviously on-the-job training—somewhat akin to an apprenticeship, with parallels applicable to athletic training education today, particularly clinical education. Generally, a student’s clinical education is the responsibility of a certified athletic trainer (who could be referred to as an SME) whose primary role is providing patient care and who may or may not have a background in educational theories and models and teaching strategies. The clinical instruction generally has neither a structure nor a logical progression. Also, I believe that in many instances, rather than a dialogue between the clinical instructor (CI) and the student, which can foster inquiry and discovery, the communication is more of a monologue from the CI.

Many times, learning theory is confused with other educational theories or concepts. Learning theory describes how learning occurs, whereas instructional design addresses how to teach something, and curriculum design outlines what is to be taught.1 Additionally, learning theory is useful for understanding why an instructional method works or might work1 and aids in developing a personal philosophy toward instruction. Several concepts of learning theory are, I believe, immediately applicable to athletic training education: the instructional setting, cognitive-processing differences between an expert and novice, and transfer of learning.

Instructional Settings

The cognitive processes at work that promote learning in a classroom environment are the same cognitive processes at work in a clinical-education setting. First, in the clinical setting, CIs must recognize that they are in an instructional setting. Although their primary job may be to provide health care services to patients, they have additionally chosen to act as CIs, which includes the responsibilities that go with that role. Also, to my mind, instruction is instruction; instead of learning in an academic classroom, the student is learning in a clinical setting, which can be a very beneficial experience. The cognitive processes that are important for learning do not differ based on the environment. Yes, environmental factors play a huge role in the effectiveness of learning, but the cognitive processes of learning (such as cognitive overload, which requires the learner to free up working memory with its small storage capacity; transferring information from working memory to long-term memory; retrieving information from long-term memory when needed; and transferring learning from one similar situation to another) are not specific to the classroom. A student struggles with these cognitive challenges in the clinical setting as well. The same barriers that inhibit learning in the classroom can present in the clinical setting. As a result, without some theory or model to provide a structure for learning and into which instructional strategies can be “plugged,” learning in the clinical setting may well be left to chance. I believe it is thought by some that learning theories and models and instructional design are the domain of the classroom teacher and should be left there. However, without some framework for clinical instruction, learning occurs haphazardly, and we may well continue to perpetuate a clinical experience instead of a clinical education.2

Expert Versus Novice

Subject matter experts think very differently about a situation or a problem than do novice learners. The SMEs’ experiences have allowed them to create many more mental models (schemas) than novice learners and to see the interconnectedness of these schemas. In many educational settings, SMEs are responsible for the instruction of novice learners in both the classroom
and clinical settings. The upside is that a very knowledgeable person is in charge of instruction; the downside is that a very knowledgeable person is in charge of instruction. Even SMEs with knowledge and expertise in learning theory and instructional design struggle to prevent their subject matter expertise from hampering instruction. In many instances, much of what an SME cognitively processes is never revealed to the learner. Additionally, when SMEs are asked why or how they did something, they find it difficult to explain or describe because much of the processing is unconscious. During instruction, SMEs tend to leave out key information that may not be important to them anymore but is critical for novice learners. The potential consequences of this processing discrepancy are cognitive overload, frustration, and a disconnect between the student and instructor. Thus, in my opinion, an SME needs some minimal understanding of learning theory and instructional strategies to frame instruction appropriately and facilitate learning by reducing the barriers that can hamper the student’s cognitive processing of information.

Transfer of Learning

The concept of transfer of learning has been purported to be the fundamental goal of all education and the very meaning of learning itself. Unfortunately, this is the point at which education fails. Transfer of learning refers to the ability to apply what one learns in different contexts and recognize and extend that learning to new situations. When students cannot perform tasks only slightly different from those learned in class or they fail to appropriately apply their classroom learning in settings outside school, then education is deemed to have failed. Transfer of learning is not just something that athletic training education struggles with, but it is a problem within the educational system itself. To me, the challenge for athletic training education with regard to transfer of learning is moving the knowledge from a classroom or laboratory setting to the clinical setting and helping the student to transfer this knowledge. Transfer of learning can be enhanced in several ways. One is to use numerous examples or similar concepts in multiple contexts and different orders and at different levels of complexity to help promote transfer. Another is to teach the knowledge and skills within the context of the job in which they will be used, so that the learner can “tie” the knowledge to an outcome versus creating what is known as “inert” knowledge.

The 4 articles in this section are a start for those who need to begin to understand the underlying concepts of how one cognitively processes information and retains and retrieves that knowledge when needed; the need to offer instruction in a “cafeteria approach” to appeal to the many cognitive (learning) styles that exist; and how critical thinking can be fostered in athletic training education programs. In addition, I urge those involved in the education of athletic training students to read outside the athletic training education research, which I believe is in its infancy, and become familiar with what researchers in educational and cognitive psychologies are reporting with regard to learning. The science in these disciplines is much more robust, and in many instances, what athletic training education programs are struggling with today has already been examined in these areas. Let’s take advantage of the opportunity for transfer of learning among these professional disciplines!

REFERENCES


Editor’s Note: Gary L. Harrelson, EdD, ATC, is a JAT Associate Editor, Manager, Educational Services & Technology for the DCH Health System, and Adjunct Assistant Professor at the University of Alabama, Tuscaloosa, AL.
Sociocultural Learning Theory in Practice: Implications for Athletic Training Educators

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*Kent State University, Kent, OH; †University of Akron, Akron, OH

Objective: To discuss cognitive and sociocultural learning theory literature related to athletic training instructional and evaluation strategies while providing support for the application of these practices in the didactic and clinical components of athletic training education programs.

Data Sources: We searched Educational Resources Information Center (ERIC) and Education Abstracts from 1975–2001 using the key words social cognitive, sociocultural learning theory, constructivism, and athletic training education. Current literature in the fields of educational psychology and athletic training education provides the foundation for applying theory to practice with specific emphasis on the theoretical framework and application of sociocultural learning theory strategies in athletic training education.

Data Synthesis: Athletic training educators must have a strong fundamental knowledge of learning theory and a commitment to incorporate theory into educational practice. We integrate literature from both fields to generate practical strategies for using sociocultural learning theory in athletic training education.

Conclusions/Recommendations: Social cognitive and sociocultural learning theory advocates a constructive, self-regulated, and goal-oriented environment with the student at the center of the educational process. Although a shift exists in athletic training education toward more active instructional strategies with the implementation of competency-based education, many educational environments are still dominated by traditional didactic instructional methods promoting student passivity. As athletic training education programs strive to increase accountability, educators in the field must critically analyze teaching and evaluation methods and integrate new material to ensure that learning is maximized.

Key Words: athletic training education, constructivism, learning theory, problem solving, scaffolding, social cognitive learning theory

With recent paradigm shifts in athletic training education, interest in pedagogic strategies and evaluation techniques for the clinical and classroom settings has increased. The integration and application of learning theory has practical implications in the field of athletic training education; however, theory and practice must have a reciprocal relationship. To educate students successfully, our teaching must reflect the way in which learners organize knowledge and represent it internally. Understanding how these representations change when new information is encountered is important in the educational process. Cognitive psychology provides a strong foundation for understanding how students learn and how educators can structure teaching to maximize student learning.

Cognitive psychology is a family of learning theories that emphasizes the role of the learner in the construction of knowledge. Specifically, the sociocultural theory emphasizes the important role of social interaction in the construction of knowledge. Within sociocultural theory, the concepts of zone of proximal development (ZPD), scaffolding, and self-efficacy are particularly relevant to athletic training education. In the application of sociocultural learning theory, learning precedes development, highlighting the importance of the didactic and clinical experiences to which students are exposed. In this article, we bring together 2 disciplines, athletic training education, and cognitive psychology, to demonstrate the direct application of sociocultural learning theory in athletic training education.

REVIEW OF LITERATURE

Sociocultural Learning Theory Defined and Applied

Cognitivists portray learners as active constructors of knowledge and emphasize that students are not simply blank slates to be filled with information or that thinking is merely a chain of stimulus-response connections. Sociocultural theory and constructivism have broad histories ranging from Piaget’s schema-based theories to the postmodern constructivist theories in which the locus of knowledge is based in social interaction. Athletic training education—with didactic and clinical components—provides an optimal environment for the direct application of sociocultural learning theory.

The Works of Lev Vygotsky. The work of the Russian psychologist Lev Vygotsky provided the foundation for the application of sociocultural learning theory. This important theorist underscored the dynamic interdependence between the social and individual processes in learning. Vygotsky’s work emphasized 3 major themes. First, he contended that cognitive
development, including higher-order learning, is rooted in social interactions and mediated by abstract symbols, which he referred to as tools. Second, Vygotsky asserted that these tools are not created in isolation but rather are products of the sociocultural evolution of an actively involved individual. Third, Vygotsky viewed learning as a developmental or genetic process. This general genetic law of cultural development emphasized the importance of concentrating on the process by which higher functioning is established.

The ZPD is a major concept in Vygotsky's work. This zone is defined as the distance between what one can achieve alone and what one can achieve with help. This idea emphasized that humans develop higher cognitive levels when the gaps in their thinking and problem solving are supported by adults, peers, or more capable others. This support was called scaffolding. The social environment supports development in such a way that what can be done collaboratively now will be accomplished independently at a later date. However, it is critical for the individual to actively participate in the learning process for this development to occur. In the active learning environment, students are constantly analyzing, puzzling over significance, searching for explanations, and speculating about relations between the new experience and what they already know.

In relation to the ZPD, Vygotsky also stressed that instruction be directed more toward the higher level of the ZPD than the lower level of the zone. This implied that a learning experience should make the student stretch to meet high expectations. However, without an optimal mix of challenge and support, student growth and development are unlikely to reach full potential. Educators must provide appropriate support through structured activities in which students can interact with other students and faculty members to reach the highest level of development.

Research related to traditional and clinical components of athletic training education reflects the basic tenets of Vygotsky's work. Mentoring, nurturing, modeling, student participation, and a humanistic orientation—all of which occur in a social environment—were found to be important factors in student development and learning. Further, Mensch and Ennis found that pedagogic strategies establishing positive relationships among faculty and students were important in facilitating learning. These authors supported the basic principles related to the ZPD by directly advocating the use of high expectations in athletic training education.

Scaffolding: The Connection-Making Process. Scaffolding is critical to student development and learning. It consists of creating supported situations in which students extend their current skills and knowledge. Through the use of scaffolding strategies, students make connections between old and new information in a social, active environment. When used liberally, scaffolding stimulates student interest, simplifies tasks so they are meaningful, and motivates students to pursue goals. In the constructivist models, peers and instructors provide the scaffolding upon which new knowledge is developed. Relating concepts and principles to real situations also contributes to learning new material. Participation in structured activities that emphasize elaboration, analysis, and inferencing helps students make connections to real-life situations.

Athletic training educational research has found similar positive effects for scaffolding strategies in the classroom and clinical settings. Breaking skills down into digestible parts and integrating knowledge from previous tasks promotes mastery in athletic training. When skills build upon existing knowledge, students begin to make sense of the new information. Student motivation is enhanced in experiential learning environments that foster autonomy, responsibility, and confidence. Many strategies encourage the use of scaffolding in both the didactic and clinical settings. Case studies, simulations, and demonstrations all promote clinical scaffolding, whereas rewriting papers, reciprocal questioning, and cooperative learning encourage scaffolding from a didactic perspective.

Self-Efficacy Theory. Self-efficacy theory provides valuable insights regarding student learning in the social environment. Bandura's social cognitive theory postulates that perceived self-efficacy affects an individual in all aspects of life, including educational experiences. Beliefs about one's competence to successfully perform a task can affect motivation, interest, and achievement. The higher the perceived efficacy, the higher the goal aspirations people adopt and the firmer their commitment to achieving those goals. Educational activities should foster self-efficacy through the use of social interaction. By doing so, the learning environment is structured to de-emphasize competition and highlight self-comparison of progress to build a sense of self-efficacy and promote academic achievement.

Grusec also found that people contribute to their own life course by selecting, influencing, and constructing their own circumstances based on perceived self-efficacy and self-regulatory capacity. Students and teachers select activities based on their self-efficacy beliefs. Strong self-efficacy by students and strong teacher efficacy enables students to control their learning, persist at tasks, and increase goal attainment by choosing tasks that challenge their existing knowledge. Teacher efficacy is as important as student efficacy in the design and implementation of learning activities.

Self-efficacy studies in athletic training education have supported learning theory literature. Jurges et al found that athletic training students who had the knowledge of a select skill and the belief that they had the ability to perform that particular skill were more effective in the clinical environment. Vela further supported the development of self-efficacy by promoting the use of learner-centered practices to enhance self-efficacy in the clinical experience. From an educational perspective, the implementation of constructivist strategies in both the clinical and didactic settings can help students relate prior knowledge to new knowledge while promoting a strong sense of self-efficacy.

Practical Applications of Learning Theory in Athletic Training Education

Social learning theories provide valuable information directly related to student learning. However, this knowledge is
wasted unless it is applied in the learning environment. In applying theory to practice, it is critical to facilitate the learning process by using methods that will allow students to incorporate everyday life into their learning tasks. Clinical education, assessment, technology, and research are several examples in which sociocultural learning theories directly apply to athletic training education.

Clinical Education and Internships

The clinical component of athletic training education is critical to student learning, whether it is in the form of carefully structured clinical education or internships. As students actively participate in clinical experiences, they are learning more than cognitive knowledge and psychomotor skills. Students observe professional behaviors and learn through mentoring relationships about the demands of the athletic training profession. Laurent and Weidner found that modeling professional behaviors gained through clinical education is one of the most helpful components in student learning. In an earlier study, the importance of structure and direction in the clinical experience was fully supported. These authors contended that student mastery is enhanced through careful selection of the clinical instructors who provide mentoring, professional acceptance, and nurturing for the athletic training student.

Exposing students to an actual work environment as part of the learning process is a necessary and fundamental component in knowledge construction. Being submerged in the culture of the profession enhances professional competency and facilitates self-efficacy beliefs for success in one’s chosen profession. In this environment, students become active learners capable of solving complex problems and constructing meaningful real-world experience. Educators can foster student motivation by providing structure in the clinical setting, autonomous support through learning activities, and active involvement with other students and teachers.

Clinical experiences and internships also provide students the opportunity to actually see how athletic training professionals work as a team. It is important for the student to learn how to interact with a variety of individuals. Students need to be exposed to the emotional aspects associated with providing health care services as they prepare for a career in the athletic training field. Internships provide that real-world experience for the learner in addition to providing the opportunity to learn from the master through acculturation.

In the social environment, students learn personal skills related to professional development, such as communication. Shapiro addressed the role of the acculturation process—commonly experienced through clinical experiences and internships—in the development of interpersonal and communication skills in athletic training students. This critical process of acculturation facilitates professional growth as students prepare to enter the workforce. The social environments in which these interactions occur build the scaffolding upon which the student frames new knowledge. Clinical experiences and internships, among other connection-making strategies, foster the development of technical and interpersonal skills. Table 2 identifies specific connection-making strategies that can be directly applied to athletic training education.

Student Assessment

Sociocultural learning theory can be applied directly to student assessment. Educational institutions are changing to teach students how to integrate their knowledge into the real world, and changes must be made in the evaluation and assessment of the students. If elaboration and analysis are encouraged in the learning process, it is critical to test the student in this fashion. As part of the assessment process, educators should provide systematic and corrective feedback on a regular basis to allow for the construction of knowledge and the application of that knowledge.

Athletic training education programs should involve a variety of assessment techniques, particularly when critical thinking is the expected outcome. Fuller encouraged the integration of critical thinking (application, analysis, synthesis, and evaluation) into testing procedures and in the design of learning objectives and written examinations to prepare students for the real-life problem solving that occurs in athletic training. Educators need to break the habit of constructing examinations that require little higher-order thinking. A gradual transition toward a more comprehensive approach to assessment can occur through careful analysis of the learning objectives and the implementation of more active strategies, such as case studies, peer questioning, and cooperative learning.

Although learner-centered approaches to teaching and assessment are promoted in sociocultural learning theory, these approaches must be carefully structured for each developmental level. One athletic training study found that teacher-centered instruction improved written performance but not practical test performance in pre-athletic training students when compared with student-centered instruction. Based on the depth of literature encouraging learner-centered instruction and assessment, this information should be viewed as part of the evolving body of literature in athletic training education that emphasizes the use of varied strategies in athletic training education.

Competency-based assessment is another strategy used in athletic training education that reflects sociocultural learning theory. According to this theory, students should be required throughout their educational program to perform in situations, formal and informal, that simulate the testing environment. Shapiro supported the use of role playing, case studies, and narratives in the didactic and clinical components of athletic training education. The educational development of the student must be consistent with the final assessment procedure in securing certification to practice in the profession. When students are exposed throughout the educational process to the actual skills needed to practice in the athletic training profession, they acquire a sense of self-efficacy. Students who do not feel that they can exercise control over stressors and highly valued outcomes foster feelings of futility and desperation.

Varied pedagogic and assessment strategies and structure in the educational process encourage critical thinking, reflective practice, and student empowerment.

Learning objectives also play a critical role in the learner’s acquisition of knowledge and typically guide assessment. Cov-
Table 3. Assessment in Constructivism

| Encourage higher-order thinking: cases, short answer, application |
| Do not reward unaltered information |
| Incorporate learning-based objectives |
| Assessment portfolios for variety in techniques |
| Self- and peer-assessment strategies |
| Authentic assessment |
| Construction of knowledge |
| Disciplined inquiry |
| Value beyond school |

Washington and Roberts differentiated between performance-based and learning-based objectives in which the student desires to learn for the sake of the grade or for the sake of learning, respectively. A curriculum that emphasizes learning-based objectives may rely heavily on the student portfolio concept, in which success is measured individually as opposed to competitively, as traditionally seen. Learning-objective development is a potential area of growth for athletic training educators.

Constructivism strongly supports the use of the assessment portfolio, which encourages self- and peer-assessment strategies. Portfolios encourage personal responsibility for success that is fundamental to constructing knowledge. Athletic training educational research reflects the importance of the portfolio as an assessment element. Portfolios document learning over time, promote critical thinking, and reinforce mastery of learning objectives. The use of portfolios can link clinical classroom practice through reflections and projects. Table 3 outlines specific characteristics and alternative options, including portfolios, for assessment under the constructivist model.

Technology

Recent technologic advances have affected the application of constructivist theory in practice. Innovative interactive computer software programs allow students to synthesize the course material through active learning. Despite some minor disadvantages, this use of technology allows interaction with others that would normally be inaccessible through distance-education and Web-based courses.

Using technology to the fullest extent is commendable when it is consistent with the ways that people learn. In athletic training education, Wiksten et al found that students preferred traditional educational strategies over computer-based instruction because of the latter’s lack of feedback and lack of contact between faculty and students. In their study, athletic training students preferred a more social environment for learning. However, new technology is being developed to promote active learning and higher-order learning. Careful selection and use of educational technology will help to ensure that student learning is occurring.

Problem-Solving Strategies and Research

Teaching students how to problem solve is critical in the construction of knowledge. If students are taught how to search actively and continuously for meaning, the passion of the student is aroused, facilitating retention. The educator should provide feedback to control student frustration and to mark critical areas of discrepancy in the resolution of the problem. McLoda and Andersen found problem-based learning a useful tool for late-stage undergraduate and graduate students. Problem-based learning promotes learner responsibility, group communication, and individual contemplation to solve problems, all of which are critical in athletic training.

Problem solving should also be incorporated into competency-based skills assessment. Students should be required to work in groups or pairs in the problem-solving processes associated with athletic training domains, such as recognition, evaluation, and immediate care of athletic injuries; rehabilitation and reconditioning of athletic injuries; and prevention of athletic injuries. Progressing from basic to advanced skill acquisition, the student can interact with other students and instructors to solve problems. By actually putting into practice what they have learned in the formal classroom setting, students maintain high motivation levels. By applying the knowledge, students are better able to understand and retain the information for later use. They are highly motivated to achieve because they know that these skills are critical to success in the field.

Limitations to Sociocultural Learning Theory

Although sociocultural theories strongly support current trends in education, limitations exist. According to Gredler, the functions of a learning theory are to provide guidelines for planning instruction, to evaluate current products for classroom practice, and to diagnose problems in the classroom. The application of learning theory in athletic training education can provide insights into how we teach and how students learn.

One limitation to sociocultural learning theory stems from the definition of critical thinking, which is central to student learning. The meaning of critical thinking may differ across academic disciplines. If critical-thinking skills involve elaboration, analysis, and synthesis of information, differences in definition must be reconciled across the disciplines. Fuller believed that all students are capable of critical thinking, regardless of their level in the athletic training program. Educators should allow for versatility in defining critical thinking to encourage development of these skills across the curriculum. This is likely to occur with the integration of the clinical and academic staffs and the implementation of clinical-instructor workshops. These formal exposures to educational theory and the application of educational theory in clinical and didactic settings may broaden the scope of critical-thinking activities in athletic training education programs.

Additionally, sociocultural theory promotes the use of non-traditional methods of instructing and evaluating student learning, which involves a significant time commitment on the part of the faculty member. Most educators are unwilling or unable to make the sacrifice of time and effort to implement this type of learning into the curriculum, particularly if they have low teacher efficacy regarding the instructional methods or are restricted by institutional constraints such as retention, promotion, and tenure requirements. Through further investigation of the role of the athletic training program director, faculty, and clinical instructors, implementation may be less of an issue as roles are further defined. With appropriate internal and external support, the transition to active learning environments, both in didactic and clinical settings, can occur.

CONCLUSIONS

Athletic training is an ideal profession for the application of sociocultural learning theory. The interactive nature of our
profession implicates the use of social-learning strategies in both the clinical and didactic settings. Learning over time will allow students to relate past information to the development and integration of new ideas that can be applied for a lifetime. Active classroom and clinical instructional strategies encourage the educator to take on the role of the “guide on the side” rather than the “sage on the stage.” As the athletic training educational literature continues to evolve, much can be learned from the existing literature in educational psychology.

As a profession, athletic training encourages cooperation and teamwork. Interaction with other allied health care providers, physicians, coaches, administrators, and students is at the core of the profession. This is consistent with the basic philosophy of cooperative learning and interactive classrooms that are essential to the application of sociocultural learning theory.

What we do as educators in the classroom and in the clinical setting has a profound effect on the lives of all students. There is much to learn from the application of sociocultural learning theory to athletic training education. We must build upon what we know about athletic training education and borrow from other disciplines the wealth of theories related to student learning. Further, we must make a commitment to the process of developing self-directed learners who can succeed in the world they are about to face. Our passion and commitment for this tremendously important process must prevail so that all students are provided the opportunity to succeed.

REFERENCES


A Nationwide Learning-Style Assessment of Undergraduate Athletic Training Students in CAAHEP-Accredited Athletic Training Programs

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Objective: To identify the learning styles and preferred environmental characteristics of undergraduate athletic training students in Commission on Accreditation of Allied Health Education Programs (CAAHEP)-accredited athletic training education programs and to determine if learning-style differences existed among geographic regions of the country.

Design and Setting: Fifty CAAHEP-accredited athletic training programs were randomly selected in proportion to the number of programs in each geographic region. Ten students from each school were selected to complete the Kolb Learning Style Inventory (LSI) and the Productivity Environmental Preference Survey (PEPS).

Subjects: A total of 193 undergraduate athletic training students (84 men, 109 women) with a mean age of 22.3 ± 2.8 years completed the PEPS, while 188 students completed the LSI.

Measurements: We used chi-square analyses to determine if differences existed in learning-style type and if these differences were based on geographic location. We calculated analysis of variance to determine if there were any geographic differences in the mean overall combination scores of the LSI. Descriptive statistics were used to evaluate the PEPS.

Results: The overall return rate was 38%. The chi-square analyses revealed no significant difference in learning-style type for athletic training students, regardless of the geographic region. The LSI yielded a relatively even distribution of learning styles: 29.3% of the students were accommodators, 19.7% were divergers, 21.8% were convergers, and 29.3% were assimilators. The overall mean combination scores were 4.9 (abstract-concrete) and 4.9 (active-reflective), and analysis of variance indicated no significant difference in the mean combination scores among the geographic regions. The PEPS revealed that undergraduate athletic training students demonstrated a strong preference for learning in the afternoon.

Conclusions: Undergraduate athletic training students demonstrated great diversity in learning style. Educators must strongly consider this diversity and incorporate teaching methods that will benefit all types of learners.

Key Words: Productivity Environmental Preference Survey, Learning Styles Inventory, clinical education

As the concern for the state of athletic training education continues to grow and change, so must our strategies for teaching the students who intend to carry on the profession. With the expansion of curriculum programs, we are faced with the task of teaching the greatest number of students in the best possible way. In order to be effective instructors, we must understand and define the learning styles of our athletic training students.

Learning style, defined as the composite of characteristic cognitive, affective, and physiologic factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment, is often assessed through learning-style inventories. The Kolb Learning Style Inventory (LSI) McBer Publishing, Boston, MA) has been used to identify an individual’s learning style. To classify learning styles has been conducted on students in the allied health professions, such as nursing, dentistry, and occupational and physical therapy. To date, only a few investigators have looked specifically at athletic training students.

Identifying and subsequently teaching to students’ learning styles has been shown to be beneficial. Therefore, classifying the learning styles of athletic training students enables educators to provide an environment that facilitates learning.
The need to continue this exploration as the athletic training profession shifts to curriculum-based programs and competency-based clinical learning is great.

In addition to identifying the learning styles of athletic training students, it is equally important to assess and evaluate the environmental conditions that enhance the learning process. The Productivity Environmental Preference Survey (PEPS) Price Systems, Inc, Lawrence, KS identifies the most important environmental variables influencing an individual’s ability to learn and perform. By evaluating students on 2 levels of learning styles, we can begin to develop a profile of the typical athletic training student, including how he or she processes information and the environment that is most conducive to learning. The purpose of our study was to identify the learning styles and preferred environmental characteristics of undergraduate athletic training students in Commission on Accreditation of Allied Health Education Programs (CAAHEP)-accredited athletic training education programs. The secondary purpose was to determine if learning-style differences existed among geographic regions of the country.

METHODS

Subjects

All subjects of this investigation were undergraduate students enrolled in CAAHEP-accredited athletic training education programs across the United States. Students in 22 of the 50 schools contacted completed the surveys. Students were asked to complete both surveys. A total of 193 students (84 men, 109 woman with a mean age of 22.3 ± 2.8 years) completed the PEPS, and 188 completed the LSI. Before completing the surveys, all subjects signed informed consent forms approved by the university’s institutional review board, which also approved the study.

Instrumentation

The instruments used in this study were the Kolb LSI, revised in 1985, and the PEPS, developed in 1979. For the purposes of this study, we chose the Kolb LSI to assess and determine the learning styles of the athletic training students and the PEPS as an instrument to assess the preferred conditions and environment of athletic training students. Both were chosen for several important reasons, including their prior use by many well-regarded educational researchers and their demonstrated high reliability and construct validity.

The Kolb LSI provides insight into a student’s information-processing capabilities. Information processing is the intellectual approach the student takes to assimilate information. The Kolb LSI is an instrument designed to assess the strengths and weaknesses of a student’s learning style. It is based on Kolb’s experiential learning theory, which describes a cycle of learning that all learners incorporate at some point. Kolb’s cycle is described as follows: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE) (Figure).

The LSI is useful in providing a measure of the extent to which a learner emphasizes abstractness over concreteness (abstract-concrete [AC-CE]) and action over reflection (active-reflective [AE-RO]). The 2 combination scores are plotted onto a grid and fall into 1 of 4 quadrants: accommodator, diverger, converger, or assimilator. The quadrant in which the student’s score falls indicates his or her preferred learning style. More balanced learning styles fall closer to the center of the grid. Table 1 displays some of the strengths and weaknesses that characterize each of the learning-style types.

A distinction of the learning cycle is that no one mode describes a person entirely. Rather, everyone’s learning style is an individual combination of these learning modes. Kolb and Wolfe advocated a balance of all 4 abilities in order to be an effective learner. Combining the scores on the LSI and plotting them accordingly allows a student’s preferred learning style (ie, accommodator, diverger, converger, or assimilator) to be revealed.

The LSI is a 9-question instrument in which the student is asked to rank 4 statements for each question that best describes his or her preferred manner of learning. The 4 words or statements in each question represent 1 of the 4 steps in the experiential learning cycle. Responses in each column are added, yielding 4 scores, indicating the person’s relative preference for each learning mode. From the 4 totals, composite scores are obtained by subtracting the concrete experience score from the abstract conceptualization score and the reflective observation score from the active experimentation score. The combination scores are referred to as abstract-concrete (AC-CE) and active-reflective (AE-RO).
According to a review of literature on learning styles and the health profession by Griggs et al., the Kolb LSI was the most frequently used instrument. Although the reliability and validity of the instrument have been questioned, it is widely viewed as a useful measure of learning-style assessment. Sims et al. found that the internal reliability ranged from .76 to .85 and test-retest indices from .24 to .66. A variety of reliability coefficients have been reported, but higher coefficients are reported for the computed scores (AC-CE, AE-RO) than the individual measures. The LSI is somewhat weak on psychometric considerations, but this problem is typical of learning-style instruments.

The PEPS, developed by Rita and Kenneth Dunn, assesses the multidimensional and instructional preferences of students, which is the outermost layer of learning style according to Curry’s onion model. It assesses individual productivity and learning style and analyzes the conditions under which an adult is most likely to achieve, create, produce, solve problems, make decisions, or learn. The PEPS is a self-report instrument consisting of 100 questions relating to 20 learning-style elements. The instrument is scored on a 5-point Likert scale and takes approximately 25 minutes to complete.

Five major stimuli to which learners respond are examined by the PEPS: environmental, emotional, sociologic, physical, and psychological. These factors are not actually measuring the learners’ internal strategies for gathering information but rather the external instructional conditions to which a learner is exposed. The PEPS provides information about patterns through which learning occurs, not why the patterns exist. This gives students and teachers information about the learning environment, which is amenable to change.

In 1979, investigators at the Ohio State University’s National Center for Research in Vocational Education reported that the PEPS had “established impressive reliability and construct validity.”21 The authors of the PEPS report reliability results of greater than .60 for 68% of the test-retest reliabilities for the 20 factors. Nelson et al. found test-retest reliabilities for the 20 subscales ranging from .39 to .87, with 40% having a correlation of more than .80. In the last 15 to 20 years, the PEPS has repeatedly shown predictive validity.

**Procedures**

The Kolb LSI and PEPS were administered to undergraduate athletic training students from 50 randomly selected CAAHEP-accredited athletic training programs. All 10 districts of the National Athletic Trainers’ Association (NATA) were represented proportionally according to the number of programs in each region. Program directors randomly distributed the LSI and PEPS to each of the 10 students and returned the completed surveys to the investigators. The students completing the survey were required to have attended grades 6 through 12 within the region in which their university is located. Intuitively, we felt that there could be differences in the learning environments and teaching styles throughout the country and, therefore, set this inclusion criterion. Regional breakdown was as follows: Region 1 (NATA Districts 8 and 10), Region 2 (NATA District 7 and Texas), Region 3 (NATA Districts 4 and 5), Region 4 (NATA Districts 3, 9, and Arkansas), and Region 5 (NATA Districts 1 and 2).

We scored the Kolb LSI ourselves, using chi-square analyses to identify any significant differences in distribution of learning-style type in athletic training students and any geographic differences in learning style among the 5 regions of the country. We conducted analysis-of-variance tests to determine if there were any differences in mean combination scores among the regions. The probability level was set at $P \leq .05$ for all tests.

The PEPS forms were returned to Price Systems, Inc, to be scored and analyzed. Descriptive statistics were completed on the 20 subscales of the PEPS to determine if there was a strong preference (indicated by a score greater than 60) or no preference (indicated by a score lower than 40) for the environmental variables that influence a student’s ability to learn.

**RESULTS**

A total of 193 undergraduate athletic training students completed the PEPS, while 188 students completed the LSI. Five LSI surveys were incomplete and, therefore, could not be used in the analysis. The overall return rates were 39% for the PEPS and 38% for the LSI.

We found no difference in the distribution of learning-style type using the Kolb LSI among athletic training students ($\chi^2 = 5.62, P = .132$ (Table 2). Learning-style type did not differ among the 5 geographic regions ($\chi^2 = 7.12, P = .849$). No significant difference in AC-CE ($F_{4,183} = .178, P = .95$) or AE-RO ($F_{4,183} = 1.970, P = .10$) combination scores was noted among the geographic regions (Table 3). The overall mean combination scores were 4.9 ± 11.5 for AC-CE and 4.9 ± 12.8 for AE-RO.

On the PEPS subscale scores, 62% of the athletic training students (120) had a strong preference for afternoon learning (Table 4).

**DISCUSSION**

Our purpose was to identify the learning styles and environmental preferences of undergraduate athletic training students in CAAHEP-accredited athletic training education programs. The secondary purpose was to compare these students’ preferences with the Kolb learning style inventory and PEPS.
learning styles among geographic regions of the country to see if learning-style differences existed across the United States.

The Kolb LSI identifies a student’s learning-style preference according to how much one relies on the 4 different learning stages (concrete experience, reflective observation, abstract conceptualization, active experimentation). Kolb described each stage of the learning process and characteristics of individuals who have a preference for each. An individual who displays an orientation toward concrete experience emphasizes feelings as opposed to thinking, often making for a good intuitive decision maker. Those with an orientation toward reflective observation focus on understanding the meaning of ideas and situations by carefully observing and impartially describing them. They are good at appreciating various points of view and rely on their own thoughts and feelings to form opinions. Those who are oriented toward abstract conceptualization focus on using logic, ideas, and concepts and emphasize thinking as opposed to feelings. These individuals are often skilled in systematic planning and quantitative analysis. An orientation toward active experimentation focuses on influencing people and changing situations. The emphasis is on practical application as opposed to reflective understanding. The individuals who are oriented to this learning process are effective in getting things accomplished and are often willing to take risks in order to achieve their objective.

The Kolb LSI determines the preferred style of learning (accommodator, diverger, converger, or assimilator) based on the orientation of the learner to a specific stage of the learning cycle. Accommodators emphasize concrete experience and active experimentation. They are involved in new experiences and often carry out plans. They seek opportunities, take risks, and often adapt to changing immediate circumstances. Accommodators rely on personal feedback and feelings as modes of perception and prefer to learn kinesthetically. Therefore, these students should be encouraged to learn by observing and then practicing hands-on activities, such as taping, brace fitting, stretching, palpation, and special tests for injury assessment. Accommodators also prefer to work with others, which is especially important for effectively communicating with athletes, coaches, and colleagues in the profession. Teachers can assist these students with their weaknesses by encouraging them to complete their work on time and by helping them to structure and commit to goals.

Divergers emphasize concrete experience and reflective observation. They perform well in “brainstorming” sessions and are imaginative and feeling oriented. Divergers are sensitive and emotional, with an ability to understand people and recognize problems. While this quality of humanity is a very valuable trait in athletic training, divergers must be encouraged to make and stick to decisions. In a profession in which split-second decisions can be life saving, divergent students, who tend to have trouble making decisions and recognizing problems and opportunities, must be prepared to act quickly and confidently both on and off the field. Fortunately, divergers are excellent at using their imaginations. Presenting them with scenarios and allowing them to think about potential decision-making situations ahead of time may maximize this strength.

Exercises modeled after the written simulation portion of the NATA Board of Certification certification examination could improve on the weaknesses of divergers by using their inherent strengths.

Convergers rely primarily on the abilities of abstract conceptualization and active experimentation. Their greatest strengths lie in problem solving, decision making, and practical application of ideas. Convergers are less inclined to deal with people and are better at tackling tasks and technical issues.

Assimilators rely on the abilities of abstract conceptualization and reflective observation. They stress logic over practicality and are less focused on people and more concerned with ideas and abstract concepts. Assimilators are more likely to be interested in areas of athletic training such as investigating patterns and mechanisms of injury and devising solutions to deal with those injuries. They should be encouraged to learn from previous experiences and focus their ideas and energy on the task at hand.

The Kolb LSI results of our study revealed a widely spread distribution of learning styles in athletic training students. In previous publications, accommodators and divergers have been associated with those in people-oriented professions. Cavanagh et al found that most of 192 nursing students had a predominantly concrete learning style. Concrete learners tend to fall within the classification of accommodator or diverger. Hendricson et al examined 48 dental students using the Gregorc Learning Style Delineator and reported a preference for the concrete sequential dimension. Although a different learning-style instrument was used, the concrete preference was revealed.

Based on previous research, we hypothesized that a significantly greater percentage of athletic training students would be classified as accommodators and divergers on the Kolb LSI. However, analysis revealed that the learning style types were relatively evenly distributed among accommodators (29.3%), assimilators (29.3%), convergers (21.8%), and divergers (19.7%). Brower et al also reported on the diversity of learning style among 40 athletic training students. Students were mostly assimilators (37.5%), followed by convergers (27.5%), divergers (20%), and accommodators (15%). Coker examined the learning styles of athletic training students in the classroom and in the clinical setting and found that the students’ learning
styles shifted depending on the learning environment. Therefore, it is important for educators to address these differences in learning style to maximize the educational experience.

Interestingly, it is believed that one's learning style translates closely into teaching style. Harrelson et al. administered the Kolb LSI, revised in 1985, at the 1999 NATA Professional Educators' Conference and found that 16% were accommodators, 8% divergers, 39% convergers, and 37% assimilators. Collectively, 76% of the educators were convergers or assimilators, and thus, more abstract learners. It is important not only for teachers to be aware of the diversity of their students but to also be in touch with their own learning styles. This enables them to incorporate teaching methods that are appropriate for all types of students, regardless of the type of learner.

The results of the Kolb LSI are very important to the education of undergraduate athletic training students. These results represent the unique diversity that exists among athletic training students. Because of this diversity, we believe it is unacceptable for educators to expect to reach all students if they adopt only one teaching style. Rather, athletic training educators must use a variety of instructional methods in the classroom and the clinical setting. Although guidelines can be given for teaching students in each learning-style type, Kolb encourages the teacher to guide students through all 4 of these learning styles in order to produce a more balanced learner. The 4 classifications of learning style represent an ongoing cycle of learning that is continually repeated throughout life. Because learning is a cycle, the 4 stages occur time after time. The effective learner uses each stage and shifts from becoming involved (CE), to listening (RO), to creating an idea (AC), to making a decision (AE).

Teaching methods have been recommended to reach students of each learning style. Kolb found that concrete learners (accommodators and divergers) tend to use kinesthetic experience as a common mode of learning and preferred learning that included experiential components. Laschinger and Boss extended this finding by advocating the use of discussion, role playing, and simulation in addition to traditional teaching methods. Athletic training educators can effectively influence concrete students by keeping those students' individual strengths in mind in both the classroom and the clinic. Using a variety of teaching methods is recommended, so that each type of learning style is taken into consideration. It is also important to expose students to teaching methods suitable for all of the learning styles to allow them to further develop those areas of learning in which they are not as strong. The more qualities of each learning style a student is able to embody, the more he or she will gain from the entire educational experience. For example, students demonstrating abstract learning-style types may become more people oriented by embracing the example set by their peers and teachers who demonstrate the qualities of concrete learners. The educator and student must understand that each of the 4 stages of the learning cycle must be experienced in order to become a balanced and effective learner. This requires students to become flexible learners and to strengthen the learning skills that are weak.

The PEPS analyzes the conditions under which a student is most likely to learn. In our study, the PEPS findings represented great diversity among students and indicated that all students' needs must be considered. Only one subscale, learning in the afternoon, had a mean score indicating a clear preference: 62% of the students in this study had a strong preference for learning in the afternoon. It is important to note that in most athletic training curriculums, classroom instruction is traditionally provided in the morning, while the afternoons are reserved for field experience. Keeping this in mind, it is critical to take advantage of those "teachable moments" that occur in the training room. It is during the afternoons that students are receptive to new information and practicing the skills they are taught in the classroom. Harrelson et al. also reported that male athletic training students displayed a preference for afternoon learning.

The students studied by Harrelson et al. also indicated a preference for structured learning experiences and the presence of authority figures; however, this information is inconsistent with our findings and with Draper's results. Draper administered the Babich and Randol LSI to 165 athletic training students sitting for the 1988 NATA certification examination and identified 63% as independent learners. Most athletic trainers preferred written to oral examinations, learned best kinesthetically, and studied for examinations primarily in the reading mode.

In our study, the PEPS did not reveal a kinesthetic and tactile preference among athletic training students. After administering the PEPS to athletic training students, Harrelson et al. also reported that students did not have a kinesthetic or tactile preference. These results conflict with the idea that students in the medical and allied health fields prefer hands-on learning. Harrelson et al. explained that the PEPS may contain a more stringent definition of kinesthetic and tactile activities, which could explain the discrepancy.

Shaver examined the learning styles of 617 freshman and sophomore radiography students using the PEPS. She found that the students demonstrated preferences for structured-learning activities with authority figures present and for learning with peers in the morning and afternoon hours. Overall, kinesthetic learning was preferred by only 8% and tactile learning by 28%. Research examining environmental preferences of students in the health care fields using the PEPS is extremely limited and, therefore, a comparison between athletic training students and those in the allied health care fields is difficult.

Our secondary purpose was to examine the learning-style types (as defined by the LSI) across 5 geographic regions. We felt that learning-style differences across the various regions could reflect the diverse teaching strategies across the country. However, our findings suggest that there were no geographic differences in learning style. Great diversity is apparent among athletic training students, regardless of the region in which they were educated. These results must be cautiously interpreted because of the low number of subjects in certain regions.

A limitation of this study is the use of the Kolb LSI, revised in 1985, which was distributed to the athletic training students. Researchers offered cautions about the use of this survey because a response bias that results from the consistent order of sentence endings may have inflated estimates of reliability and construct validity. Additional revisions have eliminated the response bias, and test-retest reliabilities were very high compared with the previous versions.

CONCLUSIONS

Athletic training students are diverse. No predominant learning-style type appears to characterize the typical athletic
training student. Therefore, it is important for educators to address the needs of all students in both the classroom and the clinical setting. In addition, educators must provide an environment that stimulates and enhances a student’s ability to learn. As athletic training programs continue to shift to accredited curriculums, educators must continually re-evaluate the effectiveness of their teaching strategies. We must establish a balance of in-class instruction and hands-on experience.

REFERENCES

Critical-Thinking Predisposition Among Undergraduate Athletic Training Students

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Objective: To investigate the tendency of undergraduate athletic training students to think critically, to assess their likelihood of using specific components of critical thinking, and to study the effect of selected demographic and educational variables on critical-thinking tendencies in this sample of students.

Design and Setting: Data were collected before regularly scheduled athletic training classes at the beginning of the spring semester.

Subjects: Ninety-one students enrolled in 3 Commission on Accreditation of Allied Health Education Programs-accredited undergraduate athletic training education programs in the southeast. The subjects ranged in age from 19 to 29 years (mean age = 22.33 ± 1.94). Forty-six (50.5%) of the subjects were men and 45 (49.5%) were women.

Measurements: The California Critical Thinking Disposition Inventory contains 75 Likert-type items assessing 7 components of critical thinking: truth seeking, open mindedness, analyticity, systematicity, inquisitiveness, cognitive maturity, and critical-thinking self-confidence.

Results: The overall mean indicated a general but mild trend toward critical thinking, with weak scores on the truth-seeking subscale. One-way analysis of variance reflected significant differences among the schools for truth seeking, open-mindedness, and maturity subscales and for the overall mean score for the entire inventory. Only the open-mindedness difference persisted between 2 of the schools after post hoc testing. Correlation analyses indicated no significant relationship between total score and age, sex, ethnicity, year in athletic training program, cumulative grade point average, completed semester hours, or clinical-experience hours.

Conclusions: Athletic training students are inclined toward critical thinking, but this tendency is relatively weak. Classroom and clinical instructors should use teaching methods and techniques that facilitate the components of critical thinking. The promotion of critical thinking and critical-thinking skills has implications for athletic training education and the advancement of certified athletic trainers and the profession of athletic training.

Key Words: California Critical Thinking Disposition Inventory, metacognition, education

The concept of critical thinking has been a concern related to the development of society since the time of the Greek philosophers thousands of years ago. John Dewey brought critical thinking to the attention of educators in 1916, and it has been a focal point in higher education for the past 2 decades. The National Education Goals Panel advocated critical thinking and effective communication and problem-solving abilities as indicators of success in higher education, and the United States Congress included significant improvement in the critical-thinking skills of all college graduates in the Goals 2000: National Goals for Education Act. Critical thinking was also delineated as an outcome measure for the accreditation of baccalaureate and graduate degree programs in nursing. Understandably, this inclusion resulted in multiple studies of critical thinking in baccalaureate and certificate programs in nursing. Critical thinking has also been investigated in athletic training, dentistry, medicine, pharmacy, and respiratory therapy.

Several factors have confounded the recent attention to critical thinking. Chief among these has been the lack of a consistent operational definition of critical thinking. Critical thinking has been defined as reflective and reasonable thinking that is focused on deciding what to believe or do; thinking about your thinking while you are thinking in order to make your thinking better; and the process of purposeful, self-regulatory judgment that gives reasoned consideration to evidence, contexts, conceptualization, methods, and criteria. Based on its consensus definition of critical thinking, the American Philosophical Association characterized the ideal critical thinker as being habitually inquisitive, well-informed, truthful of reason, open minded, flexible, fair minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results that are as precise as the subject and the circumstances of inquiry permit.

This definition implies the presence of a "critical spirit" that disposes one to critical thinking. Facione et al described the disposition to critical thinking as the consistent internal...
motivation to employ one’s own critical-thinking abilities in judging what to believe or do in any situation. Simply put, if there is no disposition toward critical thinking, then critical thinking will not take place, regardless of the presence or absence of the necessary skills.

Additionally, preliminary research has not demonstrated a relationship between critical-thinking ability and professional competence. This paradox lies in the fact that critical thinking is nonlinear and not synonymous with logical thinking. Many professionals associate critical-thinking ability with the ability to problem solve and arrive at a sound and rational judgment. Purposeful evaluation is crucial in medical and allied medical professions: practitioners must be able to analyze multiple pieces of information and render sound decisions regarding clinical care on a consistent and repetitive basis. However, a clinician can follow a prescribed template, conduct an efficient and orderly evaluation, and arrive at a workable solution without ever thinking critically. This clinician is competent, but the barrier that keeps him or her from success and expert status is the key critical-thinking component of reflection. The truly outstanding clinician follows the same template, analyzes the same pieces of information, and then compares the data with previous experience before forming a decision. This clinician has the ability to generate alternative theories or solutions to solve a particular problem, which distinguishes him or her from a merely competent peer.

While critical thinking has direct implications for the quality of patient care, it also influences individual growth and professional-development decision processes. Athletic training is characterized by the need for flexibility, creativity, and the capacity to “think on the go.” These qualities are even more important in the current health care and economic climates, when the ability to create novel solutions, readily adapt to new situations, and integrate multiple tasks is paramount. Certified athletic trainers (ATCs) who are competent and disposed toward critical thinking will thrive and advance in today’s uncertain workplace environments. By promoting the disposition toward critical thinking and teaching critical-thinking skills, athletic training educators will help prepare ATCs who are optimally positioned for career success.

The purposes of our study were to use the California Critical Thinking Disposition Inventory (CCDTI) to investigate the tendency of undergraduate athletic training students to think critically and to assess their likelihood of using specific components of critical thinking. We also studied the effect of selected demographic and educational variables on critical-thinking tendencies.

METHODS

The California Critical Thinking Disposition Inventory

The CCTDI is composed of 75 Likert-type items scored on a 6-point scale anchored by “agree strongly” and “disagree strongly.” The items measure 7 aspects of critical thinking: truth seeking, open mindedness, analyticity, systematicity, inquisitiveness, cognitive maturity, and critical-thinking self-confidence (Table 1). A subscale score of 30 or less indicates consistent opposition to the characteristic or attribute represented by that subscale, while scores between 40 and 50 suggest progressive strength. Within this range, scores closer to 40 reflect some ambivalence, while scores closer to 50 indicate affirmation of the corresponding trait. A subscale score over 50 reflects a strong tendency toward that dimension. The possible overall score ranges from 70 to 242, with a total score of 280 to 349 indicating a general disposition for critical thinking. Reliability of the overall instrument (Cronbach α = .92) and the subscales (Cronbach α = .60 to .78) was established in an administration of the CCTDI to 1019 college freshmen. The internal consistency for our total sample was .72. For psychological tests, a Cronbach alpha level greater than .60 indicates an acceptable level of reliability.

Subjects

Ninety-one students (mean age = 22.33 ± 1.94 years) enrolled in 3 Commission on Accreditation of Allied Health Education Programs (CAAHEP)-accredited undergraduate athletic training education programs in the southeast served as subjects. All of the schools were public; 2 were comprehensive universities, and 1 was a regional university. Forty-six (50.5%) of the subjects were men and 45 (49.5%) were women. Eighty percent (n = 73) of the subjects were white, 14.3% (n = 13) were black, and the remaining 5.5% (n = 5) identified themselves as American Indian, Asian/Pacific Islander, Hispanic, or other. The subjects completed an information sheet that included items on total credit hours, grade point average, and other relevant variables (Table 2).

| Table 1. California Critical Thinking Disposition Inventory Subscale Descriptions |
|-----------------|-----------------|
| **Subscale**    | **Description**  |
| Truth seeking   | Targets honesty and objectivity with findings, even if the findings do not support one’s self-interests or preconceived opinions |
| Open mindedness | Addresses being tolerant of divergent views with sensitivity to the possibility of one’s own bias |
| Analyticity     | Targets prizing the use of reason and evidence to resolve problems |
| Systematicity   | Measures the tendency toward use of an organized, orderly, focused, and diligent process in the inquiry stage |
| Inquisitiveness | Measures one’s intellectual curiosity and desire for learning, even when the application of the knowledge is not readily apparent |
| Cognitive maturity | Targets the disposition to be judicious (prudent) in one’s decision making |
| Critical thinking/self-confidence | Measures the trust one places in one’s own reasoning processes |

| Table 2. Subject Demographic Information* |
|-----------------|----------|
|                 | Range    | Mean | SD     |
| Year in ATEP    | 1–4      | 1.93 | .94    |
| Cumulative GPA  | 2.12–3.95| 3.22 | .35    |
| Completed semester hours | 25–160 | 91.08 | 26.16 |
| Clinical-experience hours | 212–1779 | 771.18 | 450.96 |

*SD indicates standard deviation; ATEP, athletic training education program; and GPA, grade point average.
Correlation analyses indicated no significant relationship between the demographic variables and the total score.

DISCUSSION

Components of Critical-Thinking Disposition

We were disappointed but not surprised that our sample had weak truth-seeking scores. This finding is consistent with other studies of nursing,10,14,15 general college,32,35 and community college students36 using the CCTDI. Like most allied medical and medical professions, competencies and facts drive the educational process for athletic training. Students are then tested on these facts and, thus, are often primarily concerned with knowing the right answer. Knowing why the answer is correct and knowing equally correct alternative responses are not often considered. This type of atmosphere can stifle the desire for the best knowledge that is characteristic of truth seeking, as the student often becomes a passive learner who is not encouraged to exchange ideas or pursue parallel lines of discussion.10

Our subjects’ other subscale scores and total scores were similar to those of a sample of 100 senior nursing students studied by Colucciello10 but much higher than those reported by Ip et al.,14 who administered the CCTDI to 125 Chinese nursing undergraduates. This disparity most likely lies in the educational atmosphere in China, where the educational system is authoritarian and learners are expected to conform and passively absorb knowledge.

The literature does not include between-school comparisons using the CCTDI. Our data do not allow us to explain the differences we observed in the open-mindedness scores between the regional university and one of the comprehensive universities. However, we believe that this difference is not specific to the athletic training students or the athletic training education programs at these 2 schools. Rather, we believe that it reflects a difference in the general characteristics of these types of universities and the attributes of the students who attend them. Generally, students at larger universities interact with a more diverse segment of the population and encounter a broader range of opposing ideas. Exposure to such divergent opinions and varied student backgrounds would tend to attract students who are comfortable in such a setting. This comfort is reinforced and expanded by the exposure itself. As a result, students at larger universities would be expected to have higher open-mindedness scores.

Correlation Analyses

Research has suggested that critical-thinking skills do increase significantly after entry into clinical practice,16 but investigations of enrolled students have been somewhat equivocal. Some evidence suggests that critical-thinking skills increase over time5,17 but most studies12,16,18,21 have found no
difference between nursing students at 2 points in their educational programs.

Results from critical-thinking investigations have been similar. Leppa\(^1\) administered the CCTDI to students in the first and fourth quarters of an undergraduate nursing program and found significant increases in total score. Coluccello\(^2\) and Ip et al\(^3\) reported increases in CCTDI scores from the sophomore to junior years of baccalaureate nursing programs, but significant decreases were seen from the junior to senior year\(^4\) and during both years.\(^5\) Differences in study design may account for these incongruent findings. Leppa\(^5\) conducted test-retest investigations on the same students at 2 points in their educational program, while the other research\(^6\) was cross-sectional in nature. Our finding of no correlation between year in program or total credit hours and subscale and total score is supported by Facione et al\(^7\), who suggested that increases in subscale scores and total score are possible but that overall disposition toward critical thinking appears to be stable over a period of years.

The lack of a relationship between sex, age, and race and critical-thinking disposition is consistent with the literature. Facione et al\(^8\) found no difference in total dispositional score between the sexes in their study of general college students, while Ip et al\(^9\) found no relationship between nursing students' mean total score or subscale scores and sex or work experience. These findings all further reinforce the concept that critical-thinking disposition is a trait that does not depend on general personal characteristics.

The reflective component of critical thinking requires the existence of some body of experience to consider and reflect upon in the decision-making process. This concept is supported by Goodfellow,\(^10\) who reported that years of clinical experience were associated with self-perceived increases in critical-thinking ability among practicing respiratory therapists. Therefore, initially, we were somewhat surprised that there was no correlation between critical-thinking disposition and clinical-experience hours. Aside from the obvious differences in types of measurement and samples between our study and Goodfellow's\(^10\) work, we speculate that our findings are also explained by the concept of quality versus quantity. The accumulation of a large number of clinical hours does not guarantee the accumulation of valuable experience, clinical competence, or the use of critical thinking during that time. Indeed, this disparity may be one driving force behind the transition to competency-based education in the allied medical and medical professions.

Previous research using the CCTDI in nursing students\(^11\) has indicated significant correlations between grade point average (GPA) and mean total score and the mean scores for the open-mindedness, analyticity, systematicity, inquisitiveness, self-confidence, and cognitive maturity subscales. The disparity between our findings and these results could be related to the method used by Ip et al\(^11\) to calculate GPA. Their process was based on an honors grading system and differed from the system used by American universities. Other research\(^7\) involving nursing students has found no relationship between critical-thinking skill and GPA.

**Recommendations for the Educator**

**Promoting Truth Seeking.** Truth seeking incorporates the concept of intellectual courage: the student desires the best knowledge even if such knowledge fails to support or under-mines his or her own beliefs, preconceptions, or self-interests. Facilitating this attribute requires an instructor who is also willing to seek the truth. Truth seeking demands self-examination on the instructor's part and the willingness to discuss instances when he or she was challenged by information that was inconsistent with values or previous knowledge. In these situations, the instructor should also provide information about strategies used to reconcile such inconsistencies. Thinking aloud and talking students through decision-making processes are helpful in this regard. Finally, both classroom and clinical instructors can improve truth seeking by using the Socratic method of teaching with open-ended questioning techniques and case studies or scenarios specifically designed not to fit into the patterns that would be expected based on readings or class discussions. Many of these techniques require planning and take time, so it is unrealistic to view them as the sole teaching method. However, their consistent, varied, and strategic use throughout the curriculum is beneficial.

**Promoting Reflection.** Because reflection distinguishes great practitioners from their peers, classroom and clinical instructors should consistently seek to promote student reflection. Journals and directed writings are 2 traditional methods that can force a student to look back on and analyze actions and clinical decisions. Written simulations are also beneficial in forcing the student to draw on previous experience while dealing with a current situation. Oral or written critiques of relevant research can also be helpful in this regard, particularly if the student is required to provide a clear explanation of his or her positions and statements and to apply this information to previous clinical experiences. A final technique for improving reflection is the use of situational learning, in which the student is allowed to make a mistake without compromising the safety of the patient. When the student sees the mistake and then is guided through possible solutions by the clinical instructor, he or she begins to identify patterns that will enable recognition of similar situations in the future. As the student improves, the clinical instructor provides less guidance to the point when the student self-corrects and avoids the mistake altogether.

The athletic training students in our study were disposed to think critically, but these tendencies were weak overall. While critical-thinking ability is not an absolute requirement for minimal professional competence, it is crucial for true quality practice and for maximal professional development. Critical-thinking disposition also has implications for job satisfaction and security. As a result, athletic training educators must strive to develop the disposition for critical thinking in their students. Doing so requires purposeful planning and teaching on the part of classroom and clinical instructors, but the potential outcomes will benefit the profession as a whole.

Clearly, the disposition to think critically does not imply the ability to think critically. Additional investigations are needed to assess the critical-thinking skills of athletic training students and the relationship between critical-thinking skill and critical-thinking disposition among this population. Changes in these measures during the transition from student to entry-level ATC should also be studied. Finally, professional competence does not imply critical-thinking ability, but there is certainly some relationship between clinical judgment and critical thinking. Further research is needed to define these factors and their relationship in the practicing ATC.
REFERENCES

Designing Instruction That Supports Cognitive Learning Processes

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Objective: To provide an overview of current cognitive learning models, including a summary of research that supports the use of specific instructional methods to foster those processes. We have developed examples in athletic training education to help illustrate these methods where appropriate.

Data Sources: Sources used to compile this information included knowledge base and oral and didactic presentations.

Data Synthesis: Research in educational psychology within the past 15 years has provided many principles for designing instruction that mediates the cognitive processes of learning. These include attention, management of cognitive load, rehearsal in working memory, and retrieval of new knowledge from long-term memory. By organizing instruction in the context of tasks performed by athletic trainers, transfer of learning and learner motivation are enhanced.

Conclusions/Recommendations: Scientific evidence supports instructional methods that can be incorporated into lesson design and improve learning by managing cognitive load in working memory, stimulating encoding into long-term memory, and supporting transfer of learning.

Key Words: transfer of learning, job analysis, cognitive overload, instructional systems design

The goal of instructional programs for professionals such as athletic trainers is to build knowledge and skills that can be transferred to the career field after learning. To achieve this goal, instruction must be designed to maximize human cognitive processes that result in learning and minimize those that disrupt learning. Research in cognitive models of learning and instruction over the past 20 years has revealed a number of relevant techniques and processes to achieve this goal. Many of these instructional innovations are particularly relevant for building problem-solving skills in knowledge workers. In this article, we provide an overview of current cognitive learning processes, including a summary of research that supports the use of specific instructional methods to foster those processes. We have developed examples in athletic training education to help illustrate these methods where appropriate.

The premise behind our discussion is that instruction is a design science. Design sciences such as engineering or information-systems design include professions in which products are developed to meet practical goals. In the case of instructional science, the products are learners who acquire specific skills in efficient and effective ways that improve professional performance. Design-science professionals draw on scientific principles and creative inspiration to develop new products. The research in instructional psychology over the past 15 years provides a good start to a scientific foundation for design of effective instruction.1-3

For the training of business and military workers, instructional-systems design (ISD) processes are applied by teaching knowledge and skills derived from an analysis of job duties most important to organizational success. Training of professionals in business and industry for everything from sales to information technology consumes about $56 billion of resources per year in the United States.4 A systematic approach to instruction helps ensure a return on this investment. Figure 1 illustrates a typical ISD process that defines a learning need, completes an analysis of the job (task analysis), designs the training program around the job analysis, develops instructional materials, and evaluates the learning outcomes for revision.

The academic community has more commonly used content analysis as the basis for organization and development of courses. In the last 25 years, some schools of medicine followed the lead of McMaster by shifting their curriculum from content-oriented courses (eg, anatomy, pathology) to courses that use medical case studies as the basis for instruction.5 This new approach is called problem-based learning. Problem-based learning students have been reported to be more highly motivated, better at problem solving, and better able to apply basic science knowledge to the solution of clinical problems than those in traditional medical education.6 We suggest that, for educating professionals such as athletic trainers, the use of critical job tasks as a basis for lesson design and development has some advantages in supporting transfer of instruction and in maximizing the relevance of the instructional environment, which, in turn, increases the interest and learning of students.6,7

COGNITIVE LEARNING MODELS

Current theories of learning are based on the interaction among 3 memory systems and the processes that move information among them.
Three Memory Systems

The 3 memory systems are the visual and auditory sensory memories, working or short-term memory, and long-term memory. First, data from the eyes and ears are temporarily stored in visual and auditory sensory memory, and then they move into working (short-term) memory. Working memory is a limited-capacity processor that includes separate storage for auditory and visual information. One landmark in the development of cognitive psychology was the classic paper by Miller, who referred to the capacity of working memory as “7 plus or minus 2.” Working memory, while limited in capacity, is the central processor for learning and thinking. For learning to occur, new sensory information from the visual and auditory systems must be integrated in working memory to form a coherent idea. Then these ideas must be rehearsed in working memory in a way that integrates new ideas into existing memories (called schemas) in long-term memory. The integration of new data into existing schemas is called encoding. Long-term memory has a large storage capacity. However, encoding into long-term memory is not sufficient. Because all processing takes place in working memory, the new knowledge and skills encoded into long-term memory must be retrieved into working memory when needed to perform a skill or task. This final stage is the cognitive basis for transfer of learning.

Cognitive Processes Involved in Learning: Overview

Clark described several critical processes that mediate the processes behind transformation of sensory data into retrievable knowledge in long-term memory (Figure 2). They include attention, rehearsal in working memory, retrieval from long-term memory, and metacognitive monitoring. Because working memory has a limited capacity and accepts data from the environment and from long-term memory, attention is the psychological mechanism used to narrow incoming information to accommodate limits of working memory. It is important that student attention be focused on elements in the environment that are relevant to learning and filter out irrelevant elements. Cueing devices, such as arrows or bolding of text in instructional materials, and providing instructional objectives are 2 instructional techniques that support attention.

New sensory data entering working memory from the visual and auditory sensory memories must be integrated first with each other to form coherent ideas, and second, into existing schema in long-term memory. Instructional events that activate relevant prior knowledge in long-term memory and stimulate rehearsal in working memory support these integrations. When new knowledge and skills are needed later on the job, retrieval from long-term memory during learning into working memory is essential to the transfer of learning. Retrieval requires that cues the learner will encounter in the work environment be encoded in new schema at the time of learning. Therefore, a lesson that teaches how to take a blood-pressure measurement must use the blood-pressure equipment during learning so the right cues are available later when the learner needs to take a blood-pressure reading on the job. Finally, metacognition serves as the operating mechanism for learning. Metacognitive skills are responsible for setting learning goals, determining learning strategies, monitoring progress, and making adjustments as needed. Learners with undeveloped metacognitive skills profit from high instructional structure and support in managing and monitoring their learning. For example, frequent skills tests to assess knowledge help these learners spot topics that require additional study.

Construction of Knowledge

Cognitive models of instruction view learning as a process that requires learners to actively construct new knowledge. The role of instruction is to provide an environment that helps the learner leverage the cognitive processes summarized earlier and minimize their disruption. Specifically, instruction should help the learner to

- Focus attention to elements of the environment relevant to learning.
• Minimize cognitive load in order to use the limited resources of working memory most effectively.
• Rehearse new information in working memory so that it is integrated into existing schemas in long-term memory.
• Retrieve new knowledge when needed after the learning, and
• Manage and monitor the metacognitive learning processes.

In this article, we describe and illustrate several specific instructional processes and methods to support these cognitive processes. Space prohibits a comprehensive discussion of all of the instructional methods recently demonstrated to increase learning. For more details, refer to the books by Clark and Mayer.6

TRANSFER FAILURE
As previously summarized, simply encoding new knowledge into existing schemas in long-term memory is not sufficient; it must be encoded in such a way that it can be retrieved later when needed. This retrieval process is the psychological basis for transfer of learning. Transfer failure is potentially one of the most costly gaps in the training of workers and the education process in general. And transfer continues to be a challenging area for research in instructional psychology.9

Inert Knowledge
One cause of transfer failure is inert knowledge. Inert knowledge refers to information that is stored in long-term memory, but because this information lacks the appropriate cues for retrieval, it fails to transfer. For example, a student makes an A in geometry but fails to use the principles of geometry, when appropriate, to learn goniometry. This also is relevant to the principles and concepts learned in physics or biomechanics and applying them to rehabilitation. In these situations, the skills have been encoded into long-term memory, but the retrieval cues that support their transfer have not. One question that researchers have asked is how instruction can improve transfer of fundamental principles and theory to activities of the profession.

Near- and Far-Transfer Tasks
Most professional work includes 2 types of tasks: near and far transfer. A near-transfer task is one that is performed more or less the same way each time by following a series of prescribed steps. These tasks are procedural. Taking a blood-pressure measurement or disinfecting a whirlpool are examples of near-transfer tasks performed by athletic trainers.

In contrast, far-transfer tasks do not have one invariant approach. The practitioner must assess the environment and use judgment to adapt guidelines when performing far-transfer tasks. Some examples in athletic training include designing a rehabilitation program and assessing an injury. Although there is a specified process in assessing an injury, the critical interpretations of signs and symptoms and decisions made in response represent far-transfer tasks. The instructional methods to ensure transfer differ between near- and far-transfer tasks; therefore, distinction between the 2 types of tasks is important.

In order to minimize inert knowledge, the instruction should be organized around the critical tasks—both near and far transfer—the athletic trainer must perform. In that way, the new knowledge and skills will be learned in a context of retrieval in the professional performance environment. This suggests that lessons and activities within a course should be organized around athletic trainers’ tasks so that the critical retrieval cues are present during learning.

Job Analysis and Taxonomies of Instruction
Transfer of learning is more likely when new knowledge and skills are acquired in their context of application. In the case of the athletic training student, the near- and far-transfer tasks provide a context for applying knowledge and skills learned in instruction. To incorporate case studies and examples based on job tasks requires that a job analysis supplement content analysis. One common approach to job analysis begins by defining the major functions of the job and then breaks each function into subfunctions and subfunctions into tasks. Course lessons, examples, and case studies are developed on the basis of these tasks to provide authentic environments for applying new knowledge and skills. For example, in Figure 3, we show a partial job analysis for an athletic trainer.10 In this example, the main job functions for the athletic trainer are formulated from the competency areas delineated in the Athletic Training Educational Competencies.11

As the tasks are defined, they are categorized as near (procedural) or far (principle) transfer. If they are near transfer, the steps are defined. The steps to perform common procedural tasks are typically documented in standard texts for athletic training. In our job analysis for athletic trainers (see Figure 3), the procedures for auscultation of the lungs are listed along with the associated knowledge needed to perform these procedures. For tasks that are far transfer, guidelines (rather than steps) are documented. Unlike steps, guidelines leave room for interpretation and are applied on the job in different ways depending on the situation. For example, when designing and advancing rehabilitation programs, there are guidelines to follow based on variables such as healing time. However, the athletic trainer must use his or her judgment and consider many variables (such as pain, muscle function, swelling, etc) collectively when making a decision about advancing a patient in the rehabilitation progression. This explains the difficulty novices have in applying their cognitive knowledge to the clinical application of rehabilitation after injury.

Cognitive Task Analysis
Guidelines of far-transfer tasks are more difficult to define than steps of near-transfer tasks. In some career fields, such as sales, observations of proficient practitioners engaged in performing far-transfer tasks can reveal the underlying guidelines. However, in other career fields, such as information technology, observations yield little because the critical actions are mental and the most important aspects of the task are invisible. While traditional textbooks refer to processes to perform far-transfer tasks such as injury assessment, in most cases the mental judgments behind activities such as assessing an injury are not explicitly stated. It is only in recent years that the dominance of knowledge work has revealed the gap in many instructional materials that treat most tasks as procedures. In response, cognitive techniques of task analysis have been used to identify the thoughts and decisions that underlie far transfer skills.

One example is a specialized interview technique called Prerequisites, Actions, Responses, Interpretations (PARI) that
is used to define the thoughts experts have while solving a problem. Specifically, the interview seeks to define the prerequisites, actions, responses, and interpretations that experts have in their mind as they solve a problem. Table 1 illustrates part of a PARI interview from an analysis of intensive-care nurses doing patient assessment.

After the guidelines and steps to perform job tasks are defined, the knowledge required to perform the tasks is identified. Typically, this knowledge is of 3 types: facts, concepts, and processes. Thus, the completed job analysis results in defining 5 types of knowledge to be included in instruction (Table 2). This taxonomy adapted from Merrill’s component display theory is effectively used as the basis for the design of instruction for delivery in the classroom or the Internet. As we will see, it serves as a useful taxonomy during the design and development of instructional content because it is based on job analysis, and each type of content has specific instructional methods linked to it.

As an example, in our athletic training job analysis (see Figure 3), most of the content type is facts, except for distinguishing between normal and abnormal breath sounds, which is a concept.

MANAGING COGNITIVE LOAD IN WORKING MEMORY

After new data from the environment enter working memory, they must be processed. Specifically, auditory and visual data must be integrated into a coherent idea. And new ideas must be integrated with preexisting knowledge stored in long-term memory schemas. All of this processing activity requires capacity in working memory. Because working memory is a limited-capacity processor, instructional techniques that reduce cognitive load have been proven to improve learning effectiveness and efficiency. This is especially true of novice learners, who are most susceptible to cognitive overload.

Numerous load-management techniques have been reported in recent literature. We describe several here, including the
Table 1. Cognitive Job Analysis Prerequisites, Actions, Responses, Interpretations (PARI) Interview

| Interviewer: | Which body system would you start with? |
| Expert: | Neurology system. |
| Interviewer: | Why? |
| Expert: | I want to see if the patient is conscious. |
| Interviewer: | What would you do first? |
| Expert: | I would use my flashlight to examine reaction of the pupils. |
| Interviewer: | The pupils both react equally to the light stimulus by contracting. What does the result imply or mean? How do you interpret this? |
| Expert: | There's no brain damage. . . . |

modality principle, the contiguity principle, the chunking of lessons and placement of practice exercises, and the use of worked examples.

**Modality Principle**

Mayer\(^7\) and Clark and Mayer\(^6\) derived a number of principles for the development of lesson materials based on controlled experiments that measured learning from the study of instructional materials (books or multimedia) teaching scientific processes. The modality principle asks the question, "Is learning better when instructional visuals are described with text or with audio narration?" A number of experiments in which multimedia lessons teaching scientific processes, such as how lightning forms or how a brake works, used animation or with audio narration? The materials using audio to describe the words resulted in an 80% median gain in learning, for an effect size of 1.17.\(^7\) Mayer\(^7\) concluded that learning is deeper when the limited capacity of working memory is maximized by coordinated inputs into the visual and auditory subsystems rather than just the visual subsystem, as is the case when text is used to describe visuals.

**The Contiguity Principle**

When designing instruction materials or Web-based instruction in which bandwidth precludes the use of audio, graphics must be explained by text. In these situations, a number of researchers have shown that integrating the text into the graphic is better than separating the text. For example, if demonstrating a geometry problem solution in text, Sweller et al\(^18\) found that an integrated version, in which the problem steps are placed into the geometry illustration, produced better learning than the same steps placed underneath the illustration. Mayer\(^7\) found similar results with placement of text adjacent to or distant from illustrations in multimedia lessons. From comparisons in 5 experiments, Mayer found a median gain in learning of 68%, with an effect size of 1.12 for lessons that integrated text into illustrations. Less mental effort is involved in integration of pictures and text when they are placed physically close to each other on the page or screen. Mayer referred to this as the contiguity principle of instruction.

**Lesson Size and Practice Distribution**

To avoid overload, lesson length or the topic size within lessons should be adjusted based on the background of the audience and the technical difficulty of the material. Novices learning relatively technical content profit from shorter lessons. Additionally, many studies have shown that regularly spaced practice exercises yield better learning than the same amount of practice completed all at once. According to the National Research Council, "the so-called spacing effect—that practice sessions spaced in time are superior to massed practices in terms of long-term retention—is one of the most reliable phenomena in human experimental psychology. The effect is robust and appears to hold for verbal materials of all types as well as for motor skills."\(^19\) For example, consider 2 groups that study the same material and practice for the same length of time (ie, four 20-minute segments). One group spreads its practice over 2 days (morning and afternoon), while the second group practices all at once on the same day. The group with a distributed practice schedule has consistently better long-term retention than the group that practiced only once. This effect is observed only with delayed testing, not on immediate measures of knowledge. Based on cognitive-load theory, it is likely that spaced practice clears the limited capacity of working memory more frequently, freeing it for additional new information.

**Worked Examples**

In courses that teach problem solving, such as mathematics, time is saved and learning is improved when learners study worked examples in lieu of working all the problems themselves.\(^20\) Controlled experiments showed that it is best to intersperse practice problems with worked examples.\(^21\) For example, rather than work out 12 problems themselves, the learners study 2 worked examples and then solve a third themselves, followed by studying 2 more worked examples, and so on. The advantage of worked examples decreases as the learners gain more experience in the domain being trained.\(^22\) Worked examples in athletic training can take the form of case studies in which the solution process is described for the student along with an explanation of the thought process. These worked case studies are followed by several examples in which the student must reach a correct conclusion.

The examples we have summarized represent a number of instructional techniques that improve learning by managing cognitive load. Novice learners in particular need such instructional support to help them use the limited resources of their working memory effectively.
PROMOTING ENCODING INTO LONG-TERM MEMORY

The reason for managing cognitive load is to free limited working-memory capacity for the kind of processing that facilitates encoding into long-term memory. Although some learners are good at spontaneously processing new information, many lack this skill and benefit from processing support in the instruction. One important way to support encoding is to include overt processing opportunities during the instruction in the form of practice exercises, including case studies, group projects, and short-answer exercises. As discussed earlier, it is important to schedule these at frequent intervals and, to maximize transfer, to incorporate as many cues for the work tasks as possible.

Practice for Near- and Far-Transfer Tasks

We distinguish 2 types of tasks performed by athletic trainers: procedural tasks (near transfer) and principle tasks (far transfer). Procedural-task practice is the easiest to plan, although its implementation requires job tools and resources. For example, if teaching novice athletic training students how to take blood-pressure measurements, you would list the procedural steps, provide a demonstration, and have the students follow the procedures using actual tools. Additionally, you would use a similar method to teach the near-transfer steps for auscultation of the lungs in our job-analysis example.

Because there is no one correct way to perform far-transfer tasks, arranging appropriate practice requires greater creativity. Research has shown that to build the robust schemas needed for far-transfer tasks, learners need opportunities to study several problems whose solutions are based on the same principles but whose surface features differ. For example, students can be given case studies that deal with evaluating a conscious athlete with a head injury. In each case, signs and symptoms can be changed to give the students different perspectives that may occur with a given injury. The goal is to help learners build a mental model to apply to the many diverse professional situations they will encounter. Typically, some form of case study or simulation is used. If possible, learners should work in groups and prepare solutions to be presented to the class. The instructor can facilitate discussions of the tradeoffs in the different solutions reported. For instance, if 4 groups of students are given the same case study for rehabilitation after an elbow injury, the 4 different approaches to the treatment plan allow students to see different perspectives. The instructor could use class time to facilitate a discussion around the tradeoffs of each. In more complex instructional environments, simulation using multimedia or simulators allows the learners to try out their solutions and learn from the results.

To illustrate this approach, we describe multimedia instruction developed to help intensive-care nurses assess patients and take appropriate actions. Based on the cognitive task analysis for intensive-care nurses we described earlier, the research team developed a multimedia lesson in which nurses solve a variety of patient cases. Figure 4 illustrates the course interface designed to teach the decision-making processes derived from the job-analysis assessment.

The students are given the case study shown in the center of the screen. They are provided with buttons that allow them to take various actions, such as checking vital signs, performing tests, or administering medications. As they collect patient data, they can select from a menu list of hypotheses. The system records the students’ solution actions, which can be compared with experts’ solution actions at any time. Although this system has yet to be evaluated, with an instructional system designed along similar lines to teach troubleshooting of electric equipment, learners spending 25 hours in instruction
gained the expertise of 4-year practitioners.24 Although this seems like magic, most of this acceleration of expertise is due to time compression of experience through simulations. Twenty-five hours in the tutorial provides the equivalent of 4 years of experience on the job, with the advantage of learning in a structured progression of case exercises. While there are some written simulations available for athletic training students, they are more linear in nature and do not contain the robustness of other simulation products available in medicine or business.

**Practice for Supporting Knowledge**

We previously summarized our version of Merrill’s component display theory.13,14 In addition to the main job tasks that are either procedures or principles, lessons must also teach associated knowledge, including facts, concepts, and processes. Figure 5 illustrates these 5 content types at 2 levels of performance. The “remember” level requires recall of the content. The “use” level requires application of the content. We recommend that instructional exercises be written at the “use” level because the rehearsals prompted by use involve practices similar to those required on the job. Therefore, they build more transferable knowledge in long-term memory. For instance, when learning how to take a blood-pressure measurement, the student can practice either by listing the steps to take a measurement or by actually taking one. Clearly, performing the task yields better learning than describing how to perform it.

To practice concepts at the “use” level, we recommend exercises that promote discrimination of new concepts. Rather than giving a definition of a concept, the learner identifies an instance of one not previously seen. For example, upon hearing tapes of lung sounds, the learner identifies normal lung sounds, or given several photographs of different injuries that all have similar characteristics, the student identifies the requested injury and explains why the photograph is correct. To practice processes, the instruction should include some kind of case or exercise that requires the learner to solve a problem or make a prediction based on that process or a malfunction of that process. For instance, if one is teaching the therapeutic effects of moist heat, the student should be able to explain the normal physiologic processes before the application of the heat to the area and how the normal physiologic processes change as a result of heat being applied and predict what will happen and explain the physiologic rationale if the heat is applied to an acute injury.

Notice on the content-performance matrix (Figure 5) that the cell for “facts” at the use level is blocked out. This is because there are no ways to process facts at the use level; they can only be memorized. Because human memory is poor, we recommend that factual information be placed on a learning aid and used in conjunction with the task that would require it. For example, in auscultation of the lungs, the stethoscope placement could be indicated with a diagram. Over a period of time, the student would no longer need the learning aid as the landmarks become encoded into long-term memory through repetition.

In some cases, however, factual information must be accessed quickly and a working aid is inappropriate. This is often true in safety-critical situations requiring an immediate response. In these situations, drill and practice are needed to automate the skill in long-term memory. We know any skill practiced for hundreds of times becomes “hard wired,” or automated, in long-term memory. Once automated, a skill does not require the resources of working memory. In most cases, automation occurs naturally during job-task repetitions, yet sometimes it must be achieved during instruction because the real world requires a fast and accurate response. In these cases, drill and practice must occur over many hundreds of trials. This is particularly true for low-frequency, high-risk situations the athletic trainer may encounter. Some examples from athletic training include assessment of an unconscious athlete, determining the need for and performing rescue breathing and cardiopulmonary resuscitation, and other emergency situations.

We suggest that instruction for professionals such as athletic trainers should use instructional methods that support human...
learning processes, including attention, management of cognitive load, rehearsal in working memory, and retrieval of new knowledge from long-term memory. Educational psychology research in the past 15 years has provided many principles for designing instruction that mediates these processes. We recommend the use of the instructional taxonomy called the content-performance matrix to define job content as fact, concept, process, procedure, or principle. Our goal was not to provide an exhaustive accounting of the many diverse learning methods associated with cognitive processes or with the content-performance matrix; rather, we provide an overview of these methods and references for those interested in further reading.

REFERENCES

8. Miller GA. The magical number seven, plus or minus two: some limits on our capacity for processing information. Psychol Rev. 1956;63:81–97.
Educational Research

Denise L. Wiksten

“Those who know why will follow those who know how.” I give this quote to my students on the first day of their therapeutic modalities class. As a profession, we have grown tremendously over the last several decades, particularly in the area of clinical research. Our scientific inquiry into the clinical application of athletic training has led to new practice and theory. Thus, it is only natural that our professional quest evolve to include educational research, as has been the case in other disciplines. The medical field, being highly clinical and scientifically based, has forged a path in medical education research. Pedagogy has become quite prolific in its educational research inquiry. As we become better clinicians, so must we strive to better educate our students. The purpose of the manuscripts in this section is to provide insight into potential areas of educational research in athletic training and also show the gaps that require further study.

In the first article, Turocy provides an overview of the types of educational research that have been conducted in our profession, highlighting the gaps in our current level of inquiry. The intent of this article is not to provide an overview of how educational research can be applied to the athletic training profession but rather to “help educators identify areas within athletic training education that require further validation and to provide both educators and clinicians with insight into the current validated educational practices that may be appropriate to incorporate into educational settings or practice.”

The manuscript by Pitney and Parker expands on a previous article regarding the application of qualitative research in athletic training. As educators, we recognize a place for qualitative research in our profession. The qualitative approaches introduced in this manuscript will aid educators in asking the right questions and provide them with direction in setting out on a solid path of inquiry.

Turocy’s article on survey research is also intended to introduce a research technique that will aid investigators in developing a study based on sound design principles. The purpose of survey research is to “[allow] an investigator to get a ‘snapshot’ of what is happening at a given time or situation and then [allow] the investigator to determine how that snapshot influences other behaviors or situations.”

As mentioned by Harrelson in his commentary, we must look outside our profession and learn what other professionals like us are doing to educate their students. Although we should not set out to reinvent the wheel, we do need to ensure that our educational practices constitute a sound, valid approach for athletic training students. Therefore, we must strive to set out on our own journey of inquiry. The educational practices infused into our curricula cannot be accepted without study and question. I encourage you to step outside the box, refer to other disciplines for insight, and commit to testing new theories and educational practices.

Allow me to provide some examples of scholarship in other disciplines that we might consider for our own research agendas:

1. Service-learning research. Service learning is a pedagogic approach that has been incorporated into physical education teaching. It is an educational process in which students learn and develop skills through active participation in organized service experiences that meet community needs.

2. Action research. Action research is designed to provide educators with the opportunities to reflect on and assess their teaching methods. It begins with exploring and testing new ideas, methods, and materials. Researchers then share feedback with fellow educators involved with the program in question, and they make decisions about how the program’s curriculum, instruction, and assessment plans might be improved. Action research has the potential to generate genuine and sustained improvements in educational programs.

I have also listed a few other resources for your reference as you consider stepping outside the box to validate our educational practices in athletic training.

REFERENCES


OTHER SOURCES


Editor’s Note: Denise L. Wiksten, PhD, ATC, is a JAT Associate Editor and Athletic Training Program Director at San Diego State University, San Diego, CA.
Overview of Athletic Training Education Research Publications

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Objective: To provide an overview of the limited amount of peer-reviewed literature on athletic training education that has been published in athletic training journals. Publications that related specifically to the development of evaluation tools or specific addenda to the required athletic training curriculum were not included.

Background: As education reform continues to unfold in athletic training, it is important for all certified athletic trainers to understand the research that undergirds the educational practices in athletic training. Many of the profession's educational practices have been taken from standards and methods developed by the discipline of education, with very little validation for applicability to the discipline of athletic training. A very limited number of comprehensive scientific investigations of the educational standards and practices in athletic training education have been carried out; however, for more research to be conducted, it is essential that the currently available research be reviewed.

Description: The summaries of athletic training educational research in this article include the topics of learning styles, facilitation of learning and professional development, instructional methods, clinical instruction and supervision, predictors of success, administration, continuing education.

Key Words: learning styles, professional development, instructional methods, clinical instruction, clinical supervision, predictors of success, administration, continuing education.

Many of today's professional-education practices have been adapted from standards and practices investigated generally in education, with very little investigation into or validation for applicability to the discipline of athletic training. Although research in athletic training education has evolved and proliferated during the past 15 years, the breadth and depth of that research still is very limited. Several of the studies found in this body of literature have used very limited samples from just a few institutions interested in collecting data on specific topics. The topics of the research range from learning styles and teaching methods to passing the National Athletic Trainers' Association Board of Certification (NATABOC) certification examination and continuing education.

As education reform in athletic training continues to unfold, it is important for all certified athletic trainers to understand the research that undergirds the educational practices in athletic training and to continue the investigation of educational theory as it relates to athletic training education. My intent is to provide an overview of the peer-reviewed literature in athletic training education that has been published in athletic training journals. Publications that related specifically to the development of evaluation tools or specific addenda to the required athletic training curriculum were not included but may be located in 2 national databases: Health and Psychosocial Instruments (HaPI) and the Mental Measurements Yearbook electronic databases.

LEARNING

Learning is the goal of all educational programs, and understanding how athletic training students learn is essential. Athletic training students have been identified in one study as independent learners who learn best from experience and self-involvement. Appropriate supervision allows students to have a sense of autonomy, as students become more accomplished when they have a sense of working or learning alone. Although these students valued others' opinions, their own opinions were most important to them. They also required a variety of stimuli to learn and were able to learn best kinesthetically when they touched and manipulated the learning materials. These students preferred written examinations to oral examinations, with most of their study time devoted to reading. Draper recommended that, based upon these findings, athletic training instruction should incorporate more "hands-on" activities that promote active participation. He also proposed as-
students can be facilitated in many ways. Students making the transition to entry-level professional must develop more advanced learning skills that incorporate critical thinking. Critical thinking integrates a hierarchy of learning behaviors into more abstract and complex learning. When using critical thinking, students are required to recall and comprehend knowledge, then apply that knowledge to specific and concrete situations. Once students understand those applications, they are asked to analyze how situations can be compared and contrasted with other situations, recognizing relationships and organizational principles. The last step in developing critical thinking is to synthesize the learning to other learning. This method of learning requires students to skillfully apply the knowledge and experiences they have acquired in making discriminating judgments and evaluations.

By increasing the expectations for critical thinking, students were able to analyze and synthesize situations and to evaluate criteria to improve the quality of skills. Fuller found that athletic training educators attempted to foster more critical thinking, as demonstrated through the development of learning objectives that stressed critical thinking; however, only 14% of all examination questions required students to use critical thinking. Educators also attempted to promote critical-thinking skills through written course assignments, such as research papers and case studies, with the expectations for critical-thinking skills increasing as students progress through their education.

Portfolio development is one example of the promotion of critical thinking through written works. Portfolios include a collection of materials representing documented evidence of the scope and progress of the students’ learning. As part of portfolio development, students are asked to convert documents into evidence of their learning, articulating the precise thinking about how the documents assisted in learning. They are encouraged to compare recent and earlier documented evidence placed in the portfolio, bridging the gap between theory and practice.

Because critical-thinking skills are the essence of professional practice, this area of educational research is critical to the continued development of athletic training professionals. Future research could include analysis of the effectiveness of current practices and the development and assessment of new methods to improve critical thinking in athletic training students. Many of the other health care professions already have performed these types of investigations, including nursing and occupational therapy. These studies may provide a foundation for similar validation processes in athletic training education.

INSTRUCTIONAL METHODS: TECHNOLOGY

During the 1990s, a number of investigations focused on the use of technology to develop learning. Many athletic training educators were found to be interested in incorporating computer-based instruction into their academic programs, and many programs already used computer-based instruction at the undergraduate level as an adjunct to other forms of instruction. Two unique types of computer-based instruction were examined: computer-assisted instruction, which generally consisted of only text materials, and an interactive athletic training educational curriculum (IATEC) computer program, which incorporated multimedia technology. The IATEC yielded learning effects; however, these effects were not sufficient to validate using the IATEC alone without other instructional methods. The application of learning on
an oral practical examination was similar between traditional and IATEC methods.\textsuperscript{14,17} The application of learning to written examinations was less for the IATEC method as compared with the traditional lecture method of instruction, but IATEC did demonstrate a learning effect on the written examination.\textsuperscript{14}

Investigators in this area noted the great need for further research in this area, including the identification of factors that influence the effectiveness of computer-based instruction and the identification of content areas in which computer-based instruction could be most effective. Fincher and Wright\textsuperscript{12} noted that it may be important to identify the type of students who could benefit most by the use of computer instruction. Other research recommendations included further validating the previous studies by incorporating a broader sample of students, incorporating full teaching units as opposed to single lessons, and determining the ability of students to retain learning gained through IATEC.\textsuperscript{14} Similar peer-reviewed works in the professions of dentistry,\textsuperscript{19} medicine,\textsuperscript{20} and nursing\textsuperscript{21} may assist athletic training educators in identifying other areas within computer-based instruction for investigation.

**CLINICAL INSTRUCTION AND SUPERVISION**

Clinical instruction is one of the foundations of athletic training education, and the role of the clinical instructor (CI) in that education is vital. One study\textsuperscript{22} found that CIs spent approximately 21 hours per week participating in clinical education, and that amount of time was expected to increase with the evolution of educational reform. The CIs solicited enjoyed teaching and valued the opportunity to be involved with the process. They cited a sense of responsibility as their motivation for clinical teaching.\textsuperscript{22} Clinical instructors with more than 6 years of experience found more time for clinical teaching than did those with less experience, and those with teaching certifications felt more confident in their academic preparation for the role than did nonteachers. Experienced teachers also developed more diverse clinical-instruction activities than did those with no teacher preparation; however, the most common clinical-instruction methods used by all CIs included athletic-trainee-dominated methods such as lecture, telling, and presenting styles.\textsuperscript{22}

Effective clinical instruction was also linked to the qualities of the CI. Good CIs modeled the positive characteristics they expected from their students. They were involved with their students, demonstrated good communication skills and a positive attitude, and served as mentors. They were clear and organized when working with students, provided good feedback, and emphasized problem solving in their demonstration of clinical skills. Good CIs consistently worked to improve their own knowledge and skills.\textsuperscript{23} The antithesis of a good CI was one who demonstrated negative characteristics. Negative CI characteristics included treating students with disrespect, providing negative feedback, and being unavailable to students.\textsuperscript{24}

Regardless of the quality of clinical instruction, students are supervised by CIs during clinical-education experiences. Andersen et al\textsuperscript{25} found that students believed they were adequately supervised during clinical education, and they were satisfied with the quality of the supervision they received.\textsuperscript{25} The students and their CIs held the same perceptions of the quality of clinical supervision based upon 6 categories of supervisory skills: providing information and technical support, fulfilling supervisory responsibilities, facilitating interpersonal communication, fostering student autonomy, promoting competence in athletic training domains, and providing a professional role model.\textsuperscript{25} An important product of this work was the development and validation of the Athletic Training Supervisory Skills Inventory (ATTSI),\textsuperscript{25} which could be used by educational programs to evaluate the quality of supervision provided by CIs.

The quality of clinical education and supervision often is influenced by the quality of the clinical-education setting. Weidner and Laurent\textsuperscript{26} identified 12 characteristics of an acceptable clinical-education setting, which include criteria for the environment and the attributes of the CI (Table 1). Future research suggestions in this area of CI effectiveness and supervision include comparing CI criteria with student success (competence),\textsuperscript{23} identifying helpful teaching behaviors and methods for the teaching and evaluation of clinical skills, and identifying how students learn clinical skills. It was suggested that research include analysis of the effects of the environment, administration, and other personal factors on clinical instruction and student learning.\textsuperscript{26} Examples of peer-reviewed publications on clinical instruction and CI effectiveness in the professions of nursing,\textsuperscript{27} physical therapy,\textsuperscript{28} and allied health education\textsuperscript{29} may provide other models for future research in athletic training.

### Table 1. Standards for Acceptable Clinical-Education Settings\textsuperscript{26}

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<tr>
<td>1.</td>
<td>An active and stimulating learning environment is available.</td>
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<td>2.</td>
<td>Students are required to meet specific objectives set by the educational program and the individual student.</td>
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<tr>
<td>3.</td>
<td>A variety of learning experiences is available to the student.</td>
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<td>5.</td>
<td>Clinical-education-setting administration is interested in and supportive of the athletic training education program.</td>
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<tr>
<td>6.</td>
<td>Communication at the setting is effective and positive.</td>
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<tr>
<td>7.</td>
<td>Staffing is adequate.</td>
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<td>8.</td>
<td>One clinical instructor is designated as responsible for coordinating assignments and activities of the students in the clinical setting.</td>
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<tr>
<td>9.</td>
<td>Clinical instructors are selected based on selection criteria.</td>
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<td>10.</td>
<td>Clinical instructors apply basic principles of teaching and learning to their clinical-instruction work.</td>
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<tr>
<td>11.</td>
<td>Clinical instructors are interested and active in professional associations.</td>
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<tr>
<td>12.</td>
<td>Space is adequate for study, conferences, and treatment of the athletes and patients.</td>
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**Success on the National Athletic Trainers’ Association Board of Certification Certification Examination**

Determining the students’ success rate on the NATABOC certification examination is one method to assess the overall learning achieved in an academic program. Students graduating from ATEP programs had a higher first-time passing rate on the examination than did non-ATEP program graduates.\textsuperscript{30,31} These students also outsourced internship students on each performance domain of the written examination\textsuperscript{30,32} and oral practical section of the examination.\textsuperscript{32} Harrelson et al\textsuperscript{33} observed that no single criterion was predictive of overall success on the examination. They, like others, found that overall grade point average (GPA) was most predictive of passing all 3 sections of the examination,\textsuperscript{32,33} and students with higher GPAs scored better on the written section of the examination.\textsuperscript{3,30} A combination of overall GPA, athletic training GPA, academic minor GPA, American College Testing (ACT) com-

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posite scores, and the number of semesters enrolled in the university predicted success on the NATABOC certification examination.33

Other researchers found that certain criteria, once perceived as affecting the quality of learning and, thus, the passing rate on the examination, did not affect the outcomes. Little relationship was found between learning styles3 or the acquisition of clinical-experience hours in excess of 2000 and passing the national examination.3,31 Other perceptions that students who participated in more high-risk sport clinical assignments or had specific sport experiences (such as football) were more likely to pass the NATABOC certification examination were unfounded, as was the effect of past athletic training experiences.31 However, those individuals with past allied health experience were more likely to pass the written portion of the examination than those without past experience. Older students were more likely to pass the practical portion of the examination than younger students.31 Findings from these studies were used to validate the recent revision in the NATABOC requirements from an hour-based model to a competency-based model.

Current research on the ability to predict outcomes on the NATABOC certification examination has been comprehensive, but future research into the effect of the new academic requirements on student examination success will be necessary for the continued growth of the profession. Other outcomes, such as employer satisfaction and correlation of learning to future job requirements, also could be important.

PROGRAM ADMINISTRATION

The task of administering an ATEP is complicated and varies greatly from program to program; however, some commonalities have been identified in the athletic training literature. One common consideration is the selection of students into academic programs in athletic training. Generally, this process involves either a direct admission to the program upon entering as a freshman or a competitive second admissions process. Both processes are designed to predict a student’s potential success based upon specified criteria. Admission criteria must be objective and verifiable as required by the current Commission on Accreditation of Allied Health Education Programs (CAAHEP) standards (section 1C I).34 Most criteria involve an evaluation of GPA or some other type of standardized tests.

For those students admitted directly into the athletic training program as freshmen, Platt et al.35 found that high school GPA was most predictive of college or program GPA. Scores on the Scholastic Aptitude Test (SAT) did not predict student academic success in athletic training programs.35 Kesekula et al.36 reported similar findings in graduate athletic training admissions. Undergraduate GPA was predictive of graduate GPA, accounting for 34% of the variance in scores. Standardized tests (eg, Graduate Record Examinations) were not predictive.30 Future research in this area could include an analysis of program admissions requirements and the ability of those criteria to predict student academic and clinical success.

The selection of students into an academic program often falls to the program director. This administrative portion of the program director’s responsibilities has become much more important in the last 13 years.37,38 In 1987, research/publishing and teaching were found to be the most important responsibilities of undergraduate program directors, with graduate program directors ranking research/publication as the most important responsibility.38 However, in 2001, teaching and administration were recognized as the most important responsibilities of undergraduate program directors, and scholarship was ranked least important.37 It must be noted, however, that the level of importance of responsibilities delineated in these 2 studies continued to be the antithesis of the promotion and tenure guidelines37,38 that require most faculty to excel in both teaching and scholarship. Starkey and Ingersoll39 identified the amount of scholarly productivity as consistent with academic rank and not necessarily affected by educational degree. Program directors included more doctoral-trained faculty with more years of experience as certified athletic trainers and more years working as a program director.37 They had fewer clinical and clinical-instruction responsibilities than in past years and carried more academic responsibilities.37 These new responsibilities made program directors more eligible for elevation in academic rank and, subsequently, more accountable to academic tenure and promotion standards. The future research in this area could include an analysis of the success of program directors in achieving promotion and tenure and the effect of these standards on the evolving group of the certified athletic trainers who are assuming more full-time academic appointments other than as program directors.

CONTINUING EDUCATION

Continuing education is one way for those professionals involved in athletic training education to stay current and continually improve their clinical skills. Several factors were identified as contributing to this need for continuing education. These factors, identified by Cuppett40 (Table 2), address the needs of every certified athletic trainer involved in an ATEP. The continuing-education topics most identified and of interest to certified athletic trainers included organization and administration, rehabilitation, and counseling and guidance.41,42 Other, less traditional topics included time management, legal issues, promotion and marketing, and the provision of care and management of the business associated with the “nontraditional” athlete. Surveys of certified athletic trainers revealed that most desired more breadth and depth in continuing-education presentations.41 These findings have been the basis for several changes in the structure and composition of the national symposia program.

It was suggested that more alternative avenues for continuing education be considered to address the certified athletic trainer’s adult learning needs. These alternatives included such topics as workplace self-directed learning.43 Other adult learning needs included identifying the learning needs, then involving the learners in the setting of learning goals and objectives. It was also suggested that the developed programs implement particular learning strategies that were specifically based upon the goals and objectives established by the group.43 These activities also included more small-group dis-

Table 2. Perceived Needs to Pursue Continuing Education40

| 1. Rapidly changing knowledge in the field of athletic training. |
| 2. Increased diversity in the employment settings of athletic trainers. |
| 3. Restructuring of the professional-preparation requirements for students. |
| 5. Changing health care system. |
Table 3. Continuing-Education Needs by Practice Domain

<table>
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<th>Domain</th>
<th>Continuing-Education Needs</th>
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<tr>
<td>1. Prevention</td>
<td>Identification of physical conditions predisposing athletes to increased risk of injuries or illness (preseason screening, nutrition, normal anatomy and physiology)</td>
</tr>
<tr>
<td>2. Recognition, Evaluation, Immediate Care</td>
<td>Special tests for injured areas, appropriate course of action, and selection/application of emergency equipment</td>
</tr>
<tr>
<td>3. Rehabilitation, Reconditioning (area of highest perceived need)</td>
<td>Construction of rehabilitation programs, identification of injury/illness status, functional testing and measurement, selection of appropriate rehabilitation equipment, techniques, and therapeutic modalities</td>
</tr>
<tr>
<td>4. Health Care Administration (area of least perceived need)</td>
<td>Development of emergency plans, referrals, management of injuries/illnesses, athletic training business (insurance, billing for service, liability)</td>
</tr>
<tr>
<td>5. Professional Development, Responsibility</td>
<td>Professional development, communication skills, research, public relations</td>
</tr>
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</table>

Cuppert recently identified 5 areas, one for each domain of practice, that certified athletic trainers most wanted covered in a continuing education program (Table 3).

CONCLUSIONS

The purpose of this article is to provide certified athletic trainers with an overview of the research in athletic training education that has been published in athletic training journals. It is not intended to be a critical review of all literature in these topic areas. As education reform continues to unfold in athletic training, it is important for all certified athletic trainers to be knowledgeable about the available research, to understand the need to conduct more comprehensive research on these educational standards and practices with broader samples of subjects, and to publish the results in refereed journals. Young investigators should be encouraged to publish the results of master’s theses and doctoral dissertations to further strengthen the science that undergirds the practices of athletic training education. Experienced investigators should be encouraged to begin to examine the new educational standards and criteria to determine the validity of using those standards to educate future athletic training professionals. The future of athletic training education depends upon the future of research in athletic training education.

REFERENCES

30. Starkey C, Henderson J. Performance on the athletic training certification...
Qualitative Research Applications in Athletic Training

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Objective: To explain the ethnographic, phenomenologic, and grounded theory approaches to qualitative research and to describe how these approaches can be applied to contemporary topics related to athletic training education.

Background: Athletic training education has recently experienced an increase in the use of qualitative methods, and various qualitative approaches are viable for answering many questions related to athletic training education. Ethnography focuses on describing a culture or subculture. Phenomenology focuses on the meaning of lived human experience. Grounded theory focuses on developing theory related to social processes. Each approach is contextual and attempts to facilitate insight and understanding related to the human condition.

Description: We provide an in-depth discussion of each of the selected qualitative approaches and explain the focus and unique data-collection and data-analysis strategies and identify the distinctive outcomes of each approach. Each research approach has a distinct purpose, and the specific application is driven by the questions asked. We also identify questions that are amenable to a specific method.

Applications: To better understand the interactive nature of education and learning, athletic training researchers are beginning to ask questions that require information to be gathered about meaning, contexts, culture, and processes. Such questions are best answered through the use of qualitative research methods that most commonly include ethnography, phenomenology, and grounded theory. In order for athletic training professionals to gain the most from the research conducted, it is essential that they have an understanding of the theoretic underpinnings of these methods and when each should be used.

Key Words: qualitative methodology, ethnography, phenomenology, grounded theory

The profession of athletic training has recently witnessed an increased use of qualitative methods to answer research questions pertaining to both educational and professional development issues. Although qualitative research methods generally share similar tenets and strategies, a variety of approaches is available. The ideal approach depends on the specific research questions posed and the purpose of the study.

As research in athletic training is continually expanded to form a considerable knowledge base, we are likely to witness the application of many forms of qualitative inquiry, necessitating that we fully understand the various approaches and research applications. Our purpose, therefore, is twofold. We will first provide an explanation of the 3 most commonly used approaches to qualitative research, specifically ethnography, phenomenology, and grounded theory. Second, we will give practical examples illustrating how a qualitative researcher might select and apply each approach to a specific research issue associated with athletic training. In order to provide readers with the necessary information and context, we have tried to tailor our examples to topics covered in this issue of the journal: clinical decision making and technology.

QUALITATIVE APPROACHES

A great number of qualitative approaches exist, including ethnography, phenomenology, grounded theory, hermeneutics, case studies, biography, ethnology, ethnomet hodology, historical, and phenomenography, just to name a few. Although the approaches may share common principles of qualitative inquiry, each is somewhat unique (Table) with respect to the central purpose of the study, data-collection and data-analysis strategies, and the outcome or end product that is derived.

Ethnography

Ethnography has been identified as both a research product (ie, the written account of a culture) and a research process. Like grounded theory, ethnography corresponds to the theoretic requirements of symbolic interactionism and is based on social anthropology, which traditionally investigated small communities, although contemporary ethnography is applicable to any social research in everyday settings. As a research approach, ethnography focuses on describing and interpreting the beliefs, values, norms, and practices of cultures such as organizations, institutions, and communities. As such, ethnographers are interested in life ways or patterns of behavior within a culture or subculture, and the product of ethnography is a thick, rich description of a cultural setting.

Examples of athletic training-related research questions that suggest an ethnographic approach include, "What are the cultural influences that affect the professional development of certified athletic trainers in the high school setting?" and "What is the athletic trainer's role in an inner-city high school envi...
environment?” Although not a recent account, Field\textsuperscript{11} provided a good example of an ethnographic study in the health professions. Field specifically examined the beliefs and behaviors of nurses by investigating and describing their perspectives and how the work culture influenced them.

Ethnographic data-collection strategies fundamentally involve participant observation and prolonged fieldwork, but the extensive data collection involved in most ethnographies exceeds participant observation alone; ethnographers literally immerse themselves in the day-to-day activities and lives of the participants. Ethnographic data-collection strategies vary a great deal and tend to emerge over the course of a study. That is, a researcher maintains flexibility in the research design in order to employ the necessary variety of data-collection procedures to understand a specific culture. For this reason, ethnographers may traditionally focus on participant observations, then choose to use interviews, conversations, and surveys and collect artifacts such as memos, pictures, videos, etc., to describe a culture. Ethnographers often rely on specific individuals (gatekeepers) to help them gain access to the research site.

While many forms of data analysis are used by ethnographers,\textsuperscript{21} ethnographic data analysis often involves examining transcriptions from interviews, text from field notes, or observational summaries to create domains.\textsuperscript{25} Domains are composed of symbols, which are pieces of information, objects, ideas, or events that have specific meaning to those in a given culture.\textsuperscript{9} Once an ethnographer has identified domains, he or she generates a taxonomy to identify structures in the culture.\textsuperscript{9} However, ethnographers do not limit themselves to this single data-analysis strategy. In fact, ethnographers may also use the grounded theory approach to organize and analyze their qualitative data. In addition, ethnographers commonly use quantitative data to understand various cultures. For example, in order to understand the extent to which a particular cultural group exhibited specific behaviors, an ethnographer would likely organize a matrix or coding sheet to record each time the behavior was witnessed.

**Phenomenology**

Phenomenology is both a philosophy and a qualitative research approach. As a philosophy, phenomenology is based on the initial work of Husserl, which was later extended by Heidegger and Merleau-Ponty.\textsuperscript{12,13} Husserl posited that experience is the basis of knowledge; phenomenology, therefore, has its hallmark in attempting to examine the meaning of human experience\textsuperscript{26} and describing the human life world.\textsuperscript{15} The context of the life world includes not only one’s social and physical surroundings but also one’s emotional, historical, and professional world, where meaning is created.\textsuperscript{13} As a qualitative research approach, phenomenology focuses on human action, experience, life world, and consciousness in order to understand the meaning a particular phenomenon has for that individual or group.\textsuperscript{14}

Examples of athletic training-related research questions that suggest a phenomenologic investigation include, “How do nontraditional students experience clinical education with Approved Clinical Instructors who are substantially younger than themselves?” and “How do athletic training students experience student-centered learning in a clinical setting?” Kosowski\textsuperscript{27} offered an example of a phenomenologic investigation in the health professions. Her work examined how nursing students learn or experience professional nurse caring in the clinical context of nursing education.

Phenomenologic researchers often “bracket” their previous thoughts and experiences about the phenomenon. Bracketing involves thoroughly examining and then suspending one’s beliefs so that a description about the phenomenon is not contaminated with the researcher’s bias.\textsuperscript{28} Put another way, Munhall\textsuperscript{28} stated that the aim of bracketing is to “set aside our own beliefs for a period of time so that we can ‘hear’ and ‘see,’ as undisturbed as possible by our own knowing.” In traditional research reports, bracketing is accomplished in 3 ways. First, the author fully explains the basis for the study. Second, he or she identifies any presumptions about a phenomenon based on his or her previous experiences. Third, assumptions about phenomenology itself are disclosed. Bracketing allows researchers to be open to understand themselves and the participants as 2 distinctive beings and, ultimately, to
Grounded theory procedures were used, and a socialization of their professional role in the NCAA Division I level? A socialization process involves taking the transformed meaning units and synthesizing them to create a consistent statement of the phenomenon's structure. A sense of the whole phenomenon is obtained by reading and rereading transcripts, listening to audio recordings of interviews, and gaining a “sensitivity to the entire transcription from the participant’s interview.” Meaning units are discriminated by examining the transcripts and identifying or specifying statements related to the phenomenon. Meaning units always maintain the exact words of the participants and are then reviewed by the researcher to later transform the language. Transforming the participants' language related to a phenomenon involves reviewing each meaning unit and expressing the meaning of the statement in language that is consistent with the discipline (ie, athletic training). The last step of analysis involves taking the transformed meaning units and synthesizing them to create an exhaustive description of the essence of the phenomenon, taking into account all of the participants' lived experience. Many phenomenologic researchers ask the participants to verify that the description is reasonable, based on their knowledge of, and experience with, the phenomenon. This is often referred to as a member check.

**Grounded Theory**

Grounded theory was originated by Glasser and Strauss in the mid to late 1960s and more recently refined by Strauss and Corbin in the late 1990s. The grounded theory approach makes explicit the purpose of generating theory that is grounded or formed on the data obtained in the study. Like ethnography, grounded theory is based on the theoretic framework of symbolic interactionism, which states that meaning is derived from social interactions. Grounded theory studies are most appropriately used for identifying and explaining social processes and creating theoretic models. Examples of athletic training-related questions that suggest a grounded theory approach include, “By which processes are students socialized into the profession of athletic training?” and “In what way do athletic training students become autonomous learners?” A recent study conducted by Pitney et al provides an example of a grounded theory investigation. One research question asked by these authors was, “What informal and formal processes socialize certified athletic trainers into their professional role in the NCAA Division I level?” Grounded theory procedures were used, and a socialization-process model was developed.

Grounded theory traditionally involves participant inter-views and, to a lesser extent, observations. Interview and observation notes are transcribed and then analyzed using specific procedures, including open, axial, and selective coding. Data are collected until theoretic saturation or redundancy of information is achieved. This means that no new information is obtained or that the researcher is exposed to the same information over and over.

The initial step in data analysis is open coding, which occurs concurrently with data collection. This process involves “opening” the text contained in the transcripts and uncovering concepts such as thoughts, ideas, and meanings. Essentially, a researcher attempts to identify units of textual data that have significance based on the study’s purpose. These units of data are then organized together into like categories and subcategories. Once the open-coding procedures are concluded, axial and selective coding are performed.

Axial coding is described as the process of relating the categories and subcategories in order to create “more precise and complete explanations about the phenomena” being studied. Axial coding attempts to make connections between and among the categories by exploring such things as the conditions that helped to create the category and the context in which the categories are embedded. Selective coding, which was originally called theoretic coding, involves identifying a category of data around which the others are integrated or linked. A central category is one that can explain the phenomenon or issue under investigation and all other categories related to it. Strauss and Corbin suggested that a central category may evolve from an existing category, or the researcher may create “a conceptual idea under which all the other categories can be subsumed.” Ultimately, selective coding is used to generate theory by creating a set of explanatory concepts linked to the stated purpose of the study.

An important point is that data collection and open coding occur simultaneously. That is, data collection and analysis are continuous and ongoing. Once theoretic saturation is obtained and data collection is terminated, then the researcher completes the axial and selective coding.

**QUALITATIVE RESEARCH APPLICATIONS**

Qualitative inquiry is potentially limitless in application to topics and content related to education. In the next section, we identify clinical decision making and technology, 2 topics germane to athletic training, with accompanying explanations of how each topic could be addressed by the qualitative approaches. Included within each topic are examples of purpose statements and descriptions of how qualitative researchers would address the subject differently depending upon their selected approach.

**Clinical Decision Making**

The recent interest in problem-based learning and critical thinking underscores the ability to learn appropriate decision making in a clinical setting as a significant outcome for athletic training education programs. Clinical decision making is a rich topic for qualitative investigation, considering that it can be influenced by specific contexts. The “win at all costs” attitude that permeates many athletic environments, for example, can raise unique questions regarding the cultural influences of making decisions, the decision-making processes in returning
Research Questions

What are the cultural influences of decision making for athletic training students?

What are the norms and values that guide decision making in this particular clinical culture?

How do athletic training students experience and learn clinical decision making?

From a student's perspective, what does it mean to make an effective clinical decision?

In what way do interactions with coaches influence the clinical decision making of athletic training students?

By what process is decision making learned by students in athletic training education programs?

Appropriate Qualitative Approach

Ethnography

Phenomenology

Grounded Theory

Athletes to play, and what the clinical decision means for those involved. Figure 1 lists several questions that a researcher may pose about clinical decision-making and identifies the appropriate method for answering each question.

An ethnographer might state, "The purpose of this ethnographic investigation is to gain insight and understanding about the culture of learning as it relates to developing clinical decision-making skills." Ethnographers negotiate to gain access into a particular athletic training education program setting and spend a great deal of time observing the actions of the athletic training students, clinical instructors, program faculty, physicians, athletes, coaches, and administrators. They pay meticulous attention to the interactions of these individuals as they relate to decision-making processes, and they conduct interviews to further understand the culture. The ethnographer examines inter- and intradepartmental memos, learning modules, written assignments, injury evaluations, and other necessary documents. A great length of time is needed to fully experience the culture and understand the subcultures that influence the development of clinical decision-making skills. The end product is a thorough educational ethnography describing the athletic training education program culture and the learning of decision making among students.

From a phenomenologic perspective, clinical decision making is treated as a phenomenon, and the researcher might state, "The purpose of this phenomenologic investigation is to describe the essence and structure of learning to make clinical decisions as an athletic training student." Athletic training students are first interviewed regarding their past experiences with clinical decision making. A second interview explores their current experiences with making clinical decisions, and a third interview integrates the 2 experiences and develops a thorough explanation of the students' overall experience. At interviews, the researcher attempts to understand the extent to which students make clinical decisions, the factors that influence their decision making, and how they make meaning from these experiences. Students are interviewed several times individually and may also be interviewed collectively to examine shared experiences. The researcher organizes the data into themes that ultimately provide an exhaustive description of how athletic training students learn to make clinical decisions.

A grounded theory researcher might state, "The purpose of this grounded theory investigation is to understand the process by which clinical decision making is learned by athletic training students." Grounded theorists conduct in-depth interviews related to decision-making processes that athletic training students have experienced. Students, clinical instructors, and program faculty are interviewed and observed in action. The researcher collects and analyzes data simultaneously until theoretic saturation is reached, meaning that no new information is forthcoming. Grounded theorists create a process model of learning clinical decision making, resulting in a set of propositions explaining the phenomenon under investigation.

Technology

In many colleges and universities, technology is increasingly being used to promote student learning, reach multiple settings (via distance learning), and assist learning assessment (ie, electronic portfolios). As exemplified in the athletic training education literature, technology is being used for many purposes, including documenting clinical experiences and facilitating or assisting instruction. The use of technology, however, has been called into question due to its potential dehumanizing effects, although the problem may lie with how human beings relate to technology rather than technology itself. Technology is arguably a prime topic for qualitative inquiry, which is most appropriate for investigating humanistic aspects. Figure 2 raises several questions that a researcher...
**Research Questions**  
**Appropriate Qualitative Approach**

- What is a learning culture like when technology is highly utilized by faculty and required to be used by athletic training students?  
  **Ethnography**

- What are the faculty values, beliefs, and attitudes regarding the use of technology in an athletic training education program?  
  **Phenomenology**

- How do athletic training students experience the use of technology in an athletic training curriculum?  
  **Grounded Theory**

- From an athletic training student’s perspective, what does it mean to learn through technology?  

- By what process is technology implemented and utilized in an athletic training education program?  

- In what way and by what processes does the use of technology enhance student learning?  

**Figure 2. Potential research questions related to the topic of technology and the appropriate qualitative method to help answer each question.**

might ask regarding the use of technology in athletic training education.

An ethnographer focuses on understanding the culture of a given student group to learn its beliefs, values, perceptions, and general perspectives about the use of technology. A purpose statement might read, “The purpose of this investigation is to provide a cultural description of an athletic training program that uses many forms of technology to facilitate student learning.” An ethnography that gives a rich description of these perspectives and how culture influences the use of technology and, indeed, how technology influences a given culture, could help educators understand barriers and problems related to implementing technology.

From a phenomenologic approach, a researcher might state, “The purpose of this investigation is to understand how athletic training students experience technology in learning to be competent future practitioners.” Using the previously mentioned procedures, a phenomenologic investigator attempts to describe what technology means to the art of learning and applying content knowledge and skills in the athletic training context. Such a research approach facilitates insight at a humanistic level and entertains alternative perspectives to using technology in education.

Grounded theorists might state, “The purpose of this study is to gain insight and understanding and develop theory related to how technology is implemented and used among athletic training faculty.” Understanding how faculty view, use, and implement technology and how these processes affect students allows for the development of hypotheses for future testing and identifies the interactions between humans and technology.

**IMPLICATIONS FOR ATHLETIC TRAINING**

Qualitative research approaches are viable for answering many questions related to athletic training education and practice. Ethnography focuses on describing and interpreting cultural groups; phenomenology focuses on lived human experience; and grounded theory focuses on developing theory related to social processes. Each approach is contextual and attempts to facilitate insight and understanding related to the human condition. As researchers begin to investigate an increasingly complex athletic training environment, care must be taken to select and apply the appropriate methods. As suggested by Norton, the research method employed is not void of context or free of individual values. A researcher must, therefore, be reflective and understand the philosophic underpinnings and focus of the selected method. This paper offers an extended step toward understanding qualitative research methods for the readership of the *Journal of Athletic Training*, and we encourage continued dialogue regarding the application of qualitative inquiry within the profession of athletic training.

**REFERENCES**


7. Wolcott HF. Qualitative research in higher education. In: Conrad C, Neu-
Survey Research in Athletic Training: The Scientific Method of Development and Implementation

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Objectives:
To provide a scientific method for the development, validation, and correct use of a survey tool.

Background:
Many athletic trainers are becoming involved in research to benefit either their own situations or the larger profession of athletic training. One of the most common methods used to gain this necessary information is a survey, with either a questionnaire or an interview technique. Formal instruction in the development and implementation of surveys is essential to the success of the research. As with other forms of experimental research, it is important to validate and ensure the reliability of the instruments (i.e., questionnaires) used for data collection. It is also important to survey an appropriate sample of the population to ensure the appropriateness of applying the findings to the larger population. Lastly, to ensure adequate return of data, specific techniques are suggested to enhance data collection and the ability to apply the findings to the larger population.

Description:
A review of the procedures used in the development and validation of a survey instrument is provided. Information on survey-item development is provided, including types of questions, formatting, planning for data analysis, and suggestions to ensure better data acquisition and analysis.

Advantages:
By following the suggested procedures in this article, athletic training researchers will be able to better collect and use survey data to enhance the profession of athletic training.

Key Words: evaluation, questionnaire development, validating surveys, research procedures

Survey research using questionnaires or interviews is becoming increasingly visible in athletic training education today. Focused questionnaires and interview methods are 2 of the more common methodologic strategies; the techniques I discuss in this work are specific to questionnaire research. Survey research involves the use of a self-administered questionnaire designed to gather specific data via a self-reporting system. Self-reporting is not a direct method of observation of a respondent’s behavior or actions; however, there is no better method to assess a subject’s psychologically based variables (such as perceptions, fears, motivations, attitudes, or opinions) and specific demographic data. Through the data collected, the investigator attempts to assess the relative incidence, distribution, and interrelations of naturally occurring phenomena, attitudes, or opinions and to establish the incidence and distribution of characteristics or relationships among characteristics. In other words, survey research allows an investigator to get a “snapshot” of what is happening at a given time or situation and then allows the investigator to determine how that snapshot influences other behaviors or situations.

Using questionnaires can be a more advantageous process than interview research for the survey-research process. Questionnaires allow for a standardized set of questions, not biased by interviewer participation, to be answered by subjects on their own time. Questionnaires also allow for anonymity, encouraging more honest and candid responses, and often a higher response rate. A response rate from 60% to 80% of a sample is considered excellent. Finally, this method of research is appealing to many athletic trainers, because the time needed to conduct the research is more under the control of the investigator. Investigators may use the less busy times in their schedules to develop and analyze their data, which decreases the demands on them during the busier periods of their jobs.

The disadvantages of this type of research are the limitations of a self-reporting system, the potential for misunderstandings or misinterpretations of questions or response choices, and gaining adequate access to subjects. However, if attention is paid to ensuring validity and reliability of the instrument, the effect of these disadvantages is lessened.

Survey-Research Plan of Action

Successful survey research must be purposeful, useful, and applicable. There should be a guiding purpose or reason for collecting data; as a method of data collection, surveys are used to collect all types of data, based upon research questions that need to be answered. Too often, surveys are conducted without specific direction, because “they are the easiest way to do research” or to “find out what others are thinking” about a specific topic. The purpose of a research survey is not to “fish” for answers but to assess if a predetermined issue is indeed the issue and whether it influences the outcomes as
hypothesized by the investigator. If done correctly, survey research can be just as fact finding, challenging, and rewarding as experimental-design research. Finally, survey research should be important and useful to not only the individual or group collecting the data but also to a larger group. That is, the results of a specific survey can only be generalized to the population represented by the sample used in the study. For consideration for publication and consuming others' time, the analysis of the data collected should have a wider impact and applicability. Although broadening the subject pool or geographic distribution may increase the likelihood of greater applicability of results, it cannot be assured.

As with all types of research, the development of a survey-research study requires a specific plan of action. This 6-step process begins with the identification of the research question and the applicable subtopics. It involves a sequential process that ensures that the information gathered is useful and usable. Table 1 provides an overview of the plan of action for a survey study. Each area of this plan is discussed in more detail in subsequent sections.

**DEVELOPING THE QUESTION**

When beginning an investigation, it is important to determine the goal or purpose of conducting a survey. Most individuals begin by determining a specific question to answer, then develop the questions or hypotheses that guide the initial question. For example, if an investigator wishes to examine the characteristics of an effective clinical instructor (CI), the investigator may want to examine psychological characteristics, teaching techniques, and personal attributes found in those CIs who are perceived to be effective. To help determine the underlying principles or variables that should be considered when developing a research question, it is essential to examine the published literature.

It is important to determine how others have addressed this question, their perceptions of the need for the question to be answered, and the outcomes of their investigations. It is also important to look at the literature in fields related to athletic training, such as physical therapy, nursing, and teacher education. These professions are older than the profession of athletic training and, as such, have developed and validated survey tools. After examining the literature, the investigator re-examines the research question and clarifies and refines the topic to be examined.

**DEVELOPING THE INSTRUMENT**

One of the more time-consuming parts of survey research involves the creation and validation of the survey instrument or questionnaire. Many steps are involved in the development of a series of items that address the research question or questions. The most efficient way to develop appropriate items is to create a Table of Specifications (ToS). The ToS delineates the main topics of the survey; these topics should be directly related to the research question. Under each topic area, there may be subtopics or subtopics that the ATI wishes to investigate more specifically. In essence, the ToS becomes an outline of the content of the survey. Table 2 demonstrates an excerpt from a typical ToS for a research question that examines the effectiveness of CIs; this example is continued through each section of the article.

The ToS is used as a guide to develop appropriate questions and to determine criterion-related validity and the plan for item analysis. As questions or items are developed, they should be assigned to a topic area in the ToS. Items should fit into one of the categories of the ToS; an item can be reworded to fit more appropriately into a category, or it may be placed aside for use in a future study.

Writing questions depends on the kind of information being sought, question structure, and actual choice of words. Most questions involve assessments of attitudes, beliefs, behaviors, or attributes. Attitude questions indicate direction of the respondents' feelings: whether they are in favor of or oppose an idea, or if something is good or bad. For example, an attitude question might read, "It is important for all clinical instructors to possess good communication skills." Belief questions assess what a person thinks is true or false, and may be used to determine knowledge of a specific fact. For example, a belief question might read, "To be a clinical instructor in athletic training, I must be an Approved Clinical Instructor as recognized by the National Athletic Trainers' Association and the Commission on Accreditation of Allied Health Education Programs."

Behavior questions are designed to elicit respondents' beliefs about their behaviors. Because there is no direct observation of the respondent, there is no way to ensure that the
respondent is truly telling the ATI what he or she really does. Belief questions tell the ATI what respondents believe they do; this is a weakness of the self-reporting system. One way to cross-check the authenticity of a respondent's belief is to ask someone else to evaluate how the respondent responds to the situation or to use interview techniques. For example, if a CI is asked to evaluate how often he elicits questions from his athletic training student, he may indicate several times throughout a day. The athletic training student then could be asked how often his CI elicits questions from him. This type of questioning may confirm that the respondent's beliefs are consistent with his student's beliefs about his or her behavior. Consistency of response is evaluated during the analysis phase of the study.

The fourth type of question that can be used in a survey is an attribute question that provides primarily demographic data. Most surveys involve some collection of demographic information, so that the investigator can use these variables later to analyze the data based upon specific demographic considerations. For example, by acquiring information as to sex of a CI and years of clinical experience as a CI, the investigator may be able to determine later if sex or years of clinical experience or both influenced the outcome of CI effectiveness. Investigators should be cautioned to have a designated purpose or need to collect specific demographic information and to collect only that data germane to the research question. Collection of personally sensitive data, such as annual income or political affiliation, should only be included if it is important to the overall purpose of the study.

Survey questions can be written in many ways, and each method requires different considerations for item analysis, or how the data will be used to determine the results of a specific question. Close attention should be paid to how the data will be analyzed upon the completion of the study, as different statistical techniques require different formats of data (eg, ordinal, nominal). For example, age can be assessed as an exact number or as part of a range of numbers. The ATI must determine in advance if it is important to analyze the results of the survey based upon a specific age or if age ranges will be sufficient.

When writing survey questions, open-ended versus closed-ended questions provide unique challenges for the ATI. Open-ended questions may allow respondents to answer completely, creating personalized answers using their own words and without investigator bias or limits; for example, “Please describe the attributes of an effective clinical instructor.” This method is very appropriate for qualitative studies but may create more concerns if the analysis is quantitative. Open-ended questions may be difficult to code and analyze because respondents may answer in many different ways. The ATI may be unable to interpret the open-ended response without clarification from the respondent. One method for using the open-ended question technique is to delimit the response. For example, the ATI might ask the respondents for their opinions on the best method to tape an ankle for a recent injury (2 weeks old) to the calcaneofibular ligament, rather than asking for the best method to tape an ankle.

Closed-ended questions are one of the more common types used in athletic training literature. Closed-ended questions require the subject to select a response from a list of predetermined items developed by the investigator. These types of questions are typical of standardized multiple-choice tests; they allow for consistency in response and may be coded more easily. Potential responses may be presented in either random or purposeful order. The disadvantage to this style of question development is that it may limit the expression of respondents’ opinions in “their own ways,” thus potentially biasing the data. The items developed should be exhaustive in nature, providing the respondent with all possible responses, and they should be mutually exclusive. With mutually exclusive items, each choice should clearly represent a unique option. An example of a poorly worded item would be, “I feel that I am prepared academically and clinically for my role as a clinical instructor.” This example is asking for feedback on 2 separate concepts: academic and clinical preparation. It would be preferable to separate the concepts into 2 different questions: “I feel that I am prepared academically for my role as a clinical instructor,” and “I feel prepared clinically for my role as a clinical instructor.” Table 3 provides additional considerations for developing both open-ended and closed-ended questions.

The other common data-collection method is the scale. The scale is an ordered system that provides an overall rating representing the intensity felt by a respondent to a particular attitude, value, or characteristic. Scales allow the ATI to distinguish among respondents. While several types of scales are used in questionnaires, the 2 most common in athletic training literature are the Likert and Guttman scales. Likert scales are summative scales that are used most often to assess attitudes or values. A series of statements expressing a viewpoint is listed, and the respondents are asked to select a ranked response that reflects the level with which they agree or disagree with the statement. Potential responses are presented in rank order. A large number of items or statements, usually 10 to 20 items, is required when using a Likert scale. An equal number of the items should reflect favorable and unfavorable attitudes to truly discriminate the respondents’ opinions. Responses generally are provided in 5 categories (strongly agree, agree, neutral, disagree, and strongly disagree), but some support exists for the use of an even number of categories to require respondents to take a definitive position (either positive or negative) on the response. In other words, if 3 responses are positive and 3 are negative, respondents are forced to make a directional decision.

Guttman scales are cumulative scales that present a set of statements reflecting increasing intensities of the characteristics being measured. This technique is designed to ensure that only one dimension exists within a set of responses; only one unique combination of responses can achieve a desired score. In this cumulative scale, if respondents agree with one item, they also should agree with designated other items. For example, if a respondent believes that an effective CI communicates well with coaches, he or she also would select responses that indicate that the CI has open communication with colleagues and students. Success using Guttman scales relies on having a large number of respondents to assess patterns accurately.

VALIDATING THE INSTRUMENT

To ensure the accuracy of the data collected and the conclusions derived from the findings, it is essential to validate the survey; a valid test is also reliable. Validation of an instrument ensures that the instrument is measuring what it is intended to measure and allows the investigator to make decisions that answer the research question(s) based upon a specific population. When conducting survey research, it is important to determine the validity of the instrument via 4 assessments: face validity, content validity, construct validity, and criterion-related validity (Table 4).
Table 3. Developing the Questionnaire and Related Materials²,4,5

<table>
<thead>
<tr>
<th>General</th>
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<tbody>
<tr>
<td>1. Ensure that materials are attractive and professional, including layout, quality of paper, and overall appearance.</td>
</tr>
<tr>
<td>2. Most surveys include 3 parts: cover letter that includes acknowledgment of consent; questionnaire; and self-addressed, stamped envelope to ensure return.</td>
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<tr>
<td>3. Surveys should have a cover that includes the study title, attractive graphic design, necessary general directions, and the name and address of the sponsoring agency.</td>
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<table>
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<tr>
<th>Cover Letter</th>
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<tr>
<td>1. Provide respondents with an overview of the purpose of your questionnaire in such a way that it will not bias their responses. In this overview, include sponsorship, method of respondent selection, anonymity, informed consent, length of time needed to complete the survey, and incentive for their cooperation.</td>
</tr>
<tr>
<td>2. Provide appropriate definitions or terms that must be universally understood to complete the questionnaire. Operational definitions can be developed if there are several ways to interpret a specific term.</td>
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<tr>
<td>3. Describe the importance of study and participation in the study. Students are more likely to respond if they are informed as to how the results will affect them.</td>
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<tr>
<td>4. Provide very clear and concise directions as to how to complete and return the questionnaire. Always include, in prominent type, when and how the survey must be returned.</td>
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<table>
<thead>
<tr>
<th>Questionnaire (general)</th>
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<tbody>
<tr>
<td>1. Ensure that the length and difficulty of the questionnaire is realistic for the audience solicited. Inform respondents of the time needed to complete the form.</td>
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<tr>
<td>2. Ensure that all questions are of the same format (eg, all closed-ended questions with check off) or consist of no more than 2 format styles (eg, check off and write in information).</td>
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<tr>
<td>3. Attempt to put all responses in the same place on the form for ease of coding. For example, all responses are under each question on the left hand side of the page.</td>
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<tr>
<td>4. Place completion and return information at the bottom of each sheet of the questionnaire.</td>
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<tr>
<td>5. Provide directions in a clear and concise manner at the top of the first page and repeat on subsequent pages if needed.</td>
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<th>Question Wording</th>
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<tr>
<td>1. State all questions precisely but not so specifically that they require research to respond.</td>
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<tr>
<td>2. Ensure that each item asks only one question. A question should not be embedded within a question.</td>
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<tr>
<td>3. Keep questions language neutral so as to not present the respondent with a perceived bias.</td>
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<tr>
<td>4. Avoid universal words such as all, always, non, or never, and jargon, slang, or words with double meanings.</td>
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<tr>
<td>5. Avoid questions with double negatives or hypothetical situations.</td>
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<tr>
<td>6. Ask short questions in a consistent way using simple words.</td>
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<tr>
<td>7. Avoid responses that condense data to ranges rather than asking for specific information.</td>
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<tr>
<td>8. Do not underestimate the knowledge or intelligence of respondents.</td>
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<table>
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<tr>
<th>Question Sequence</th>
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<tr>
<td>1. Ensure that later responses are not biased by earlier questions.</td>
</tr>
<tr>
<td>2. Ensure that questions are listed in a logical, efficient sequencing. Group similar content questions together unless this will bias the response.</td>
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<tr>
<td>3. Ensure that major issues are covered thoroughly, while minor issues are not overemphasized.</td>
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Face Validity

Face validity is the evaluation by both experts and sample participants to determine whether they believe that the instrument measures what it is intended to measure.³ Face validation is subjective and the weakest of the assessment methods scientifically; however, it is essential in the development of a valid survey tool. Face validity helps to ensure that the instrument will be acceptable to "those who administer it, those who are tested by it, or those who will use the results."²,4 One way to determine the face validity of an instrument designed to assess the impressions of a specific group is to gather a small sample of that group and have them review the questionnaire. For example, if the effectiveness of CIs was being assessed, CIs and possibly their students would be solicited for their opinions. Individuals selected for this task may be part of a local group of students or CIs (convenient sampling) or may be randomly solicited from all CIs and athletic training students from across the county, district, or region (stratified random sampling).

This small sample would be asked to complete the questionnaire, noting confusing items or concerns as they proceed through the instrument. Upon their completion of the survey, the ATI would record the amount of time it took to complete the questionnaire for future use as part of the introduction section of the instrument. Then the ATI would solicit information regarding issues and concerns noted while completing the survey. These issues need to be addressed and corrected before the instrument is used to collect data for the actual study. Sample participants also provide feedback as to the quality of the overall intent of the questionnaire and their perceptions of how other similar participants may perceive the questionnaire. An item-by-item discussion of the questions may take place to ensure that all sample participants perceive the questions in a consistent manner.⁴

This portion of the instrument assessment also assists in determining the reliability of the instrument. The sample group may be used to assist in establishing the reliability of the instrument. The sample could either take the survey twice (test, retest) to determine their ability to answer the questionnaire consistently, or the group could answer the questionnaire only once. The results of the survey would be split (eg, odd-numbered and even-numbered questions) to compare one section of questions with another (split half) to determine if the responses were consistent. If the results are consistent, then the instrument may be considered reliable.

If this sample contains "experts" in the content included in the questionnaire, those individuals may assist in the establishment of the content validity (explained below). A similar evaluation process also would be conducted using an instrument-development expert who may or may not be knowl-

Table 4. Types of Validity

<table>
<thead>
<tr>
<th>Validity</th>
<th>Overview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face</td>
<td>Evaluation by experts and sample participants to determine whether they believe that the instrument measures what it is intended to measure.</td>
</tr>
<tr>
<td>Content</td>
<td>Experts ensure that the content of the questionnaire accurately assesses all essential aspects of the topic.</td>
</tr>
<tr>
<td>Construct</td>
<td>Experts agree with the hypothetical constructs (causes) that the investigator suggests underlie the research question.</td>
</tr>
<tr>
<td>Criterion-related</td>
<td>Evaluation to determine that all items used in the survey are related to specific criteria to be analyzed.</td>
</tr>
</tbody>
</table>
edgeable about the content. If this individual is also an expert on the content or construct of the instrument, it would be appropriate to utilize those skills in other validation processes (eg, content validity, construct validity).7

Content Validity

Establishing the content validity of an instrument helps to ensure that the questionnaire accurately assesses all essential aspects of a given topic.1,2,8 Content validity, also referred to as intrinsic validity, relies on at least one "expert" (but does not prohibit the use of a panel), who reviews the instrument and determines if the questions satisfy the content domain.2,4 An example of an expert panel is a group of experienced CIs who personally have been recognized for their work as CIs or whose effectiveness has been validated by their students' successes. After the expert review of content, the questionnaire is revised before it can be used for the actual study. Although subjective in function, this process indicates that the questionnaire "appears" to be serving its intended purpose and can be reflected accurately in the ToS.

Construct Validity

Construct validity is linked very closely to content validity and is thought to be more abstract and basic in the validation of a questionnaire.1 Construct validity should be determined if no criterion or content area is accepted as entirely adequate to define the quality to be measured. Empirically, factor analysis can be used to identify constructs; the factors identified should reflect the constructs. For example, if we are attempting to determine the effectiveness of CIs, we realize that many intangible reasons underlie why individuals are effective in this role. In the development of the questionnaire, the ATI must infer that some imperceptible things contribute to the CIs' demonstrations of effectiveness. To determine construct validity of a questionnaire, the ATI must validate that others agree with the hypothetical constructs (causes) the ATI suggests underlie the CI's effectiveness.1,8 Therefore, as the experts determine content validity, they also are accepting the construct validity that underlies the content.

Criterion-Related Validity

Criterion-related validity is the most objective and practical approach to determining the validity of a questionnaire. In an earlier step in this process, a ToS for the survey is developed. To determine the instrument's criterion-related validity, the ATI must validate that all items in the questionnaire can be related to a specific criterion delineated in the ToS. This validation is important in the determination of the concurrent and predictive validity of the questionnaire results.2 Concurrent validity allows the ATI to interpret that the findings derived from the instrument can be used to accurately replace a more cumbersome process to determine the same outcomes. To determine concurrent validity, the ATI must demonstrate that results from one instrument correlate with the findings generated by an existing instrument. This technique is helpful in the development of new evaluation tools or to replace older tools that are less specific to athletic training.

More appropriate to athletic training research, predictive validity attempts to establish that a measure will be a valid predictor of some future criterion score.2 In athletic training education research, we may wish to determine if the scores on the National Athletic Trainers' Association Board of Certification certification examination or future successes of students can be predicted from specific behaviors demonstrated by the CIs with whom they have worked. Predictive validity is an essential concept in clinical and educational decision making, because it provides a rationale for using that measurement as a predictor for some other outcome.2,3 Predictive validity does not imply causality but does verify an association between outcomes.1

As with all types of research, it is important to ensure the protection of the subjects used in the study. Appropriate institutional review-board procedures should be followed, and approval must be granted by the ATI's internal review board before human subjects are involved in the instrument-review process. Each institutional review board has its own standards as to when approval is required in this instrument-development process; therefore, it is important for ATIs to check with their board representatives before beginning the instrument-development process. Survey research rarely requires a full board review and generally is considered using the expedited review process. Investigators using this research technique should consult with their individual institutional review boards before initiating any use of human subjects.

DATA ACQUISITION AND ANALYSIS

The sampling techniques used in other types of research are appropriate when conducting survey research. A sample is not representative of a population unless all members of that population have a known chance of being included in the sample.4 Once an appropriate sample has been identified, the validated instrument may be distributed. An adequate return rate (60% to 80%) can be ensured in several ways.2 Consideration of the time commitments and responsibilities of the potential respondents is very important. For example, if the ATI wants to solicit information from certified athletic trainers working football, it may be wise to avoid mailing surveys to them from August through November. Another consideration may be the number of surveys the designated individuals receive over the course of a year. For example, PDs may receive 10 to 20 surveys each year assessing their opinions and programmatic data in a variety of areas. If an ATI requires the input of PDs, then the best way to elicit an appropriate response rate is to ask for cooperation and permission to mail the survey in advance. The quality of the survey and importance of the results to the respondents also are determining factors in the response rate.

One way to inform a potential respondent of the importance of the results of a study is to include a short, motivational cover letter. No survey should be sent without a cover letter. The purpose of the cover letter is to introduce the survey and provide the motivation for the respondent to complete the survey. It also provides an opportunity for the ATI to anticipate and counter any questions or reasons why a potential respondent would not complete the survey,4 such as being too busy, not having enough time, or the results not affecting the respondent. Also included in the cover letter is encouragement and confirmation that the respondent is very important to the success of the study and that any personal or individual information gathered is held in confidence; the length of time required to complete the study is also noted.4
Table 5. Procedure for Soliciting Results with a Validated Survey

<table>
<thead>
<tr>
<th>Timing</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial mailing</td>
<td>Code questionnaires and envelopes; include self-addressed, stamped envelope, cover letter, and questionnaire with mailing deadline displayed on first and last pages.</td>
</tr>
<tr>
<td>1 Week</td>
<td>Send postcard reminding respondents of the importance of completing the questionnaire.</td>
</tr>
<tr>
<td>3 Weeks</td>
<td>Send second copy of questionnaire, shortened cover letter with revised mailing deadline, and self-addressed, stamped envelope.</td>
</tr>
<tr>
<td>7 Weeks</td>
<td>Send third copy of questionnaire, shortened cover letter with revised mailing deadline, and self-addressed, stamped envelope via certified mail.</td>
</tr>
</tbody>
</table>

The procedure for soliciting responses to a survey involves 3 basic steps (Table 5). The ATI begins by coding all forms with a tracking number before they are distributed. This coding system helps an ATI to identify individuals who have not responded and to provide those who have not responded with additional reminders and opportunities to respond. The coding of the forms may be kept blinded from the ATI with the help of a disinterested colleague who assists in follow-up mailings and reminders. A data-coding—system data analysis also must be determined. A predetermined plan is needed to transfer nominal, ordinal, or interval data into numeric formats for use in statistical programs. This system varies with the type of statistical program to be used for analysis; however, most institutions have statistical experts on staff who can assist with this process.

After the initial mailing, a follow-up reminder postcard may be sent 1 week after the initial mailing to encourage participation. The postcard should provide a way for the potential respondents to contact the ATI if they misplaced the questionnaire or have questions regarding the survey, and it should thank those who already responded. Three weeks after the initial mailing, a second copy of the questionnaire, with a shortened cover letter and a revised return mailing date, may be sent again to all of those potential respondents who have not yet returned the survey. Seven weeks after the initial mailing, a final mailing, similar to the second mailing, should be sent via certified mail to emphasize the importance of a response. The second and third mailings are not always possible due to financial or time constraints, but they aid in ensuring a better return rate.

Once all the forms are returned, the data must be coded based on the predetermined data-coding system. Some ATIs may choose to use computerized assessment tools, such as Scantron sheets (Scantron Corp, Tustin, CA), as opposed to instruments that must be coded by hand. Although the computerized forms may facilitate data processing for the ATI, they may not be as convenient or as motivational for the subject. As mentioned previously, to maximize the potential of the data collected, an ATI should consider how the data will be coded for analysis during instrument development. The data-analysis technique used at this point in the study is standardized and is done in the same manner that is used with other research techniques. Specific analysis is not included in this discussion.

In conclusion, survey research is a very worthwhile and important method for gathering information about issues involving athletic training education. The purpose of this article was to provide ATIs with a scientific method for the development and implementation of valid survey instruments. As with all types of research, it is important for the future of the profession to ensure that this type of research is done in the most scientifically appropriate manner possible. The findings from this research can be used to establish policy, validate policies and procedures, and move the education of athletic training professionals into positive future directions.

REFERENCES

Curriculum Development

Chad Starkey

The articles in this section address some of the most pertinent issues related to the current changes in athletic training education. Although each describes an important aspect, the most prominent need of athletic training education programs is that of communication between the athletic training faculty and clinical athletic trainers, especially at the host institution. All other aspects of the curriculum can be impeccable, but the quality of the program is critically diminished if the clinical educators are not an integral part of the planning, development, and implementation process. Consider the example of a stereo system: a $10 000 amplifier, receiver, and CD player will still sound like a $50 system if $50 speakers are used.

Lack of cooperation between the faculty and clinical staff stands to create an “us versus them” mentality that is inherently unhealthy for the profession and potentially disastrous for the institution. It was not too long ago that the academic and clinical staffs were one and the same. The formation of academic programs (and academic departments) for athletic training education, housed in academic departments, and the clinical staff remaining housed in athletics has created a fissure between the 2 groups. Each unit head reports to an administrator on the opposite side of the university structure, and each has unique job responsibilities and criteria for continued employment.

Students are also exposed to a situation in which one group provides knowledge and skills, and the other group is essentially responsible for the students’ introduction and socialization to the profession and teaching the students to apply the knowledge and skills gained in the classroom and laboratory to the clinical setting. Perhaps most importantly, clinical instructors must model acceptable professional and ethical behaviors.

Problems can arise when the theories and techniques described by the academic staff are different from the clinical staff and vice versa. Over time, this can magnify the “us versus them” phenomenon and create disunity between the 2 staffs. The responsibility for assuring open lines of communication and bridging any gaps that may form should be the responsibility of the academic staff, especially the program director.

It is interesting to note that Carr and Drummond found that classroom instructors were older and had more experience than clinical faculty. This could be evidence that athletic trainers who have grown weary of the long hours associated with athletics have begun to migrate to the classroom in search of a more acceptable quality of life.

If the above hypothesis is true, then we may be facing a situation in which many of our classroom instructors do not have a formal background in education or educational methods. This situation is not unique, and it is not limited to our profession. Indeed, many colleges use the fact that courses are taught by “experts in their fields” as a marketing tool. However, this technique seems to be most appropriate and most applicable to graduate education.

We often seem to overemphasize the importance of adult learning styles and problem-based learning during the student’s undergraduate education. Graduating from high school does not make one an adult learner; instead, there is a progression that should be modeled during the undergraduate years. For this reason, undergraduate students should be exposed to the best teachers early in their education, ideally beginning with the first term.

In her article on problem-based learning, Heinrichs used flight training as an example of how these methods have been implemented in another profession. All aspects of pilot training do have a problem-based component (and the problem is always ultimately how to avoid crashing), but the learning and teaching methods are far from those expected of adult learners. Pilot training is awash with the use of memory aids (eg, “BLT and mayo” before takeoff, “GUMP check” before landing), checklists, charts, and other modalities to recall rote knowledge and skills and to maintain consistent procedures.

An unintended comparison is the fact that pilot training is in need of a major overhaul as well, including a single route to the entry level (private-pilot certification). However, the Federal Aviation Administration has finitely detailed the tasks and acceptable tolerances for all of its practical tests. To address these deficits, governmental, professional, and private organizations are increasingly relying on multimedia learning techniques, distance learning, and continuing education.

Although computer technology, computer-assisted learning, and computer and Internet-based multimedia educational tools have been with us for some time now, from the perspective of a consumer and producer of this technology, they have seemed slow to catch on in our profession. With the increased academic demands placed on faculty and students alike, it is logical that these technologies would be a welcome and rational extension of our existing pedagogies.

Improved user interfaces and the ability for computers to display graphic images more rapidly and with enhanced quality have better positioned these technologies for use in health and medical education. Virtual reality is now being used extensively to teach surgical techniques. As virtual-reality technology becomes more commonplace (and therefore lower in cost), many of the concepts used in medicine can easily be applied to athletic training education. Quality technologies can increase the realism and efficacy of problem-based learning approaches.

For entry-level undergraduate students, we must view computer-based learning resources, including the Internet, as adjuncts...
to other teaching approaches. We often tend to view the decision to incorporate multimedia technologies, especially those that
are computer based, as "one or the other." A comprehensive, structured, and hierarchic learning approach should rely on both
techniques.

Reading this series of articles, I had a flashback to when I was conducting research for my doctoral dissertation. Vivid
memories of my gluteal reaction on learning that athletic trainers once hid to prevent other athletic trainers from learning their
secret taping techniques rambled through my head. At first, I could not make the connection as to what triggered this thought,
as is often the case with me. Then perspective hit: athletic trainers are now helping other athletic trainers perform their jobs
better and more efficiently, regardless of workplace setting or job description.

REFERENCES

3. Barzak MY, Ball PA, Ledger R. The rationale and efficacy of problem-based learning and computer assisted learning in pharmaceutical education. Pharmac

Editor's Note: Chad Starkey, PhD, ATC, is an Associate Professor of Athletic Training at Northeastern University, Boston,
MA, and the Chair of the NATA Education Council.
Collaboration Between Athletic Training Clinical and Classroom Instructors

W. David Carr*; Jan L. Drummond†

*The University of Tulsa, Tulsa, OK; †The University of Southern Mississippi, Hattiesburg, MS

W. David Carr, PhD, ATC, contributed to conception and design; acquisition and analysis and interpretation of the data; and drafting, critical revision, and final approval of the article. Jan L. Drummond, EdD, contributed to conception and design and drafting, critical revision, and final approval of the article.

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Objective: The education of an athletic training student involves a balance between theory and application, which can be stated as a balance between classroom and clinical education. The instructors in these settings should work together to promote the overall educational process. Our primary purpose was to measure the observations and perceptions of physical presence, cooperation, and communication between clinical and classroom instructors and secondarily to determine if these have a perceived effect on the education of the student.

Subjects: Clinical instructors, classroom instructors, and athletic training students in Commission on Accreditation of Allied Health Education Programs-accredited and National Athletic Trainers’ Association-approved athletic training education programs.

Measurements: Data were analyzed using various correlation techniques, a general linear model, and a one-way analysis of variance.

Design and Setting: We designed a questionnaire to measure the observations and perceptions of physical presence, cooperation, and communication between the clinical and classroom instructors.

Results: Of the 30 athletic training educational programs solicited for involvement in this study, 19 responded (63%). A total of 737 questionnaires were distributed, and 547 were returned (74%). Classroom instructors rated observations of cooperation between clinical and classroom instructors at a significantly higher frequency than did clinical instructors. Students rated observations of communication at a significantly lower frequency than did the clinical and classroom instructors. All 3 groups agreed that the physical presence, cooperation, and communication between the clinical and classroom instructors has a large effect upon the education of the student.

Conclusions: Clinical instructors must be educators as well as care providers. At the same time, classroom instructors must make efforts to include clinical instructors in all aspects of the educational process. Also, athletic training students should be exposed to the inner workings of their educational programs, so they may have a better understanding and appreciation of how theory and application tie together.

Key Words: theory-practice gap, collaboration, physical presence, cooperation, communication, athletic training education

Athletic training students are exposed to a wide variety of educational experiences in several settings. The classroom and various clinical settings are some of the locations in which athletic training students are provided the knowledge and experiences necessary for the National Athletic Trainers’ Association (NATA) Board of Certification (NATABOC) examination. By learning skills in more than one setting, the students are exposed to a potential theory-practice or theory-application gap. Waterman et al1 asserted that theory is not practice, so there must be distinctions between one and the other: hence, the presence of a theory-application gap. They maintain that the term “theory-application gap” suggests a straightforward problem that must be addressed. However, Lindsay2 suggested that the theory-application gap is not a problem and is necessary to push the boundaries of current practice; in order to improve what is currently practiced, it is necessary to apply new theories to move forward. Many athletic training education programs have clinical and classroom instructors employed by 2 different departments, athletics and academics. As a result, the departments share the role of educating the athletic training student.

Howard and Leppert3 illustrated that collaboration of instructors can help to create a balance between education and service. Programs with a wide separation between the 2 departments may have a division between theory and practice. The National Commission on Allied Health Education4 stated that the primary role of an allied health education program is to prepare students with entry-level job competencies in their field of study by providing a curriculum that combines didactic and clinical education. The effectiveness of a Commission on Accreditation of Allied Health Education Programs (CAAHEP)-accredited athletic training education program may depend on several factors, including the working relationship of the clinical and classroom instructors. Anecdotal discussion of this issue was overwhelmingly supportive of the idea that an educational program in which the clinical and classroom instructors do not work together must have a negative effect on the education of the student.

For this study, this working relationship will be defined as the physical presence, cooperation, and communication between the clinical and classroom instructors. In order to determine if clinical and classroom instructors are physically present, cooperating, and communicating in an effective manner, observations and perceptions of clinical instructors, classroom instructors, and athletic training students were measured using various correlation techniques, a general linear model, and a one-way analysis of variance.
room instructors, and athletic training students were assessed. Physical presence was defined as physically being together in the same educational setting. Cooperation was defined as a combination of resources and efforts to reach common educational goals. Communication was defined as an open exchange of thoughts, ideas, and opinions about the educational process. Our primary purpose was to measure the observations and perceptions of physical presence, cooperation, and communication between the clinical and classroom instructors and secondarily to determine if this working relationship has a perceived effect on the education of the student.

METHODS

We used a questionnaire (Appendix) to measure the observations and perceptions of physical presence, cooperation, and communication between clinical and classroom instructors.

Subjects

Subjects consisted of clinical instructors, classroom instructors, and athletic training students involved in CAAHEP-accredited and NATA-approved athletic training education programs. At the time of this study, there were approximately 75 CAAHEP-accredited and NATA-approved athletic training programs. Thirty randomly selected programs were solicited for involvement in this study. Twenty-one programs gave formal consent, and 19 of these programs returned questionnaires.

Survey Instrument

We designed a demographic and observation and perception survey instrument. The instrument was used to collect demographic data to allow the researchers to categorize the certified athletic trainers (ATCs) according to work responsibilities and the athletic training students according to educational level after formal admission to an athletic training education program. Certified athletic trainers were categorized as clinical or classroom instructors based upon where the majority (more than 50%) of their work responsibilities lay; those who reported a 50/50 split of responsibilities were excluded from the analysis. Subjects were asked to estimate their observations of physical presence, cooperation, and communication between the clinical and classroom instructors. Subjects were also asked to rate their perceptions of the quantity or frequency of physical presence and the quality of cooperation and communication between clinical and classroom instructors on a 5-point Likert-type scale anchored by poor (1) and excellent (5). Additional space was provided for open-ended responses for each survey item.

The following procedures were used to establish face validity and internal consistency of the instrument. A focus-group meeting was conducted with 3 athletic training students representing a cross-section of matriculation levels. They were asked to read the instrument and provide feedback on items that needed clarification. The instrument was then distributed to 3 athletic training program directors who were asked to review the instrument with regard to the readability and ease of completion of the items. Changes were made based on responses from the students and program directors. The instrument was then distributed to 6 ATCs and 12 athletic training students to establish internal consistency. The ATCs represented 3 clinical and 3 classroom instructors. The athletic training students represented a cross-section of matriculating students. The Cronbach alpha calculated for the 3 independent variables were .86 for physical presence, .84 for cooperation, and .85 for communication.

Procedures

The study was approved by the institutional review board. We obtained written permission from program directors of each of the participating athletic training programs before data collection. No subjects were identified by name or by institution.

At the time of the study, a current list of all CAAHEP-accredited and NATA-approved athletic training education programs was obtained from the Joint Review Committee on Athletic Training. Thirty programs were randomly selected and a solicitation letter describing the procedures was sent to each program director. Program directors were then contacted by telephone to solicit involvement. When the program director was solicited for involvement in the study, an account of the total number of clinical instructors, classroom instructors, and athletic training students within each program was obtained. Participating program directors were then mailed a packet of questionnaires and return envelopes. Separate envelopes were provided for each clinical and classroom instructor to ensure open and honest responses. An additional envelope was used to collect all student questionnaires. The program director was asked to solicit the involvement of one of the students to collect the student questionnaires. All completed questionnaires placed in sealed envelopes were collected by the program director and returned in a self-addressed, postage-paid envelope. Each program was assigned a specific alphanumeric code to allow the researchers to monitor which programs responded. The same code was placed on the survey forms and return envelopes of the clinical or classroom instructor and athletic training student. Twenty-one days from the initial mailing, a follow-up telephone call was made to the programs that had not responded.

Statistical Procedures

Descriptive statistics were employed for the entire population. Data were analyzed using SPSS (version 8.0, SPSS Inc, Chicago, IL) to calculate a variety of tests, including a general linear model, Pearson correlational techniques with a Fisher Z test, and a one-way analysis of variance. The .05 level of significance was used.

Limitations and Assumptions

Due to the qualitative nature of this issue, several limitations and assumptions were expressed before the study began. Clinical instructors and classroom instructors may have had varying levels of practical experience, which could have affected their observations and perceptions of physical presence, cooperation, and communication. Athletic training students may have developed a preference for a particular instructor, which may have biased responses. The number of returned questionnaires was limited due to self-selection. Some participants may not have participated due to personal bias. We assumed that all subjects responded honestly to the questionnaire.
RESULTS

Return Rates

Of the 30 programs solicited, 19 (63%) participated in the study. A total of 737 questionnaires were distributed, 155 to ATCs and 582 to athletic training students; 547 were returned, for a response rate of 74%. Certified athletic trainers returned 111 questionnaires (71%), with 1 incomplete form. Nine of the ATCs who responded classified themselves as splitting their time evenly between athletics and academics. These subjects’ data were not included in the analysis. Athletic training students returned 436 questionnaires (75%), with 12 incomplete forms that were not used in the analysis.

Descriptive Statistics

Certified athletic trainers were predominately male (65.5% for classroom instructors, 58.3% for clinical instructors), while the athletic training students were predominately female (59.7% women, 40.3% men) (Table 1).

Classroom instructors were, in general, older than clinical instructors (36.13 years versus 31.65 years), had more years of certified experience (12.34 years versus 8.54 years), and had spent more time working at that institution (8.55 years versus 5.45 years) (Table 2). Sixty-seven ATCs (66.3%) held a master’s degree.

For the athletic training students (n = 424), the average age was approximately 21 years (mean = 20.89 years). Just over half of the students (n = 218, or 51.5%) reported being in the first or second semester of enrollment.

Each program had approximately 10 students (mean = 9.76) taking the NATABOC examination in the previous year, with approximately 6 students (mean = 5.76) passing all 3 sections of the examination on their first attempt. The overall first-time passing percentage for all programs combined was 54%, well above the national average of 31.7%, as reported by the NATABOC for that time period.5

Table 1. Frequency and Percentage Distributions for the Sample by Sex*

<table>
<thead>
<tr>
<th></th>
<th>Classroom</th>
<th>Clinical</th>
<th>Student</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Men</td>
<td>19</td>
<td>65.5</td>
<td>42</td>
<td>58.3</td>
</tr>
<tr>
<td>Women</td>
<td>10</td>
<td>34.5</td>
<td>30</td>
<td>41.7</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>100</td>
<td>72</td>
<td>100</td>
</tr>
</tbody>
</table>

* n indicates number of subjects.

Table 2. Demographic Values of Clinical and Classroom Instructors*

<table>
<thead>
<tr>
<th></th>
<th>Clinical (n = 72)</th>
<th>Classroom (n = 29)</th>
<th>Total (n = 101)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>Mean SD</td>
<td>Mean SD</td>
<td>Mean SD</td>
</tr>
<tr>
<td>Age</td>
<td>31.65 8.70</td>
<td>36.13 9.14</td>
<td>33.30 9.05</td>
</tr>
<tr>
<td>Experience</td>
<td>8.54 7.80</td>
<td>12.34 8.59</td>
<td>9.97 8.23</td>
</tr>
<tr>
<td>Institution</td>
<td>5.45 6.90</td>
<td>8.55 10.20</td>
<td>6.47 7.90</td>
</tr>
</tbody>
</table>

* n indicates number of subjects; SD, standard deviation; experience, years of certified experience; and institution, years of employment at current institution.

Table 3. Test of Between-Subject Effects

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sums of Squares</th>
<th>Mean Square</th>
<th>F*</th>
<th>P value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical presence</td>
<td>2.143</td>
<td>1.072</td>
<td>1.339</td>
<td>.263</td>
</tr>
<tr>
<td>Cooperation</td>
<td>5.053</td>
<td>2.527</td>
<td>3.120</td>
<td>.045</td>
</tr>
<tr>
<td>Communication</td>
<td>15.642</td>
<td>7.821</td>
<td>8.461</td>
<td>.000</td>
</tr>
<tr>
<td>Subjective perception of physical presence</td>
<td>7.227</td>
<td>3.613</td>
<td>1.961</td>
<td>.142</td>
</tr>
<tr>
<td>Subjective perception of cooperation</td>
<td>5.236</td>
<td>2.618</td>
<td>1.599</td>
<td>.203</td>
</tr>
<tr>
<td>Subjective perception of communication</td>
<td>2.039</td>
<td>1.520</td>
<td>.872</td>
<td>.419</td>
</tr>
</tbody>
</table>

* F indicates results of Pillai trace multivariate test; df = 1,98 for each test.
†P < .05 is statistically significant.

Results of Hypotheses

The main hypothesis of this study, stated in the null, was that there would be no significant difference between clinical instructors’, classroom instructors’, and athletic training students’ observations and perceptions of physical presence, cooperation, and communication between clinical and classroom instructors.

A general linear model was used to test this hypothesis. The Pillai trace multivariate test indicated a statistically significant difference between the groups (F12,868 = 4.45, P < .001). The test of between-subject effects demonstrated that the significant difference was in the observed frequency of cooperation (F1,98 = 3.12, P < .05) and communication (F1,98 = 8.46, P < .001) (Table 3). Therefore, based upon these data, the null hypothesis was rejected at the .05 level of significance.

The Tukey Honestly Significant Difference multiple-comparison test showed that the clinical and classroom instructors observed the cooperation differently, with the classroom instructors rating observations of cooperation at a higher frequency than the clinical instructors (Table 4). The students also observed the communication differently than did the clinical and classroom instructors, rating observations of communication at a lower rate than the clinical and classroom instructors.

On a scale of 1 to 5, subjects shared the opinion that the working relationship between the clinical and classroom instructors affects the education of the student (4.1353 ± 1.0158).

DISCUSSION

Based on the findings and limitations of this study, we made several interpretations. Classroom instructors reported a higher frequency of observed cooperation between the clinical and classroom instructors. Students observed the communication at a lower frequency than the clinical and classroom instructors. Subjects agreed that the working relationship has a large effect on education.

Classroom instructors reported a higher frequency of observed cooperation between the clinical and classroom instructors. This finding could be interpreted several ways. Perhaps classroom instructors are more concerned about, or more focused on, cooperating and working with the clinical instructors. Conversely, classroom instructors may be observing cooperation that the clinical instructors do not observe. The education of athletic training students requires the involvement of both the clinical and classroom instructors. The fact that
classroom instructors observed more cooperation than did the clinical instructors might suggest that the classroom instructors feel that collaboration is necessary to improve the education of the students. However, this collaboration should be a 2-way endeavor. Paraphrasing from some of the open-ended responses on the questionnaire, classroom instructors should make an effort to involve clinical instructors in policy decisions rather than imposing the policy, and clinical instructors should make a conscious effort to involve classroom instructors in what is taking place in the clinical environment.

McDaniel and Colarulli identified 4 dimensions of successful collaboration: integration, interaction, active learning, and faculty autonomy. Curricular integration allows students to make connections between divergent subject matter. This can lead to a better understanding of the information. Clinical and classroom instructors must collaborate to enhance the educational environment. True collaboration can create conflict when the faculty members are accustomed to a high level of autonomy. Out of conflict comes compromise, sharing, and understanding of new ideas.

Robinson and Schable developed guidelines for successful collaborative teaching. The team should be restricted to 2 members, and they should agree upon a trial period. Selection of the team should be done by the members themselves rather than administrators. The team members should have an open discussion of teaching philosophies, methods, and grading criteria. Most importantly, the members should anticipate teaching and interpretation differences. The authors assert that by following these guidelines, effective collaborative relationships can be created. Athletic training educators may benefit from applying these guidelines to their own programs.

Lachat et al presented a model for bridging the education-practice gap at Georgetown University Hospital. This “bridging” is achieved with the appointment of clinical educators. These clinical educators have dual appointments within 2 distinct departments, the Department of Nursing and the School of Nursing. The Department of Nursing is housed within the hospital, while the School of Nursing is housed within the university. From their experience, the dual appointment encourages a more efficient use of nursing resources. Athletic training education programs that have a similar 2-department model need individuals who can bridge the gap.

Fine discussed a symbiotic relationship between nursing educators and nursing directors, outlining several ways in which the educator and director can work together in order to improve the education of the student and the quality of care given to the patient. This is achieved by improving the teaching of basic technical skills and the establishment of nurse-patient contracts.

We found that students observed the communication at a lower frequency than the clinical and classroom instructors. It is possible that students are not privy to all of the communication among staff members. Several open-ended responses from students indicated that they were aware of communication but were not there to see it. Athletic training students should be allowed to gain some exposure to or insight into the inner workings of their educational program so they may better understand and appreciate how it functions.

Clinical instructors, classroom instructors, and students agreed that the working relationship between clinical and classroom instructors has a large effect on the education of the athletic training student. This was an important result. Up to that point, the assertion that the interaction between the clinical and classroom instructors affected the education of the student was purely anecdotal. We did not show a direct cause-and-effect link between the interaction of clinical and classroom instructors and the education of the student. However, the agreement of the subjects is encouraging in that it does support the idea that the interaction of clinical and classroom instructors is an important indicator for student success.

The moderate to high intercorrelation of the physical presence, cooperation, and communication variables suggests that they all measure as one combined attribute. This implies that they are all components of the broader idea of a working relationship between clinical and classroom instructors.

**CONCLUSIONS**

The education of athletic training students requires the involvement of both the clinical and classroom instructors. The fact that classroom instructors observed more cooperation than did the clinical instructors might suggest that the classroom instructors feel that collaboration is necessary to improve the education of the students. Conversely, it could be said that classroom instructors are observing cooperation that the clinical instructors do not observe. This collaboration should be a
2-way endeavor. Recently, the profession of athletic training has placed a new emphasis on clinical instruction. The profession is shifting away from counting hours of clinical experience and moving toward a competency-based experience. Collegiate athletic trainers working within an accredited athletic training education program must be both educators and care providers for their athletes, a situation similar to attending physicians working within teaching hospitals. At the same time, classroom instructors must make efforts to include the clinical instructors in all aspects of the educational process. We hope all clinical and classroom instructors will strive to reach a balance within their educational programs.

Future areas of research include a closer examination of the working relationship on a case-by-case or institution-by-institution basis. This might allow for greater objectivity instead of allowing each individual to characterize his or her program. Another area of interest would be to study why clinical and classroom instructors observe cooperation differently.

ACKNOWLEDGMENTS

We thank the many program directors, staff members, and students who participated in this study. We also thank Jim Gallaspy, MEd, ATC, for his guidance, patience, and counseling and the late Mary B. Johnson, PhD, ATC, for her encouragement.

REFERENCES

Appendix. Questionnaire of Certified Athletic Trainers’ Perceptions of Physical Presence, Cooperation, and Communication Between Clinical and Classroom Instructors

DIRECTIONS
Please read each question carefully and completely before responding. When responding to the questions, please generalize about the program as a whole instead of thinking about specific instructors within the program. All estimation questions are to be answered within the timeframe of this current semester/quarter. Use the following definitions as reference:

Clinical Instructor: certified athletic trainer who has the majority of work responsibilities in an athletic department and is in direct supervision of the acquisition of clinical hours by student athletic trainers.

Classroom Instructor: certified athletic trainer who has the majority of work responsibilities in an academic department and is in direct supervision of the acquisition of classroom credits by student athletic trainers.

Clinical Setting: educational setting outside of the classroom such as the athletic training room or the practice and competition area.

Classroom Setting: traditional educational setting in which a lecture/discussion format is presented.

DEMOGRAPHICS
1. Please circle the approximate percentage of time you spend working in an athletic setting and in an academic setting (ie, 30% athletic and 70% academic equals 30/70).
   0/100 10/90 20/80 30/70 40/60 50/50 60/40 70/30 80/20 90/10 100/0

2. My age is: ___

3. My gender is: Male ___ Female ___

4. Number of years of certified experience: ___

5. Number of years at current institution: ___

6. Highest degree held: BA/BS MA/MS EdD/PhD Other ___

PHYSICAL PRESENCE
Physical presence is defined as physically together in the same educational setting.
Use the following scale for the estimation questions: 1 = never, 2 = monthly, 3 = weekly, 4 = daily, 5 = please explain. If responding with a score of (5) please explain your answer on the line provided. You may use the margins if more space is needed.

7. Please estimate how often this semester/quarter you have observed the clinical instructors and classroom instructors together in the clinical setting.
   1 2 3 4 5

8. Please estimate how often this semester/quarter you have observed the clinical instructors and classroom instructors together in the classroom setting.
   1 2 3 4 5

9. Please estimate how often this semester/quarter you have observed the clinical and classroom instructors together helping to educate a student athletic trainer.
   1 2 3 4 5

10. Please estimate how often this semester/quarter you have observed the clinical and classroom instructors working together on educational projects.
    1 2 3 4 5

11. How would you rate the amount or frequency of physical presence between the clinical and classroom instructors this semester/quarter? Please circle the appropriate answer:
    1 = Poor 2 = Fair 3 = Average 4 = Good 5 = Excellent 6 = Not observed
    On what criteria do you base the rating in question 11?

COOPERATION
Cooperation is defined as a combination of resources and efforts to reach common educational goals.
Use the following scale for the estimation questions: 1 = never, 2 = monthly, 3 = weekly, 4 = daily, 5 = please explain. If responding with a score of (5) please explain your answer on the line provided. You may use the margins if more space is needed.

12. Please estimate how often this semester/quarter you have observed the clinical instructors utilizing academic department resources (overhead displays, textbooks, classroom space, etc) with the classroom instructors to reach common educational goals.
    1 2 3 4 5

13. Please estimate how often this semester/quarter you have observed the clinical instructors utilizing athletic department resources (taping supplies, therapeutic modalities, etc) with the classroom instructors to reach common educational goals.
    1 2 3 4 5

14. Please estimate how often this semester/quarter you have observed the clinical instructors making an effort to help the classroom instructors in the classroom setting.
    1 2 3 4 5

15. Please estimate how often this semester/quarter you have observed the classroom instructors making an effort to help the clinical instructors in the clinical setting.
    1 2 3 4 5
Appendix. Continued

16. How would you rate the quality of cooperation between the clinical and classroom instructors this semester/quarter? Please circle the appropriate answer:
1 = Poor  2 = Fair  3 = Average  4 = Good  5 = Excellent  6 = Not observed
On what criteria do you base the rating in question 16? _______________________________________________________________________

COMMUNICATION
Communication is defined as an open exchange of thoughts, ideas, and opinions about the educational process.
Use the following scale for the estimation questions: 1 = never, 2 = monthly, 3 = weekly, 4 = daily, 5 = please explain. If responding with a score of (5) please explain your answer on the line provided. You may use the margins if more space is needed.
17. Please estimate how often this semester/quarter you have observed the clinical and classroom instructors sharing opinions about the education of student athletic trainers.
1 2 3 4 5 _______________________________________________________________________
18. Please estimate how often this semester/quarter you have observed the clinical and classroom instructors exchanging thoughts and ideas about the education of student athletic trainers.
1 2 3 4 5 _______________________________________________________________________
19. Please estimate how often this semester/quarter you have observed the clinical and classroom instructors engaged in a discussion about the education of student athletic trainers.
1 2 3 4 5 _______________________________________________________________________
20. How would you rate the quality of communication between the clinical and classroom instructors this semester/quarter? Please circle the appropriate answer:
1 = Poor  2 = Fair  3 = Average  4 = Good  5 = Excellent  6 = Not observed
On what criteria do you base the rating in question 20? _______________________________________________________________________
21. To what extent do you believe the physical presence, cooperation, and communication between the clinical and classroom instructors affects the first-time passing percentage of the student athletic trainer on the NATABOC examination? Please rate the following statement by circling the appropriate number:
1 = None  2 = Small  3 = Moderate  4 = Medium  5 = Large
Problem-Based Learning in Entry-Level Athletic Training Professional-Education Programs: A Model for Developing Critical-Thinking and Decision-Making Skills

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Objective: To establish the underlying theory and benefits and describe the implementation of a problem-based learning curriculum.

Data Sources: I searched MEDLINE, SPORT Discus, and nursing, evidence-based medicine, and educational psychology databases from 1987 through 2002 using the terms problem-based learning, physical therapy, nursing, and medicine.

Data Synthesis: In the problem-based learning process, students encounter a problem, bring to it their preconceived understanding (accurate or not), learn to identify what they need to learn to better understand the problem, engage in self-directed study, and begin to resolve the problem. Problem-based learning has its origins in medical education but is widely used in K–12 education, social sciences, health professions education, law, business administration, engineering, and aviation. An entry-level master of science degree program in athletic training based on problem-based learning and integrated clinical education is described.

Conclusions/Recommendations: Problem-based learning curricula, if implemented correctly, can facilitate the entry-level athletic training student’s professional development into that of a life-long learner who bases clinical decisions and procedures on the best available evidence.

Key Words: curriculum, practice-based education, Objective Structured Clinical Examination, curriculum design, clinical practice, crew resource management

As athletic training and sports medicine professional-education programs continue to evolve, a plethora of teaching techniques has been set forth, including traditional lecture-based methods, skills-based methods (laboratory settings for teaching psychomotor skills, drill and practice, conceptualized practice, and modeling), technology-enhanced methods (electronic tools, computer simulations, Internet-based or -assisted courses, electronic assessment), individual versus group methods (self-study, cooperative learning), and inquiry-based methods (cases, projects, problems). At first glance, these methods may appear to compete directly with each other; however, understanding the science of how people learn shifts the focus from “Which technique is the best?” to “Which teaching strategies are best used to develop an instructional program?”

“It is as important to learn the important questions as it is the important answers. It is especially important to learn the questions to which there may not be good answers.” The greatest challenge facing any professional-education program (eg, medicine, health professions, law, business, aviation) is to produce professionals who are capable of independent and critical thinking, who can sequentially analyze and solve dynamic problems, who possess a commitment to lifelong learning, who can rapidly understand problems in order to make critical decisions on the field and in the clinic, and who can work as part of a team.

Problem-based learning (PBL), grounded in cognitive theory and with its origins in medical education, is a useful approach for teaching students how to think critically and solve problems they will encounter. Problem-based learning has gained popularity in disciplines as diverse as K–12, university, law, business, computer science, engineering, aviation, and medical education. During the PBL process in the medical and health professions, basic science, psychomotor skills, and clinical reasoning are learned in the context of clinical practice. Four processes occur as the learning group is introduced to a problem: (1) hypotheses as to the cause, physical diagnosis, or management are established, (2) data pertinent to the case are obtained, (3) learning issues requiring further inquiry emerge and are assigned to group members for self-directed study, and (4) the hypotheses, data, and learning issues are reassessed, and the problem and its solution are further developed at a follow-up session. The path to the solution, unknown at the outset, develops through the PBL process.

Athletic training education, like other disciplines, will benefit from reevaluation of teaching methods in light of the fact that our cultural environment is vastly different than it was 10 years ago, thanks to the technologic revolution and the availability of information. This raises the question, “Is the way we were taught the most appropriate way to learn in today’s society?” Scientific, medical, and technologic advances far
surpass the ability of the human mind to integrate and assimilate all the available knowledge. Therefore, traditional teaching methods (eg, lecture format) may no longer be the most effective in today’s culture, where the critical skills include problem solving and decision making. The challenges of learning for today’s world require disciplined study and problem-solving skills from the earliest grades forward. My purposes are to present the learning theory and historical context for PBL, to present the benefits and elements of PBL in entry-level athletic training education, and finally, to describe a modified PBL curriculum for an entry-level athletic training master of science professional-education program. Some of the information regarding the program description is based on my experience in curriculum-program development.

WHAT IS PROBLEM-BASED LEARNING?

Problem-based learning occurs in the context of a community of learners who share the same objective: solving the problem. Ideally, the group should consist of 5 to 7 members but can be modified to accommodate up to 14 members. Unlike the lecture format, the PBL process addresses group dynamics, including the relationships and contributions of each group member. Leadership, cooperation, communication, resource utilization, collaborative team building, and decision-making skills are crucial to group success and are developed through the PBL learning process. The active-learning process of the PBL environment allows the learner to engage the real-world problem with enthusiasm, initiative, and inherent motivation because the knowledge acquired is integrated, flexible, and immediately useful.4 The content to be learned is immediately important and relevant to the learner's life and career. The PBL process likely facilitates the development of the relationship among learning, cognitive competence, and motivation.

The development of these qualities and the universal applications of the PBL process are critical skills well documented in various industries such as aviation. The broad spectrum of the application of PBL in aviation ranges from the most basic concepts developed for the K–12 ages by the NASA Center for Distance Learning,5 as students are exposed to fundamental concepts of science, technology, mathematics, physics, and information retrieval to advanced aviation research and training in crew resource management (CRM), development of cognitive processes, and flight training.6-7 Crew resource management has been defined as “the process of using all available resources, both human and machine, to effectively and safely fly the airplane. Crew resource management skills include communication, leadership/followship, team building, team decision making, team problem solving, and task prioritization. Crew resource management training is distinct from technical training (basic airmanship, spins, stalls, other maneuvers, navigation, etc)” (J. D. Rodriguez, unpublished data, 2001). Technology in aviation is designed ergonomically and operationally to assist the pilot in the critical decision-making process, integrating automatization of functions with CRM (J. D. Rodriguez, unpublished data, 2001). The application to sports medicine is clear: learning of the psychomotor (technical) skills is separate from the decision-making process, yet those skills must be used in the context of the decisions to be made regarding the management of the on-field situation. Technology-assisted assessment (eg, isokinetics, arthrometers) supports the clinical decision-making process. Pediatric surgical medicine has transferred the “aviation paradigm” of CRM to the operating-room environment, recognizing that the human and technologic systems are designed to minimize and absorb the inevitable errors.8 Similarly, these concepts of CRM can be applied to the athletic health care team in the clinic and to emergency trauma management on the athletic field. Key to aviation, medicine, and athletic training is the use of all available resources, communication, and teamwork to effectively solve problems. These qualities cannot be learned in a traditional classroom environment but are integral to the success of the PBL approach.

Theoretic Foundations for Problem-Based Learning

Student-centered teaching has gained considerable attention across the disciplines in academe as faculty seek to implement approaches other than the traditional, passive lecture format.9-12 Active learning has been defined as environments that allow students to talk and listen, read, write, and reflect as they approach course content through problem-solving exercises, informal small groups, simulations, case studies, role playing, and other activities—all of which require students to apply what they are learning. The case-study method has been used the longest to promote clinical problem-solving skills and develop the decision-making process. These are not new concepts: more than 60 years ago, observers noted that students became active rather than passive participants in the classroom when they were engaged in real problem-solving skills.13 This collaborative learning, or “distributed cognition,” affords students the opportunity to learn from each others’ insights and to clarify their thinking by articulating an idea or decision and supporting it with a clear rationale.

Research in cognition and neuroscience has continued to influence how academicians approach the learning process. Cognitive theorists such as Bruner14 contended that learning is an active process in which individuals make sense of facts through the process of conceptualization and categorization; the process of attaining a concept is viewed as a series of decisions. However, cognitive theorists are quick to point out that it is equally important to have a substantial content-knowledge emphasis.15 For this reason, students must have a knowledge base to use in solving problems. The basic science prerequisites of chemistry, biology, anatomy, physiology, physics, and statistics provide the student with the content knowledge base from which to build. Academic courses alone do not address the dilemma of “book smarts but not an ounce of common sense,” as a number of researchers have demonstrated few connections between what is learned in school and everyday problem-solving skills. Concept mapping as part of the PBL process allows students to draw the connections and interrelationships among simple and complex ideas, content, and applied knowledge to solve the problem.

Pea15 suggested several ways to facilitate knowledge transfer from the known situation to the new problem: learning must take place in the context in which the knowledge will be used, the knowledge must be functional, and concepts and skills are acquired with a purpose in mind. The purpose of this knowledge transfer is to develop decision-making skills. This approach requires teachers to move from an authoritarian, all-knowing position in the classroom to a position as collaborative colleagues, from the proverbial “sage on the stage” to the “guide at the side.” Cognitive science research1 further suggests that knowledge is organized in memory according to
the conditions under which that knowledge is to be retrieved and applied. For example, the biology and chemistry knowledge required for the entry-level athletic training student to understand the inflammatory process in sufficient depth to plan an appropriate physical intervention plan differs from the breadth and depth of understanding required for the medical and pharmacologic management of inflammatory arthritis. The implications for curriculum design are clear. PBL experiences must be designed so that the knowledge students develop in the classroom can be best retrieved in the anticipated context of knowledge use: the clinical setting.

The traditional lecture, psychomotor competency “checkoff,” case, and discussion methods may achieve the goal of imparting knowledge but fall short of producing professionals who are capable of critical thinking and independent problem solving. Furthermore, traditional, highly competitive models of education, particularly preprofessional studies (eg, medicine, law), do not foster a climate of teamwork or collaborative learning—essential skills for success in the workplace.

Benefits of Problem-Based Learning

The traditional didactic and clinical models of athletic training education may not be the best to address the expectations of students who should be able to (1) become independent and critical thinkers, (2) reason their way through patient problems, (3) recall and apply what they have been taught to the care of their patients, (4) recognize when their skills and knowledge are not adequate to the clinical task they are confronting, and (5) learn new information as they need it and as their professional lives demand. The problem-based learning approach has several requirements:1

1. Tutor: The tutor facilitates small-group (5 to 7 students) learning and may come from the basic or clinical sciences. Tutors may also be actively practicing in the field of sports medicine and athletic training, although content expertise (while ideal) is not necessary to be a good tutor. “The skillful tutor will cause students to develop effective reasoning skills, acquire a solid knowledge base, become effective self-directed learners, take control of their own learning, and enjoy the whole process. The skillful tutor will be able to eventually fade away and allow the students to carry on the process by themselves.”2

Barrows3 noted 4 steps to assist an inexpert tutor to feel comfortable in this role: (1) state the curricular objectives so both the tutor and students know what is to be accomplished; (2) provide the learning issues the faculty feel should be identified by the students for each problem, task, or situation addressed in the group; (3) orient the tutor to the problem, task, or situation and identify its importance in the curriculum, why it was chosen, what the students should learn from it, and any difficult issues and traps it may entail; and (4) provide the tutor with an expert who can be consulted at any time and who might be able to attend a tutorial session to listen to a group’s deliberations and give feedback about the group’s progress.

2. Resource Faculty (Consultants): These faculty (clinicians or academicians or both) with content expertise are available to students during self-directed study as a source for references and information from their area of expertise (basic science or clinical). The CIS often serves as a resource for the students and may provide a lecture if requested by the students (ie, student-initiated learning).

3. Problem Simulations: The initial presentation, history, physical examination, laboratory and imaging results, and special tests of actual patient cases are addressed. Just as in real-life situations, the cases are ill structured. The students face the problems just as they would in real-life clin-
The Role of the Tutor in Problem-Based Learning

The tutor functions on a metacognitive level, which has been defined by Barrows and Boud as thinking: pondering, deliberating, or reflecting on the problem or situation; reviewing what is known and remembered about the kind of problem confronted; creating hypotheses; making decisions about what observations, questions, or probes need to be made; questioning the meaning of new information obtained from inquiry.

Barrows further identified the role of the tutor as a guide to facilitate student independence and critical thinking, keep the process moving in the right sequence, probe the student’s knowledge depth, be sure all students are involved in the group process, and engage in educational diagnosis of each student (errors in reasoning, difficulties in understanding the information and concepts). The tutor is responsible for several tasks critical to the group’s success: keeping the learning process moving and taking each phase in the right sequence (eg, students should explore the causes of a problem before moving to inquiry to gain more information); probing the student’s knowledge deeply with “why” questions challenging ideas, terms, definitions, explanations, and comments; being sure that all students are involved in the group; offering educational diagnoses (eg, reasoning difficulties, problems understanding the information and concepts, or problems finding the appropriate information); and modulating the challenge of the problem at hand (ie, the task should not be so easy that the students are bored, nor should they be faced with a problem that is far too complex or overwhelming). These skills are not used in traditional, didactic education and must be learned by the tutor. Tutorial and facilitation styles vary and may have a profound impact on the outcome and the group’s ability to continue the process on its own.

The skilled tutor asks probing questions to determine whether the students’ discussion has reached the depth and breadth of the topic as determined by the instructor’s learning objectives and anticipated learning outcomes for that problem. The tutor may assist the students in organizing the information and moving to the next level of understanding without directing where the group discussion should go. For example, the group may have identified the neural structures (receptors, nerve types, pathways, fiber types, diameter, etc) involved in pain transmission but not linked those concepts to electrotherapy-setting selections. The tutor may say, “Given what you know about the nervous system, how does this relate to what you will do clinically to achieve your goal of pain relief?” With each passing week, students “discover” and learn new information in the context of solving a case; the tutor can provide cues to the students if they begin to draw incorrect conclusions. The tutor also focuses the group on the task at hand if the discussion moves toward themes that are “nice to know” but not essential to the case. As students gain more experience with PBL, the tutor becomes less necessary to the success of the group.

One of the dangers the tutor must guard against is the students’ temptation to believe they have solved the problem when they have only achieved a superficial understanding of it. The problem should be designed with sufficient depth and breadth so that students must uncover the deeper, underlying basic science principles responsible for the clinical presentation or intervention problem. Didactic education and fact memorization keeps the learning at the superficial level. It is only when the student develops the connections among facts, principles, and clinical presentation that critical-thinking, analysis, and decision-making skills begin to manifest. The final discussion period of the week is designed to deepen these connections and to facilitate the transfer of the knowledge gained during the week to new situations later in the semester. The cases encountered in the PBL curriculum begin to provide students with a deeper understanding of interrelationship between the basic and clinical sciences. Rather than memorizing facts, students learn to draw connections and think critically about a cluster of findings, much in the same way they will encounter problems in the field. Concept mapping is a useful process for students to discover the connections from superficial to deep areas of knowledge and understanding. The tutor can determine if the students have achieved the depth of inquiry by comparing the concept map to the list of anticipated learning issues developed as the problem was designed (Figure).

Tutor training is essential to the success of a PBL curriculum. Options for learning effective tutorial skills include faculty colleagues who have experience and success in the tutorial process, PBL tutor-training courses offered by institutions (eg, Southern Illinois University Medical School), analysis of videotape tutorial sessions, and in-depth understanding of the tutorial process. The tutor’s skills are also further refined based on the group’s constructive feedback at the end of each weekly case-summary discussion. Once trained, the CIS can facilitate groups and laboratory sessions in his or her area of expertise for short periods (2 to 3 sessions, typically lasting a week): for example, the field management of the athlete with suspected spinal trauma. The CIS works closely with the course coordinator in debriefing sessions after the tutorial sessions to determine whether underlying learning objectives were met, the progression of the case, and methodologic issues related to improving tutorial skills. This represents an investment of the university in the clinical setting and provides a unique opportunity for clinicians to be involved in the curriculum and to interact closely with the students.

CURRICULUM STRUCTURE

The PBL entry-level athletic training master’s degree curriculum spans 4 semesters, with clinical education commencing during the first semester and progressing in complexity.
and intensity during the curriculum (Table 1). Because the program offers a master of science degree, students are required to complete a research thesis, selecting from the research themes and agendas of the faculty. The entry-level professional-education requirements are the same, so this model can be used for either undergraduate or graduate curricula. From the outset of the program, students are challenged to support their assessment findings and intervention plans (field management, therapeutic modalities, and exercise) with evidence from the literature. Throughout the curriculum, students are encouraged to practice evidence-based medicine.\(^2^2\)

Evidence-based medicine is a method for evaluating the validity of research in clinical medicine and applying the results to patient care. It integrates clinical expertise with the best available clinical research because neither expertise nor research on their own merits are sufficient to guarantee optimal care.\(^2^3\) First, traditional sources of information (textbooks) are often out of date, contain errors, are ineffective, are too overwhelming in their volume, or are lacking in validity for practical use. Second, with novice students, disparity among assessment skills, judgment, and clinical knowledge is great. Third, reimbursement often depends on the ability to produce evidence and justification for a particular treatment approach or intervention.\(^2^2\) Problem-based learning and the practice of evidence-based medicine (as applied to the health professions, including athletic training) share a number of features, including identifying the problem or area of uncertainty, formulating relevant and clinically focused questions, finding and appraising the evidence, assessing the clinical importance of the evidence, assessing the clinical application of the recommendations or conclusions of the research, assessing the outcomes of the clinical actions taken, and summarizing and storing information for future reference.\(^2^4\)

The athletic training curriculum follows a modified PBL format to provide students with guidance through appropriate readings and learning objectives. This offers needed structure to the students’ learning experience, particularly early in the first semester of the program. Unlike the passive lecture for-
Table 1. Sample Problem-Based Learning Curriculum Structure*

<table>
<thead>
<tr>
<th>Semester 1. Orthopaedic and Musculoskeletal Focus</th>
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<tbody>
<tr>
<td>Human Anatomy, Structure, and Function I</td>
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<tr>
<td>Assessment of Athletic Injuries and Illnesses I</td>
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<tr>
<td>Therapeutic Modalities and Therapeutic Exercise in Athletic Injuries and Illnesses I</td>
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<tr>
<td>Practice Issues in Athletic Training I</td>
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<td>Clinical Skills in Athletic Training I</td>
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<tr>
<th>Semester 2. Medical Conditions and Emergency-Management Focus</th>
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<tr>
<td>Human Anatomy, Structure, and Function II</td>
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<tr>
<td>Assessment of Athletic Injuries and Illnesses II</td>
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<tr>
<td>Therapeutic Modalities and Therapeutic Exercise in Athletic Injuries and Illnesses II</td>
</tr>
<tr>
<td>Practice Issues in Athletic Training II</td>
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<td>Clinical Skills in Athletic Training II</td>
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<tr>
<th>Semester 3. Advanced Medicine, Physiology, and Clinical Focus</th>
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<tr>
<td>Pathophysiology of Athletic Injuries and Illness I</td>
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<tr>
<td>Exercise Physiology</td>
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<tr>
<td>Research Methods</td>
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<tr>
<td>Master’s Thesis/Professional Project (developing the research idea, literature review, proposal)</td>
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<tr>
<td>Clinical Skills in Athletic Training III</td>
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<tr>
<th>Semester 4. Advanced Medicine, Human Performance, and Clinical Focus</th>
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<tr>
<td>Pathophysiology of Athletic Injuries and Illness II</td>
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<tr>
<td>Sports Nutrition</td>
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<tr>
<td>Drugs and Ergogenic Aids in Sports Medicine</td>
</tr>
<tr>
<td>Master’s Thesis/Professional Project (data collection, analysis, manuscript production)</td>
</tr>
<tr>
<td>Clinical Skills in Athletic Training IV</td>
</tr>
</tbody>
</table>

*Each semester’s courses are corequisites.

When designing a PBL curriculum, ideally all instructional faculty of the basic and clinical sciences will reach a consensus on the content sequence and location in the curriculum. Specific learning objectives and reading assignments are provided to the students to assist them in developing and focusing their resources. Course work in cadaver anatomy and physiology is coordinated with assessment, treatment (field management, therapeutic modalities, manual therapy, therapeutic exercise), reconditioning, injury prevention, practice issues, and clinical-skills development. The subject matter revolves around the cases and the information necessary for each case. The weekly content is spread across the courses with the same underlying theme. Students participate first in a small-group discussion to begin to address the problem, followed by the laboratory session the next day. For example, the first week of the semester focuses on tissue response to injury in the case of an acute onset of shoulder pain. The cadaver anatomy and physiology course content focuses on introductory anatomical, physiological, and biomechanical concepts, including movement definition, basic arthrology, palpation, injury response, pain transmission, scapulohumeral biomechanics, torque, force couples, and the anatomy of the shoulder complex. The assessment course introduces the basic concepts of history and physical examination, the screening examination, shoulder-complex examination (manual muscle testing, goniometry, and special tests), and functional examination. The therapeutic modalities and exercise course introduces the modalities used for inflammation and acute pain, principles of therapeutic exercise, and specific manual and exercise interventions for the case. Athletic taping and bracing techniques, functional progression of exercise and return to performance, and in-depth practice and assessment of the techniques learned in the earlier laboratories are further practiced and reinforced in the clinical-skills courses using drill and practice, simulations, and computer-based models. Students are introduced to the profession of athletic training, scope of practice, and evidence-based medicine in the practice issues course.

In the second year, the PBL approach must be integrated into courses taught by faculty from other departments who are not familiar with PBL. Conceivably the content (exercise physiology and pathophysiology) could be linked with common cases used in both courses. Despite the challenges, multidisciplinary groups are beneficial in that students are exposed to philosophies, skills, practice issues, and decision-making pathways in other disciplines. Lary et al,9 in a pilot project to test a model of rural health assessment, designed a multidisciplinary education model consisting of students in physical therapy, physician assistant, and dental hygiene programs. Phase I involved discipline-specific content and problems and team concepts; phase II consisted of working in multidisciplinary groups to solve a PBL case; and phase III had students working in small groups on real patients. Overwhelmingly, more than 90% of the students evaluating the program reported enhanced problem-solving skills, improvements in working in groups, and an enhanced knowledge of the other disciplines.

The process begins during the first discussion session, when the students are introduced to the case and read the problem (this often happens on Friday so students have the weekend for independent study and preparation for the upcoming week) (Table 2). During the first discussion session, students brainstorm to identify hypotheses and possible solutions; data, including information obtained from the patient or test results, diagrams, pictures, radiographs, models, answers to any ques-
Table 2. Sample Curriculum Schedule, Semester 1

<table>
<thead>
<tr>
<th>Time</th>
<th>Anatomy Laboratory</th>
<th>Assessment Laboratory</th>
<th>Clinical-Skills Laboratory</th>
<th>Intervention Laboratory</th>
<th>Clinical-Skills Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>10:00</td>
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<td>11:00</td>
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<td>12:00</td>
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<td>13:00</td>
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<td>14:00</td>
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<td>15:00</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>16:00</td>
<td></td>
<td></td>
<td></td>
<td>Supervised Clinical</td>
<td></td>
</tr>
<tr>
<td>17:00</td>
<td></td>
<td></td>
<td></td>
<td>Experiences 15 hours/week</td>
<td></td>
</tr>
<tr>
<td>18:00</td>
<td></td>
<td></td>
<td></td>
<td>minimum</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Sample Case-Planning Worksheet

CASE: 17-Year-Old Swimmer Presents with Left Shoulder Pain

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Learning Issues</th>
<th>Action Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supraspinatus tendinitis</td>
<td>Terminology</td>
<td>Specific physical examination tests</td>
</tr>
<tr>
<td>Thoracic outlet syndrome</td>
<td>Shoulder, cervical spine anatomy</td>
<td>Imaging (magnetic resonance imaging, computed</td>
</tr>
<tr>
<td>Adhesive capsulitis</td>
<td>Neurovascular physiology</td>
<td>tomography, radiographs)</td>
</tr>
<tr>
<td>Cervical ventral rami dysfunction</td>
<td>Brachial plexus functional anatomy</td>
<td>Therapeutic modalities</td>
</tr>
<tr>
<td>Muscular strain</td>
<td>Tissue injury, healing responses</td>
<td>Therapeutic exercise</td>
</tr>
<tr>
<td>Multidirectional instability</td>
<td>Bone-stress response</td>
<td>Technique modification</td>
</tr>
<tr>
<td></td>
<td>Tendon healing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Management of acute inflammatory conditions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exercise during acute inflammation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Neuroanatomy of receptors and ascending</td>
<td></td>
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<tr>
<td></td>
<td>sensory pathways for pain perception</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Arthrokinematics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manual muscle testing, goniometry</td>
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<tr>
<td></td>
<td>Organization of peripheral nerves</td>
<td></td>
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<tr>
<td></td>
<td>Length-tension relationship</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Muscle action types</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stress-strain curve</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Radiographs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diagnostic tests</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medical specialties</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kinesiology of the shoulder complex</td>
<td></td>
</tr>
</tbody>
</table>

The work is difficult, but they are learning principles and more clinically applicable material over a wider range of topics.

The faculty—both academic and clinical—design the problem around the basic and clinical sciences in an integrated fashion. They have structured and designed the case to reach the desired depth of knowledge. Case-planning worksheets clearly demonstrate where each of the competencies is addressed in the curriculum and are included in the documentation for the accrediting agencies. All educational competencies have been cross-referenced with multiple exposures in the classroom, laboratory setting, clinical-skills courses, and finally, the open clinical setting. The curriculum is revised at the conclusion of each semester as part of an ongoing curriculum assessment: cases are modified and revised after the students work through the problems. Additional anticipated learning issues and difficult areas are identified and included in the problem description for the following year.

For example, the basic sciences focus on introductory anatomy concepts (as reflected by the anatomy learning objectives provided the students), basic organization of the nervous system, introduction to pain theories, acute tissue injury (biology and clinical presentation), and anatomy of the shoulder com-
plex via cadaver dissection, while the clinical sciences focus on introductory assessment principles and shoulder assessment. After the first tutorial (assessment), the students participate in the assessment laboratory, where they learn the techniques highlighted in the discussion. The tutor and the students also have learning objectives for the laboratory sessions. At the second session, one student summarizes the case as if presenting at grand rounds, and the discussion moves toward intervention methods.

Integrated Development of Clinical Skills

Considerable discussion has focused on the notion of assessing "learning across time" and each of the cognitive, psychomotor, and affective competencies and the clinical proficiencies described by the National Athletic Trainers' Association competencies document. Although decision making and skill application are mentioned in the preface, the clinical proficiencies are, for the most part, listed as technical abilities (locate, identify, apply, select settings, etc). However, clinical proficiency is more than technical ability or a prescribed amount of knowledge. It is the combination of knowledge; understanding of the basic sciences, skills, and attitudes; understanding of factors influencing the current clinical situation; and the ability to think critically to make appropriate decisions. For example, a fourth grader can learn the psychomotor task of performing a Lachman test: hand placement, direction of pull, position of the body part, etc. However, the fourth grader would likely be unable to demonstrate clinical competency in the broader sense.

In decision making, several features distinguish psychomotor competencies from clinical competencies. Psychomotor competency is based on understanding how and why a decision will lead to successful results, what other factors may be involved, what other physical examination techniques should be employed, and having the ability to solve the problems presented by the clinical situation. Clinical competency is a broad, far-reaching combination of skills, knowledge, and decision-making skills. For example, competence as a clinician includes the broad range of knowledge and understanding upon which the assessment and subsequent intervention are based, including competence in patient and athlete assessment, management, tissue healing, processes that would promote or inhibit wound healing, and factors involved with functional return to competition. Mere technical skill does not necessarily translate to the skills needed to be a reflective practitioner. Thus, the notion of "learning across time" must mean more than documenting that the skill has been taught 3 times during the training curriculum. Assessment of skill attainment occurs first in the context of psychomotor proficiency and then progresses to appropriate use in a clinical or field setting. To that end, the curriculum design should move from assessing isolated psychomotor clinical skills to a contextual evaluation of decision making to select the appropriate group of skills relative to the situation. It is impossible to predict every situation that the sports medicine clinician will experience on the athletic field; however, highly developed critical-analysis and problem-solving skills enable the clinician to make good field decisions.

Beginning with the first semester, students are introduced to the clinical proficiencies and skills in the appropriate laboratory session (assessment or intervention) and are provided a psychomotor checklist breaking the skill into its component parts, including "fatal flaws," which, if present, result in automatic failure for that skill. The first assessment of clinical skills in the curriculum occurs in a closed laboratory environment. Students have the opportunity in the corequisite clinical-skills courses to further refine the clinical skills in a progressively open environment and place them in the context of field practice. During the first year, the students are closely supervised by the clinical CIS during the laboratory sessions and on the field in an open, applied environment. The CIS is familiar with the progression of the curriculum and seeks to design clinical experiences in concert with the student's progress in the classroom. Because the students have learned the didactic and clinical information in an integrated fashion, once they are placed in the clinical environment, they are judged on their critical-thinking and analysis skills against the benchmark of a practicing certified athletic trainer. During the closely supervised clinical-skills courses, students are also socialized into the profession with the assessment of professional abilities, including interpersonal skills, commitment to learning, communication skills, effective use of time and resources, use of constructive feedback, problem solving, professionalism, responsibility, critical thinking, and stress management.

The Objective Structured Clinical Examination (OSCE) used in medical and physical therapy education has been adopted as an assessment tool in the clinical-skills courses. The OSCE, or standardized patient, requires students to interact with a simulated patient or situation who presents with a standard history and physical examination or with a standardized scenario. The clinical examination focuses on 6 areas of clinical competence: (1) detailed and relevant history; (2) physical examination; (3) identification, performance, and interpretation of the appropriate tests and measures (special tests, diagnostic tests, physical performance, radiographs, etc); (4) identification of the problem and working diagnosis; and (5) management. The OSCE is completed with a checklist or rating scale for each station. The grading forms have been tailored to each station according to a standardized blueprint, including (1) test situation presented to the examinee, (2) diagnosis or nature of the problem, (3) level of student to be assessed, (4) time allowed, (5) objectives to be tested, (6) task examinee is asked to perform, (7) data to be observed and how they are to be observed and recorded, (8) scoring method, and (9) strategies for making decisions. The OSCE represents a higher-level assessment, as the skills are now evaluated in the context of a complete examination. The final stage of assessment occurs in the context of the students' clinical experiences. Results of the basic-skills laboratory examinations, OSCE, and field assessment span the continuum of assessment from psychomotor skill assessment to assessment of clinical decision making.

Assessment of Student Learning

Assessment in a PBL environment occurs in the context of the students' abilities to revise and improve their thinking and to see progress and revise any errors in understanding. The tutor identifies problems that need to be remedied. Written and practical examinations fall short in assessing whether the student has learned to think critically or ask the important questions. These examinations often focus on the student's ability to memorize facts rather than assessing learning and understanding. The ability to think independently and clinically must be fostered throughout the curriculum, recog-
nizing that it is a process, not an outcome, and contains both rational and emotive elements. Brookfield30 identified 4 components of critical thinking: (1) identifying and challenging assumptions, (2) challenging the importance of context, (3) attempts to imagine and explore the alternatives, and (4) imagining and exploring the alternatives leads to reflective skepticism. Clearly the PBL curriculum addresses each of these components. Assessment in a PBL curriculum must be ongoing in order to make the students’ thinking, misconceptions, and development evident to the teacher, who continuously monitors their progress.

The traditional, multiple-choice examination format focuses on students' ability to memorize facts. If structured in the context of solving a problem and requiring synthesis of information and prioritization of options,31 written examinations may also provide opportunities for clinical decision making. In a modified PBL curriculum, it is most effective to provide students with the data about a particular case and then ask questions relating to anatomy and physiology; assessment; signs, symptoms, and mechanisms; field intervention; rehabilitation; and prevention for that case. As the examination progresses, additional data may be provided to further develop the case. Because all the courses are corequisite and emphasize evidence and context of the material covered. With the tutor's assistance, students develop a concept map (see Figure), beginning with the superficial knowledge of the case and its presentation. Founded in cognitive science, concept mapping demonstrates true competence in an area of inquiry (the case) as students demonstrate factual foundations (i.e., basic sciences), understand those facts in the context of the conceptual framework developed by the map, and organize the new knowledge in meaningful ways that facilitate retrieval and clinical application. Daley et al24 suggested 6 steps in creating a concept map:

1. Select the topic, reading, or case for which you want to develop a map.
2. Identify the most general concepts first and place them at the top of the map.
3. Identify more specific concepts that are related to the general concepts.
4. Tie the general and specific concepts together with linking words in some fashion that has meaning for the learner.
5. Look for cross-linkages between the more general and more specific concepts.
6. Discuss, share, think about, and revise the map.

As students gain more experience and familiarity with concept mapping, the maps become more complex, providing graphic representations of their progress during the preceding week.

**Challenges in Implementing a Problem-Based Learning Curriculum**

Designing and implementing a PBL curriculum is easiest for new programs, which have the luxury of being able to assign content and teaching methods across the curriculum. Each major area (ours was divided into musculoskeletal/orthopaedics, neurologic/spine/head trauma, cardiovascular, thoracoabdominal, and internal medicine content blocks) should be carefully designed to integrate both the basic science (anatomy, physiology, pathophysiology, and biomechanics) and clinical science components. Typically in a 16-week semester, 13 to 14 cases are developed to address the interrelated nature of the biological, physical, and clinical concepts illustrated by each case. In that sense, the cases become the curriculum. The resistance to a PBL curriculum may come from our colleagues in the basic sciences who fear that knowledge of the basic sciences will be reduced, thus undermining the scientific foundation of the profession. Most curricula will have to integrate their courses with other disciplines (e.g., basic sciences, other departments) and faculty who may not share the enthusiasm or commitment for PBL. Therefore, it may be more feasible to integrate the PBL approach into modules or blocks within a semester.

The PBL process is introduced to the students during the application process, when they are invited to the campus for group interviews to provide the faculty with the opportunity to observe how they function in a group setting. Also, applicants gain a notion of what to expect in a PBL curriculum. Before the semester starts, the students participate in a week-long orientation session during which they are provided with more materials about the PBL process.33 experience the PBL process for the first time, and are taught essential skills required on the first day of their clinical experience.

**CONCLUSIONS**

Problem-based learning, grounded in cognitive theory and medical education, is a useful approach in teaching students how to think critically and solve problems they will encounter in the athletic training professional environment. Students who participate in PBL curricula generally find less of a dichotomy between the didactic and clinical settings. Athletic training education programs, particularly start-up programs, should consider integrating PBL into portions of their curricula. The modified PBL is the most feasible option, given academic environment and manpower restrictions. Although evidence to support PBL as superior to traditional methods is lacking, students and faculty report that the PBL process is more immediately relevant, interesting, and motivating than the traditional lecture format. The formal preparation of sports medicine professionals should foster the development of critical thinking, rational decision making, the ability to be a team player, and the curiosity to seek new knowledge to solve any problems that present themselves. Selecting the appropriate educational approach, based on the current understanding of how people learn and use information will allow the right questions to be asked and answered.
REFERENCES


Pedagogic Strategies Perceived to Enhance Student Learning in Athletic Training Education

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*University of South Carolina, Columbia, SC; †University of Maryland, College Park, MD

Since its inception in 1950, the National Athletic Trainers’ Association (NATA) has striven to enhance athletic trainers’ knowledge and skills by improving educational experiences within its education programs. The transition of athletic training education from an internship program to a Commission on Accreditation of Allied Health Education Programs (CAAHEP)-accredited competency-based program has helped to standardize athletic training education and improve its consistency with professional preparation in other allied health disciplines. Instructors in both clinical and classroom settings are expected to integrate a common body of athletic training competencies across a wide range of student educational experiences.

An essential component of good educational practices found consistently in research on teaching and learning is the integration of achievement motivation constructs into student learning. Biddle’s1 integrative framework of control-related achievement motivation identifies 2 specific pedagogic constructs that are critical for explaining why and how students respond in achievement situations: (1) Self-determination theory distinguishes 2 general classes of motivated behaviors, those that are self-determined (eg, governed by the process of choice and experienced as emanating from the self) and those that are controlled (eg, governed by the process of compliance and experienced as compelled by some interpersonal force); (2) Self-efficacy motivation theory suggests that academic motivation is enhanced when the teacher helps students make correct judgments about their capabilities to successfully perform a specific task or produce an outcome in a specific situation.3 Each of these pedagogic constructs has contributed to our understanding of how students learn in various educational contexts and provides the theoretic framework for this study.

The influences of various pedagogic constructs of achievement motivation have not been examined in athletic training education research. To date, educational research efforts in athletic training have largely been limited to investigations of relationships among certain educational var-
variables and student success and failure rates on the NATA Board of Certification (NATABOC) certification examination. Previous research suggests that student learning styles, course-based versus internship-based route to certification, and student academic variables are each related to student success or failure on the NATABOC certification examination. Investigators have looked at specific aspects of athletic training education, including assessment of learning styles, inclusion of critical-thinking skills in course syllabi, and clinical teaching roles. In each case, specific educational variables (eg, learning styles, clinical teaching skills, critical thinking) were investigated through specific questionnaires or examination of course syllabi or both. Qualitative athletic training education research examining the nature of students' educational experiences within CAAHEP-accredited athletic training programs may provide a more complete picture of pedagogic variables that contribute to student learning. In athletic training education, one group used a critical-incident form and qualitative analysis to examine students' perceptions of clinical supervisors' behaviors. Supervising athletic trainers' behaviors were identified as having a profound effect on the professional development of the athletic training students. The use of qualitative and descriptive research in athletic training education can benefit both students and instructors by providing a more meaningful understanding of educational practices, including effective curriculum development (eg, scope, sequence, coherence) and appropriate instruction (eg, problem-based learning, effective questioning, guided discovery).

Our purpose was to investigate students' educational experiences in CAAHEP-accredited athletic training education programs. Specifically, our focus was to determine to what extent pedagogic strategies were reflected in students' perceptions of their learning experiences in CAAHEP-accredited athletic training programs, instructors' perceptions of their teaching in CAAHEP-accredited programs, and CAAHEP-accredited athletic training course syllabi. Integration of information from multiple educational sources provides a more in-depth examination of how students learn in CAAHEP-accredited athletic training programs.

METHODS

Subjects

Students. A total of 21 students (9 males, 12 females) currently enrolled in 5 athletic training education programs accredited by CAAHEP participated in the study. The 5 CAAHEP-accredited athletic training programs were Master's 1 comprehensive institutions as classified by the Carnegie Foundation and represented 3 East Coast states (Pennsylvania, Virginia, and Maryland). Table 1 provides the demographic characteristics of student participants.

Instructors. A total of 12 instructors (7 men, 5 women) currently teaching in CAAHEP-accredited athletic training education programs were interviewed individually to examine their perceptions of educational experiences within their athletic training courses. Instructors averaged 9.1 years of teaching experience in athletic training education, with a range of 2 to 26 years of teaching experience. All 12 instructors were white.

Design

This study was designed to investigate educational experiences of CAAHEP-accredited athletic training programs from 3 potential data sources: students' interviews, instructors' interviews, and course syllabi.

Students' and Instructors' Interviews. Students currently enrolled in and instructors currently teaching in university athletic training programs accredited by CAAHEP were interviewed during a 1- to 2-day visit by the researcher (J.M.M.). The sample strategy used in this study was criterion sampling, in which each participant (student, instructor, or school) met some predetermined criterion of importance (students or instructors in CAAHEP-accredited athletic training programs). Criterion sampling is identified as an important qualitative component to monitoring program quality through in-depth qualitative analysis.12 Interview questions were designed to elicit students' and instructors' perceptions of teaching and learning processes with an emphasis on students' educational experiences. A semistructured format using open-ended questions enabled the researcher to elaborate on students' and instructors' responses and ask follow-up questions. All interviews were tape recorded and transcribed for analysis. The study was approved by the human subjects review committee at each university, and all subjects reviewed and signed a human subject informed consent before participating. All student, instructor, and university names referred to throughout this study are pseudonyms.

Course Syllabi. Each athletic training instructor was asked to provide a copy of course syllabi from athletic training courses he or she had previously taught within the current CAAHEP-accredited program. The course syllabi collected represented 5 subject-matter areas required by CAAHEP to be taught through formal instruction in a structured classroom: care and prevention of athletic injuries (n = 5), therapeutic modalities (n = 6), therapeutic exercise (n = 5), assessment/evaluation of athletic injuries (n = 5), and organization/administration of athletic training (n = 3). The content knowledge within these 5 courses is acknowledged as part of the 12 content areas included in educational competencies for the NATA.

Instrumentation

All data were analyzed qualitatively using constant comparison. The transcribed interviews, syllabi, and documents were
Table 2. Data-Analysis Overview

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Data</th>
<th>1st-Level Analysis</th>
<th>2nd-Level Analysis</th>
<th>Common Themes Across Data Sources</th>
<th>Conceptual Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students' interviews</td>
<td>Statements</td>
<td>Specific experiences identified by students</td>
<td>Triangulation across data sources</td>
<td>1. Use of scenarios and case studies as education tools</td>
<td>1. Encourage student autonomy</td>
</tr>
<tr>
<td></td>
<td>Sentences</td>
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<tr>
<td></td>
<td>Thoughts</td>
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<td>Thoughts</td>
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<tr>
<td>Instructors' interviews</td>
<td>Statements</td>
<td>Specific experiences identified by instructors</td>
<td>Triangulation across data sources</td>
<td>2. Authentic athletic training experiences</td>
<td>2. Enhance student self-confidence</td>
</tr>
<tr>
<td></td>
<td>Sentences</td>
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<tr>
<td></td>
<td>Thoughts</td>
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</tr>
<tr>
<td>Course syllabi</td>
<td>Course objectives</td>
<td>Specific pedagogic practices/assignments</td>
<td>Triangulation across data sources</td>
<td>3. A positive educational environment</td>
<td></td>
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<td>Course requirements</td>
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</tbody>
</table>

entered into the NUD*IST (Nonnumerical, Unstructured, Data, Indexing, Searching, and Theorizing) qualitative data analysis computer program (QSR International, Melbourne, Australia) to facilitate data reduction and analysis. The program allows researchers to analyze unstructured data such as text from interviews and documents (syllabi) to identify and explore complex relationships. Researchers code single transcribed sentences or complex relationships and common themes (Table 2).

In this study, the NUD*IST computer program was used to help identify emerging categories and themes across students' and instructors' interviews and each course syllabus. The qualitative data analysis was based on the guidelines of LeCompte and Preissle15 and included construction of conceptual categories, differentiating and sorting data, and converging on a theme. First-level analysis of data provided an overall description of concrete categories across athletic training educational experiences. During first-level data analysis, each text unit from students' and instructors' interviews was examined and coded into specific categories. First-level categories were characterized by specific educational experiences identified by students and instructors in each CAAHEP-accredited athletic training program. The process continued until all text units were initially coded.

During the second level of constant comparison, initial interview data were compared across students and instructors from each CAAHEP-accredited athletic training program. First-level text units were reanalyzed and coded into more specific categories that reflected common themes of educational experiences consistent throughout each CAAHEP-accredited program. Questions identified by LeCompte and Preissle15 were used to guide the differentiating and sorting of data. Questions included, "Which things are like each other?" and "Which things go together and which things don't?" A detailed analysis of students' educational experiences in athletic training was determined through second-level analysis after all text units were recoded and compared with course syllabi from each program.

The categories and themes to emerge from the data were reviewed for overlap and recoded if necessary. The decision to stop processing the data was a result of the following criteria outlined by Guba16: exhaustion of sources, saturation of categories, and overextension of information. Ultimately, the data were classified into manageable common themes that reflect teaching and learning across all data sources. Trustworthiness of the results was established through triangulation of the multiple data sources (students' interviews, instructors' interviews, course syllabi). Triangulation is a technique used in qualitative research that refers to a researcher's cross-checking information from multiple perspectives to ensure authenticity of the findings.17 Triangulation of all data sources was used to help present a more complete and accurate analysis of athletic training educational experiences in CAAHEP-accredited programs.

Limitations

The student participants included in this study were a small, purposeful, nonrandom sample that may influence the generalizability of the results. Student participants were selected on the basis of their availability during the interview times selected by the researcher. A few of the athletic training students within the program were off campus at clinical sites, away on trips with athletic teams, or at a practice or game across campus. With regard to those students available for interviews, an effort was made to include students with a wide variety of athletic training experiences (eg, sophomores, juniors, and seniors). The course syllabi collected from each participating instructor did not represent all content areas included in the educational competencies for the NATA.

The design of this study is intended to provide insightful information for athletic training educators. Each program director, clinical supervisor, or athletic training educator should determine how the information provided in this study may be useful and benefit his or her own educational practices.

RESULTS

Based on the analysis of students' and instructors' interviews and course syllabi, 3 pedagogic strategies were identified as essential components of athletic training education in CAAHEP-accredited programs: use of scenarios and case studies, authentic experiences, and a positive educational environment.

Use of Scenarios and Case Studies as Instructional Tools in Experiential Learning

An initial category to emerge from the data was instructors' use of scenarios throughout students' educational experiences. Scenarios were included as strategies or instruc-
ional tools by teachers to facilitate comprehension and application of athletic training knowledge and skills. The following quotations represent responses from junior and senior athletic training students concerning how learning takes place in their athletic training education program. Sally, a junior at Jackson University, indicated that learning athletic training content in her classes was often structured around the instructors’ use of different scenarios. She noted that

They [instructors] like to give us real-life scenarios of specific athletic injuries that they have experienced at one time or another. The stories that they [instructors] tell from their own experiences helps us understand. It makes it [class] more interesting when the teacher has a story to go along with it [content/topic].

Lisa indicated that learning in athletic training classes at Timberland University was easier when instructors used scenarios. She explained that she learned best when

Instructors give us a situation and we have to determine the best way to deal with it. Like they [instructors] tell us that an athlete comes into the training room complaining of pain on the medial side of the knee and we have to figure out how to treat the athlete correctly. They [instructors] do this for all kinds of different situations and for me it is easier than just talking about it.

Most students and instructors considered the use of scenarios an essential component for making education more meaningful. Educational experiences that offer scenarios as a part of learning seem to increase students’ motivation to learn as well as increase their ability to integrate athletic training content knowledge. Bobby, a senior athletic training student at Westwood University, and Janet, an instructor at Jackson University, both discussed the practical application of instructional task-based athletic training scenarios. Bobby indicated that in his program, teachers use scenarios in class as a part of student preparation for clinical rotations. In response to a question concerning student education, Bobby said,

The scenarios that our teachers use in our classes help prepare us for when we have a team on our own. It is good for me. When someone is screaming on the field, it [will not] be that big of a deal if you have talked about that type of situation before.

From an instructor’s perspective, Janet indicated,

I like to take advantage of hands-on stuff and try to bring in as many real-life situations and tell them a lot of my own experiences or the experiences that my colleagues have had. So I try to give them scenarios and I ask them what they would do in a specific situation related to an athletic injury. I want to know how they are going to handle the situation.

Athletic training scenarios were also described by Ken, a junior at Lakeside University, as an effective tool for enhancing motivation. When asked what types of things are done in classes to help motivate students to learn, Ken replied,

The most motivating thing is the handouts of situations, the practical scenarios we get in class. We decide what we think we should do in these situations and can bring that information to class. That motivates me because I know we are going to get into a discussion. Discussions are much more motivating than listening to lectures and opinions. Scenarios are much more helpful.

Another instructional tool frequently described by students and instructors in CAAHEP-accredited athletic training programs was application of more advanced scenarios or case studies. Case studies were integrated into class assignments and required knowledge application of real-life events and actual injuries within athletic training programs. These assignments were consistently identified throughout CAAHEP-accredited athletic training course syllabi and appeared to be more meaningful to students. For example, an evaluation and assessment course at Lakeside University required integration of authentic athletic training experiences. In this class, students were required to complete a case study in which the student and partner select a varsity athlete who has sustained a unique and significant injury (ie, missed more than one practice or game). Each student was required to research the injury and present the case to the class.

A second example of an assignment that integrated authentic athletic training experiences was from a therapeutic modalities course at Timberland University. In this class, students selected an individual who had suffered an acute injury or was receiving ongoing treatment for a chronic condition due to a sport-related injury. Students were required to present both in writing and orally an overview of the use of therapeutic modalities in this case study along with progress and evaluation measures.

Students and instructors from each of the 5 programs indicated that assignments were more meaningful to students when they included a real-life individual or scenario. Other authentic assignments described by instructors in these programs included student mock interviews, designing a training room, and researching a specific topic in athletic training and presenting it. Conversely, these assignments were perceived by students and instructors as having more meaning and application to real athletic training situations.

Examples of instructor facilitation of teaching scenarios for athletic training students were also identified within 2 instructors’ assignments from a therapeutic modalities class at Jackson University. The assignment required students to select appropriate modalities and settings for a given clinical scenario and provide sound rationale for the selection. Students were also given a situation in which they were in charge of a clinic and needed to purchase a modality. Students were required to “determine the needs of the clinic, financial ability, etc, and research available products that meet all the needs.” The assignments required students to integrate their knowledge of therapeutic modalities and make appropriate decisions for specific situations in athletic training.

It is evident from the data that experiential learning in the form of instructional scenarios and case studies is an overriding theme and important focus for instructors, students, and course syllabi within these 5 programs. Instructors at each of these universities used scenarios and case studies that were viewed by students as interesting, meaningful, motivating, and helpful in facilitating the learning process.

Authentic Athletic Training Experiences

A second category to emerge from the data was the value of authentic experiences within the 5 athletic training curricula. Students commented on the importance of creating multiple opportunities for them to apply knowledge and skills in a variety of authentic experiences. Data from these programs suggested that observational and hands-on opportunities in students’ clinical rotations provided authentic learning experiences that enhanced student education.

Athletic training educational experiences in the programs provided varying levels of authenticity. For example, experiences that were more structured and limited to classrooms and associated laboratories appeared more meaningful than lectures but less authentic than those experiences associated with real-life athletic training situations. Students’ interactions with
patients with real injuries and rehabilitations were perceived as most helpful.

**Hands-On Learning in Athletic Training Education.** Most participants agreed that practical, hands-on components of athletic training education provided a more authentic learning experience than classroom lectures. Two juniors and one senior discussed why hands-on learning experiences were an important component of their athletic training educational experiences. Bob, a junior at Manato University, indicated that hands-on learning is the best way to learn athletic training content. He said,

> "...better because you are able to see more." Larry, an instructor at Timberland University, explained why observational learning experiences are important to her for learning the content. Patty, a junior at Lakeside University, indicated, "I am definitely a visual learner." Including observational learning experiences in the athletic training experiences described above are each integrated into classroom and laboratory structures in which students are able to work with peers and practice specific athletic training skills. Students from each of the programs indicated that providing opportunities to apply knowledge and skills in classrooms and associated laboratories was an important aspect of their education.

**Observational Experiences in Athletic Training Education.** In addition to hands-on learning, students and instructors also spoke of the importance of observational learning in structured educational practices. Patty, a junior at Lakeside University, explained why observational learning experiences are important to her for learning the content. Patty’s explanation exemplified the view of many athletic training students when she said, "I can read it and read it, but I need to see it. I am definitely a visual learner." Including observational learning as a part of students’ educational experiences in athletic training was also supported by Nichole, a junior at Lakeside University. She indicated, “A lot of people complain about the hours you spend in this major, but it is all beneficial. The hours make you better because you are able to see more.” Larry, an instructor at Timberland University, described similar benefits of observational learning by indicating that

> Students do a lot of hours in our program and that is by design. I think the more hours our students get, the better. The more chance they [students] get to see different things in the training room, the better. There is a big difference between talking about it and actually seeing it.

Both students and instructors indicated that hands-on learning and observational learning were important components of students’ educational experiences in their programs. Although each provided authentic learning experiences for students, more authentic experiences were described through experiences outside the confines of class and associated laboratories.

**Authentic Experiences of Treating Real Athletic Injuries.** Students and instructors suggested that athletic training experiences associated with clinical rotations were more meaningful than structured experiences within the classrooms and associated laboratories because knowledge and skills are applied to real athletes. Students’ comments reflected high levels of excitement and engagement in learning when participating in a variety of clinical rotations.

Clinical rotations within the 5 CAAHEP-accredited athletic training programs included educational experiences at high schools, sports medicine or physical therapy clinics, and collegiate training rooms and specific sport assignments in university athletics. Both students and instructors indicated that a variety of experiences enhanced their understanding and ability to apply the content knowledge associated with educational competencies and clinical proficiencies. When asked to describe his education at Manato University, Fred, a senior student, said, “I think the education I had here was realistic. It had some real-world experiences.” Instructors at each university also felt that realistic and diverse clinical experiences were an important component of athletic training student education. Anthony, an instructor of 3 years at Manato University, explained how his program addressed student educational experiences by saying,

> I think the focus changes when they [students] realize that they are not taking therapeutic exercise because it is required but rather they take it because they need to know the material. We [instructors] try to get them [students] to understand that if they don’t know this material, it is not that they [students] just didn’t pass the class, but rather in the real world when they are treating athletes, they will be deficient.

Students explained that experiences in a variety of clinical settings were more meaningful because of their association to real-life athletic training. Students and instructors in each of the programs suggested that this type of authenticity could not be duplicated in a structured classroom and laboratory environment.

Interview data from students and instructors indicated, however, that not each clinical setting provided the same quality of learning experiences. Students and instructors spoke of having both good and bad clinical experiences throughout their programs. The following quotations represent students’ and instructors’ perceptions of the effectiveness of clinical experiences in their athletic training programs to address real-life situations. Jeff, an instructor at Westwood, offered his perspective on the educational experiences in his program by indicating,

> It is our goal to give every student a quality educational experience. We try to give students a chance to work in a variety of clinical settings including collegiate athletics and high schools. Students get two semesters on campus and two semesters of clinical experience off campus. It is a much better experience for students when they are the main person and given more responsibility.

Jamie, an athletic training student at Lakeside University, and Alice, an athletic training student at Manato University, discussed how clinical experiences in athletic training influenced their level of confidence. When asked how confident she was in her abilities, Jamie indicated that her sport assignment was an influential factor for self-confidence. She suggested that
A lot depends on the sport that you work with. I worked with swimming and you just don’t get a chance to see that many things. Then I went to football and I saw a lot of different things. I mean you can have all the book knowledge in the world, but until you see it for real, you really don’t understand it.

Alice attributed her level of confidence to her internship experiences. In response to a question pertaining to student self-confidence, Alice responded,

It [my confidence] is getting better. Part of our learning experience here is getting the chance to experience things at different athletic training settings. You get a chance to work at either a high school or a clinic as well as with the sports teams here. You can apply whatever you learn at one setting to another. It is all the same stuff, but it is just at another setting.

Clinical rotations seem to provide an extension of the classroom and laboratories to enhance the application of knowledge and skills in a real athletic training situation. Specific clinical rotations were viewed by students and instructors as authentic learning environments. Environments that provided students with autonomy, diversity, and a clear link to the athletic training classes seem to be viewed as most effective.

The benefits of including authentic experiences in student education were identified through students’ and teachers’ perceptions of teaching and learning and assignments from courses within the athletic training curriculum. Evidence from students’ and instructors’ interviews and course syllabi suggested that instructors in these 5 programs enhanced students’ educational experiences by integrating varying degrees of authentic athletic training experiences into the curriculum. Instructors incorporated authentic experiences by examining and discussing real athletic injuries, using therapeutic modalities as instructional tools, and creating student assignments that were meaningful.

A Nice Place to Learn: Creating a Positive Educational Environment Within Athletic Training Education

A third and final category to emerge from the data was creating a positive educational environment within the programs. Creating a learning environment that fostered adaptive student behaviors, such as confidence in one’s abilities, increased motivation to learn, and persistence, appeared to enhance student learning. With regard to students’ educational experiences in the programs, both students and teachers identified a variety of factors related to a positive educational environment. These included establishing positive instructor-student and peer relationships.

Positive relationships between instructors and students within athletic training programs appeared to develop slowly over time and in conjunction with student progression through the athletic training curriculum. Data suggested that these relationships were enhanced by a sense of trust and responsibility between instructors and students.

**Instructor-Student Relationships.** Students commonly described their educational experiences in athletic training as continually applying the knowledge they have learned in a variety of relevant situations. Often students’ levels of confidence in these situations were influenced by the relationship they established with their instructors. Tammy, a junior at Lakeside University, indicated that her confidence in athletic training skills and knowledge was enhanced when instructors exhibited trust in her. She explained,

We [students] get to do everything by ourselves, which makes you realize that you know this stuff. It is not like you have someone [certified athletic trainer/instructor] there all the time; they are just there in case you need them. We get to work by ourselves a lot. I think it helps that we get to travel [with a sports team] by ourselves. So that builds our confidence when they have confidence in us.

Patty explained why her confidence level had increased throughout her educational experiences at Lakeside University. She said,

In the training room they [staff athletic trainers] will give you more responsibilities and trust you to work the rehab without standing over your shoulder. I got to have a team almost to myself in the fall and that showed that they [staff athletic trainers] had a lot of confidence in me. He [my instructor] told me that with anyone else, he might be worried, but with me he said he was not so worried and that I could handle it. So that was nice. It pretty much reassured me that they were confident in me.

Joanie, a sophomore at Jackson University, indicated that her relationship with her instructors was helpful in learning the material. When asked what was done to help her learn, she indicated that a positive relationship with her instructors was helpful. She also said,

I think we have good instructors. They [my instructors] are really concerned that we understand the material. They [my instructors] are in this profession because they love what they do and they want us to be successful. Like when he [instructor] is teaching us, he has more than one way to explain a concept. He [instructor] has more than one way to explain it so all students can understand.

When considering the number of interactions between students and instructors throughout athletic training educational experiences, it is not surprising that establishing a strong relationship between students and instructors and creating a family-type atmosphere was deemed very important by both students and instructors. Sally, a student from Jackson University, and Bob, a student from Manato University, both explained how a family-type atmosphere was beneficial in their program. Sally described her learning environment as a positive one as she spoke about the instructor-student relationship at Jackson University. She indicated that teachers from Jackson create an environment that is easy to learn in. The instructors here treat us more like peers in the profession instead of like teacher-student. It makes me feel good. When one of my teachers sees me, it is a first-name basis and that makes me feel more comfortable interacting with them and it builds a certain rapport with instructors and the students that I don’t think you get at other programs.

When asked what makes athletic training education at Manato University so special, Bob indicated that it has to do with the instructors and creating a positive learning environment. Bob said, “We have a diverse staff with different personalities and backgrounds and I appreciate that and I like it.” He also stated that all members of the program, including the program director, graduate assistants, athletic trainers, and students, work together as a “cohesive unit” to make the program successful. Janice, an instructor at Lakeland University, identified personal relationships between students and instructors as a useful strategy for influencing student motivation. She said,

It is easier for me to motivate our athletic training students because I know them [students] and I am around them [students] a lot. I know their personalities and I know when they are getting stressed out or when they need to laugh or be ridden a little bit or given a hard time about something.

**Peer Relationships.** In addition to positive instructor-student relationships, students and instructors mentioned the
importance of creating positive relationships among students within the program. Students and instructors identified positive peer relationships as an important component in athletic training education programs for enhancing student learning. When asked to describe his interactions with students, Larry at Timberland suggested that establishing a good relationship with his students was an important part of his job. He said,

When I see students in their clinical rotations, it gives me the chance to interact with them on a more informal basis and more of a one-on-one basis. I think it is important to know the students and know what they want. I take a lot of pride in getting my students into graduate school and getting them jobs and getting them to pass the certification exam.

Steve, a sophomore at Lakeside University, explained his relationship with other students from an underclassman's perspective. He indicated that “the most experience that you get in the training room is working with upper-level students and just going over everything. It helps to be able to ask a buddy how to do a Lachman’s test when you are a freshman.” Bobby, a senior student, suggested that the structure of the program at Westwood University contributed to establishing positive student relationships. He said,

Our sports are assigned so that you get to work with an upper-level student. That experience helped me to realize that I knew more than I thought I did. When I was a lower-level student, I worked with a student [upper level] that would often times check with others when she didn’t know something. I learned a lot from working with her and watching how she reacted to certain situations.

Yvonne, a senior at Lakeside University, explained that when she was responsible for peer teaching younger students, the entire process enhanced her own knowledge and understanding. She suggested that a mentor program was a good idea because

Students would come and ask me a question about something that I had not seen since my sophomore year, and I would have to go back and review it. That is good for me because I am preparing for the NATABOC certification exam in a few months, so I get to review those special tests and everything else.

The students from each program suggested that creating positive relationships is not always structured directly into the curriculum but rather expected as a part of a quality athletic training program. Fred provided an underclassman’s perspective on peer relationships at Manato University. He suggested that “it is our duty to help the younger people because I learned a lot from the seniors ahead of me.” Sally described working relationships between upper- and lower-level students as an expected component of her education as well as something that makes the program at Jackson University special. She indicated that

The underclassmen that worked here all remember what helped them out when they were going through the same thing [clinical rotations], and they are willing to share their knowledge. That is one thing that I really love about this program is that I have not really run into people with a selfish attitude.

The influence of positive peer and instructor relationships in athletic training education was identified by both students and instructors as an important component of educational experiences in the programs. Increasing the level of student autonomy in clinical experiences was described by students and instructors as an effective practice for enhancing student confidence in their abilities. Students and instructors described trust in terms of its association with the level of responsibility given to students. For example, instructors’ trust in students was associated with the level of clinical responsibilities experienced by each student. When students were given increased independence in their clinical settings, students described the educational experiences as having a positive influence on their self-confidence.

DISCUSSION

Three categories (use of scenarios, authentic experiences, a positive educational environment) emerged from the data as helpful tools for athletic training educators, clinical supervisors, and program directors. Students and instructors identified meaningful educational practices that assist students in understanding and applying concepts in athletic training. These 3 useful educational tools presented in the previous section appear to reflect a few broad conceptual themes (self-determination theory and self-efficacy theory) that seem to organize and facilitate athletic training education in this study. Each conceptual theme may provide insight and understanding for athletic training educators seeking more effective ways to educate students. When integrated into an effective curriculum, each theme contributes to a learning process in which student autonomy and confidence become essential vehicles through which students learn.

Encourage Student Autonomy

Experiential learning in athletic training offers students a chance to become actively involved in their learning experiences. The clinical experiences described by students and instructors as most authentic and meaningful were those that provided students with increased autonomy and control. A major component of self-determination theory is active student involvement, which has a long history in the achievement motivation literature. Research on self-determination has suggested that promoting an educational environment with a greater sense of choice, more self-initiated behavior, and greater responsibility has been identified as an important developmental goal for enhancing student outcomes such as creativity, cognitive flexibility, and self-esteem. Deci et al2 offered specific pedagogic strategies for enhancing students' self-determination and their sense of autonomy. The strategies outlined by Deci et al2 (offering choices, minimizing controls, acknowledging feelings, and making information readily available) are reflected in the responses from athletic training students and instructors.

Students and instructors indicated that athletic training laboratories and practical situations in which students become involved created a better learning environment than traditional classroom lectures. Students and instructors both indicated that a combination of lectures associated with some type of experiential learning was more authentic and meaningful. A traditional classroom environment characterized by teacher-directed lecture provides students with little responsibility and autonomy in their learning. It appears that effective instructors in these athletic training programs created instructional tasks and environments that incorporate student control. For example, the use of scenarios in athletic training education provided students with the opportunity to be a part of the decision-making process in particular learning tasks. Challenging scenarios requiring active participation and collaboration with others to solve a complex problem are consistent with a task-
involved goal perspective. All athletic training educators should make an effort to provide educational opportunities that encourage student choice and autonomy.

**Enhance Student Confidence**

Students from all 5 programs spoke extensively regarding experiences in their education that influenced their level of confidence and motivation to learn. Student confidence was an issue addressed throughout students' educational experiences in the programs. Increased levels of student confidence were associated with student autonomy, authenticity, and positive relationships. Research on self-efficacy theory suggests that educators are able to create instructional tasks that foster self-efficacy by building on students’ prior knowledge and arranging for students to see peers successfully perform certain tasks. Bandura also indicated that the level of a student’s self-efficacy influences the choice of activities, effort, and persistence. It was evident from this study that students felt more confident and motivated to learn when they were provided with experiential learning and were able to observe their peers performing specific skills and tasks.

Pedagogic practices that incorporate self-efficacy theory seemed to be reflected in the perceptions of athletic training students and instructors. For example, athletic training students spoke positively about instructors who provided ample practice time to learn skills and authentic situations to integrate their knowledge. Students also indicated that instructors who exhibited trust in them and provided them with increased independence enhanced their self-confidence. The trust and independence provided to students by their clinical supervisors were most often associated with their level of involvement with a sports team. Our findings suggest that students' confidence can be enhanced when instructors design teaching practices that build upon their prior knowledge in a meaningful way, foster student autonomy and decision making, and encourage positive peer and instructor relationships. Simply possessing certain skills does not ensure that students will be motivated or able to apply them in a practical situation. The ability of an instructor to be able to identify pedagogic strategies that seem to enhance student self-confidence and motivation is an invaluable tool for enhancing the educational experiences of athletic training students.

**RECOMMENDATIONS**

We hope this research study provides useful pedagogic tools and encourages athletic training educators to examine how learning is fostered within their own classrooms, clinical experiences, and programs. Reform efforts in other practitioner-based disciplines (i.e., medical education) have already provided research that examines the relationship between students' educational experiences and effective teaching and learning practices. We recommend that all athletic training educators reflect on their current pedagogic practices and examine what students and instructors at other CAAHEP-accredited programs view as helpful. The pedagogic practices identified in this study are consistent with sound theories of achievement motivation identified in the literature and, therefore, offer athletic training educators an opportunity to critique and possibly enhance their own athletic training education program. We hope this study will initiate both reflection and future discourse on educational experiences in CAAHEP-accredited athletic training programs.

We also hope this paper serves to generate discussion about qualitative inquiry and its usefulness in athletic training education. Qualitative inquiry in athletic training research is seldom used; however, the development of the body of knowledge within athletic training education warrants the use of alternative methods of analysis to answer many questions. Research in athletic training can be enhanced by including analysis of students’ and instructors’ thoughts and perceptions that often cannot be identified on a survey or questionnaire as well as from an in-depth interview. Pitney and Parker outlined the possibilities of qualitative inquiry for athletic training research and identified how such methods can benefit the athletic training profession.

**REFERENCES**


eLearning: Is There a Place in Athletic Training Education?

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Objective: To provide an overview of current issue and research literature that discusses the use of eLearning in an academic curriculum. We address several components to be examined before eLearning is incorporated into athletic training education.

Data Sources: We searched MEDLINE and Educational Resources Information Center (ERIC) from 2000 through 2002 using the key words distance education, online learning, and the individual research studies referenced in this article.

Data Synthesis: Educational research studies have confirmed that multiple methods in instruction delivery exist. Within the changing culture of higher education, the use of effective communication tools has been shown to increase student knowledge and skills. Through eLearning, methods of instruction design are designed to be student centered and allow the educator to become a facilitator.

Conclusions/Recommendations: Even though the use of eLearning faces many challenges in athletic training education, the research literature does support this method of instructional delivery in selected courses in athletic training education.

Key Words: cybergogy, distance education, student centered

DEFINING eLEARNING IN THE ACADEMIC SETTING

In academic institutions, administrators, faculty, and staff are constantly faced with the challenges of gaining access to funds to support their academic programs and research agendas. The most probable ways to achieve this goal are to increase enrollment and to secure external funds. According to Duderstadt,1 most institutions depend on several sources of revenue, including tuition and fees, state appropriations, federal research grants and contracts, gifts and endowment income, and auxiliary services such as athletics, residence halls, and campus dining programs.

In an academic culture, many challenges exist. Adult learners are obtaining degrees in the face of existing difficulties including time, distance, family commitments, work-site issues, and economic barriers. Characteristics of the college learner are changing. Additionally, the use of technology increases access to higher education programs for the non-traditional student population.5-7

To meet today's challenges, the growth of distance education in our colleges and universities has confronted traditional models. According to Gibson,8 nearly 90% of institutions with an enrollment greater than 10,000 were involved in distance-education efforts. Many programs are struggling to provide adequate quality-control measures.

We focus on several eLearning issues that relate to the discipline of athletic training education. The 4 critical factors include (1) return on investment, (2) quality, (3) knowledge and skill-based learning, and (4) the effectiveness of eLearning.
to computer systems and various chat applications, which allow users to communicate at the same time while connected to the Internet, can also be considered synchronous. Through asynchronous learning, access can occur at any time of day and at any location and does not result from real-time contact with the instructor (Figure 1). Several variations of asynchronous instruction exist, including mailing videotapes to students, compressed video, e-mail, and comprehensive Web-based courses. The typical elements of an online course include the lecture, which can include text and video clips, graphics, useful links, downloadable files, e-mail, and areas for synchronous contact such as chat. Converting or designing a course for online delivery takes time and demands a team approach.

Through eLearning, the method of teaching changes to a student-centered culture (Figure 2). Cybergogy has become a frequently used term to define teaching via technology-based instructional programs. As student populations are being recruited to enroll in technology-based courses, faculty involvement is critical. For many faculty members, eLearning is a major shift in the fundamental roles of the instructor. Much of the course development must be done before the beginning of the class; technical skills and support are critical to the success of the class; and a shift from a presenter of information to a facilitator of knowledge is key for eLearning instruction.

Use of eLearning in the Academic Setting

Evolving technologies have made online instruction appealing and have increased interest among both the academic and the business communities. Kearsley noted that many users of online instruction do not take full advantage of the Internet’s asynchronous potential. While traditional, synchronous instruction typically takes place in a classroom with instructors delivering lectures and students being assessed via tests and written papers, in an asynchronous format the courses provide for a more student-centered and project-based learning environment. A typical online, asynchronous course may consist of online syllabi, study guides, external research links, online assignments, threaded discussion boards, and electronic mail correspondence.

In the discipline of athletic training, the delivery of online content can occur in many ways. One of the most common ways is to develop the files using an HTML (hypertext markup language) editor and then to load those files to an institution’s network server. Additionally, some institutions may have templates or purchased site licenses to commercial products, such as WebCT (Lynnfield, MA) and BlackBoard (BlackBoard Software, Inc, Arvada, CO), that enable instructors to develop courses without using HTML editors. Educators routinely use collaborative learning and teamwork activities to accomplish learning objectives and to motivate and empower students. Educators have also seen the value of collaboration on research projects and now, with the evolving use of technology, can more quickly and easily collaborate with distant colleagues on other efforts, such as online instruction and serving as mentors in areas in which one colleague may feel more comfortable than another. In the Olson and Blye study of distance learning of collaboration via distance, the researchers found that computing includes tools that support interactions and encourages work beyond the boundaries of physical space.

Impact of eLearning

The increased availability of technology, including the Internet, allows faculty to develop distance-education courses and to deliver content to learners who would not otherwise have the opportunity to complete courses. As students in today’s colleges and universities change from the traditional 18- to 22-year-old group to the adult learner, higher education must seek ways to build educational programs that are more appealing to these students. Currently, only 17% of students attending college are 18 to 22 years old. Nontraditional learners demand that universities provide lifelong learning programs and that these programs include flexible instructional models.

A frequent topic of debate related to the use of computer-based instruction is the question of effect on student learn-
The question cannot be ignored at any level of education. Do students participating in an online course perform as well as their traditional counterparts? To consider this question, we will outline thoughts related to return on investment, quality, knowledge- and skill-based learning, and the effectiveness of eLearning. While we used several sources to gather data on these issues, including questions on both faculty and student surveys, results from state and national certification and licensing examinations provide the most promising evidence regarding the outcome of eLearning.

DISCUSSION

Return on Investment: Is it Worth it?

Creative administrators have targeted distance education as a response to the economic, political, and educational changes taking place on college campuses.22 The exploration of new technologic delivery methods to increase access to higher education in conjunction with cost-effective degree programs is a high priority for administrators.5,6 Even upon entering college, many undergraduates are beginning to be required to own or to use computers.

Before the development of online courses is considered, it is important to determine whether the content is appropriate for online delivery. Through collaborative efforts, faculty can determine content and delivery methods. A team approach aids in conversion of online delivery. Building a team to accomplish the goal of online delivery is also important. Potential team members are content experts, instructional designers, technical support and administrative support members, and evaluators. Once a timeline is established, implementation of strategies can be assessed and whether learning is appropriate can be determined. Only through a systematic approach (analysis, design, development, and evaluation) can the return on investment be determined.

Quality: Can it be Controlled?

Concrete evidence about the quality control of distance education is readily available when one catalogs the recent rash of distance-education reports and standards. The Southern Regional Education Board23 has created sets of quality guidelines titled Principles of Good Practice that constitute a checklist of criteria for an effective online program. Additionally, the American Federation of Teachers24 recently released a report suggesting that the lack of quality control in distance education could greatly jeopardize an institution's effort to implement a quality distance-education program. Through these efforts, guidelines can be implemented to structure quality control.

The development and implementation of a quality-control system for online course delivery is a work in progress and will continue to evolve in the foreseeable future. For change related to technology integration to occur, instructors must not only acquire new skills, but they must also change attitudes and behaviors in order to function successfully in the electronic classroom.25,26 In many ways, the issues and concerns are the same as with traditional classroom-based instruction. At the same time, assessing and ensuring the quality of online instruction requires a rethinking of some of our traditional approaches to quality control. When confirming quality, the program, institution, and accrediting bodies must agree upon the appropriate use of technology-based instruction within the discipline. Once this has been established, a continuing monitoring system addressing development, delivery, and evaluation must ensure appropriate outcomes.

Knowledge- and Skill-Based Learning: All or None?

In selected disciplines, the debate concerning the use of nontraditional learning methods will always exist. Personal preferences regarding instructional design and delivery sometimes override current research trends. With this in mind, faculty and staff should always consider the students and their current knowledge of the basic core of productivity and Internet software (ie, word processing, Web-based instructional programs, databases, browsers). Tapscott27 noted that the baby-boom echo generation is the first generation to grow up in the digital age and, therefore, has no fear of new technologies. Thus, selected knowledge- and skill-based components might be better presented in a more appealing and convenient manner.

Faculty must understand the fundamentals of time spent on learning and its effects on retention. Also, educators should address their goals and how they can use technology to help achieve those goals in a way that traditional means cannot. Most instructors are discovering that the new generation of students is more knowledgeable and comfortable with technologies because they grew up with technology and, further, expect technology to be integrated into their educational experiences. These expectations of students will only increase.

eLearning moves the instructional model from an instructor-centered presentation model to a student-centered learning model. The instructors act as facilitators of learning, assisting and engaging students in group discussions.27,28 Students who participate in eLearning courses expect regular interaction and feedback from the instructor.

Can the Effectiveness of eLearning be Measured?

Much research has been conducted on the quality of educational technology. According to Russell,29 this instruction is equivalent to traditional instruction. Russell examined more than 250 research reports from 1928 to 1999, comparing traditional instruction with various forms of alternative instruction, including radio, film, open-circuit television, audiotape, closed-circuit television, audio-visual, satellite, teleconferencing, videotape, and computer-assisted instruction. In each case, the innovation was as effective as traditional instruction. Russell called this the "no significant difference phenomenon": regardless of the actual quality of traditional instruction, distance education can be just as effective.

A major difference in traditionally taught courses and distance-education courses is that in distance courses, assessment is typically performed via student-centered projects and the use of standardized tests administered online in a proctored environment.29 Peter Ewell, of the National Center for Higher Education Management Systems, noted that higher education is moving toward outcome-based assessments and that e-Learning is leading the charge in this area.29 Using outcome-based assessments, students are able to show learning by performance and have the ability to apply that content in a real-life component.
eLearning in Athletic Training Education

Athletic training education through the Internet is possible. The ability to deliver multimedia content asynchronously via the Internet offers many possibilities to the athletic training educator. For example, success in the profession of athletic training requires professional education in athletic training. Students of athletic training are required to accumulate many hours of clinical experience to acquire the competencies of a National Athletic Trainers’ Association Board of Certification (NATABOC) certified athletic trainer. However, for the athletic training educator, recreating realistic injury scenarios for practice purposes can be challenging. Without actual injuries, the quality and realism of the experience are limited. Well-designed multimedia via the Internet can assist in recreating realistic injury scenarios to facilitate learning and provide quality assessment opportunities.

Assessment of eLearning courses can be performed using both standardized tests delivered online and multimedia simulation and practical examinations administered by Approved Clinical Instructors. The quality of these courses is still controlled by the instructors of record at accredited institutions, but the physical location of the students is not a limiting factor because Approved Clinical Instructors (ACIs) may be located anywhere.

Using eLearning courses in athletic training education may require a standardized clinical-instructor certification, much like the current model of NATABOC practical examiner certification, which would be a shift from the current model. This allows Committee on Accreditation of Allied Health Education Programs-accredited programs to expand clinical opportunities to students to virtually anywhere in the world, provided an ACI is available to administer the clinical aspect for the student.

One of the most challenging issues facing athletic training educators today is adequately presenting all of the educational competencies within the time allotted to the curriculum. Existing eLearning modules can help the athletic training educator. For example, within the area of general medical conditions, infectious disease content must be provided to the student. In most situations, the athletic training educators either present the content or invite another health care specialist (such as a physician) into the classroom to lecture on the topic. In either case, the information is presented in a synchronous fashion and requires valuable classroom time. In contrast, the athletic training educator could use the online infectious disease resource made available by the National Athletic Trainers’ Association Education Council Continuing Education Committee. (See http://www.csuchico.edu/~sbarker/CEC/virtual_library.html) Even though this Web site is intended as a continuing education resource for certified athletic trainers, the content could easily be used in the athletic training education process. The infectious disease material could be completed asynchronously as an out-of-class assignment. The athletic training educator could then decide how to incorporate the application and assessment of this content. One example would be to structure a brief, in-class discussion to allow for application of this content. This is just one example of incorporating eLearning into the athletic training education process. Many other resources such as this can be used, and many more will be available in the future (Figure 3).

CONCLUSIONS

The use of eLearning methods in the discipline of athletic training education faces many challenges. However, several allied health disciplines use distance education to deliver educational content to students. These programs are identified in the 2001 Peterson’s Guide to Distance Learning Programs (http://www.petersons.com/dlearn/dlsector.html). Even though this Web site is intended as a continuing education resource for certified athletic trainers, the content could easily be used in the athletic training education process. Many other resources such as this can be used, and many more will be available in the future (Figure 3).
nology is changing the way we deliver knowledge and skills. Distance should no longer be an obstacle for learning.

There is no turning back or minimizing the role of technology in our educational systems. As educators, we must learn to work in teams to meet the challenges of educating tomorrow's students. Representatives from the private business sectors agree that information technology has allowed them to either gain a competitive edge or to simply remain competitive. Many of us currently in the classroom did not grow up with the technological edge our students have today; therefore, we do not have technology mentors. With this in mind, it becomes even more important to collaborate with other faculty members and to take advantage of technological learning opportunities offered by one's institution. For changes to occur, athletic training educators need to make efficient use of technology in teaching. With so many different ways to collaborate across distance, the professional and educational growth will occur among colleagues. Through collaboration with other athletic training educators, we can expand our use of technology-based learning modules in our discipline.

REFERENCES


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Effective Use of Multimedia Technology in Athletic Training Education

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Objective: To examine the effectiveness of using a CD-ROM, Sports Injuries 3-D, by Cramer Products (Gardner, KS) in an introductory athletic training laboratory class as a supplement to traditional lecture instruction. Attitudes toward the computer-assisted instruction and usefulness of the CD-ROM program were also examined.

Design and Setting: Students in 2 introductory athletic training laboratory classes from one institution were randomly assigned to either a traditional lecture (n = 11) or traditional-lecture/CD-ROM (n = 15) group.

Subjects: Undergraduate kinesiology majors enrolled in "Techniques of Athletic Training" (10 men, 16 women; mean age = 22.39 ± 3.64 years).

Measurements: We compared scores from 2 written examinations and 1 practical examination between groups. Subjects also completed weekly journals and participated in a focus-group interview at the end of the semester to elaborate on how often they accessed each resource and their feelings toward their various resources. Subjects in the traditional lecture/CD-ROM group also completed the Alien Attitude Toward Computer-Assisted Instruction Survey to evaluate pre- and poststudy attitudes toward computer-assisted instruction.

Results: No significant differences (P = .05) were found between groups on either the written or practical examination scores. The journals and interviews both indicated that subjects used their lecture notes (8/11 [73%] in the control group, 14/15 [93%] in the CD-ROM group) most frequently, while several students used a combination of lecture notes and the laboratory manual when studying for their examinations. Although they did not list it as their primary resource, most subjects in the experimental group reported accessing the CD-ROM for anatomical landmarks on a weekly basis.

Conclusions: Although no significant difference was found between groups, we feel that given the correct application, computer-assisted instruction may have a place in athletic training education. Student attitudes toward the CD-ROM program were favorable, and the qualitative data suggest that students would use this type of educational resource provided it was targeted toward the specific course and offered a time-efficient method for access. We recommend examining the use of a CD-ROM specifically designed for a course to determine whether it would prove to be a more effective resource for students than traditional instructional resources.

Key Words: multimedia instruction, computer-assisted instruction, CD-ROM programs, Alien Attitude Survey, instructional technology

The use of computers is growing at an exponential rate as new technologies are being developed. Because of the increased availability and affordability of computers, their use is expanding to new educational arenas. Fincher and Wright defined computer-assisted instruction (CAI) as "any form of instruction that uses the computer to present instructional information." Multimedia simply refers to the use of a variety of mediums to convey information. For the sake of discussion in this manuscript, the terms multimedia instruction and computer-assisted instruction will be used interchangeably. Research examining the effectiveness of multimedia instruction is varied and controversial. Two types of research designs are basically used to examine the effectiveness of multimedia instruction: multimedia instruction as a supplement and multimedia instruction as an alternative. Much of the controversy that exists in the literature is due to inconsistent, inappropriate, or ineffective means of multimedia implementation or application of the research design, or both. A large amount of research has been conducted in traditional medicine and nursing, with little focus on the field of athletic training. The research has centered on medical students, nursing students, radiology students, and occupational therapy students. Multimedia instruction has been tagged with many advantages, including the capacity to provide high-quality images, active learner involvement, and flexibility by allowing students to learn at their own pace. Computer-assisted instruction is an effective resource when teaching medical or occupational therapy students. More specifically, it is as effective as using a textbook or traditional seminars. Comparable results have been found in nursing students. Rouse suggested that CAI was as effective as traditional classroom lecture for teaching nursing students; however, she believed that the combination of the 2 was the most effective because the test scores from the combined CAI-traditional lecture group were significantly higher (P < .001) than those of the other 2 groups.

According to Khoiny, the effectiveness of CAI is based...
on 3 main variables: quality of the software program, environment in which the computer is used, and characteristics of the learner. According to Lynch et al,17 CAI "permits the adaptation of educational content to individual student learning styles." This may have significant implications for athletic training students given the recent findings by Stradley et al.18 No significant differences were noted in the distribution of learning styles among the 188 athletic training students surveyed nationwide using the Kolb Learning Style Inventory.18

While CAI appears to be an effective resource, the existing literature is unclear about attitudes toward computers and test performance. Lynch et al17 suggested that CAI programs are effective resources, yet they did not find evidence to suggest that student learning preferences or attitudes toward computers allowed them to perform better. This supports the findings of Calderone,19 who reviewed the existing literature with "inconclusive results regarding computer-assisted instruction (CAI) on learning and attitude."

The use of CAI has only recently been incorporated into athletic training. In 1996, Fincher and Wright1 reported that approximately half of all undergraduate athletic training programs were using some form of CAI. Of those that were using CAI, approximately 80% reported using CAI for less than 5 years.1 Toth-Cohen14 suggested that CAI was particularly suited for visually intensive and detail-oriented subjects because it "allows textual information to be combined with still and moving graphics." It would stand to reason that the use of CAI in athletic training education would benefit the visually intensive and detail-oriented athletic training student. Only recently have studies in athletic training focused on the effectiveness of CAI as an educational tool. Wiksten et al20 showed that CAI was as effective as traditional lecture when teaching Q-angle measuring techniques to undergraduate athletic training students. However, attitudes toward instruction for the traditional-lecture group were significantly more favorable (P < .05) than for the CAI group. Thus, while the CAI module was effective, it might not be able to stand alone.

A subsequent pilot study conducted by Wiksten et al21 examined the effectiveness of using a CD-ROM as a supplemental resource in conjunction with traditional lecture (CD-ROM/TL) versus traditional lecture (TL) alone when teaching upper extremity injury-evaluation skills over a 3-week time period. Both groups were taught the same content by the same professor. Teaching aids such as overhead transparencies, a laboratory manual, and hands-on demonstrations were used for both groups. Both groups had access to their lecture notes, laboratory manuals, and textbooks as standard resources. The only difference between the groups was that the CD-ROM/TL group had access to an additional resource, a CD-ROM program that served as a tutorial on special tests used during an injury evaluation. Subjects in the CD-ROM/TL group (n = 9) performed significantly better than the TL group (n = 22) on both the written (P = .002) and oral-practical (P = .001) examinations. All subjects in the CD-ROM/TL group used the CD-ROM program at least once per week. All subjects in the CD-ROM/TL group commented that they would continue to use the CD-ROM program if it was available. The most commonly cited dislikes of the CD-ROM program were related to computer compatibility and technologic glitches. Subjects in the CD-ROM/TL group felt that the CD-ROM was most helpful to them when they were studying for the practical examination. Due to the pilot nature of the study and unequal number of students registered in each laboratory section, it is difficult to draw definitive conclusions from this study. However, future researchers should examine the use of multimedia instruction as a supplement to traditional instruction throughout an entire course to further assess the effectiveness of multimedia instruction in athletic training education.

Therefore, the purpose of our study was to examine the effectiveness of a CD-ROM program as a supplemental resource in an introductory athletic training laboratory course taught over a 16-week period. Another purpose of our study was to assess whether athletic training students would actually use the computer-assisted resource over the course of a semester when it was offered as a voluntary (not required) resource. The final purpose of our study was to assess athletic training students’ attitudes toward computer-assisted learning through the Allen Attitude Survey22 and qualitative data from weekly journals and focus-group interviews.

METHODS

Subjects

Twenty-six students from 2 introductory athletic training laboratory classes at the same institution volunteered for participation in this study. Students enrolled in the laboratory classes were also enrolled in a concurrent introductory athletic training lecture course; however, only data from the laboratory classes were examined. One professor taught the lecture course and both laboratory classes to ensure that subjects received the same course information, lecture instruction, and demonstrations. The learning objectives for this course were based upon athletic training competencies relating to the domain of care and prevention of athletic injuries. Specifically, the laboratory course was designed to teach students psychomotor skills relating to palpation of pertinent anatomical landmarks, taping and wrapping techniques, spine-boarding techniques, and the application and use of various types of protective equipment and materials. The study was approved by the Committee for the Protection of Human Subjects. Informed consent was obtained from all volunteers.

The 2 classes were randomly assigned to either the traditional instruction method or the traditional-instruction/CD-ROM method. Before participating, subjects were asked to fill out a preliminary data sheet that assessed descriptive data, including overall grade point average (GPA), age, sex, ownership of a computer, and level of computer experience. The traditional-instruction (control) group contained 11 subjects (1 man, 10 women; mean age = 22.18 ± 2.14 years), and the traditional-instruction/CD-ROM (experimental) group contained 15 subjects (9 men, 6 women; mean age = 22.60 ± 5.14 years). Most subjects in both groups owned computers (control 9/11, 81.8%; experimental 14/15, 93.3%) and described their computer skills as intermediate or higher (control 9/11, 81.8%; experimental 13/15, 86.7%). Intermediate was defined as the ability to use or install (or both) word-processor, Internet, and other programs on the computer. Students were assured that participation would in no way affect their grade for the course. As an added measure of protection, subject data were not accessible by the professor and were not analyzed until the semester grades had been turned in.

Instructional Methods

Throughout a 16-week semester, one introductory athletic training laboratory class received traditional methods of in-
struction (ie, lectures, overhead transparencies, hands-on demonstrations and practice, and access to a laboratory manual and textbook). The other class received the same instruction and a multimedia CD-ROM as an additional resource. Each subject in the traditional instruction/CD-ROM group received an individual copy of the multimedia CD-ROM, Sports Injuries 3-D (Cramer Inc, Gardner, KS). This particular CD-ROM was chosen based on the introductory content presented in the program and how it correlated with the learning objectives of the introductory athletic training course at this institution. Information on the CD-ROM is divided into 7 sections (ankle, knee, hip, head and neck, abdomen, elbow, and shoulder), with each having several subsections (anatomy, range of motion, muscles and function, dermatomes, PRICES [protection, rest, ice, compression, elevation, and support], evaluation, referral, and common injuries). Students in the traditional-instruction/CD-ROM group were asked not to allow students in the control group to view the CD-ROM program until after the study was completed.

Assessment

To determine whether there were differences between the 2 instructional methods, we collected several outcome measures throughout the semester.

Written Examinations. Two written examinations were administered to each class. The first test consisted of 15 questions (2 short answer, 13 fill in the blank), and the second examination consisted of 16 questions (14 multiple choice, 2 short answer). Content-related validity was established by 6 certified athletic trainers (average experience = 8 years) at 3 local universities. After content-related validity was established, 2 questions on the first examination and 1 question on the second examination were removed, leaving the first examination with 13 questions (2 short answer, 11 fill in the blanks) and the second examination with 15 questions (13 multiple choice, 2 short answer). The examination scores were combined for analysis of cognitive knowledge at the end of the semester. Unfortunately, the researchers had access only to the subjects' examination scores and were not given the actual examinations for confidentiality reasons; therefore, written-examination reliability was not established.

Practical Examination. Students were also administered a practical examination. The practical examination consisted of 15 anatomical landmarks or basic athletic training techniques (or both). Content-related validity was established by the same 6 certified athletic trainers. We were unable to establish practical-examination reliability because each student chose 15 different landmarks/techniques from a random list of 40 anatomical landmarks and athletic training techniques.

Allen Attitude Survey. The Allen Attitude Survey22 was used in the traditional-instruction/CD-ROM group pre- and poststudy. The tool, which is designed to unveil any preconceived biases and changes in attitude toward interactive multimedia instruction, uses semantic differential scoring and is composed of 14 statements, each anchored by bipolar adjectives. The responses are rated on a 7-point scale. The positive adjective is scored as a 7, the negative adjective as 1, and the middle, or unbiased, response as 4. The 14 bipolar statements are grouped into 3 subscales: comfort, creativity, and function (Table 1). A total score and scores for each subscale were calculated. Total scores ranged from 14 to 98, while scores for each of the subscales were as follows: comfort, 4 to 28; creativity, 4 to 28; function, 6 to 42. The reliability coefficient alpha was .853 for undergraduate students.22

Student Journals. Subjects in both groups kept a 12-week journal throughout the semester. The laboratory subject for each week and the students' time spent using each of their available resources (ie, lectures, laboratory manual and textbook, hands-on demonstrations and practice, overhead transparencies, and CD-ROM [for the traditional-instruction/CD-ROM group]) were recorded in the journal. The journal required weekly entries that took from 5 to 10 minutes.

Focus-Group Interviews. Focus-group interviews are structured and have specific, well-designed goals.23 The groups consisted of 3 or 4 students and were held 2 weeks before final examinations. A facilitator was present to introduce several topics (subjects' likes and dislikes concerning the available resources, which resources they used most for tests and why, etc), and students were asked to elaborate from their perspectives. The interviews were recorded on audiotapes, and sessions lasted 15 to 20 minutes. The instructor was not allowed to listen to the tapes, and students were assured that their grades would not be affected in any way by their responses.

Table 1. Bipolar Adjectives Contributing to the 3 Subscales of the Allen Attitude Survey

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Adjectives</th>
<th>Adjectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creativity</td>
<td>Rigid</td>
<td>Flexible</td>
</tr>
<tr>
<td></td>
<td>Stimulating</td>
<td>Boring</td>
</tr>
<tr>
<td></td>
<td>Creative</td>
<td>Unimaginative</td>
</tr>
<tr>
<td></td>
<td>Impersonal</td>
<td>Personal</td>
</tr>
<tr>
<td>Function</td>
<td>Useful</td>
<td>Useless</td>
</tr>
<tr>
<td></td>
<td>Meaningless</td>
<td>Meaningful</td>
</tr>
<tr>
<td></td>
<td>Time saving</td>
<td>Time consuming</td>
</tr>
<tr>
<td></td>
<td>Valuable</td>
<td>Worthless</td>
</tr>
<tr>
<td></td>
<td>Efficient</td>
<td>Inefficient</td>
</tr>
<tr>
<td></td>
<td>Inappropriate</td>
<td>Appropriate</td>
</tr>
<tr>
<td>Comfort</td>
<td>Comfortable</td>
<td>Uncomfortable</td>
</tr>
<tr>
<td></td>
<td>Nonthreatening</td>
<td>Threatening</td>
</tr>
<tr>
<td></td>
<td>Overpowering</td>
<td>Easy to control</td>
</tr>
<tr>
<td></td>
<td>Pleasant</td>
<td>Unpleasant</td>
</tr>
</tbody>
</table>

Statistical Analysis

Before we analyzed the examination scores, we conducted an independent t test on the overall GPAs to determine if there was a significant difference between groups. A Pearson product-moment correlation was calculated between GPA and examination scores to determine whether GPA should be used as a covariant for a subsequent analysis of covariance. A paired t test was used on the total pre- and poststudy attitude scores, as well as each subscale's pre- and poststudy scores, for the traditional-instruction/CD-ROM group to evaluate whether their attitudes toward computer resources changed. Qualitative data were collected with a naturalistic framework, an approach using actual settings as the source of data.23 Journal and focus-group data were analyzed thematically: data were coded by concept, then categories emerged based upon common themes.

For all statistical data analysis, an alpha level of .05 was used. The rather strict alpha level was due to the inability to establish reliability on the written and practical examinations; however, a stricter alpha level was not chosen because of the limited prior research in the field of athletic training.
RESULTS

Quantitative Results

The combined written examination score was worth 139 points, and the practical examination was worth 30 points.

Grade Point Average

An independent t test indicated a significant difference between group GPAs ($t_{24} = 2.61, P = .015$), with the control group having a significantly higher GPA (Table 2). Therefore, a Pearson product moment correlation was calculated between GPA and both written and practical examination scores. The correlation was positive between GPA and written examinations ($r = .40, P = .043$). There was no significant relationship between GPA and the practical examinations ($r = .27, P = .189$).

Written Examinations

Given the significant relationship between GPA and the written examinations, GPA was used as a covariate in an analysis of covariance. The adjusted written examination scores were $130.6 \pm 1.6$ for the control group and $131.7 \pm 1.4$ for the CD-ROM group. No significant difference was found between the adjusted scores of the groups ($F_{1.23} = .240, P = .629$).

Practical Examinations

We calculated an independent t test on practical examination scores. No significant difference was found between group scores on the practical examinations ($t_{24} = 1.42, P = .169$).

Allen Attitude Survey

Total pre- and poststudy and subscale results are presented for the CD-ROM group on the Survey (Table 3). Likert scores ranged from 1 (very negative) to 7 (very positive), with 4 being the neutral score.

Using the paired-samples t test, we found no significance difference between the traditional-instruction/CD-ROM total pre- and poststudy attitude survey scores ($t_{14} = 1.26, P = .227$), or any of the subscales: comfort ($t_{14} = -.15, P = .886$), creativity ($t_{14} = 0.76, P = .461$), or function ($t_{14} = 2.27, P = .043$).

Qualitative Results

Both the weekly journals and comments made during the focus-group interviews were reviewed and thematically cate-

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Mean</th>
<th>SD†</th>
<th>Likert Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comfort</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prestudy</td>
<td>20.93</td>
<td>3.63</td>
<td>5.23</td>
</tr>
<tr>
<td>Poststudy</td>
<td>21.13</td>
<td>4.05</td>
<td>5.28</td>
</tr>
<tr>
<td>Creativity</td>
<td>20.27</td>
<td>1.98</td>
<td>5.07</td>
</tr>
<tr>
<td>Prestudy</td>
<td>19.73</td>
<td>1.75</td>
<td>4.93</td>
</tr>
<tr>
<td>Function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prestudy</td>
<td>33.87</td>
<td>3.34</td>
<td>5.65</td>
</tr>
<tr>
<td>Poststudy</td>
<td>29.87</td>
<td>5.04</td>
<td>4.98</td>
</tr>
<tr>
<td>Pretest</td>
<td>75.07</td>
<td>5.97</td>
<td>5.36</td>
</tr>
</tbody>
</table>

Table 2. Grade Point Average and Test Scores (Mean ± SD)*

<table>
<thead>
<tr>
<th>Grade point average</th>
<th>Written test</th>
<th>Practical test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Group (n = 11)</td>
<td>3.39 ± 0.45</td>
<td>131.91 ± 5.17</td>
</tr>
<tr>
<td>CD-ROM Group (n = 15)</td>
<td>2.93 ± 0.43</td>
<td>130.80 ± 5.49</td>
</tr>
</tbody>
</table>

*SD indicates standard deviation; n, number of subjects.

Focus-Group Interviews

Using semistructured questions, the facilitator sought to obtain information concerning the most effective resources used during the course. Both groups identified the lectures and demonstrations as the best course resources. Students commented on the benefit of “very specific topics” and that these resources “brought the course to life.” When asked about which supplemental resource prepared the students for their written tests, lecture notes were identified. Students stated that lecture notes “covered everything that would be on the test.” While the CD-ROM group identified the CD-ROM as having “good pics,” lecture notes were still selected as the best resource for written examinations. The best resource identified by students to prepare them for the practical examinations was hands-on experience and demonstrations.

Questions specific to the use of the CD-ROM provided information concerning student perception of this resource. Positive responses for the computer program included “lots of information,” “good visuals,” and “ease of use.” In spite of the positive comments, some students believed that the computer program was “difficult to boot up” and “too time consuming,” and because there was “no test section,” they felt it did not help them study. Overall, students felt the CD was a beneficial resource and they would purchase the CD if it were specifically related to the content of the course.

Journals

The journals were not a required course component; therefore, student accountability to the journals was low. For example, 2 students in each group did not even complete the journals. Furthermore, most students did not reflect or take the time to elaborate on answers to the journal questions. As a result, the qualitative data from this source were compromised and lacked the richness of quotes and perspectives. Data from the journals were analyzed by frequency to provide the approximate amount of time that students used each resource.

Frequencies of journal responses indicating time spent using each resource, usage, and the percentage of the group spending the specified resource time are presented in Table 4. Frequency data indicated that students used their laboratory manual and lecture notes for either less than 30 minutes or about an hour most (>60%) of the time. Students typically accessed their

<table>
<thead>
<tr>
<th>Does not help them study</th>
<th>Total time spent using resource</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 minutes</td>
<td>75.07 ± 5.97</td>
</tr>
<tr>
<td>240 minutes</td>
<td>70.73 ± 8.63</td>
</tr>
<tr>
<td>360 minutes</td>
<td>65.40 ± 10.34</td>
</tr>
<tr>
<td>480 minutes</td>
<td>60.08 ± 12.06</td>
</tr>
<tr>
<td>600 minutes</td>
<td>54.76 ± 13.74</td>
</tr>
<tr>
<td>720 minutes</td>
<td>50.44 ± 15.42</td>
</tr>
<tr>
<td>840 minutes</td>
<td>46.12 ± 17.10</td>
</tr>
<tr>
<td>960 minutes</td>
<td>41.80 ± 18.77</td>
</tr>
<tr>
<td>1080 minutes</td>
<td>37.48 ± 20.43</td>
</tr>
<tr>
<td>1200 minutes</td>
<td>33.16 ± 22.10</td>
</tr>
<tr>
<td>1320 minutes</td>
<td>28.84 ± 23.77</td>
</tr>
<tr>
<td>1440 minutes</td>
<td>24.52 ± 25.43</td>
</tr>
<tr>
<td>1560 minutes</td>
<td>20.20 ± 27.10</td>
</tr>
<tr>
<td>1680 minutes</td>
<td>15.88 ± 28.77</td>
</tr>
<tr>
<td>1800 minutes</td>
<td>11.56 ± 30.43</td>
</tr>
<tr>
<td>1920 minutes</td>
<td>7.24 ± 32.10</td>
</tr>
<tr>
<td>2040 minutes</td>
<td>2.92 ± 33.77</td>
</tr>
<tr>
<td>2160 minutes</td>
<td>.60 ± 35.43</td>
</tr>
</tbody>
</table>

Table 3. CD-ROM Group Prestudy and Poststudy Alien Attitude Survey Scores (Mean ± SD) and Average Likert Scores (7-Point Scale)*
textbook less frequently than the other 2 resources. The CD-ROM group indicated that they used the computer program for anatomical landmarks but typically for less than 30 minutes (46%). Similar to the number of student responses indicating that they accessed the program, another group of responses indicated either no access or a blank answer (45%). This brings to bear an important aspect of the journal data for this group. In hindsight, it is unfortunate that the journal did not have a category for “no use.” This proved to confound the data, as many students would create a “no-use” space or leave the area blank. Therefore, whether a “blank” response indicated that the students did not use the resource or whether they just skipped the question is unknown. Hence, the “no-data” category encompassed student responses of “no use” and “blank.”

**DISCUSSION**

We found no significant difference between groups on either the written or practical examination scores. Qualitative data suggested that some students in the CD-ROM group used the CD-ROM as a resource for anatomical references but overall, the CD-ROM program was not perceived as a necessary or valued resource. Both groups reported using lecture notes and the laboratory manual as their primary resources when studying for the course. Additionally, the students’ attitudes in the CD-ROM group toward computer-assisted resources did not appear to change over the course of the semester. These findings are different from previous studies reported by Wiksten et al.20,21 and Voigt et al.24 in athletic training education. One potential explanation for the conflicting results reported in athletic training education may be related to the specific multimedia program investigated and the learning environment in which it was applied. Keane et al.2 emphasized the criticality of researchers recognizing the learning environment in which certain CAI programs are applied. Additionally, they felt that more educational research should identify the learners and learning tasks for which CAI may be most appropriate.2 Devitt and Palmer25 evaluated the appropriateness of CAI based upon teaching style and learning style of the students. They concluded that when the learning outcome is measured by short-term recall, as typically occurs with multiple choice examinations, students performed best when the information was presented in a didactic or textbook manner. Furthermore, they suggested that students whose success depends on the ability to pass a knowledge-based test will most likely choose a learning method that delivers “information in as uncluttered a manner as possible.”25 Perhaps the Sports Injuries 3-D program would be better suited for more advanced learning-acquisition methods.

One of the first questions we posed when designing this study was the level of athletic training student that should be used as subjects. The CD-ROM was very elementary and only introduced the very basics of athletic training knowledge and techniques; therefore, introductory kinesiology students enrolled in a “Techniques of Athletic Training” course were chosen as subjects. This may have been a drawback of this study. The laboratory is a required class for all kinesiology majors; therefore, not all students in this course were pursuing a career in athletic training. As a result, some of the information taught in the class was not perceived as relevant to some students. Focus-group data supported this notion, as the CD-ROM program content was identified as “too advanced,” and these students tended not to use the program. In fact, several students said the CD-ROM program would be more advantageous in an advanced course. Interpretation of the qualitative data would have been greatly enhanced had students been asked to report whether athletic training was their future career choice or not.

Another goal of this study was to see if the experimental group would use the CD-ROM, although they were not required to do so. Based on the data from the journals and focus-group interviews, the subjects in the experimental group did use the CD-ROM on a regular basis but for less than 30 minutes per week and not as a primary resource when studying for examinations.

Many of the students in this study reported that the program was very effective for reviewing anatomy because the graphics and animations made it easy to see landmarks and muscles. Several students reported that the visual aids “brought the anatomy to life.” Many students stated that they did not use the program as much for actual techniques in athletic training because the professor and laboratory manual were so thorough. Also, subjects reported that they did not use the program because they did not need it to do well in class, and this was their primary goal. This may have been due to the fact that the combination of the professor’s lectures and the laboratory manual were so effective. The laboratory manual had been designed by the professor to outline the topics discussed in lectures. Because the manual has been revised and refined several times to allow the students to follow along, the CD-ROM may have been at a disadvantage from the outset. A CD-ROM similar to the manual might have been more effective, and

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**Table 4. Students Using the Resource for the Specified Time Reported**

<table>
<thead>
<tr>
<th>Resource</th>
<th>&lt;30 min</th>
<th>~ 1 h</th>
<th>&gt; 1 h</th>
<th>~ 2-3 h</th>
<th>&gt; 4 h</th>
<th>No Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory Manual</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>49 (39%)</td>
<td>28 (22%)</td>
<td>4 (3%)</td>
<td>2 (2%)</td>
<td>3 (2%)</td>
<td>40 (32%)</td>
</tr>
<tr>
<td>CD ROM</td>
<td>87 (48%)</td>
<td>34 (18%)</td>
<td>5 (3%)</td>
<td>3 (2%)</td>
<td>0 (0%)</td>
<td>53 (29%)</td>
</tr>
<tr>
<td>Notes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>53 (42%)</td>
<td>23 (19%)</td>
<td>3 (2%)</td>
<td>3 (2%)</td>
<td>2 (2%)</td>
<td>42 (33%)</td>
</tr>
<tr>
<td>CD ROM</td>
<td>86 (47%)</td>
<td>35 (19%)</td>
<td>9 (5%)</td>
<td>2 (1%)</td>
<td>0 (0%)</td>
<td>50 (28%)</td>
</tr>
<tr>
<td>Textbook</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>35 (28%)</td>
<td>1 (1%)</td>
<td>0 (0%)</td>
<td>1 (1%)</td>
<td>0 (0%)</td>
<td>89 (70%)</td>
</tr>
<tr>
<td>CD ROM</td>
<td>46 (25%)</td>
<td>10 (5%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>126 (70%)</td>
</tr>
<tr>
<td>CD ROM</td>
<td>84 (46%)</td>
<td>14 (8%)</td>
<td>2 (1%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>82 (45%)</td>
</tr>
</tbody>
</table>

*Number of students (percentage).*
several of the students even commented that they would have paid extra money for *Sports Injuries 3-D* had it accompanied the laboratory manual.

Unlike the pilot study conducted by Wiksten and Voigt and colleagues, the CD-ROM used for this study was not designed specifically for the class in which it was used. This might explain the statistically favorable CAI results reported by Wiksten and Voigt and colleagues, who used a CD-ROM specifically designed for an “Injury Evaluation” course, as compared with the lack of support for CAI in this study. In fact, not only was the CD-ROM designed specifically for the “Injury Evaluation” course, but the instructor of the course also designed it. Keane et al reported that learning-effect differences were larger when the same instructor has authored both the CAI and non-CAI resources, which was not the case in the present study. The explanation offered for this instructor effect is that the CAI author is better informed pedagogically and more aware of the advantages of various resources for different learning tasks. The CAI author is also more strongly motivated to demonstrate the superiority of CAI over the other resource. Again, this might explain the favorable CAI pilot results reported by Wiksten et al and Voigt et al.

We found no studies that specifically looked at the effectiveness of a professor’s teaching style and philosophy versus computer-assisted learning or that examined professor outcome measures as a potential confounding variable (for example, student evaluations). Most students would probably agree that a very effective professor offers the advantage of quality dissemination of information and the option of one-on-one feedback and classroom dialogue. Most of the literature has sought to replace traditional teaching methods, traditional lectures, or textbooks with computer-assisted programs. On the other hand, we think that an effective CD-ROM program, properly implemented, can offer quality instruction. It can provide immediate feedback and be readily available to the student at any time of day or place when a computer is available, for example at home at 1:00 AM.

Previous research shows that the major drawback of computer resources is that they are too time consuming and tedious to use. For this study, we sought to negate that issue by giving the students an entire semester, not a specified time or day, to use the program. The results were surprising because some of the students reported that, although the program had good information, it was still too time consuming. They reported that it took too long to turn the computer on, wait for the computer to boot up, and then have to look through the program when they could just grab their laboratory manual or notes to get a quick answer. As mentioned earlier, Devitt & Palmer concluded that for certain introductory levels of learning, sophisticated interactive CAI might not result in any advantage and might even be considered a waste of time by some. They believed that students who wish to do well on basic knowledge and test performance. The results of the pre- and poststudy attitude surveys were not significantly different; however, there did appear to be a negative trend in the students’ attitudes. The difference between the pre- and poststudy attitude survey total scores is a direct reflection of the function category (Table 3). The negative trend in the function category may relate to the fact that the CD-ROM was not designed specifically for the course. Regardless, overall the students’ attitudes were favorable in the attitude surveys (>4) and focus-group interviews. These findings are similar to those of Voigt et al, whose subjects reported that their computer-based instructional materials were effective and useful.

In addition to the limitations and concerns presented, we caution readers to keep in mind the small sample size of the laboratory groups studied and to be careful about generalizing these data. The varied results reported in athletic training education related to multimedia instruction can be best explained by the following recommendations. When determining the pedagogic delivery of your course content, first consider your specific learning objectives for the course, your teaching style, and the learning styles of your audience. A combination of educational resources may have the most effective impact on student outcomes. Our data and those of Dewitt and Palmer suggest that perhaps a multimedia CD-ROM program is not well suited for introductory-level knowledge. When considering the use of a CD-ROM program, evaluate how well the program fits with your teaching style and the organization of your course. Based upon our pilot data and the observation reported by Keane et al, highly motivated delivery and support for the multimedia program will affect student response and learning outcomes; therefore, we recommend that faculty subscribe to multimedia programs that they have reviewed carefully or even developed themselves for appropriate application to their course. Finally, we recommend developing specific course assignments or projects that incorporate the use of the CD-ROM to enhance its value. Several investigators have strongly asserted that when using technology, the purpose should be clearly defined and should be perceived as valuable by the students.

**CONCLUSIONS**

Even though there were no statistically significant findings, our qualitative data suggest that computer-assisted learning may be an effective resource in athletic training education, given the appropriate application of its use. As stated by Wiksten et al, our role as educators is to maximize the advantages of all types of instructional resources and minimize the disadvantages. We hope that continued examination of instructional techniques and their application to athletic training education will serve to guide our future curricula and educational strategies.

**ACKNOWLEDGMENTS**

Our most sincere gratitude is extended to the National Athletic Trainers’ Association Research and Education Foundation for funding the pilot study upon which the current study was based. Data for the pilot study were published as 2 separate abstracts in the *Journal of Athletic Training Supplement, 1999;34(supp);S-12, S-63. We also thank Cramer Products for donating individual copies of the CD-ROM *Sports Injuries 3-D* for use in this study. We are grateful to Dr Patricia Patterson for her statistical advice and interpretation of the data. We are especially grateful to the *Journal of Athletic Training* for recognizing the importance of this topic in our profession.
REFERENCES


Clinical Education

Karen R. Toburen

In the process of evaluating the current status of clinical supervision in athletic training education programs (ATEPs), I have been most impressed by the extraordinary progress in the expanded scope of the profession and the recognition of athletic training as an allied health profession. Although great strides have been made in ATEPs during the past 30 years, a significant challenge to achieve a true clinical-education model for our discipline exists. Because our profession was developed through the apprenticeship/internship structure, the primary focus has been on attaining practical skills to provide service for athletes. Although the contributions of mentoring and professional socialization cannot be negated, the information imparted to the students was unsystematic.

As ATEPs continue to mature, a greater emphasis on didactic preparation along with a clinical-education model will be required to ensure consistency in the academic preparation of entry-level National Athletic Trainers’ Association Board of Certification (NATABOC)-certified athletic trainers. The competencies and proficiencies adopted by the National Athletic Trainers’ Association (NATA) Education Committee have standardized the structure across the profession. Athletic training education is now faced with the challenge of adopting a strong clinical-education model that will focus on the learning experiences of athletic training students. The following are issues that need to be addressed to successfully integrate the clinical-education component with the curricular standards and students’ needs.

Preparation and Qualifications of Clinical Supervisors

Experience has demonstrated that not everyone who is an NATABOC-certified athletic trainer (ATC) should be a clinical supervisor, yet this knowledge is seldom applied when students are assigned for their clinical experiences. Students are frequently assigned to particular clinical supervisors based on the sport or clinical activity for which they have responsibility. Under such a system, ATCs who are uninterested in working with athletic training students or have little understanding of individual learning styles, evaluation techniques, or enhancing critical thinking may consistently be assigned numerous students. Unfortunately, in these situations, the clinical experience of the student frequently comprises predominantly low-level repetitive tasks and limited interaction with the clinical educator.

Because more athletic trainers are graduating from college without degrees in education, it cannot be assumed that they have benefited from courses in learning principles, educational methods, or evaluation. This void needs to be addressed because it is the responsibility of the clinical supervisors to serve as instructors and mentors. Instead of assigning more students to a clinical-education site, we should assign fewer students and then only to competent and educationally committed ATCs or other qualified allied health personnel.

Graduate assistants (GAs) serving as clinical supervisors need to be carefully selected and monitored for their commitment to athletic training education and maturity to work with undergraduate athletic training students. Most GAs are trying to earn the respect of the staff for future recommendations that will launch their careers while they complete their graduate-degree requirements. Because the turnover rate for GAs is intentionally high, attempts to enhance clinical-education instructional skills become fragmented. Although some graduate students are ready to commit themselves to athletic training education, the clinical-education needs of the athletic training students are not near the top of most GAs’ crowded lists of priorities. Unfortunately, administrators continue to assign less expensive graduate assistantships instead of exploring options for hiring more qualified clinical-education faculty.

Athletic training education badly needs quality integration across the didactic and clinical components of the curriculum. The academic unit often fails to appreciate that understaffing problems on campus or at affiliated settings will not be solved by the assignment of undergraduate students to clinical experiences at the understaffed site. When appropriately implemented, clinical education demands more time than it saves the clinical supervisor.

Association With Allied Health Professions

Whenever possible, the ATEP should be located in the college with other allied health professions having similar accreditation requirements and clinical-education components. In addition, it is important that academic majors in athletic training receive programmatic status equivalent to other academic majors, including comparable compensation and released time for clinical education. Although organizational factors may appear to be only peripherally related to the topic of clinical education, having administrators who are familiar with clinical education and responsible for units with similar needs and funding formulas facilitates obtaining much-needed resources and positions for the clinical-instruction component. For the ATEPs not currently
located in units with other allied health professions, the need to educate administrators will be crucial to obtaining funding for personnel to offer quality clinical-education experiences.

To enhance clinical education, strategies need to be implemented to establish clinical faculty positions. Clinical hours that are tied to academic credit should be comparable with the formulas used to determine student credit and clinical faculty workloads for other allied health programs. Clinical supervisors who meet ATEP standards should be compensated with a stipend or released time and provided with clinical faculty status. These awards should be on a limited-term, renewable contractual basis to assure accountability to the academic unit.

Focus on Student Learning

The primary concern in clinical education is the professional development of the athletic training student. If institutions are to meet the challenge of understanding and implementing competency-based and proficiency-based education, the emphasis must be on the quality of the learning experience and individual instruction. The strength of the current structure is that the Role Delineation Study of the NATABOC,1 the NATA Educational Competencies,2 and the NATABOC certification examination have resulted in clearly defined expectations for entry-level athletic training professionals. The students know what is expected of them and must take ownership for their learning experiences.

Another issue that needs to be addressed is direct supervision. Upper-class athletic training students have frequently been placed in unsupervised environments that allow for little communication with their clinical supervisors at a time when they can benefit most from meaningful interaction for integrating theory and practice. The content requirements of the NATA Educational Competencies are extensive, and every opportunity to reinforce learning and application will assist the student in gaining greater mastery of the material. Being relegated to the role of first responder because the upper-class athletic training student is unsupervised is a sad commentary on clinical education.

A concern that encompasses athletic training in general and clinical education specifically is the attrition rate of prospective athletic training students. Considerable effort is exerted to recruit highly qualified individuals through a competitive admission process. Unfortunately, we often lose the students we thought had the potential to be most successful in the profession because they frequently become disillusioned by repeating mundane duties that fail to challenge them intellectually and require a significant time expenditure.

The athletic training student must apply the knowledge and skills learned in the didactic and laboratory sessions in a clinical environment. Learning experiences need to be assigned according to each student’s academic and clinical progress. Students require experiences beyond the intercollegiate settings; exposure to various professional work settings should be mandatory and not merely recommended because athletic team coverage is no longer a major source of employment for ATCs.

Program directors should take the time to listen to the students and have them evaluate their learning experiences. The students can provide valuable feedback on the effectiveness of their clinical supervisors and the quality of the instruction being received. Communication with the students relative to taking ownership of their professional preparation is more easily defined with the recent educational reforms. Students need an advocate when caught in uncomfortable situations with their clinical supervisors. It is important to obtain all perspectives but pay attention to the valuable insights the students can provide.

Successful, high-quality athletic training clinical education rests squarely on the shoulders of professional personnel working with the students in a clinical environment. The clinical supervisor must be aware of the content being taught each week to which the clinical-education component is linked. Strong clinical education requires careful planning for each individual and time for interaction to develop and integrate skills for optimal professional development. Rather than more students, fewer students assigned to clinical supervisors would enhance the learning process and provide a more enjoyable experience for all parties.

The clinical-education plan is in place. The challenge before us is to embrace clinical education as a crucial element to support the didactic portion of the athletic training students’ professional development. Change can be difficult. We are being asked to adapt to a system that is quite different from the way we were prepared for our careers in athletic training. Students have always been valued by athletic training as critical links to the future of the profession. By implementing quality clinical-education programs to meet the current demands of the discipline, the future of athletic training will be assured.

REFERENCES


Editor’s Note: Karen R. Toburen, EdD, ATC, served as a department head and program director and member of the Joint Review Committee on Athletic Training and the NATA Professional Education Committee. She chairs the NATA Convention Committee and currently works as an athletic training education consultant.
Athletic training clinical education can be described as the portion of the athletic training student’s professional preparation that involves the formal acquisition, practice, and evaluation of clinical proficiencies through classroom, laboratory, and clinical experiences in medical care environments. Clinical education in the health professions could be viewed as a triad involving the interplay of setting, instructor, and student. With little time spent in observation, clinical education is the portion of the curriculum in which the theoretic and practical educational components are integrated into real-life situations with actual athletes or patients. Few limitations are placed on which activities constitute clinical education. The hands-on activities can include any experience that provides a practical or applied focus. For instance, students might practice their psychomotor skills in a simulated environment on simulated patients. Clinical education progresses from general technical skills to clinical competence, and students must learn to appreciate the affective aspects of their profession’s distinctive working environment and develop necessary interpersonal and social skills and attitudes.

Clinical education constitutes a substantial portion of professional preparation in the allied health care fields. Entry-level certified athletic trainers perceive that approximately 53% of their entry-level professional development came from clinical education. In physical therapy, clinical education has been reported to be approximately 23% to 30% of the total curriculum. Given the importance of clinical education, an awareness of and appreciation for the background, history, and future directions of clinical education is valuable to clinicians and educators alike. Much can be gleaned from the development and maturation of clinical education in medicine and other health care fields; from this background, a current perspective of athletic training clinical education can then be more easily understood and appreciated. Further, this perspective can heighten our attention and focus to more adeptly shape athletic training clinical education in the future. In this review, we present the historical developments of clinical education, specifically athletic training clinical education. We also discuss recent trends and future directions in allied health professions and athletic training clinical education.

Data Sources

We identified information from the Educational Resources Information Center (1966–2001), MEDLINE (1966–2001), SPORT Discus (1830–2002), and CINAHL (1982–2002) searches of historical literature relating to the development of medical, allied health, and athletic training clinical education. Literature searches were guided using the following key terms: clinical education, clinical instruction, medical education, allied health education, history of medical education, athletic training education, and history of clerkships. We also used reference materials cited in historical textbooks on medical education.
Historical Development of Clinical Education

Allied health care professions such as athletic training, physical therapy, and nursing have clinical education as part of their curricula. Clinical practice has always been at the heart of a student's educational experiences and is of vital importance in the transformation from novice to competent practitioner. Consequently, competency-based education has emerged as the central focus in clinical instruction in the health professions.

Historically, clinical education in the allied health professions has evolved from the medical-education paradigm for training physicians. Most notably, clinical education is derived through training apprenticeships in which an aspiring student learns many facets of the profession from the "master." Pioneer medical educator Dr William Osler wrote, "by what may be called the natural method of teaching, the student begins with the patient, continues with the patient, and ends his studies with the patient, using books and lectures as tools, as means to an end." This basic concept has guided clinical education in the medical profession over the past century. Medical students still begin to acquire clinical skills at the patient's side, usually in a hospital or outpatient-based clinical affiliation. This approach has been accepted by medical educators as an effective means of teaching clinical medicine.

The evolution of medical clinical education from the apprenticeship model to the competency-based instruction and evaluation model, however, was a precarious one. Clinical instructors and clinical-education settings, 2 elements of the clinical-education triad, presented difficulties. As early as the mid 19th century, medical educators reported a lack of uniformity among clinical instructors or preceptors (clinicians who provide clinical experiences and instruction for a student). Certainly this situation gives strong justification for the Approved Clinical Instructor requirement we discuss later. A subcommittee report on the "uniform and elevated standards or requirements" given at the National Medical Convention in 1847 placed a good part of the blame on the preceptorial system. The subcommittee decided that the chief responsibility for training young doctors must rest with the preceptors; they were the ones who encouraged students to enter the profession and provided the early medical training. The subcommittee felt that the preceptor must determine and certify the quality of the preliminary education of his students. As early as the mid 1800s, then, it was felt that only through work with preceptors and study in hospitals could medical students acquire the knowledge and experience necessary for successful practice.

In the generation before 1910, didactic and clinical medical education in America had not developed evenly. Clearly, by 1910, the strength of the country's medical schools had come to lie in the basic science instruction of the first 2 years. Equivalent progress in clinical instruction had not occurred. Although the academic courses provided students the latest knowledge, instruction remained predominantly didactic, with limited clinical opportunities. After the Civil War, the lecture was supplemented by the section method of clinical teaching, which allowed for more personalized instruction. In this form of teaching, groups of students, as small as 8 or 10 at the better schools, would spend 1 or 2 hours a day, 3 to 5 days a week, observing patient care in the hospital and following the progress of selected cases. With section teaching, students were closer to patients than ever before.

However, the section method contained an inherent flaw. It did not incorporate the principle of "learning by doing," as did laboratory instruction in the scientific courses. Bedside section teaching was much more effective than the didactic methods of earlier years, but it was still demonstration and was no different than the lecture and demonstration in the scientific subjects. In section teaching, patients were cared for in the presence of students but not by students. Students were passive observers, witnessing rather than participating in the medical work. Although frequently perceived as practical bedside instruction, section teaching in reality was little more than an illustrated lecture. This pedagogic weakness was corrected only by the new clinical-teaching paradigm called the clerkship. Under this system, students not only received instruction in the hospital but became an active part of the hospital functions. Rather than visiting the wards for an hour a day, students were assigned 4 or 6 patients of their own and spent much of their day carrying out duties related to their patients' care. This method allowed students to experience rather than observe the conditions of medical practice.

The clerkship began to struggle because few medical schools had acquired control of teaching hospitals. Although most schools had access to clinical facilities, they were severely restricted in how they could use those facilities. Therefore, clinical education was greatly hampered. Certainly this situation provides strong justification to the importance of quality clinical-education settings briefly discussed later in this paper. Medical schools had no responsibility for deciding whether students could work as clinical clerks, because permission of hospital boards was always required but seldom granted. Clinical professors were also handicapped in their own research, since they were often denied access to patients for purposes of clinical investigation.

Hospitals began to tolerate teaching, reluctantly, as long as it was carefully regulated and did not interfere with their other functions. Until the latter 19th century, responsibility for medical education was seen as belonging to the schools, not the hospitals. Hospitals were considered supportive for even the limited teaching they did allow. If students were felt to be bothering patients, they were just barred from the wards. After the Civil War, however, medical professors started to recognize that advances in medical knowledge and practice created a different set of requirements for clinical instruction. In the late 19th century, many medical schools tried very hard to secure better clinical facilities. One approach was for a school to build a hospital of its own. This strategy offered an obvious advantage to a school, because then the faculty could make staff appointments and organize its clinical teaching without the threat of outside interference. Many schools adopted another approach: establishing educational affiliations with existing community hospitals. This approach offered schools the advantage of not having to build and operate hospitals themselves. However, officials, reluctant to accept the newer teaching methods, were unwilling to offer their facilities to medical schools on terms the schools desired. Thus, despite the attempts of many medical schools to obtain hospital facilities, there had been little success before 1910. The problem was clearly not any lack of interest on the part of the schools. The haphazard relationship between medical school and hospital, which had been quite common in the United States, needed to change. The medical school needed complete and permanent control of the hospital staff and facilities for clinical teaching.
Table 1. Athletic Training Curriculum Course and Clinical Clock-Hour Requirements in the Mid-1970s

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy (1 course)</td>
<td></td>
</tr>
<tr>
<td>Physiology (1 course)</td>
<td></td>
</tr>
<tr>
<td>Physiology of exercise (1 course)</td>
<td></td>
</tr>
<tr>
<td>Applied anatomy and kinesiology (1 course)</td>
<td></td>
</tr>
<tr>
<td>Psychology (2 courses)</td>
<td></td>
</tr>
<tr>
<td>First aid and safety (1 course)</td>
<td></td>
</tr>
<tr>
<td>Nutrition (1 course)</td>
<td></td>
</tr>
<tr>
<td>Remedial exercise (1 course)</td>
<td></td>
</tr>
<tr>
<td>Personal, community, and school health (1 course)</td>
<td></td>
</tr>
<tr>
<td>Basic athletic training (1 course)</td>
<td></td>
</tr>
<tr>
<td>Advanced athletic training (1 course)</td>
<td></td>
</tr>
<tr>
<td>Laboratory or practical experience in athletic training to include a minimum of 600 total clock-hours of clinical experience under the direct supervision of an NATA-certified athletic trainer.*</td>
<td></td>
</tr>
</tbody>
</table>

*NATA indicates National Athletic Trainers’ Association.

In spite of these difficulties, it is notable that the clinical-clerkship program has stood the test of time. It is still considered as satisfactory an educational experience as it was in the early 1900s.

Development of Athletic Training Clinical Education

As medical clinical education continued to develop and improve during the 20th century, the National Athletic Trainers’ Association (NATA) was formally established in 1950. Athletic training historians indicate that athletic training curriculum development began in the 1950s and 1960s; however, athletic training clinical education more formally began taking shape in the 1970s. During this time, the NATA Professional Education Committee formalized a list of behavioral objectives that identified desired learning outcomes for the athletic training student based on the 11 required courses identified in Table 1. This effort represented a significant early step toward identification of a specialized body of knowledge. In addition, a clinical clock-hour requirement and a skill-competency checklist were created to guide and monitor development of the students’ clinical skills. Yet because the scope of the behavioral objectives was dictated and restricted by the existing content of required courses, the behavioral objectives did not represent a true competency-based approach to education of athletic training students. For example, because a course in therapeutic modalities was not required, the curricular development of corresponding learning objectives, the NATA body of knowledge for the certified athletic trainer. In retrospect, the behavioral objectives developed during the 1970s were viewed as a conceptual framework for the first edition of the Competencies in Athletic Training developed by the Professional Education Committee in 1983.

The Competencies in Athletic Training represented a major component of the 1983 NATA education-program guidelines. The competencies were based on the “performance domains” of a certified athletic trainer identified in the first role delineation study conducted by the NATA Board of Certification (NATABOC) in 1982. Incorporation of the subject-matter requirements and athletic training competencies into the 1983 guidelines represented an effort to promote the development of true competency-based athletic training education programs.

The NATABOC has historically offered 2 routes to certification. One requires education in the context of a formal educational program, whereas the other takes a more “hands-on” experiential route supplemented by a minimal amount of course work. From the 1970s until the early 2000s, students became clinically eligible to take the NATABOC certification examination by completing 600 to 800 clinical-experience hours in an approved or accredited program or 1800 clinical hours as an apprenticeship student and later 1500 hours as an internship student. Additionally, students were required to complete clinical experiences with contact and collision sports. In contrast to the development of clinical education in medical schools, athletic training professional preparation was initially more steeped in clinical experiences and less in didactic instruction.

Recent Trends in Allied Health Professions Clinical Education

In recent decades, clinical education in the allied health professions has become more structured and organized, progressing from somewhat haphazard learning experiences to deliberate and focused learning experiences. Responsibilities of the student, clinical instructor, and clinical-education setting have become more clearly understood and delineated. Before attention was given to the elements of this clinical-education triad, professional socialization seemed to be the primary thrust of clinical education. This socialization is a process whereby a person is accepted into a tradition and acquires the group’s values and attitudes, interests, skills, and knowledge. Socialization, though, is not entirely directed toward the student’s learning and understanding. An element of socialization exists within any system of professional education, but education and socialization are 2 separate processes.

Without appropriate attention, allied health profession students often felt that they were providing a labor force and being socialized into the profession rather than receiving focused clinical instruction. Students in the nursing, physical therapy, and athletic training fields have all encountered such attitudes. Students would conform to the expectations of their teachers and staff, concentrating more on external appearances such as “looking busy.” These students learned that they were expected to pick up the “job” and fill the vacant slot in the clinical setting. Today’s athletic training students, however, receive close supervision during their clinical-education experiences. Certainly socialization plays an important role in professional preparation, but today’s structured athletic training clinical education represents a significant step. In 1990, Knight introduced the modularized concept of athletic training clinical education, in which students focus on prescribed competencies and proficiencies during their clinical-education experiences. The environmental, administrative, and personal factors of a clinical-education setting have been formally addressed in the fields of physical therapy and athletic training. In the early 1980s, 20 validated standards and associated criteria for the selection and evaluation of clinical-education centers in physical therapy were developed. In the late 1990s, 12 athletic training clinical-education-setting standards and associated criteria were subsequently developed. Copyrighted evaluation forms for evaluating clinical settings are available at the NATA Education Council’s website.
Recent Developments in Athletic Training Clinical Education

The NATA has made great strides over the past 20 years in providing athletic training education programs with the guidance needed to develop the clinical portions of their programs. By June 1990, the American Medical Association (AMA) formally recognized athletic training as an allied health profession. In October 1990, an initial meeting was conducted for the development of standards and guidelines for accreditation of educational programs for athletic trainers. The standards and guidelines were prepared by the Joint Review Committee on Educational Programs in Athletic Training (JRC-AT). The NATA and the Commission on Accreditation of Allied Health Education Programs (CAAHEP), formerly the AMA’s Committee on Allied Health Education Accreditation (CAHEA) accepted and adopted the standards and guidelines in June 1991. The initial standards and guidelines and the JRC-AT were also approved and cosponsored by the NATA, the American Academy of Family Physicians, and the American Academy of Pediatrics. The current 2001 standards and guidelines and the JRC-AT are also approved and cosponsored by the American Orthopaedic Society for Sports Medicine. The Commission on Accreditation of Allied Health Education Programs accredits entry-level education programs for athletic training upon the recommendation of the JRC-AT. The standards and guidelines are used for the development, self-study, and evaluation of entry-level athletic training education programs.

Educational reform in the athletic training profession continues to evolve in the areas of curriculum, clinical education, and continuing education. In 1997, the NATA Board of Directors approved 18 initiatives recommended by the special Education Task Force established in 1994. The NATA Board of Directors subsequently established an Education Council to assist in the implementation of these initiatives. The overall goal of the reform was to enhance the credibility of the field within the health care professions and to better prepare athletic trainers to perform their function of caring for the physically active. The most significant of the 18 specific initiatives developed by the task force was to eliminate the internship route to certification, thus creating a standardized approach to athletic training professional preparation. This action was supported by a body of evidence indicating that the internship route no longer functioned to consistently prepare entry-level athletic trainers in accordance with the preferred standards of the profession.

The National Athletic Trainers’ Association Board of Certification certification-examination eligibility requirements will require that all students complete a CAAHEP-accredited entry-level athletic training education program. This change takes place in 2004 and will bring athletic training in line with the credentialing process of other allied health care professions.

Another significant reform proposal made by the task force addressed the responsibilities and preparation of the clinical instructor. The NATA recommended to the JRC-AT that the CAAHEP’s “Essentials & Guidelines for an Accredited Educational Program for the Athletic Trainer” be amended to include a guideline that certified athletic trainers complete professional training for their role as clinical instructors. The Commission on Accreditation of Allied Health Education Programs formally adopted the Approved Clinical Instructor (ACI) designation in the 2001 revised standards and guidelines.

Under direction of the Clinical Education Subcommittee of the NATA Education Council, Clinical Instructor Educator (CIE) seminars were developed and first conducted in June of 2000. An overriding goal of the seminars is to equip program directors or clinical-education coordinators with information and resources to serve as CIEs at their institutions. The CIEs train ACIs to effectively teach and evaluate the athletic training clinical proficiencies. In this way, clinical education would no longer be conducted under the assumption that all certified athletic trainers are naturally qualified to educate students. Just by virtue of being clinicians, certified athletic trainers do not have the knowledge or skills regarding the methods for teach-
ed delineation study, the Competencies Committee developed the third edition of the entry-level educational competencies.33 Since the second revision of the 1982 and 1999, the NATA Board of Certification completed the vast majority of athletic trainers have had no previous formal training in these areas.31

Another important initiative aimed to include the different clinical settings and their distinct populations within athletic training clinical education.31 The clinical skills required in various settings with various types of patients must be addressed. The athletic training profession asserts that its members are qualified to work in a variety of settings; however, until the NATA reforms were initiated, it was difficult to justify that assertion because students did not have access to the kinds of patients they are likely to encounter in those settings. For instance, a certified athletic trainer in the high school setting needs to have familiarity with adolescents. Clinical experiences with patients in clinics also needed to be expanded. The 2001 CAAHEP standards and guidelines recommend that athletic training clinical education include experiences in sports medicine clinics, physical therapy sites or rehabilitation clinics (or both), college or university health centers, hospital emergency rooms, physicians' offices, or other appropriate health care settings. In contrast to the previous requirement to complete clinical experiences with contact and collision sports, the standards and guidelines require students to gain exposure to upper extremity, lower extremity, equipment-intensive, and general medical experiences of both sexes.30 Additionally, for the first time, attention is to be given to the selection and evaluation of these settings, including appropriate clinical instructors for the student.

In concert with the reform initiatives regarding elimination of the internship route to certification, creation of the CIE and ACI designations, and proactive use of diverse clinical settings, the NATA Education Council created a Competencies Committee in 1997 to review and expand the current NATA competencies in athletic training.32 During the period between 1982 and 1999, the NATA Board of Certification completed 4 role delineation studies. Concurrent with the most recent role delineation study, the Competencies Committee developed the third edition of the entry-level educational competencies. Since the second revision of the Competencies document in 1992, the competencies relative to the scope of athletic training expanded from 6 domains to 12 domains33 (Table 2). For the first time, clinical proficiencies developed by the NATA Education Council were added within the appropriate domains. As before, the Educational Competencies described the cognitive, psychomotor, and affective requirements in athletic training professional preparation. The new clinical proficiencies synthesize similar cognitive, psychomotor, and affective teaching objectives and describe them in terms of measurable clinical skills.34 As such, these clinical proficiencies are replacing clinical hours as the measure of a student’s clinical progression and eligibility to sit for the certification examination. These proficiencies are now the basis for a student’s clinical education, and clinical-experience hours are no longer considered an effective measure of a student’s clinical learning.35

A continuation of the competency-based design of athletic training education programs can also be seen in the third edition of the CAAHEP standards and guidelines.30 This edition is presently used as a guide to develop entry-level athletic training education programs accredited by CAAHEP; it will be required in all programs starting with the 2002–2003 academic year. Clearly, professional-preparation requirements and responsibilities in athletic training clinical education have grown dramatically. Athletic training clinical education compares favorably with that found in medical education and at least several other allied health preparation programs.

### Table 2. Athletic Training Educational Competency Domains

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<th>Domain</th>
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<td>Risk management and injury prevention</td>
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<td>Pathology of injuries and illnesses</td>
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<td>Assessment and evaluation</td>
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<td>Nutritional aspects of injury and illness</td>
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<td>Psychosocial intervention and referral</td>
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<td>Health care administration</td>
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<td>Professional development and responsibilities</td>
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Future Directions in Athletic Training Clinical Education

Clinical education in medicine has particularly evolved and developed over the past century and over the past 30 years in numerous allied health fields. Clinical education in athletic training, as in numerous allied health professions, likely evolved from the medical-education model for training physicians in which clinical experiences serve as a critical component for student learning. The clinical instructor, or preceptor, plays a vital role during these clinical experiences. The clinical instructor has been identified as the person most critical to the students’ learning. Similar to what has occurred in nursing, though, it may be increasingly difficult for today’s certified athletic trainer to find adequate time to accept extra responsibility for teaching athletic training students. The general trend is toward increased work loads to provide medical care coverage for expanding sport seasons and off-season conditioning, practice, and competition schedules—with fewer resources and pressures from all sides. A greater responsibility for the teaching, supervising, and assessing of students may often be unrealistic. Similar to what has occurred in nursing, it is possible that athletic training clinical instructors will encounter role stress when conflict occurs between the needs of the athlete or patient and the needs of the student. In this situation, accountability to the patient will take precedence. Because athletic training students are no longer expected to be a labor force to provide athletic medical coverage, similar to what occurred in nursing, there is less urgency for permanent staff to ensure that students are able to perform clinical care adequately in order to become useful members of the health care team. Intentional and incidental peer education, in which students assist one another in learning and practicing clinical skills and socializing into the profession, will likely become more important in athletic training clinical education.

Interestingly, the gap in clinical supervision of students may not be adequately filled by academic faculty. They may have superior teaching skills but often do not have clinical credibility among clinicians and students. In our opinion, ideally athletic trainers with primarily an academic role need to remain at least somewhat clinically active. In addition to providing clinical supervision, these athletic training faculty must find a way of demonstrating their unique role of integrating academic knowledge with clinical practice. In this process,
they have the opportunity to infuse new information and practice into the clinical environment for the benefit of both student and clinician. Particularly important here is that they model how to seek evidence to support their practice decisions. Athletic training research will have increasing value in this process. According to a recent editorial, the NATA Education Council clinical proficiencies, which provide a strong framework to assess the common practices of athletic trainers, need critical review to establish the guidelines that will define the educational preparation and clinical practice of certified athletic trainers in the 21st century. In this way, improved clinical education will strengthen the best practices of athletic training. Similarly, athletic training clinical instruction itself should be subjected to rigorous educational research in order to develop an understanding and appreciation of evidence-based clinical teaching practices.

The 21st-century student will also need to be purposefully addressed and accommodated in the educational process. The new technology of learning will suit athletic training education well. Highly decentralized, Internet-mediated, satellite-facilitated, portable digital-assisted, and distance-based learning models, while in their infancy, are clearly a part of the emerging models for education in the 21st century. The classroom, teacher-driven learning model no longer predominates, and accountability for ensuring that learning occurs is shifting to the student; however, many teachers and students are not yet ready for this shift in accountability and ownership for learning. Further, a current trend in college student demographics indicates that more students in the 21st century will complete college on a part-time basis. These part-time students will require more time to complete a degree. Clinical schedules for these students may have to be more flexible and creative, not compromising clinical skills in the process. Athletic training professional preparation has undergone recent reform to move from apprentice-based education to more formal and structured clinical education. Continuation of this process will require deliberate organization of clinical experiences; selection, development, and administration of clinical settings; selection, training, and evaluation of clinical instructors; and the appropriate type and amount of clinical supervision. Athletic training educators who avail themselves of the numerous graduate programs worldwide dedicated to teaching individuals how to direct, research, or improve the education of health professionals will be better prepared to educate athletic training students. Without a doubt, the future will see the development of more of these programs, as professionals with special training in health professions education become more involved at institutions worldwide. Similarly, numerous education journals in the health professions (eg, Medical Teacher, Academic Medicine, Journal of Nursing Education, Physical Therapy, Journal of Allied Health) and textbook series (eg, Springer Series on Teaching Nursing) can serve as valuable resources for the athletic training educator and represent model work to emulate. Athletic training clinical education has entered an exciting era in its history. Much lies ahead for developing and improving the preparation of the athletic trainer clinician.

REFERENCES


An Assessment of Athletic Training Students’ Clinical-Placement Hours

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Michael G. Miller, EdD, ATC, CSCS, contributed to conception and design; acquisition and analysis and interpretation of the data; and drafting, critical revision, and final approval of the article. David C. Berry, PhD, ATC, contributed to conception and design; analysis and interpretation of the data; and drafting, critical revision, and final approval of the article.

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Objective: To establish a time profile to determine how athletic training students use their time in clinical placements and to determine the effects of academic standing, sex, sport type, and risk of injury associated with a sport during athletic training students’ clinical placements on instructional, clinical, unengaged, managerial, and active learning time.

Design and Setting: Subjects were enrolled in clinical placements within National Collegiate Athletic Association Division I athletics, intramural sports, and a local high school. Students were individually videotaped for approximately 4 hours.

Subjects: A total of 20 undergraduate athletic training students (17 women, 3 men) from a Committee on Accreditation of Allied Health Education Programs (CAAHEP)-accredited athletic training education program.

Measurements: We created a conceptual behavioral time framework to examine athletic training students’ use of clinical-placement time with the performance domains associated with the 1999 National Athletic Trainers’ Association Board of Certification Role Delineation Study. Students’ use of time was analyzed with the Behavior Evaluation Strategies and Taxonomies software.

Results: Students spent 7% of their overall clinical-placement time in instructional activities, 23% in clinical activities, 10% in managerial activities, and 59% in unengaged activities. Using multiple $3 \times 3$ factorial analyses of variance, we found that advanced students were engaged in significantly more active learning and clinical time compared with novice and intermediate students. Students assigned to sports in which injuries predominately occur in the upper extremities (upper extremity sports) spent significantly more clinical-placement time unengaged compared with students assigned to sports in which injuries predominantly occur in the lower extremities (lower extremity sports) or in both upper and lower extremities (mixed extremity sports).

Conclusions: In this exploratory study, we examined only the clinical-placement component of 1 athletic training program; therefore, it may not be accurate to generalize the results for all CAAHEP-accredited programs. However, these results can be used by athletic training educators to examine the amount of time students are actually engaged in specific domains of athletic training, to determine the domains in which skills are most commonly being performed, to identify the relationships between the students and clinical instructors or supervisors, and to develop clinical placements in which students learn and practice clinical and educational competencies.

Key Words: engaged time, clinical behaviors, active learning time

Athletic training students spend many hours in the clinical setting working with a variety of patient populations in an attempt to learn the skills necessary to become competent certified athletic trainers. Competence, however, does not occur overnight; rather, “competence is attained only after a series of learning experiences that may take months or years to complete before a learner has developed a satisfactory degree of attainment in the field.” Competence, whether it occurs in the classroom or in the clinical placement, requires that students be provided with adequate time to learn and that this time be used constructively.

Over the last 50 years, numerous authors have examined the effects of time on learning in a variety of educational settings. The focus of these studies varies, with most of the research dealing with the relationship of length of education time to student achievement, the effects of class size and availability of equipment on time engagement in motor-appropriate skills, allocation and utilization of the school day, and time engaged in on-task behaviors and academic learning. For example, in physical education, researchers found students spent approximately 20% to 30% of their time waiting for active classroom engagement and 15% to 20% of their time engaged in management activities. In elementary education, researchers found that of the approximately 6 hours allocated to classroom instruction, students spent only 32% to 38% of this time engaged in active learning. Although the methodologic approaches varied among these studies, one common denominator is the suggestion that a relationship exists between engaged time and achievement and between academic learning time and achievement.

If a relationship between engaged time and achievement exists, as suggested by Aronson et al, then the more time (hours) allocated to athletic training students in clinical placements, the more they should learn. Some allied health care educators challenge this notion that simply increasing the overall amount of time spent in clinical placements increases a student’s competence level. Simply lengthening the time spent in clinical placements to provide more opportunity for learning is
not the answer. Students participating in clinical placements and even in the classroom must be provided with a foundation that allows them to be focused and engaged in skills and behaviors relevant to their academic level and cognitive or psychomotor ability. Clinical placements that provide clear cognitive and psychomotor objectives (identified in a clinical placement or practicum syllabus), adequate clinical supervision and instruction, and the opportunity for students to practice skills and behaviors relevant to their ability are more effective for learning and may be accomplished in a shorter period of time. However, if inadequate time allocation was the major cause of lower student achievement in the first place, then increasing opportunity or allocated time may enhance learning after all.

Unlike traditional educational settings and other allied health care professions that have made a conscious effort to study the relationship between time and learning (eg, physical therapy and nursing), research examining the use of clinical-placement time by athletic training students is not well represented in the literature. It is imperative that athletic training educators begin to take the initial steps to disaggregate clinical-placement time to determine whether students are engaging in activities related to learning, academic achievement, and the development of professional competence. Therefore, our purpose was twofold: first, to establish a time profile to determine how athletic training students used their time in performing specific skills, tasks, and behaviors related to athletic training; and second, to determine the effects of student academic standing, sex, sport type, and risk of injury with respect to the use of clinical-placement time according to the dependent variables of instructional time, clinical time, unengaged time, managerial time, and active learning time.

METHODS

Subjects

Twenty subjects (17 women, 3 men) enrolled in a Commission on Accreditation of Allied Health Education Programs (CAAHEP)-accredited undergraduate athletic training education program located in the midwestern United States volunteered to participate in the study. The subjects were divided into 3 groups according to their academic level: sophomore (novice), junior (intermediate), and senior (advanced). Subjects were orally informed of the study’s procedures and guidelines and signed an institutionally approved consent form before the videotaping. The institutional review board approved the study.

Videographers

Two student employees were hired by the investigators to videotape the subjects while they were engaged in their clinical placement. The videographers were provided with a Sony CCD-TRV57 8-mm video camcorder (New York, NY) and Memorex MP 120 8-mm videotapes (Santa Fe Springs, CA). Two training sessions were held to acclimate the videographers to the video equipment and videotaping procedures. After the second training session, each videographer participated in a mock videotaping trial session at one of the approved clinical-affiliation sites used in the study with a student volunteer who was excluded from the study sample. To control for Hawthorne effects, the videographer was instructed to remain 6 to 8 feet (1.83 to 2.44 m) away from the students at all times and to not interfere with the clinical placement.

Procedures

Before the videotaping, we obtained permission from the site coordinator or administrator at each participating clinical affiliation. The subjects, investigators, and videographers then met to establish dates, times, and locations for videotaping each subject. The average length of a regular clinical-placement day was 4 hours. Therefore, to accurately capture the subjects’ clinical-placement experience (eg, football, volleyball, field hockey, swimming, ice hockey, wrestling, etc), subjects were scheduled for 4 hours of videotaping 1 month into the fall academic quarter.

All observations were conducted during regular athletic practice sessions. Game-day preparation and postgame-day practices were not videotaped. Once the videotaping was completed, the videos were labeled with the subject’s code number, clinical-placement location, date, and time. All tapes were locked in an investigator’s office until all of the data were ready for analysis.

Behavioral Analysis Framework

Using Murphy’s model for examining or profiling time in schools and information from the American Association of School Administrators, we created a conceptual behavioral time framework to examine athletic training students’ use of clinical-placement time. A review of literature on academic learning time identified the remaining components necessary for completing the time-profiling framework. The National Athletic Trainers’ Association Board of Certification (NATABOC) 1999 role delineation of performance domains and essential tasks was included in the time framework to construct a model representing the use of time during clinical placements. This time-profiling framework included the following time categories: instructional time, clinical time, unengaged time, and managerial time.

Instructional time is defined as the amount of time subjects perform behaviors associated with didactic, practical, or observational learning with either a clinical instructor or supervisor (CIS) or peer. Clinical time is the total amount of time subjects perform clinical skills and behaviors associated with athletic training defined by the NATABOC’s 1999 role delineation. Combining instructional time and clinical time yields the variable of active learning time, which represents the overall amount of time subjects are engaged in learning athletic training skills and behaviors. Unengaged time is the amount of time subjects spend performing behaviors seemingly unrelated to athletic training that appear to offer no apparent educational or clinical value, such as waiting, bathroom breaks, and social behaviors (eg, discussing events outside of athletic training, performing tasks unrelated to athletic training). Managerial time is the time subjects spend engaged in activities related to the day-to-day operational organization and administration (eg, record keeping, restocking taping tables) of their clinical placement.

We analyzed the videotapes using the Behavior Evaluation Strategies and Taxonomies (BEST) software package (version 3.0 Sage Publications Inc, Thousands Oaks, CA), which facilitates the real-time collection and analysis of observational category data. BEST consists of 2 parts: 1 for data collection.
and 1 for data analysis. The software program allows for the recording of start and stop times of mutually exclusive or overlapping events in real time using predefined keys on a laptop keyboard.

The videotapes were viewed, and all the observed clinical skills and behaviors for each subject were entered into the software application. All skills and behaviors were recorded in seconds and later converted to minutes for analysis. Before analyzing the data, intrarater reliability of the data was calculated. The project director, who had experience with observational recordings and interpretation of clinical and educational data, analyzed the videotapes to ensure that the coding of the skills or behaviors of the students was consistent. The principal investigator (M.G.M.) observed 3 separate 10-minute video segments of the videographers’ mock training session and calculated the frequency and duration of times of the clinical skills and behaviors. He then reviewed the segments again and compared the results until a 90% agreement between trials was recorded.

Statistical Analysis

We calculated means and standard deviations for each of the framework’s behavioral time categories and subcategories. Five 3 × 3 factorial analyses of variance (ANOVAs) were computed to compare the independent variables of academic standing (novice, intermediate, and advanced) and clinical placement (Table 1) with respect to the dependent variables of instructional time, clinical time, unengaged time, managerial time, and active learning time. A post hoc test with a Bonferroni critical-value procedure was used to determine significant differences within the independent variables. Independent t tests were also performed to compare the mean differences between sex and sport risk (Table 2) with respect to the dependent variables. All statistical testing was 2 tailed, and the level of statistical significance was set at \( P < .05 \). We used the Statistical Package for Social Sciences (version 10.0, SPSS Inc, Chicago, IL) to calculate the statistics.

RESULTS

Factorial ANOVAs revealed significant differences among the levels of academic standing with respect to active learning time (\( F_{2,17} = 7.07, P < .05 \)) and clinical time (\( F_{2,17} = 4.88, P < .05 \)) (Tables 3 and 4, Figures 1 and 2). Using the Bonferroni critical-value procedure, we determined that advanced students spent significantly more time engaged in active learning compared with novice students (100.00 ± 28.48 minutes
versus 52.60 ± 15.73 minutes) and that advanced students also spent significantly more time engaged in clinical time (88.15 ± 34.16 minutes) than intermediate (42.50 ± 24.12 minutes) and novice students (41.18 ± 12.15 minutes).

A factorial ANOVA revealed significant differences among the clinical placements with respect to unengaged time \( (F_{2,17} = 6.61, P < .05) \) (Figure 3). With the Bonferroni critical-value procedure, we found that students assigned to clinical placements in upper extremity sports spent significantly more time unengaged \((166.33 ± 8.95 \text{ minutes})\) compared with students assigned to lower extremity sports \((110.90 ± 28.76 \text{ minutes})\) and mixed extremity sports \((137.68 ± 22.13 \text{ minutes})\). Independent \(t\) tests revealed no significant difference between sex and sport risk with respect to the dependent variables.

**DISCUSSION**

Athletic training educators generally agree that exposing students to quality clinical placements is as important as providing them with appropriate classroom instruction. The challenge for contemporary educators is to optimize the productivity of the clinical placement to ensure the learning and comprehension of educational and clinical competencies rather than the mere application of skills and behaviors. However, most of the research examining clinical placements in other allied health care professions has been conducted qualitatively, providing narrative themes of how students viewed their clinical-placement experiences rather than providing quantitative data that identify how students actually used their time during clinical placements. Our study is the first known attempt to establish a time-profiling technique to examine students’ use of clinical-placement time and to analyze the behaviors quantitatively.

**Clinical Behaviors**

Allied health care educators have used quantitative variables to predict examination-performance success. These quantitative variables are usually the accumulation of hours instead of the analysis of clinical skills and behaviors. In one such study, the passing rate was higher for athletic training students earning approximately 400 clinical-placement hours above the required 800 hours compared with those meeting the minimal requirements and those surpassing 1200 clinical-placement hours. Battersby and Hemmings found that nursing students who accumulated a high number of clinical-placement hours did not differ significantly in competency or clinical-performance levels compared with students accumulating a low number of clinical-placement hours. Thus, accumulating more or fewer hours than required does not necessarily improve examination performance, and the types of skills and behaviors performed by students during clinical placements should be the main emphasis of educational programs instead of hour accumulation.

Frequently, athletic training students count hours that address no apparent athletic training educational skill or behavior. Students are often scheduled to arrive 1 hour before athletic practice and remain 1 hour after the completion of practice. Additionally, athletic training students are engaged in tasks, such as cleaning and restocking, that are not necessarily geared toward any specific competency achievement. These unengaged and managerial tasks of clinical placements might produce students who lack the cognitive and psychomotor skills necessary for the development of a competent professional. Because unengaged or managerial tasks are part of the clinical placement, students may be accumulating experiences that are not necessarily geared for the successful development of educational or clinical-skill acquisition.
We found that approximately 59% of the athletic training students’ clinical-placement time was spent in unengaged activities, such as socialization (discussions or activities not related to athletic training clinical skills or behaviors), waiting, and moving between practice facilities. If this trend continued over the course of the student’s clinical placement, less than 50% of his or her time would actually be engaged in activities related to athletic training skills and behaviors. Therefore, only a fraction of the time provided to students is used to cultivate and refine their cognitive, psychomotor, and affective competencies. Simply requiring students to meet a minimum number of clinical-placement hours does not ensure clinical competence and learning over time, especially if these earned hours are spent in unengaged activities. For this reason, the NATA is eliminating the hour requirement in favor of more emphasis on the quality and completion of clinical proficiencies during clinical placements and embracing the National Athletic Trainers’ Association Education Committee’s concept of learning over time.

As a result, athletic training educators need to determine if the remaining 37% of the earned clinical-placement hours (59% unengaged time + 3.9% managerial time [custodial domain specifically] = 62.9%) are adequate for professional and academic success. If not, how does the profession encourage quality clinical-placement experiences? Future research should investigate educational and clinical practices and interventions that facilitate an increase in the amount of time students are engaged in clinical skills and activities conducive for successful academic and clinical learning and achievement.

Clinical Placements

Research examining other allied health care professions has shown that the time offered to students during clinical placements is often used ineffectively. This poor use of time is most likely reflected by several factors, such as the increase in faculty workload both in the classroom and in the clinical setting, time spent writing formal assessments rather than directly interacting with students, lack of available or adequate equipment and facilities, overcrowding in the clinical setting, and decreased availability of quality CISs. These factors tend to expose students to clinical placements devoid of critical feedback, active learning, and patient and injury variety and to provide inadequate clinical supervision and instruction. Differences in clinical placements may occur among National Collegiate Athletic Association athletic levels and traditional versus nontraditional settings; however, due to our small sample size, this point is beyond the scope of this study.

Foster and Leslie found that athletic training clinical supervisors spent less than half of their time teaching students in the clinical setting. We found that only 7% of our subjects’ clinical-placement time was spent in instructional activities with the CIS or peers. This limited time spent in instructional activities may be the result of CISs who are not professionally prepared to teach clinically or are unsure of the proper means to mentor students. In some instances when instruction does occur in the clinical setting, it is influenced by the strengths and weaknesses of the CIS. Additionally, demands placed upon the CIS to care for athletes and patients may limit time interactions with his or her students, ultimately affecting the amount of time available to instruct, monitor, test, correct, and retest students’ competency levels. This problem not only plagues athletic training but also other allied health care professions. Polifroni et al. found that 75% of nursing students’ clinical-placement time was unsupervised, reflecting the need for more clinical supervision and instructional opportunities between the supervisor and the student.

The fact that students in our study spent so little time with their CIS was astonishing. Students, particularly those at the lower levels, require more guidance and encouragement to gain confidences in their skills. They also need constructive feedback to ensure that they are “on task” and properly performing athletic training clinical competencies within their ability level. An experienced CIS who is willing to recognize individual learning styles and who possesses good clinical skills sets aside time to work with the students and knows that reflecting on the students’ experiences may help to facilitate a better learning environment. Harris and Naylor found that when clinical supervisors provided direct feedback, instructional activities, and appropriate daily structure, the quality of the clinical placement increased and led to independent student learning and autonomy.

Without proper clinical-placement guidance and structure, students may enter the workforce ill prepared to perform adequately. To increase clinical-placement effectiveness, CISs should schedule time with their students to perform clinical proficiencies and allow more opportunities for students to interact with athletes and patients to practice these proficiencies. Decreasing the number of students assigned to an individual, decreasing some of the job responsibilities of the CIS, and increasing the number of CISs are other suggestions to increase student-CIS interaction time. However, with the introduction of the approved clinical instructor (ACI), students should have more opportunity to interact with their CIS to assess clinical and educational proficiencies and increase their contact time. Follow-up studies should be conducted to determine whether this is actually occurring.

Academic Standing

Students’ academic standing or their initial exposure to the clinical placement may influence how they react or perform during their clinical placement. We found that advanced students spent 41% of their time engaged in active learning compared with intermediate (32%) and novice students (22%). Additionally, advanced students spent 36% of their time engaged in clinical tasks compared with intermediate (18%) and novice students (17%). Novice athletic training students, similar to the novice nursing students studied by Neill et al, are sometimes unsure of the roles they are expected to play and withdraw from active participation to become passive observers. This withdrawal may be a result of differences between expected and actual roles, or it may be part of the normal cognitive development. As students begin to develop a certain level of autonomy and confidence and become familiar with their roles, they can move from passive observers to active participants during clinical placements. This transition enables novice students to effectively engage in learning activities and promotes professional development.

Type of Sport

When examining the types of sports associated with clinical placements, we found that students assigned to upper extremity sports spent significantly more time unengaged compared
with students assigned to lower extremity sports or in mixed extremity sports. Students assigned to upper extremity sports spent 70% of their time in unengaged activities and only 23% in active learning. In comparison, students assigned to lower extremity sports spent 48% and 40% of their time in unengaged activities and active learning, respectively, while students assigned to mixed extremity sports spent 57% of their time unengaged and 29% in active learning. These differences may be based on the CIS’ clinical emphasis or a student’s comfort level with the anatomical structures of the lower extremity versus the upper extremity. Other possible reasons include (1) increased exposure to lower extremity injuries, (2) season in which different sports are played (more lower extremity sports were in season), (3) classification of sports as upper, lower, or mixed extremity sport, (4) time of year when the observations were made, and (5) the clinical-engagement opportunities of students provided by the CIS.

These differences in the amount of time students are engaged in active learning support the idea that variations in students’ clinical placements are necessary to ensure adequate clinical learning and competency achievement. Assigning students to a variety of clinical-placement settings allows them to interact and practice techniques learned in class with a diverse population and with a different CIS. The challenge for the CIS is to understand how each student learns by identifying his or her learning style and attempting to make a conscious effort to develop and implement teaching and clinical strategies and evaluate students based on their learning preference. Therefore, rotating students through different clinical-placement settings and clinical supervisors may be more effective in increasing the amount of time students spend engaged in active learning and decreasing the overall amount of unengaged time. In addition, these rotations might expose students to sports in which more injuries or certain types of injuries occur, thereby increasing active learning.

Limitations/Recommendations

Limitations of the present study include a relatively small sample size, sex biases, and a limited number of direct observation hours of the athletic training students. We also want to stress that the study is exploratory in nature and relevant only to the particular institution in question. In addition, the dynamics of this particular athletic training program may make it difficult to generalize to other accredited athletic training programs. However, unless substantial training is conducted to ensure consistency and reliability in the measurement of student clinical-placement time, direct determination of significant meaning using the quantitative measures used in this study is not readily feasible. Our findings and recommendations are intended to highlight aspects of student clinical placements and the need for athletic training educators to assess their students’ use of clinical time relative to the activities occurring during clinical placements.

Another variable to consider is the likelihood that all the subjects were not performing their regular or normal daily activities while being videotaped. To control for Hawthorne effects, the project director only noticed differences in behaviors during off-task time when several students made comments directly to the camera, and thus, these behaviors should not have affected the outcome. Therefore, to limit Hawthorne effects, we suggest videotaping students for several sessions so they become acclimated to the camera.

We recommend conducting a nationwide survey of a larger sample size to determine students’ perception of time spent engaged in the clinical placements and then using this information to guide educators to enhance students’ clinical placements. We also recommend conducting a study with students matched by sex and setting and videotaping students in various clinical-placement environments and athletic seasons to determine if these variables produce differences in clinical skills, activities, and behaviors. Additionally, athletic training educators should examine the amount of time CISs are actively engaged in clinical instruction with athletic training students during the clinical-field placements. Finally, we recommend that athletic training educators examine the relationship between the amount of time spent by students engaged in active learning during their clinical placement and success on the NATABOC certification exam.

CONCLUSIONS

The question athletic training educators and other professionals need to ask is, “How much time is enough time for students to develop adequate skills to become competent allied health care providers?” Although we only examined 79 hours of student clinical placements, the results clearly indicate that most of their time was spent in unengaged activities. As educators, identifying how students’ time is managed is undoubtedly the first step in developing clinical placements that will maximize student learning and promote professional development. Examining the use of clinical-placement time may allow educators to address work-force issues, competency achievement, quality of clinical hours, and clinical instructors’ and supervisors’ management of students’ use of time. In addition, videotapes of athletic training students in the clinical setting can become part of a portfolio assessment to provide students with constructive feedback of their clinical skills. The student and the clinical instructor can review the videotapes periodically to determine the level of skill acquisition and proficiency achievement.

ACKNOWLEDGMENTS

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REFERENCES

A Model for Learning Over Time: The Big Picture

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Objective: To present a method of describing the concept of “learning over time” with respect to its implementation into an athletic training education program curriculum.

Background: The formal process of learning over time has recently been introduced as a required way for athletic training educational competencies and clinical proficiencies to be delivered and mastered. Learning over time incorporates the documented cognitive, psychomotor, and affective skills associated with the acquisition, progression, and reflection of information. This method of academic preparation represents a move away from a quantitative-based learning module toward a proficiency-based mastery of learning. Little research or documentation can be found demonstrating either the specificity of this concept or suggestions for its application.

Description: We present a model for learning over time that encompasses multiple indicators for assessment in a successive format. Based on a continuum approach, cognitive, psychomotor, and affective characteristics are assessed at different levels in classroom and clinical environments. Clinical proficiencies are a common set of entry-level skills that need to be integrated into the athletic training educational domains. Objective documentation is presented, including the skill breakdown of a task and a matrix to identify a timeline of competency and proficiency delivery.

Clinical Advantages: The advantages of learning over time pertain to the integration of cognitive knowledge into clinical skill acquisition. Given the fact that learning over time has been implemented as a required concept for athletic training education programs, this model may serve to assist those program faculty who have not yet developed, or are in the process of developing, a method of administering this approach to learning.

Key Words: Approved Clinical Instructor (ACI), clinical proficiency, mastery, portfolio, psychomotor skills

The formal process of learning over time has recently been introduced to the athletic training profession. In the academic and clinical settings, learning over time is primarily associated with psychomotor skills and clinical proficiencies. However, the cognitive and affective domains must be considered when developing the overall curriculum plan. Athletic training, similar to many other professions, has always required the learning of clinical proficiencies. Students practice these skills many times before final testing. At no time were the skills and proficiencies taught, tested once, and then forgotten. What has changed pertaining to learning over time is that the required proficiencies are presented early in the academic program and formally assessed in a logical progression. Prior planning and the need for documentation of testing has now become a key component for student learning in the overall educational process. Our purpose is to define the concept of learning over time and how it can be applied to the athletic training educational setting and to present one model.

Students need to work and learn at their optimal level. This optimal level is believed to be an accumulation of structured learning experiences that have greater positive benefits than merely the number of required clinical hours. Number of hours accumulated in a clinical setting has little influence on examination performance. Less emphasis should be placed on the number of hours needed and more on acquiring the knowledge, skills, and abilities delineated in the Athletic Training Educational Competencies. Shifting the emphasis away from required clinical hours to learning over time prepares students leaving Commission on Accreditation of Allied Health Education Programs (CAAHEP)-accredited programs to be competent to practice in the field of athletic training, as validated by the National Athletic Trainers’ Association Board of Certification (NATABOC) certification examination and state regulatory boards.

By definition, learning over time is the documented, continuous process of skill acquisition, progression, and student reflection. This concept reinforces the demonstration of a systematic progression through the cognitive, psychomotor, and affective domains within different educational settings. Learning opportunities may vary from structured classrooms and laboratory settings to clinical rotations consisting of practicums, internships, and field experiences.

The concept of learning over time is not new. Many educators say that it is part of their curriculum design; however, little research or documentation can be found relating to how long or how much practice is needed before learning or mastery of a psychomotor skill occurs. The physical education profession uses mastery learning to develop individual gross motor skills to some extent. Lettus et al referred to the concept of learning over time as part of portfolio assessment. In nursing, clinical portfolio assessments are described as a...
means to evaluate a student’s ability to apply nursing skills and to look at the decision-making process in the clinical setting. However, the authors focused on the use of portfolios, not learning over time.6

Learning over time has indirectly been a part of the athletic training curriculum design for many years. Without using the actual phrase, “learning over time,” the athletic training profession has been using the concept. The former Oral/Practical (now the Practical portion) of the NATABOC certification examination requires athletic training students to review and be tested on material that was taught and practiced several months or years earlier. The implementation of a comprehensive examination such as this could be considered a cumulative assessment for learning over time.

Assessment of learning over time is designed around multiple indicators and sources of evidence.5 These assessment methods for athletic training students vary from watching their interactions with patients or athletes, discussing their cases with them, and requiring them to demonstrate skills in test-like environments to evaluating them by using scenarios that assess decision-making skills. Assessment includes not only what they demonstrate but also what they choose not to do or say.5 When learning over time, it is important that students have many opportunities to acquire specific knowledge, skills, values, and proficiencies. The key to assessing learning over time is the ability to demonstrate and document a student’s progressive development of skills taught in a closed environment and transferred to the practical application in the clinical setting.1

Learning over time is not limited to individual skills and should not be restricted only to tiers of psychomotor-oriented tasks.1 For example, the “big picture” pertaining to the evaluation of an inversion ankle sprain or the rehabilitation for a medial collateral ligament injury of the knee is what is expected for mastery of entry-level clinical proficiencies. Clinical proficiencies are not a collection of unrelated elements or skills. Rather, they are a common set of entry-level skills that need to be integrated into the athletic training educational domains.4,5

Houglum and Weidner1 used the example of learning over time as a continuum (Table 1). On the far left side of the continuum, the instructor teaches the individual skills and monitors the athletic training students’ progress very closely. On the right side of the continuum, the student progresses from taking the individual skills learned to using them in a meaningful way, as expected of an entry-level athletic trainer. At this end of the spectrum, the Approved Clinical Instructor (ACI) or the Clinical Instructor (CI) only intervenes as needed.1 A psychomotor-oriented checklist may be used in the beginning stages of mastery of clinical proficiencies; it is located on the far left of the continuum. These activities on the left side are helpful in learning and mastering individual skills. However, students preparing to enter the athletic training profession need their actions to approach the right side of the continuum for an accurate reflection of optimal proficiency.

Table 1. Learning-Over-Time Continuum1

<table>
<thead>
<tr>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct clinical supervision</td>
<td>Intervention as needed</td>
</tr>
<tr>
<td>Initial task acquisition</td>
<td>Mastery</td>
</tr>
<tr>
<td>Basic task subset</td>
<td>“Big picture”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2. Clinical-Education Matrix</th>
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</thead>
<tbody>
<tr>
<td>Level 1: Instruction → practicing → monitoring → testing → correcting</td>
</tr>
<tr>
<td>Level 2: Practicing → monitoring → retesting → correcting → challenges</td>
</tr>
<tr>
<td>Level 3: Teachable moments → application of skills and concepts → intervention as needed</td>
</tr>
<tr>
<td>Level 4: Increase the challenges → modify concept or skill to fit the situation</td>
</tr>
<tr>
<td>Level 5: Student and program assessment, exit interviews, self-reporting survey</td>
</tr>
</tbody>
</table>

Optimal proficiency is determined by the ACI’s perception of when entry-level standards of the profession are mastered.

**Progression: Psychomotor Skills → Clinical Proficiencies**

Many times, it is difficult for athletic training students to successfully transfer knowledge gained in the classroom into the clinical setting. We cannot assume that mastery of psychomotor skills and clinical proficiencies will occur simply because a student is presented with the material in the classroom.7 Learning over time needs to be presented in a logical progression. The process begins with learning, then performing, and finally retaining. The learning of didactic material and exposing students to clinical-education experiences starts the process. Once the knowledge and clinical skills are acquired, the student then progresses through the continuum to the development of critical-thinking and decision-making skills.5

Before the progression from classroom knowledge to field application can begin, the clinical proficiencies must be identified. The proficiencies that are expected for entry into the athletic training profession can be found in the 1999 edition of Athletic Training Educational Competencies.3 Each clinical proficiency comprises an array of psychomotor, cognitive, and affective components to be broken down into subtasks that will ultimately form the foundation for a comprehensive proficiency. A plan to accomplish this could include the following:

- Break down into subtasks the psychomotor skills and basic knowledge needed to perform each of the clinical proficiencies.
- Introduce the psychomotor skills and didactic information early enough in the educational process to ensure sufficient time for retention to occur.
- Develop a progressive prerequisite structure for all psychomotor skills and didactic information to ensure students’ readiness for each clinical proficiency.
- Develop objective criteria to demonstrate that each clinical proficiency has been mastered.
- Design a matrix or blueprint of all clinical proficiencies to ensure that instruction and testing occur.5,7,8

**Program Matrix or Institutional Planning**

After the key subtasks of the clinical proficiencies are addressed, a program matrix or institutional plan can then be developed and put into practice. Developing a matrix of clinical proficiencies and their subsets aids educators by providing a road map or blueprint to mastery.7 An example of this blueprint consists of 5 distinct levels (Table 2).

**First Level.** The first level of the matrix is the introduction and demonstration of the basic skills and concepts by the in-
stractor in a controlled environment (eg, classroom or laboratory setting) (Table 3). At this stage in the learning process, it is very important that these concepts and psychomotor skills are learned and practiced correctly. Instruction may be aided by the use of textbooks, videos, and interactive software. A variety of teaching and learning methods should be considered at this point. As noted by Brower et al, athletic training students learn in a variety of ways and at different paces. They also need ample practice time and monitoring by a trained eye. The collaboration of students in small groups or with a partner may be helpful in stimulating early discussions pertaining to the greater understanding of the overall concepts. The use of a peer-review system may also be helpful in forcing students to practice psychomotor skills before formal objective testing by the ACI. An instructor must create multiple opportunities for practice (eg, class time, open laboratory time, and clinical-rotation down time). Opportunities to practice recently presented skills are essential for learning.

Second Level. The second level of the matrix reinforces learning that has occurred earlier in a controlled environment. In most cases, athletic training concepts and psychomotor skills are not introduced during this level: prior learning is reinforced. Reinforcement may occur in a structured practicum within the clinical setting or in an isolated practicum class. As an example, this level may have very specific psychomotor skills associated with it in order to build on future clinical proficiencies.

In addition to the ACI’s testing of individual psychomotor skills as part of a practicum requirement, follow-up with specific corrections and constructive interaction with the student is important during the second level: prior learning is reinforced. Reinforcement may occur in a structured practicum within the clinical setting or in an isolated practicum class. As an example, this level may have very specific psychomotor skills associated with it in order to build on future clinical proficiencies.

Third Level. The third level in the development of the matrix revolves around the teachable moment. At this level, it is difficult to document the point when specific, desired outcomes have occurred or even whether the opportunity arises. However, with respect to learning over time, this level is very important in bringing individual skills and concepts from the classroom that have been formally evaluated by the ACI to the clinical environment. As students are given more clinical responsibilities with regard to evaluation, rehabilitation, and treatment of athletic injuries, the ACI and CI must allow student learning to move from the left side to the right side of the learning-over-time continuum (Table 1). For the mastery of psychomotor skills and clinical proficiencies, the third level deals more with confidence building and the application of knowledge than with providing the student with opportunities to practice or having specific clinical skills assessed. This level of learning over time is perhaps the most important in terms of affective and cognitive learning for the athletic training student. Many times, this stage is a student’s first exposure to a positive sign or a patient’s reaction to a truly painful stimulus. It is important to note that when specific tasks are performed incorrectly, immediate intervention and feedback should be given. The ability of the student to not only perform a psychomotor skill, such as the empty-can test, but also to interpret findings related to pain, weakness, and functional limitations truly indicates the student’s progress toward the right side of the continuum.

Fourth Level. To maintain appropriate documentation of all clinical proficiencies, the setting for part of the fourth level of the matrix takes place in a structured environment. Psychomotor skills and clinical proficiencies learned and practiced in the earlier levels of the athletic training educational program are used. This level of learning over time involves the scenario-based testing of individual skills and proficiencies. Testing is designed to increase the clinical challenges encountered by the students. Individual psychomotor skill sets, case studies, and structured progressions are developed so that students must apply prior learning, modifying previously learned concepts and skills to fit a given situation. Ideally, some of the assessment and documentation occurs as part of the clinical experience when actual injury and abnormal conditions present themselves on a daily basis. However, due to the lack of uniformity in injury incidence and the different abnormalities students see in their clinical-education experiences, portions of the assessment of proficiencies not occurring naturally during clinical rotations need to be performed in a controlled and structured environment.

Fifth Level. The final level is based on assessment and student feedback. Feedback is gathered by student and program assessment, exit interviews, and a self-reporting survey. The self-reporting survey (Table 4) may be included as part of the
Table 4. Sample Self-Reporting Survey

Examples:

Clinical evaluations
- Unconscious athlete
  1. ____
- Elbow
  2. ____

Taping Wrapping Special Padding Bracing
- Foot
  3. ____
- Wrist
  7. ____

Therapeutic modalities
- Hydrotherapy
  Theory
  11. ____
- Thermotherapy
  Application
  12. ____
- Cryotherapy
  13. ____

Scoring: 5/A indicates extremely confident with this skill or concept; 4/B, confident; 3/C, confident but needs practice; 2/D, not totally confident; and 1/E, very little confidence.

Table 5. Clinical Proficiencies and Psychomotor Skills Matrix

<table>
<thead>
<tr>
<th>Curriculum Phase</th>
<th>Preprofessional Phase</th>
<th>Junior Year</th>
<th>Senior Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Courses</td>
<td>Practicum</td>
<td>Courses</td>
</tr>
<tr>
<td></td>
<td>Ex.</td>
<td>AT291</td>
<td>Clinical</td>
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<td></td>
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</tbody>
</table>

Clinical proficiencies, "big picture"

Individual psychomotor skills

Senior's exit interview. This component of the fifth level is a discussion of the student's strengths and concerns. These concerns should lead to an action plan. The fifth level is the culmination of a senior-level practicum, final assessment examinations (written and practical), and evaluations from each student's final clinical rotation.

Evaluation and Documentation

Before formal documentation of clinical proficiencies can occur, planning is needed to ensure that individual skills and all clinical proficiencies are given the proper emphasis and time needed to demonstrate learning over time. Table 5 is an example of a basic matrix that allows for mapping of clinical proficiencies and the individual psychomotor skills needed to master the proficiency. This visual reference serves as a written document to help ensure that all skills and proficiencies are addressed and the proper sequencing has occurred.

At the end of a student's educational experience, a portfolio is a common method of documenting that learning over time has occurred in respect to clinical proficiencies. This portfolio is built upon throughout the athletic training student's entire educational experience. Sample contents of a student portfolio may consist of the following items:

1. Psychomotor Skills Assessments
   a. Individual skills check sheets
   b. Clinical-education-practicum packets: inservices attended and clinical requirements met

2. Evaluation of Clinical Proficiencies
   a. Rehabilitation laboratory tests
   b. Evaluation laboratory tests
   c. Therapeutic modalities laboratory tests
   d. Self-reporting survey
   e. Exit interview

3. Reviews of Affective Clinical Traits
   a. Journals
   b. Clinical instructors’ evaluations (midterm and final)

4. Written Examination Results

5. Assessment Examination Results
   a. Mock examinations (written)
   b. Mock examinations (practical)

6. Case Studies

7. Projects Completed
   a. Rehabilitation design and budget
   b. Athletic training facility design and budget
   c. Poster presentation

8. Research Papers: Critical analysis of special tests and published manuscript

9. Videos

10. Computer Simulations

11. Capstone Project: Senior Presentation

CONCLUSIONS

Learning over time, in relationship to clinical proficiencies, should focus on the "big picture." Individual psychomotor skills...
skills are important for all athletic trainers; however, what is needed by students to become entry-level athletic trainers should not be forgotten. Students must be able to evaluate a head injury, treat an acute injury, and design a rehabilitation program for the shoulder. The big picture is not based upon skills alone. It incorporates many specific psychomotor, cognitive, and affective competencies into meaningful clinical outcomes. Mastery of clinical proficiencies enables the student to select, administer, and interpret results. Houglum and Weidner stated that learning over time involves the entire patient, not just the injury itself. This process is a systems model, not a block of isolated, unrelated sets of activities. The entire picture needs to be seen, as opposed to an isolated injury away from the person and the situation. We present a model of how learning over time can be incorporated into the athletic training education program. Other models must include a similar comprehensive approach with a logical progression to ensure mastery of educational objectives and clinical proficiencies over time.

REFERENCES
Clinical Supervision of Athletic Training Students at Colleges and Universities Needs Improvement

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*Ball State University, Muncie, IN; †DePauw University, Greencastle, IN

Objectives: To assess the type and amount of clinical supervision athletic training students received during clinical education.

Design and Setting: An online survey was conducted with a questionnaire developed specifically for this study.

Subjects: Head athletic trainers from National Collegiate Athletic Association Division I (28), Division II (34), and Division III institutions (30). Thirty-four represented Commission on the Accreditation of Allied Health Education Programs-credited athletic training education programs, 20 represented athletic training programs in Joint Review Commission on Athletic Training candidacy, and 35 offered the internship route.

Measurements: Descriptive statistics were computed. Three sets of chi-square analyses were completed to assess associations among athletic training students with first-responder qualifications, program and institution characteristics, certified athletic trainer medical coverage of moderate- and increased-risk sports, and clinical supervision. A trend analysis of students’ class standing and time spent in different types of clinical supervision was also completed. The alpha level was set at < .05.

Results: Most of the athletic training students (83.7%), particularly in accredited programs, had first-responder qualifications. More than half of the head athletic trainers (59.8%) indicated that athletic training students were authorized to provide medical care coverage without supervision. A minimal amount of medical care coverage of moderate- and increased-risk sports was unsupervised. No significant difference between the size of the education or athletic program and type and amount of clinical supervision was noted. Freshman athletic training students spent more time in direct clinical supervision and less time in unsupervised experience, but the opposite was true for senior students.

Conclusions: Athletic training students are being utilized beyond appropriate clinical supervision and the scope of clinical education. Future research should employ methods using non-participant observation of clinical instructors’ supervision of students as well as students’ own perceptions of their clinical supervision.

Key Words: clinical education, clinical experience, field experience, clinical instruction

Athletic training students need clinical experiences that include the appropriate type and amount of clinical supervision. Athletic training education programs accredited through the Commission on the Accreditation of Allied Health Education Programs (CAAHEP) are subject to strict adherence to standards and guidelines, including types of clinical supervision. Although both clinical-education experience and field experience are parts of clinical education, clinical instructors must recognize a definite distinction. Clinical-education experience applies to the instruction and evaluation of clinical proficiencies under the direct supervision of an approved clinical instructor (ACI). This requires constant visual and auditory interaction between the student and ACI. Field experience, on the other hand, applies to the application and practice of clinical proficiencies in the clinical environment under the supervision of a clinical instructor. This requires daily personal and verbal contact at the site of supervision between the athletic training student and the clinical instructor. The clinical instructor must be physically present to intervene on behalf of the athlete or patient in both types of supervision. Students who are unsupervised are restricted to first-responder activities.

Athletic training education programs have the responsibility to provide the proper clinical supervision so that athletic training students can obtain an appropriate clinical education and meet National Athletic Trainers’ Association Board of Certification (NATABOC) certification requirements. Previous research assessing the supervisors’ and students’ perceptions of the quality of athletic training supervision via the internship route versus the National Athletic Trainers’ Association (NATA)-approved/CAAHEP-accredited athletic training education program revealed few differences in how students rated their supervisors. Other research has revealed that supervising athletic trainers’ behaviors can positively or negatively affect the professional growth and development of students.

Clinical-supervision guidelines today represent a shift in how athletic training students complete their clinical education. Unsupervised students may not perform the services that only a certified athletic trainer (ATC) should provide. The student should not make decisions regarding injuries without having a thorough knowledge base or sufficient experience to manage them.
deal with such injuries. Athletic training students in many places are still regarded as part of the athletic training staff.\textsuperscript{5} In the new guidelines, students must be placed in learning situations, not positions of responsibility. To amplify this situation, an NATA task force recently developed recommendations for appropriate medical care coverage for intercollegiate athletics.\textsuperscript{6} Consistent with CAAHEP standards and guidelines\textsuperscript{1} and the NATABOC requirements,\textsuperscript{7} the task force recommended that athletic training students not be considered or used as substitutes for ATCs or other equally qualified health care professionals in the medical care of student-athletes.

The purpose of our study was to assess the type and amount of clinical supervision athletic training students received during clinical education. An additional purpose was to determine the extent to which athletic training students are used beyond the scope of clinical education (ie, providing medical care services). The results of this study may assist clinical education coordinators, athletic training clinical instructors and staff, and athletic department administrators in becoming more aware of the clinical supervision currently being provided for athletic training students at colleges and universities. With this information, clinical education for athletic training students may become more appropriately designed and supervised.

The following research questions were addressed in this study:

1. Is there a difference in the athletic training clinical-education supervision of athletic training students at National Collegiate Athletic Association (NCAA) Division I, II, and III institutions?
2. Is there a difference in the athletic training clinical-education supervision at CAAHEP-accredited and Joint Review Commission on Athletic Training (JRC-AT) candidacy programs or institutions that offer the internship route?
3. Are head ATCs distinguishing among direct supervision of clinical-education experiences, supervision of field experiences, and unsupervised experiences?
4. Are athletic training students receiving the appropriate type and amount of supervision during clinical education?
5. Are athletic training students being misuse to help meet the recommended athletic medical care coverage guidelines established by the NATA task force?

**METHODS**

**Subjects**

Subjects consisted of a stratified sample of 261 head ATCs representing National Collegiate Athletic Association Division I (107 ATCs), II (64 ATCs), and III (90 ATCs) institutions. This listing was obtained from National Collegiate Directories, Inc (Cleveland, OH), and provided the e-mail and postal service addresses of every NCAA head ATC.

**Instrumentation**

We designed a 21-item online survey instrument containing closed-ended questions for the specific research questions in this study. The instrument consisted of 3 sections. The first section concerned education program and athletic program demographics (ie, status of the athletic training program, number of athletes, number of sports, number of athletic training students). The second section concerned athletic training student clinical education (ie, number of athletic training students certified in cardiopulmonary resuscitation [CPR] and first aid and educated on disease transmission; percentage of time students spent in clinical supervision, supervised field experience, and unsupervised experience per NATA Education Council definitions). The third section concerned ATC health care coverage (ie, team practices, home athletic events, and team travel for specific moderate- and increased-risk sports). Content validity was established through committee review. We conducted a pilot study of the instrument with 8 ATCs to further validate its content and make sure that its presentation was clear and the computer software program was operating correctly. Revisions of the instrument were made accordingly. Because data analyses focused on single items that addressed single concepts, internal consistency measures were not deemed appropriate.

**Procedures**

We received institutional review board approval before conducting this study. A cover letter, which explained the purpose of and the need for the research project, was e-mailed to the selected head ATCs. The subjects were free to assign a more informed designee to complete the survey. The respondents were instructed to e-mail the researchers back if they were willing to participate in the study. The uniform resource locator (URL) address to complete the survey online was returned to those head ATCs. We followed up with all nonrespondents.

**Data Analysis**

Data analyses consisted of descriptive statistics, trend analysis, and nonparametric Pearson chi square. Frequencies and percentages were calculated for each question. Not all questions had responses; therefore, data analyses were based on the responses for that particular question. Chi-square analyses were completed to examine associations in the responses to questions in section 2 of the instrument (eg, number of athletic training students certified in CPR and first aid and educated on disease transmission; amount of direct clinical supervision, supervised field experience, and unsupervised experience) and the type or status of the athletic training education program, the NCAA division affiliation, and whether the institution had football. Responses to the demographic questions from section 1 of the instrument (eg, number of ATCs, number of student-athletes, number of sports, number of athletic training students) were divided into quartiles according to the distribution. Differences between the upper and lower quartiles of these responses and the questions in section 2 of the instrument were analyzed. Chi-square analyses were also completed to explore associations among section 3 questions regarding ATCs' response to moderate- and increased-risk sports within 4 minutes and the NCAA division affiliation and status of the athletic training education program. A trend analysis was performed to reveal the mean percentage of time freshman, sophomore, junior, and senior athletic training students spent in direct clinical supervision, supervised field experience, and unsupervised experience. For this trend analysis, the Mauchly test of sphericity was used to determine a violation within the data, and the correction factor, the Huynh-Feldt test, was used in the event of a violation. The alpha level was set at .05. The target sample size of respondents from each of the NCAA division
Academic institutions from all areas of the United States were represented, of which 28 (30.4%) were Division I, 34 (37.0%) were Division II, and 30 (32.6%) were Division III. One respondent did not report the NCAA division and was not included in data analyses relative to NCAA division. Regarding the type or status of the athletic training education program, 34 (38.2%) were accredited athletic training education programs, 20 (22.5%) were in JRC-AT candidacy, and 35 (39.3%) offered the internship route. Four respondents did not report the type or status of their athletic training education program and were not included in data analyses relative to type or status of education program. Demographic characteristics of the respondents are seen in Table 1.

### Athletic Training Student Clinical Education

Seventy-seven (83.7%) of the head ATCs indicated that their athletic training students were CPR certified, first-aid certified, and educated in the prevention of disease transmission. Of the 16 head ATCs (16.3%) who indicated that their athletic training students did not possess all 3 qualifications, 9 (56.3%) reported that 20% or fewer of their students did not have all 3 qualifications, 4 (25%) reported that 21% to 40% of their students did not possess all 3 qualifications, and 3 (18.8%) reported that 41% or more of their athletic training students did not possess all 3 qualifications. In the programs and internship routes in which students did not possess all of these first-responder qualifications, 15 (100%) of the head ATCs indicated that fewer than 20% of those students were permitted to cover team practices, and 14 (87.5%) indicated that fewer than 20% of those students without all 3 qualifications were permitted to cover athletic events without the direct supervision of an ATC. Fifty-five (59.8%) of the head ATCs indicated that athletic training students were permitted to provide medical care and athletic training duties (eg, modalities, rehabilitation) without the direct clinical supervision of an ATC. Sixty (65.2%) of the head athletic trainers indicated that they allowed athletic training students to cover athletic events and practices as supervised field experience. Thirty-two (34.8%) head ATCs indicated that they do not allow athletic training students to have experiences with athletic events and practices without direct clinical supervision (Table 3). Twenty-seven (29.3%) of the head ATCs indicated that state practices limited the health care athletic training students can provide without direct clinical supervision or clinical supervision.

### RESULTS

#### Demographics

A total of 93 NCAA Division I, II, and III head athletic trainers responded to the survey, for a response rate of 35.6%.

### Table 1. Demographic Data*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCAA Division (n = 92)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>28</td>
<td>30.4</td>
</tr>
<tr>
<td>II</td>
<td>34</td>
<td>37.0</td>
</tr>
<tr>
<td>III</td>
<td>30</td>
<td>32.6</td>
</tr>
<tr>
<td>Status of program (n = 89)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accredited</td>
<td>34</td>
<td>38.2</td>
</tr>
<tr>
<td>Candidacy</td>
<td>20</td>
<td>22.5</td>
</tr>
<tr>
<td>Internship</td>
<td>35</td>
<td>39.3</td>
</tr>
<tr>
<td>Number of staff ATCs (n = 93)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–2</td>
<td>25</td>
<td>26.8</td>
</tr>
<tr>
<td>3–4</td>
<td>34</td>
<td>36.6</td>
</tr>
<tr>
<td>5–7</td>
<td>19</td>
<td>20.4</td>
</tr>
<tr>
<td>8–10</td>
<td>9</td>
<td>9.7</td>
</tr>
<tr>
<td>11–12</td>
<td>3</td>
<td>3.2</td>
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<tr>
<td>13–14</td>
<td>2</td>
<td>2.2</td>
</tr>
<tr>
<td>15+</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td>Number of athletic training students (n = 92)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–10</td>
<td>33</td>
<td>35.9</td>
</tr>
<tr>
<td>11–20</td>
<td>29</td>
<td>31.5</td>
</tr>
<tr>
<td>21–30</td>
<td>20</td>
<td>21.7</td>
</tr>
<tr>
<td>31–40</td>
<td>9</td>
<td>9.8</td>
</tr>
<tr>
<td>40+</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td>Number of sports (n = 93)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–10</td>
<td>4</td>
<td>4.3</td>
</tr>
<tr>
<td>11–15</td>
<td>38</td>
<td>40.9</td>
</tr>
<tr>
<td>16–20</td>
<td>32</td>
<td>34.4</td>
</tr>
<tr>
<td>21–25</td>
<td>14</td>
<td>15.0</td>
</tr>
<tr>
<td>26+</td>
<td>5</td>
<td>5.4</td>
</tr>
<tr>
<td>Number of athletes (n = 93)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–150</td>
<td>5</td>
<td>5.4</td>
</tr>
<tr>
<td>151–300</td>
<td>31</td>
<td>33.3</td>
</tr>
<tr>
<td>301–450</td>
<td>33</td>
<td>35.5</td>
</tr>
<tr>
<td>451–600</td>
<td>16</td>
<td>17.2</td>
</tr>
<tr>
<td>601–750</td>
<td>6</td>
<td>6.4</td>
</tr>
<tr>
<td>751–900</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td>901+</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td>Football (n = 93)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>66</td>
<td>71.0</td>
</tr>
<tr>
<td>No</td>
<td>27</td>
<td>29.0</td>
</tr>
</tbody>
</table>

* NCAA indicates National Collegiate Athletic Association; ATCs, certified athletic trainers.

affiliations was 30, which yields a power of .92 for detecting a large effect. The Statistical Package for the Social Sciences (version 10.1, SPSS, Inc, Chicago, IL) was used to analyze the data.

### Table 2. Head Athletic Trainers Reporting Student Time Spent in Unsupervised Activities and Supervised Field Experiences*

<table>
<thead>
<tr>
<th>Variable</th>
<th>≤20%</th>
<th>21–40%</th>
<th>41–60%</th>
<th>61–80%</th>
<th>81–100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unsupervised activities beyond first-responder role</td>
<td>10 (17.2)</td>
<td>7 (12.1)</td>
<td>2 (3.4)</td>
<td>19 (32.8)</td>
<td>20 (34.5)</td>
</tr>
<tr>
<td>Supervised field experience</td>
<td>29 (48.3)</td>
<td>11 (18.3)</td>
<td>16 (26.7)</td>
<td>4 (6.7)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

*Values are number (percentage).
Certified Athletic Trainer Medical Care Coverage

Certified athletic trainer coverage for team practices, home athletic events, and team travel varied by sport. An ATC most often covered home athletic events for both the moderate- and increased-risk sports (Tables 5 and 6).6

Seventy-five of the head ATCs (84.3%) indicated that if an ATC was not physically present during the practices or games, one would be able to respond to 81% to 100% of the moderate-risk sports within 4 minutes. Seven (7.9%) indicated that an ATC would be able to respond within 4 minutes to 61% to 80% of the moderate-risk sports, and 7 (8.8%) indicated that an ATC could respond to less than 60% of the moderate-risk sports. Regarding increased-risk sports, 76 of the head ATCs (81.7%) indicated that if an ATC was not physically present during the practices or games, one would be able to respond to 81% to 100% of the increased-risk sports within 4 minutes. Five (5.9%) indicated that an ATC would be able to respond within 4 minutes for 61% to 80% of the increased-risk sports and 4 (4.7%) to less than 60% of the increased-risk sports. Chi-square analyses revealed that athletic training education programs that are accredited or in candidacy were more likely to possess these qualifications, and more athletic training students in the internship route did not possess these qualifications ($X^2 = 11.20, P = .004$). A significant association was noted between the NCAA division affiliation and whether athletic training students covered individual skill sessions and informal summer workouts unsupervised. Division I head ATCs more often allowed athletic training students to cover individual skill sessions ($X^2 = 14.41, P = .001$) and informal summer workouts unsupervised ($X^2 = 6.18, P = .04$). No significant association was found among the type or status of the education program, number of ATCs on staff and number of student-athletes, number of sports, and number of athletic training students.

A decreasing linear trend was found through class standing with respect to the percentage of time spent in direct clinical supervision ($F_{1,71} = 16.61, P = .001$). As seen in the Figure, quadratic trends were identified with respect to the amount of time in supervised field experience ($F_{1,67} = 10.04, P = .002$) and unsupervised experience ($F_{1,62} = 12.02, P = .001$) (Table 4).

### Table 5. Certified Athletic Trainer Coverage of Moderate-Risk Sports*

<table>
<thead>
<tr>
<th>Sport</th>
<th>Frequency ($n = 93$)</th>
<th>Team Practice</th>
<th>Home Events</th>
<th>Athletic Team Travel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseball</td>
<td>81 (87.1)</td>
<td>48 (59.3)</td>
<td>79 (97.5)</td>
<td>23 (28.4)</td>
</tr>
<tr>
<td>Women’s basketball</td>
<td>93 (100.0)</td>
<td>71 (76.3)</td>
<td>93 (100.0)</td>
<td>53 (57.0)</td>
</tr>
<tr>
<td>Cross-country</td>
<td>86 (92.5)</td>
<td>5 (5.8)</td>
<td>71 (82.6)</td>
<td>5 (5.81)</td>
</tr>
<tr>
<td>Field hockey</td>
<td>16 (17.2)</td>
<td>9 (56.3)</td>
<td>15 (93.8)</td>
<td>5 (31.3)</td>
</tr>
<tr>
<td>Women’s ice hockey</td>
<td>9 (9.7)</td>
<td>9 (88.9)</td>
<td>100 (100.0)</td>
<td>6 (66.7)</td>
</tr>
<tr>
<td>Women’s lacrosse</td>
<td>17 (18.3)</td>
<td>11 (64.7)</td>
<td>100 (100.0)</td>
<td>5 (29.41)</td>
</tr>
<tr>
<td>Women’s soccer</td>
<td>82 (88.2)</td>
<td>48 (58.4)</td>
<td>80 (97.6)</td>
<td>31 (37.8)</td>
</tr>
<tr>
<td>Swimming and diving</td>
<td>46 (49.5)</td>
<td>3 (6.5)</td>
<td>42 (91.3)</td>
<td>2 (4.4)</td>
</tr>
<tr>
<td>Tennis</td>
<td>83 (89.2)</td>
<td>4 (4.8)</td>
<td>46 (55.4)</td>
<td>2 (2.4)</td>
</tr>
<tr>
<td>Indoor track</td>
<td>64 (68.8)</td>
<td>14 (21.9)</td>
<td>44 (88.8)</td>
<td>7 (10.9)</td>
</tr>
<tr>
<td>Outdoor track</td>
<td>71 (76.3)</td>
<td>19 (26.8)</td>
<td>60 (84.5)</td>
<td>8 (11.3)</td>
</tr>
<tr>
<td>Women’s volleyball</td>
<td>87 (93.5)</td>
<td>46 (52.9)</td>
<td>82 (9.4)</td>
<td>23 (26.4)</td>
</tr>
<tr>
<td>Water polo</td>
<td>4 (4.3)</td>
<td>0</td>
<td>2 (50.0)</td>
<td>0</td>
</tr>
</tbody>
</table>

*Values are number (percentage).
travel with a team (68.9%). It is extremely important that these modifications, most (59.8%) permitted these students to provide not permitted to be unsupervised without first-responder qualifications. Most (68.9%) of those students who completed unsupervised experiences in their states, it would behoove them to learn this information because they may be in violation of the law regarding those students who are completing unsupervised experiences.

One would expect to find that athletic training students in the freshman class received more direct clinical supervision than those students in the senior class. One would also expect to find that students in the senior class were given more time in supervised field experience than freshmen. As the education of athletic training students progresses from their freshman to senior years, they acquire more knowledge through the athletic training curriculum and more skills through the clinical experiences. Our results support these notions. Freshman and sophomore athletic training students completed more directly supervised clinical-education experiences. Junior and senior athletic training students more often completed field experiences that were less supervised, likely because of their additional knowledge and experience. Head ATCs reported that unsupervised experiences were more often completed by junior and senior athletic training students. Previous research indicates, however, that the unavailability of the supervisor leads to missed learning opportunities for students. Students need frequent feedback on their clinical performance and want to be included more often in the application of clinical skills.

Certainly anything beyond first-responder duties during unsupervised experiences is never appropriate with regard to clinical education. Rather high percentages of head ATCs indicated that some of their athletic training students were unsupervised during practices (73.0%) and during out-of-town travel with a team (68.9%). It is extremely important that these students complete first-responder duties only. Although all but 1 head ATC indicated that their athletic training students were not permitted to be unsupervised without first-responder qualifications, most (59.8%) permitted these students to provide athletic training responsibilities (eg, modalities, rehabilitation) without supervision.

Consistent ATC monitoring of injury records, update reports, etc, completed by these students becomes particularly imperative. As a class, freshmen spent an average of 5.0% (SD = 14.3) of their time in unsupervised experiences; sophomores, 7.3% (SD = 10.0); juniors, 13.7% (SD = 13.8); and seniors, 21.6% (SD = 21.6). We feel that head ATCs are distinguishing among direct clinical supervision, supervised field experience, and unsupervised experience. However, athletic training students completing unsupervised experience are not receiving appropriate clinical education. Certainly, though, until athletic department athletic training staffs are large enough, appropriate supervision of athletic training students in the college and university clinical setting will be difficult. The only way to correct this situation is to either increase the number of ATCs on staff who function as clinical instructors or reduce the number of athletic training students in clinical education. Furthermore, because nearly one third of the head ATCs (29.3%) were not familiar with the athletic training practice acts in their states, it would behoove them to learn this information because they may be in violation of the law regarding those students who are completing unsupervised experiences.

A nonparticipant observation study regarding supervision of baccalaureate nursing students also demonstrated that clinical supervision needs improvement. Researchers studied influences on student learning at the clinical site and observed that 75% of student time in the clinical-practicum experience was unsupervised. The researchers drew several conclusions:

1. Learning that occurred in clinical-practicum courses was largely unguided.
2. Students provided a service to the clinical agency (albeit a small one) and received scanty input from staff in return.
3. Without the support of staff, clinical instructors must focus more attention on the needs of patients and less on students.
4. Responsibility for patient care in several areas of the institution (with little day-to-day continuity) constituted questionably safe practice.
5. When student time is devoted to the independent provision of patient care, the opportunity to observe expert nursing practice is limited.
6. Time is not the equivalent of quality education in a clinical-practicum course.

These same problems are certainly known to confront athletic training students and educators alike. In another study,

4 minutes or less, compared with the internship route (X² = 16.11, P = .04). There was no difference regarding increased-risk sports.

### DISCUSSION

Our results suggest that athletic training students are receiving the same type and amount of clinical supervision, no matter the NCAA division affiliation or the status of the athletic training education program at the institution. However, we could only generally determine the appropriateness of clinical education through the type and amount of clinical supervision. Accredited and nonaccredited institutions apparently provide the same supervision, but the quality of that supervision in which there is a “student” and “instructor” relationship was not determined. For example, ATCs at accredited institutions may provide more instruction during clinical supervision than those at nonaccredited institutions.

<table>
<thead>
<tr>
<th>Sport</th>
<th>Frequency (n = 93)</th>
<th>Team Practice</th>
<th>Home Events</th>
<th>Athletic Team Travel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men's basketball</td>
<td>93 (100.0)</td>
<td>72 (77.4)</td>
<td>93 (100.0)</td>
<td>52 (55.9)</td>
</tr>
<tr>
<td>Cheerleading</td>
<td>61 (65.6)</td>
<td>5 (82.0)</td>
<td>41 (67.2)</td>
<td>7 (11.5)</td>
</tr>
<tr>
<td>Football</td>
<td>66 (71.0)</td>
<td>64 (97.0)</td>
<td>66 (100.0)</td>
<td>65 (98.5)</td>
</tr>
<tr>
<td>Gymnastics</td>
<td>12 (12.9)</td>
<td>8 (66.7)</td>
<td>12 (100.0)</td>
<td>7 (58.3)</td>
</tr>
<tr>
<td>Men's ice hockey</td>
<td>12 (12.9)</td>
<td>12 (100.0)</td>
<td>13 (100.0)</td>
<td>9 (75.0)</td>
</tr>
<tr>
<td>Men's lacrosse</td>
<td>12 (12.9)</td>
<td>11 (97.1)</td>
<td>12 (100.0)</td>
<td>5 (41.7)</td>
</tr>
<tr>
<td>Skiing</td>
<td>3 (3.2)</td>
<td>0</td>
<td>2 (66.7)</td>
<td>0</td>
</tr>
<tr>
<td>Men's soccer</td>
<td>64 (68.8)</td>
<td>42 (65.6)</td>
<td>64 (100.0)</td>
<td>21 (32.8)</td>
</tr>
<tr>
<td>Wrestling</td>
<td>22 (23.7)</td>
<td>13 (59.1)</td>
<td>21 (95.5)</td>
<td>6 (27.3)</td>
</tr>
</tbody>
</table>

*Values are number (percentage).
the views of students at a school of physiotherapy regarding clinical experiences were collected using qualitative approaches such as diaries, interviews, and questionnaires. The motivation and enthusiasm of the students were shown to be decreased or enhanced through the feedback they received and depended on whether the focus was on education rather than on service. There was resentment among the students about placements that they perceived as just using them to reduce patient waiting lists. During these placements, the staff did not have enough time to arrange a suitable learning environment for students. In these situations, they became “another pair of hands.” Students were often treated as junior members of staff, and there was little, if any, time available for critical reflection. Students therefore became bored and concentrated on the process of “getting the job done,” developing strategies to get them through the day. For example, they realized that regularly discharging patients would be judged as getting the work done; therefore, they would be seen in a more favorable light by the clinical educator. The danger in this situation is that students may learn to “fit in” to whatever seems to be expedient at the time and meet the expectations of those with whom they work, especially those in authority. Throughout the diaries, interviews, and questionnaires, the underlying need of the students to know how well they were doing was evident. Students learn not only from their mistakes but also from their successes, so long as they know when they are successful.10

Some clinical educators in this case study were unable to give the right quantity or quality of feedback, which is reported to be one of the main reasons that adult learning fails.10 In placements in which students felt the organization was poor or they received little supervision or feedback, their perception of the value of the clinical experience was mainly that of professional service. However, during this service time, students are socialized into the profession in which they acquire the group’s values and attitudes, interests, skills, and knowledge.11 Although socialization is an important aspect of professional development, it may not be directed toward the student’s learning and understanding.12 Without the appropriate clinical supervision, such as that identified in this study, athletic training students may also sometimes feel that they are being socialized into the profession rather than receiving clinical instruction.

Although our results revealed gaps in the students’ clinical supervision required in athletic training educational programs accredited by CAAHEP,1 students overall were not being misused to comply with the current recommended medical care coverage guidelines established by the NATA task force.6 It appears that students in the CAAHEP-accredited programs were not having to take the lead role in meeting the health care needs of athletes. The task force recommendations stated that sports with moderate risk should have an ATC on site or able to respond to the site of the athletic event or practice within 4 minutes; sports with increased risk should have an ATC physically present at all times.6,13 Head ATCs reported that athletic training students were providing small amounts of unsupervised coverage in both of these situations (less than 8.0% and 5.0%, respectively). Certainly the clinical education of athletic training students should not be compromised to provide medical coverage. If an athletic training student is at a moderate-risk sport practice without supervision and an ATC is unable to respond to an emergency at that practice within 4 minutes, the athletic training student may be put in a situation that he or she is unable to handle and, consequently, put the welfare and well-being of the injured student-athlete in jeopardy. The outcome could have negative ramifications for both the athletic training education program and the athletic department. Curiously, accredited athletic training programs and those in candidacy were more likely to respond to the moderate-risk sports within 4 minutes or less, compared with the internship route. Also, those institutions with football programs were less likely to have athletic training students unsupervised for home athletic-event coverage. However, athletic training students in Division I institutions covered informal summer workouts and individual skill sessions without clinical supervision more often than the other NCAA divisions. This may be due to the longer skill-instruction sessions and nontraditional seasons that are more common in Division I universities. Nonetheless, the results do suggest that Division I institutions are more likely to misuse athletic training students during their clinical education in order to provide this coverage.

The internship route has been viewed as the weak link in professional preparation in athletic training and has impeded licensure efforts needed to protect the profession and the public those athletic trainers serve.14 Accreditation is considered the gold standard and is consistent with other allied health care preparation programs. Accreditation is believed to lead to a consistency in the level of instruction, which results in a higher standard of professional care.14–16 Our results revealed that athletic training students at accredited athletic training education programs were more likely to possess CPR certification, first-aid certification, and education on the prevention of disease transmission compared with athletic training students in the internship route. As these results attest, the accredited programs offered more clinical-education opportunities, expectations, or requirements in terms of CPR and first-aid certifications and education on the prevention of disease transmission for athletic training students. Therefore, the athletic training students in these education programs are more appropriately trained to apply the skills of a first responder. These skills are particularly important during periods of reduced clinical supervision and for professional-preparation experience.

Our findings should be interpreted cautiously. It is plausible that the head ATCs responded to the questions the way they were “supposed to,” rather than providing valid information about the supervision of their athletic training students. Head ATCs may be supervising one way but responding to the questionnaire another way. This may result from their awareness of the important requirements today regarding supervision during clinical education. They may be reporting what is expected rather than how they actually supervise athletic training students. In the future, this research should include the perceptions of clinical supervision among athletic training students, which may differ from those of the head ATCs. Furthermore, clinical supervision of athletic training students in different settings (e.g., high school and clinic) warrants investigation. Nonparticipant observation research methods should be employed for these studies. This study should be repeated after a 5-year period to note any changes in the type and amount of clinical supervision in athletic training education programs.

**CONCLUSIONS**

The results of this study suggest that the clinical supervision of athletic training students at colleges and universities needs improvement. Medical care coverage beyond that of a first responder is provided by unsupervised athletic training stu-
dentson a fairly regular basis. This unsupervised coverage is provided more often by senior athletic training students and typically not during moderate- and increased-risk sports. Athletic training students are appropriately receiving more or less direct clinical supervision, depending on their class standing. Division I programs particularly need to be more aware of the use of athletic training students. More educational requirements and expectations exist for those athletic training students in accredited athletic training education programs in terms of first-responder certifications. The type and amount of clinical supervision among accredited and nonaccredited programs were not associated. Our results of this study are intended to enhance the education of athletic training students by providing information to make clinical instructors, ATCs, and athletic directors at colleges and universities more aware of the extent to which they use athletic training students beyond appropriate clinical supervision and beyond the scope of clinical education.

REFERENCES

Clinical-Education–Setting Standards Are Helpful in the Professional Preparation of Employed, Entry-Level Certified Athletic Trainers

Tim Laurent*; Thomas G. Weidner†

*Lynchburg College, Lynchburg, VA; †Ball State University, Muncie, IN

Objective: To determine the helpfulness of clinical-education–setting standards in the professional preparation of entry-level certified athletic trainers.

Design and Setting: We developed a 22-item questionnaire based on the 12 standards presented by Weidner and Laurent. Subjects used a Likert scale (0 = no help, 5 = very helpful) to indicate their perceptions of the helpfulness of each standard in preparing them for their roles and responsibilities as certified athletic trainers.

Subjects: We surveyed employed, entry-level certified athletic trainers who recently completed Commission on Accreditation of Allied Health Education Programs–accredited athletic training education programs.

Measurements: Percentage means were computed for the helpfulness ratings of each standard. A percentage mean was computed for the overall contribution of clinical education to professional development. Chi-square analyses were used to assess the differences in helpfulness ratings among respondents.

Results: The overall mean score across all standards was 4.17. No significant differences in the helpfulness ratings of any of the respondents were noted regardless of sex, ethnicity, number of clinical-education hours, total semesters of clinical education, settings in which students gained clinical experience, or current employment ($P < .05$).

Conclusions: The standards for athletic training clinical-education settings are helpful and should be applied to all settings. Varying standards do not need to be imposed on our different athletic training clinical-education settings.

Key Words: clinical instructors, learning environment, clinical environment
clinical education is “to provide the student with sufficient opportunity to develop specific competencies pertaining to the health care of the athlete and those involved in physical activity.”2 Because the Weidner and Laurent standards20 were judged to be relevant, practical, and indicative of a high-quality clinical-education setting, we interpreted that they would be helpful in facilitating professional development of the student. The purpose of our present study was to determine the potential helpfulness of the Weidner and Laurent clinical-education—setting standards in preparing them for their professional roles and responsibilities as ATCs. This target group was chosen because they had some work experience as ATCs, but their education was recent enough to enable them to reflect on the potential helpfulness of the clinical-education—setting standards on their professional development. In 1999, a complete list (n = 2150) of names and addresses of those individuals certified in 1997 was obtained from the NATABOC. This group of athletic trainers had all been certified within 24 months of participating in this study. A random sample of 500 entry-level ATCs was selected from this listing. Unemployed ATCs and ATCs who were students at the time of the survey were excluded because we wanted to know how the standards helped prepare them for entry-level athletic training roles and responsibilities. Those not assuming the roles and responsibilities of an ATC may have a different perspective on the athletic training clinical-education—setting standards.

METHODS

Subjects

Employed, entry-level ATCs who recently completed CAAHEP-accredited athletic training education programs were surveyed to determine the potential helpfulness of the Weidner and Laurent20 clinical-education—setting standards in preparing them for their professional roles and responsibilities as ATCs. This target group was chosen because they had some work experience as ATCs, but their education was recent enough to enable them to reflect on the potential helpfulness of the clinical-education—setting standards on their professional development. In 1999, a complete list (n = 2150) of names and addresses of those individuals certified in 1997 was obtained from the NATABOC. This group of athletic trainers had all been certified within 24 months of participating in this study. A random sample of 500 entry-level ATCs was selected from this listing. Unemployed ATCs and ATCs who were students at the time of the survey were excluded because we wanted to know how the standards helped prepare them for entry-level athletic training roles and responsibilities. Those not assuming the roles and responsibilities of an ATC may have a different perspective on the athletic training clinical-education—setting standards.

Instrumentation

We developed a 22-item questionnaire based on the 12 standards presented by Weidner and Laurent20 (Table 1). Sex, ethnicity, number of clock hours completed, number of clinical-education semesters completed, clinical-experience settings, and current employment setting were recorded to allow for a comparison of these variables to the perception of helpfulness of the standards. Using a Likert scale of 0 (of no help) to 5 (very helpful), without qualifying markers for ratings 1 through 4, respondents indicated their perceptions regarding the potential helpfulness of each standard in preparing them for the requirements of working as ATCs. In an open-ended question, respondents provided their impression of the percentage contribution that clinical education made to their overall professional development compared with the contribution of didactic education to their overall professional development. In a second open-ended question, respondents indicated the aspect of clinical education that best prepared them for their entry-level positions. The instrument went through content and format review by a professional with athletic training expertise and a professional with survey-instrument expertise but no athletic training expertise. The instrument was pilot tested with 49 entry-level ATCs to ensure that the directions and content were clear. Final adjustments to the instrument were made with this input. The internal consistency of the instrument was good (α = .74) as assessed with the Cronbach alpha.

Table 1. Clinical-Education—Setting Standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The clinical-education setting provides an active, stimulating envi</td>
<td>The clinical-education setting provides an active, stimulating environment appropriate for the learning needs of the student. (Learning Environment)</td>
</tr>
<tr>
<td>2. Clinical-education programs for students are planned to meet spe</td>
<td>Clinical-education programs for students are planned to meet specific objectives of the educational program and the individual student. (Program Planning)</td>
</tr>
<tr>
<td>3. The clinical-education setting has a variety of learning experiences available to students. (Learning Experiences)</td>
<td></td>
</tr>
<tr>
<td>4. The Clinical Instructors practice ethically and legally. (Ethical Standards)</td>
<td></td>
</tr>
<tr>
<td>5. The clinical-education setting demonstrates administrative interest in and support of athletic training clinical education (Administrative Support)</td>
<td></td>
</tr>
<tr>
<td>6. Communications within the clinical-education setting are effective and positive. (Effective Communications)</td>
<td></td>
</tr>
<tr>
<td>7. The Clinical Instructors are adequate in number to provide a good educational program for students. (Staff Number)</td>
<td></td>
</tr>
<tr>
<td>8. One Clinical Instructor with specific qualifications is responsible for coordinating the assignments and activities of the students at the clinical setting. (Setting Coordinator of Clinical Education)</td>
<td></td>
</tr>
<tr>
<td>9. Clinical Instructors are selected based on specific criteria. (Clinical Instructor Selection)</td>
<td></td>
</tr>
<tr>
<td>10. Clinical Instructors apply the basic principles of education—teaching and learning—to clinical education. (Principles of Teaching and Learning)</td>
<td></td>
</tr>
<tr>
<td>11. The Clinical Instructors are interested and active in professional associations related to athletic training. (Professional Associations)</td>
<td></td>
</tr>
<tr>
<td>12. Adequate space for study, conference, and treating athletes/patients is available to students. (Adequate Space)</td>
<td></td>
</tr>
</tbody>
</table>

Procedures

We received Ball State University Internal Review Board approval for this project. Respondents were informed that participation was voluntary and that they were free to withdraw at any time without prejudice from the researchers. The questionnaire, cover letter, and a postage-paid return envelope were sent to each respondent. Return envelopes were coded to allow a follow-up mailing to nonrespondents. A 3-week period was given for return of the questionnaires. In order to research a more homogenous group, those respondents who were not employed as athletic trainers or did not complete CAAHEP-accredited athletic training education programs were eliminated from data analysis. Demographic data (eg, sex, ethnicity, etc) for the sample were compared with the NATA membership to ensure a representative sample of the NATA certified membership.21

Statistical Analysis

Frequency counts and percentages were computed for the following questionnaire items:

1. Perceptions of whether a clinical-education—setting standard was addressed during clinical experiences;
2. Respondent sex;
3. Respondent ethnicity;
4. Total number of clock-hours spent in clinical education;
5. Total number of clinical-education semesters completed;
6. Clinical-experience settings;
7. Current employment setting;
8. Sex, ethnicity;

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Table 2. Demographic Data of Subjects (N = 129) in Comparison with the National Athletic Trainers' Association (NATA) Certified Membership*

<table>
<thead>
<tr>
<th></th>
<th>Respondents</th>
<th>NATA Certified Membership</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>63</td>
<td>49</td>
</tr>
<tr>
<td>Female</td>
<td>66</td>
<td>51</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>116</td>
<td>90</td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Black</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hispanic</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Unspecified</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Clinical Hours Completed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>800–1200</td>
<td>23</td>
<td>18</td>
</tr>
<tr>
<td>1201–1800</td>
<td>50</td>
<td>39</td>
</tr>
<tr>
<td>1801–2300</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>2301–3000</td>
<td>23</td>
<td>18</td>
</tr>
<tr>
<td>&gt;3000</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Semesters in Clinical Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3–4</td>
<td>27</td>
<td>21</td>
</tr>
<tr>
<td>5–6</td>
<td>62</td>
<td>48</td>
</tr>
<tr>
<td>7–8</td>
<td>35</td>
<td>27</td>
</tr>
<tr>
<td>9–10</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Settings in Which Students Gained Clinical Experience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>College/University</td>
<td>125</td>
<td>97</td>
</tr>
<tr>
<td>High School</td>
<td>75</td>
<td>58</td>
</tr>
<tr>
<td>Industry</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>CBHCF</td>
<td>55</td>
<td>43</td>
</tr>
<tr>
<td>Current Employment Setting of Respondents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBHCF</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>CBHCF + outreach</td>
<td>45</td>
<td>36</td>
</tr>
<tr>
<td>College or university</td>
<td>35</td>
<td>27</td>
</tr>
<tr>
<td>Professional sports</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>High school</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td>Other</td>
<td>18</td>
<td>14</td>
</tr>
</tbody>
</table>

*a*n indicates number of subjects; CBHCF, community-based health care facility; and NA, data not available.

5. Total number of semesters spent in clinical education;
6. Settings in which students gained clinical experience (eg, college, high school, industry, community-based health care facility);
7. Current employment setting.

Percentage means were computed for the helpfulness ratings of each standard. The percentage mean was also computed for the perception of the overall contribution of clinical education to professional development as gathered through the open-ended question. Responses identifying the aspect of clinical education that best prepared participants for their responsibilities and roles as entry-level ATCs were grouped according to common themes. Chi-square analyses (χ²) were used to assess differences in the helpfulness ratings among respondents. The following categories and cells were used in the analysis: sex (male or female); ethnicity (white or nonwhite); clinical-education hours (<1800 or >1800); total semesters of clinical-education (3–4, 5–6, or 7–10); settings in which students gained clinical experience (college or no college; high school or no high school; industry or no industry; clinic or no clinic); and current employment (clinical or high school, college, or other). These categories were used for analysis because of their logical groupings and to ensure adequate responses in each cell for analysis. Helpfulness was divided into 2 cells. The first helpfulness cell combined ratings 0–3 and was labeled as “little/no help.” The second cell combined ratings 4–5 and was labeled “very helpful.” This more stringent grouping (4–5 rather than 3–5) was used because the standards were presented as “indicative of a high-quality clinical-education setting.” For this reason, we determined that a middle response of 3 was not strong enough to warrant consideration as “very helpful.” Only those respondents who indicated that a particular standard seemed to have been addressed in their clinical setting(s) were included in these analyses. This stipulation was included to ensure that a respondent actually had some experience upon which to base the perception of the helpfulness of the standards. The alpha level was set a priori at ≤ .05 for all analyses.

RESULTS

With follow-up to nonrespondents and after exclusion of the 125 questionnaires that were undeliverable due to incorrect mailing addresses, 244 completed surveys (of 500 mailed) were returned, for a response rate of 65.1%. Respondents who were not employed or who had not completed an accredited athletic training education program were eliminated from the data pool. All remaining respondents indicated that all clinical-education-setting standards seemed to have been met. Thus, a total of 129 respondents were included in the data analysis. Table 2 provides the respondents’ demographics and clinical-education experience. The employment distribution of the respondents was similar to that of the NATA certified membership. Table 3 presents summary data on the helpfulness of each standard. The overall mean score across all standards was 4.17. Only 2 setting standards had a mean helpfulness rating below 4.0 (Setting Coordinator of Clinical Education [mean = 3.58 ± 1.48] and Professional Associations [mean = 3.96 ± 1.14]). No significant difference was noted in the helpfulness ratings among any of the groups of respondents, regardless of sex,
ethnicity, number of clinical-education hours, total semesters of clinical education, clinical-education–setting experiences, or current employment (P ≤ .05). Respondents indicated that 53.0% of their entry-level professional development came from clinical education. Considering the aspects of this clinical education that best prepared them for their entry-level roles and responsibilities, participants commonly cited the importance of opportunities to improve athletic training skills (eg, rehabilitation and injury evaluation) through hands-on practice in a variety of situations and settings. They also indicated that clinical education allowed them to develop their decision-making and communication skills through their responsibilities in athlete and patient care.

DISCUSSION

The Weidner and Laurent20 clinical-setting standards are considered by employed, entry-level ATCs to be helpful to very helpful for professional preparation. Ten of these setting standards were judged as very helpful (mean ≥ 4.02). According to the respondents, slightly more than half (53.0%) of athletic training professional development was perceived to come from clinical education. Thus, not only should clinical education remain a large part of the athletic training education program, but clinical-education settings should be structured and evaluated to ensure that optimal education is taking place. Failure to objectively select and evaluate the setting in which students are receiving this clinical education may result in chance learning. Such learning is contrary to the purpose and requirements of accreditation, especially regarding the quality of athletic training clinical education.

These data complement research22,23 that quality rather than quantity of clinical education is more important in the professional preparation of ATCs. Appropriately, quantitative measures are being replaced with qualitative measures in preparing entry-level ATCs.2,3

Certainly it is logical to question the connection between perceived helpfulness of a set of standards and the actual knowledge and skills gained from a setting. Was the setting really more helpful in learning, or did the students just enjoy the setting more? When student evaluations of clinical experience were compared with their clinical skill gain on an objective posttest, the Objective Structured Clinical Examination (OSCE), students in the clinical setting with the mostfavorable student ratings ultimately scored the highest on the OSCE.18 This research gives some credibility to the respondents’ perception of helpfulness ratings obtained in this study.

Consistent with the literature,22 no differences were seen between the respondents’ demographic characteristics and clinical experiences and the perceived helpfulness of the standards. Any differences among the helpfulness ratings would have indicated that the clinical-education standards should vary for students. However, the uniform helpfulness ratings obtained in this study indicate that a standard is helpful for all students in all clinical situations. What follows is a discussion of each of the Weidner and Laurent20 clinical-setting standards. The results of this study and the literature amply support their potential helpfulness in clinical education.

Learning Environment

Good management, high staff morale, harmonious working relationships, and sound interdisciplinary patient-management procedures characterize the desirable learning environment.20 Further, a desirable learning experience requires that health care personnel be receptive to students, have a variety of expertise, be interested in new techniques, and be involved with professions outside athletic training. Respondents in this study reported that an active learning environment was very helpful (mean = 4.34 ± 0.67) in their professional development. Respondents also commented that hands-on experiences were valuable and important as part of an active learning environment. Clinical experience is designed to involve students in the actual practice of a profession, allowing them an opportunity to apply theoretical knowledge to real-life situations.10,15–18,24–26 Whether through trial and error or guided by clinical instructors, learning by doing fosters skill acquisition.27 An active learning environment provides ample learning opportunities.28

Program Planning

Specific objectives should be assigned to clinical-education experiences.2 The use of learning objectives is a commonly accepted practice in pedagogy and should be central to planning educational experiences.29 Some athletic training education programs are already using learning objectives to guide students’ clinical experiences.30 Certainly objectives improve the uniformity of the educational experience31 and enable program administrators to provide for the educational needs of the individual student. Objectives create the framework to provide students with opportunities to expand their professional knowledge, skills, and attitudes. Both the taxonomy of Bloom et al32 and the CAAHEP Standards and Guidelines4 requirement of learning over time provide for a progression of student learning from introduction to mastery of professional knowledge, skills, and attitudes around which a clinical education program should be organized. Specific planning of level-appropriate learning objectives should occur for each clinical-education rotation and be adapted to the needs of the individual athletic training student.

Learning Experiences

Variety in clinical experiences has been reported by many clinical educators as valuable to students’ education.6,12,14,17,33–38 Variety in learning experiences is important not only because it provides more opportunities for students to learn, but also because it provides athletic training students with a wider array of treatment options for their future professional use.38 These treatment options are often referred to as “tools in the toolbox.” Because not every patient responds the same way to every treatment, professionals need to possess the knowledge and skill to address similar problems in a variety of ways.

This specific standard not only addresses variety within a single clinical-education setting but within the total clinical-education program. Because learning styles vary, athletic training students need to be exposed to the multiple teaching methods inherent in a variety of clinical learning experiences.39 Therefore, program directors and clinical-education coordinators should focus both on a variety of learning experiences within a clinical-education setting and on variety throughout the entire clinical-education program.
Ethical Standards

Ethics can be defined as a set of standards that guide the actions and judgments of a profession. The goal of the NATA Code of Ethics is to provide high-quality health care delivery through members who conduct themselves with high practice standards at all times. Respondents believed that practicing ethically and legally would be the most helpful standard (mean = 4.62 ± 0.63, with 93.7% of the respondents rating this as very helpful). This finding concurs with the literature that identified role modeling as the most helpful clinical-instructor characteristic. Clinical settings in which clinical instructors practice unethically may certainly detract from quality clinical education.

Administrative Support

Considering the variety of the roles and responsibilities of ATCs, it is not surprising that they may not have time to adequately serve as clinical instructors. Administrative support for clinical instruction may take the form of a reduced workload that allows time for an ATC to prepare and teach clinical skills. Accreditation standards and guidelines require that appropriate resources be available to operate the educational program, including adequate clerical and other support staff. This standard would seem to impose a similar requirement on clinical-education settings.

Effective Communications

Communication between the clinical instructor and the student is vitally important to the education process. The more people involved in communication, however, the greater the chance for misunderstanding. Course objectives and frequent interactions among program directors, clinical-education coordinators, clinical instructors, and students should help to keep communication clear.

Staff Number

The respondents indicated that a low student-to-clinical-instructor ratio would be very helpful in clinical education. The ratio of students to clinical instructors in medical and allied health clinical education is reported as 1:1 to 8:1. In general, CAAHEP Standards and Guidelines recommend a maximum of 8 students to 1 clinical instructor for appropriate overall clinical supervision, but in specific instances, the Standards and Guidelines require a direct supervision ratio of 1 student to 1 clinical instructor. Direct supervision requires that a clinical instructor be close enough to intervene on behalf of the patient and to instruct and evaluate the clinical proficiencies of a student. A low ratio may be more important with less-experienced students, who benefit from more teacher interaction. In contrast, experienced students need more autonomy, and they may benefit more from a larger student to clinical-instructor ratio (eg, 8:1). Certainly even the more-experienced student needs supervision. The ratio should never be too large as to interfere with communication between student and clinical instructor, result in minimal supervision, or cause the clinical instructor to more frequently use a lecture-based format in order to disseminate information.

Setting Coordinator of Clinical Education

Recommendations for medicine and physical therapy programs suggest using a coordinator at each clinical-education setting. The coordinator keeps the channels of communication open among the students, other clinical instructors at the setting, and program administrators. In this way, the chance for miscommunications and confusion should be less. Although this is a logical approach to coordinating clinical education for the student at the setting, respondents did not perceive this standard to be quite as helpful (mean = 3.58 ± 1.48) as other standards. This may indicate that setting coordination of clinical education is important to the clinical instructors and program administrators but beyond the awareness of the students. As athletic training clinical-education programs incorporate additional settings, a single coordinator of clinical experience likely becomes more important. The more complex the clinical-education structure, the lower the students will rate the educational experiences. A single setting coordinator should be able to minimize the confusion that may occur when multiple students are involved with many clinical instructors.

Clinical-Instructor Selection

This standard addresses the need to select clinical instructors based on attributes that make them more effective teachers. Expert teachers communicate well, are enthusiastic and organized, get students involved, and use a variety of teaching strategies. The way a clinical instructor interacts with a student can either help or hinder the learning process. The CAAHEP Standards and Guidelines suggest the importance of clinical instructors by requiring that they have at least one year of athletic training work experience. Physical therapy education programs use this same requirement for their clinical instructors. Also, CAAHEP Standards and Guidelines state, “A clinical instructor should have appropriate experience . . . and a sincere interest in the professional preparation of athletic training students.” The importance of a good clinical instructor to the overall benefit of the clinical education experience should not be underestimated. Clinical instructors are the most important factor in student satisfaction with clinical-education experience. It is therefore important to select clinical instructors who not only have clinical expertise but who understand students as learners and can facilitate the learning process through sound teaching skills.

Principles of Teaching and Learning

This standard addresses the need for clinical instructors to apply basic principles of teaching and learning in clinical education. Clinical instructors should know how to implement objectives and evaluate student performance. Clinical instructors must also have access to materials and workshops that enhance their knowledge and skills as educators; content expertise is not enough to ensure student learning or student satisfaction. A pedagogy background helps clinical instructors determine the best instructional approach to use with a particular group of students. Role modeling has been identified as the most important teaching characteristic in athletic training clinical instructors. As students learn by applying and practicing skills during clinical education, they also need guidance.
Professional Associations

Respondents did not perceive that clinical instructors who are interested and active in professional associations related to athletic training would be quite as helpful (mean = 3.96 ± 1.14) in their professional preparation compared with other standards. Certainly continuing education is required of ATCs in order to maintain their certification. The CAAHEP guidelines encourage additional professional involvement of program administrators, faculty, and clinical instructors. Clearly the logic is that professionals and professional educators, in particular, need to stay knowledgeable in order to convey current information to students. However, professional involvement does not appear to translate as well to helping students as other standards.

Adequate Space

The CAAHEP Standards and Guidelines require that there be adequate space for clinical education. Because the athletic training room is the primary clinical-education facility, space is needed for studying, instructor-student conferences, and treating athletes and patients. While total space is not the complete determinant of the educational value of a facility, the physical environment directly contributes to student learning. Students acquire and use information by doing, by interacting, and by assigning meaning to information. Adequate space allows students to practice skills and interact with patients and instructors and ultimately gives meaning to what they are learning. The physical environment can also stimulate or stifle collaborative learning as well as assist or inhibit direct supervision of athletic training students. As clinical sites are chosen, educators and clinical instructors need to be aware of the influence of physical facilities on learning.

LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

Clinical education involves the clinical setting, the student, and the clinical instructor. This research focused on employed, entry-level ATCs’ perceptions of the helpfulness of clinical-education—setting standards in preparing them to assume their professional roles and responsibilities. In this way, it serves as a means of assessing the quality of a clinical-education setting. The strength of this research was that it made the connection between clinical-education settings and their contribution in preparing athletic training students for professional roles and responsibilities. A limitation of this research was that it relied on the recall of participants. It is possible that the participants’ perceptions of their clinical-education experiences were not completely reliable. It is also possible that participants had difficulty separating those skills and knowledge gained in clinical versus didactic education. Although we asked about clinical education as an isolated part of professional preparation, it is likely that there is an important interaction between didactic and clinical education. This potential interaction should be explored. Also, outcome studies that focus on knowledge and skill gained in clinical education may help to determine which aspects of clinical-education are most helpful.

CONCLUSIONS

The 12 Weidner and Laurent standards for clinical-education settings in athletic training are considered practical, relevant, and suggestive of high-quality clinical-education settings by educators, clinical instructors, students, and employed, entry-level certified athletic trainers. The assumption about these standards before this research was that the standards were helpful in preparing students for their roles and responsibilities as entry-level certified athletic trainers. Our current findings and other research support this assumption. The standards are applicable to all athletic training students in all clinical-education settings. Regardless of where students received their experience or where they worked as certified athletic trainers after entry-level education, the setting standards were helpful. Varying standards need not be imposed on our different athletic training clinical-education settings. Athletic training program administrators may want to consider giving less weight to Setting Coordinator of Clinical Education and Professional Associations when using the Weidner and Laurent clinical-education—setting standards to select and evaluate clinical-education settings. Program administrators should be aware that this group of entry-level athletic trainers was less confident of the helpfulness of these 2 standards. Clinical education makes a substantial contribution to the professional preparation of athletic training students.

ACKNOWLEDGMENTS

This research was supported through a grant from the Great Lakes Athletic Trainers’ Association Research Assistance Fund (Tim Laurent).

REFERENCES

Athletic Training Students Initiate Behaviors Less Frequently When Supervised by Novice Clinical Instructors

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*Indiana State University, Terre Haute, IN; †The University of Southern Mississippi, Hattiesburg, MS

Objective: To identify and compare clinical-instruction behaviors based on the experience level of the instructor.

Design and Setting: Systematic observation, employing the Clinical Instruction Analysis Tool—Athletic Training II was used to identify clinical instructors', athletic training students', and athletes' behaviors.

Subjects: Thirty clinical instructors (19 men, 11 women, mean age = 31.7 ± 10.4 years) with novice, intermediate, and advanced experience volunteered to participate.

Measurements: We summarized data into contribution and target categories. Frequency data of the categories were analyzed across experiential level of the clinical instructor.

Results: Differences among clinical instructors' experience levels existed in the frequency of athletic training student behaviors (χ² = 9.6, P = .008). Post hoc comparisons identified differences in the frequency of athletic training student-initiated behaviors when novice clinical instructors were compared with intermediate (F₁,₂₇ = 5.52, P = .023) and advanced (F₁,₂₇ = 5.52, P = .026) instructors. No significant differences were seen between the clinical instructors' experience levels and total clinical instructors' contribution, total athletes' contribution, silent observation, clinical instructors' use of questions, clinical instructors' use of skill feedback, clinical instructors' use of screening and evaluation techniques, and athletic training students' use of screening and evaluative techniques.

Conclusions: Certified athletic trainers in their initial year of instructor experience appear to lack the requisite clinical-instruction knowledge, skills, and abilities to facilitate athletic training student behavior in a clinical setting. Program directors and clinical coordinators should assign instructors' responsibilities to certified athletic trainers who have more experience or demonstrate the ability to foster student interaction.

Key Words: clinical instruction, systematic observation, behavioral interaction, experience

The triad of athletic training clinical instruction consists of the athletic training student, the clinical instructor, and the athlete. Teachers, students, and patients contribute interactive behaviors in allied health education. In the field of athletic training, those patients are athletes.

The experience of clinical instructors is referred to in the Standards and Guidelines for an Accredited Educational Program for the Athletic Trainer. A guideline suggests that clinical instructors should have one year of experience in their respective fields. In the 2002–2003 academic year, Commission on Accreditation of Allied Health Education Programs (CAAHEP)-accredited athletic training education programs are required to provide Approved Clinical Instructors (ACIs) to their students for the purpose of teaching and evaluating clinical skills. Some CAAHEP-accredited athletic training education programs depend on certified athletic trainers who have less than one year of experience to provide supervision during clinical instruction.

Research in education provides evidence that experience is a predictor of teaching effectiveness. Novice teachers express a significant amount of indecision and lack pedagogic content and demonstration ability. Experienced teachers provide more skill feedback to students; demonstrate higher self-efficacy; are more efficient problem solvers; have more structured lesson content; and spend less time planning.

In both clinical instructor and traditional teaching roles, experience is an important consideration when defining the appropriate responsibilities of individuals. Little research has been conducted to observe and analyze the behavior patterns that emerge within athletic training clinical education. Systematic observation allows researchers to identify and compare behaviors of athletic training clinical instructors based on the experience level of the instructor. Our purpose was to compare the frequency of selected clinical-instruction behaviors with the experiential level of athletic training clinical instructors.

METHODS

Subjects

Thirty subjects volunteered to participate in this study. Subjects selected were certified athletic trainers listed on the university's Joint Review Committee for Accreditation of Athletic Training Education Programs Annual Report. All subjects were directly supervising athletic training students enrolled at...
5 CAAHEP-accredited athletic training education programs. Of the 5 accredited programs, 1 was located in District 5, 1 in District 6, and 3 in District 9 of the National Athletic Trainers’ Association.

Experience was based on years of experience as a clinical instructor, not simply number of years since certification as an athletic trainer. Table 1 contains clinical-instructor demographic information. Novice clinical instructors were defined as having less than 1 year of clinical-instructor experience. Intermediate clinical instructors were defined as having 1 to 4 years of clinical-instructor experience. Advanced clinical instructors were defined as having 5 or more years of clinical-instructor experience. No subjects had any formal instruction in clinical-instructor effectiveness immediately prior to the investigation.

Equal, stratified samples were used for novice, intermediate, and advanced clinical instructors. The desired sample size from each university was 2 clinical instructors per experience group. Random-selection techniques were used when more than 2 clinical instructors from each group were available to participate. Informed consent was obtained from each individual included in the videotape record. The University of Southern Mississippi Human Subject Protection Review Committee granted approval of this study.

Ten subjects from each of the novice-, intermediate-, and advanced-experience groups of clinical instructors were videotaped for one 30-minute session during clinical-instruction episodes. The athletic training students were observed during the required practicum content of their educational program. Subjects, athletic training students, and athletes were included in the videotape records.

Instrumentation

A behavior-focused, direct-observation interval recording system9,10 was used with the Clinical Instruction Analysis Tool—Athletic Training II (CIAT-AT II) (Table 2).11 We developed this instrument during 30 hours of real-time observation over 2 months in a variety of settings. Six instructors were videotaped for a total of 4 hours of clinical instruction in 4 different settings.

The observation interval for this study was set at 3 seconds. This ensured that a continuously occurring behavior was captured once per interval. If multiple behaviors occurred in a 3-second interval, they were all recorded. Instrument reliability was established using interobserver agreement11; the standard of agreement for a system with more than 11 categories is 85%.9 Our percentage of agreement using 2 trained observers was 95.4%.11 Three experts in athletic training education confirmed the face validity of the instrument.

The CIAT-AT II behaviors, definitions, and examples are shown in Table 3. Each coded behavior was associated with a letter, A through Q, (eg, A = behavioral feedback, B = skill feedback: corrective). The coding scheme included a number that indicated who initiated the behavior (eg, 1 indicated the clinical instructor; 2, the athletic training student; and 3, the student-athlete). The 4 categories of screening and evaluative techniques (ie, questioning, clarifying and explaining, documentation, and manipulation) were used only when initiated by a clinical instructor or an athletic training student. Individuals do not initiate silent observation and noninterpretive behaviors, so they were coded without numbers.

Data-Collection Procedures

After permission was granted by each educational institution, volunteers completed the informed-consent process. The camera was arranged in each athletic medicine facility where clinical instruction occurred. Situations were not contrived and were captured as part of a normal day during normal times of clinical instruction. Clinical instructors wore a telemeterized microphone to increase sound capture. The camera was placed as inconspicuously as possible to reduce the Hawthorne effect12 of direct observation. A wide-angle lens and picture zoom allowed sufficient videotape capture at an increased distance from the clinical instruction. The videotape records were analyzed using a VHS videocassette recorder with stop-shuttle switch capabilities. We assured accurate interval recording on behavioral observations with a 3-second cue tape. Using the CIAT-AT II, data from each 30-minute clinical-instructors’ session were coded and categorized into the following contribution and target behaviors:

1. Total clinical instructors’ contribution was determined by the total frequency of interactions initiated by the clinical instructor.14 This was calculated by summing the frequencies of columns A1 through O1.
2. Total athletic training students’ contribution was determined by the total frequency of interactions initiated by the athletic training student.14 This was calculated by summing the frequencies of columns A2 through O2.

Table 1. Clinical Instructors’ Demographic Information (N = 30)*

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novice (6 men, 4 women)</td>
<td>21</td>
<td>36</td>
<td>24.9</td>
<td>4.0</td>
</tr>
<tr>
<td>Intermediate (7 men, 3 women)</td>
<td>23</td>
<td>55</td>
<td>28.3</td>
<td>9.6</td>
</tr>
<tr>
<td>Advanced (6 men, 4 women)</td>
<td>35</td>
<td>56</td>
<td>42.0</td>
<td>7.5</td>
</tr>
</tbody>
</table>

*N indicates number of clinical instructors; and SD, standard deviation.

Table 2. Clinical Instruction Analysis Tool—Athletic Training II (CIAT-AT II)

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Initiated by Clinical Instructor</th>
<th>Initiated by Athletic Training Student</th>
<th>Initiated by Student-Athlete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral feedback</td>
<td>A1</td>
<td>A2</td>
<td>A3</td>
</tr>
<tr>
<td>Skill feedback: corrective</td>
<td>B1</td>
<td>B2</td>
<td>B3</td>
</tr>
<tr>
<td>Skill feedback: evaluative</td>
<td>C1</td>
<td>C2</td>
<td>C3</td>
</tr>
<tr>
<td>Skill feedback: descriptive</td>
<td>D1</td>
<td>D2</td>
<td>D3</td>
</tr>
<tr>
<td>Accepts or uses the ideas of others</td>
<td>E1</td>
<td>E2</td>
<td>E3</td>
</tr>
<tr>
<td>Asks questions</td>
<td>F1</td>
<td>F2</td>
<td>F3</td>
</tr>
<tr>
<td>Gives information</td>
<td>G1</td>
<td>G2</td>
<td>G3</td>
</tr>
<tr>
<td>Gives verbal directions</td>
<td>H1</td>
<td>H2</td>
<td>H3</td>
</tr>
<tr>
<td>Predictable response</td>
<td>I1</td>
<td>I2</td>
<td>I3</td>
</tr>
<tr>
<td>Interpretive response</td>
<td>J1</td>
<td>J2</td>
<td>J3</td>
</tr>
<tr>
<td>Initiative response</td>
<td>K1</td>
<td>K2</td>
<td>K3</td>
</tr>
<tr>
<td>Screening or evaluative technique:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questioning</td>
<td>L1</td>
<td>L2</td>
<td></td>
</tr>
<tr>
<td>Clarifying and explaining</td>
<td>M1</td>
<td>M2</td>
<td></td>
</tr>
<tr>
<td>Documentation</td>
<td>N1</td>
<td>N2</td>
<td></td>
</tr>
<tr>
<td>Manipulation</td>
<td>O1</td>
<td>O2</td>
<td></td>
</tr>
<tr>
<td>Silent observation</td>
<td>P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noninterpretive</td>
<td>Q</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3. Clinical Instruction Analysis Tool—Athletic Training II (CIAT–AT II) Behaviors, Definitions, and Examples

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Behavioral feedback</strong></td>
<td>Positive, negative, verbal, or nonverbal response to an affective or cognitive behavior</td>
<td>Athletic training student nods head as the clinical instructor discusses an ultrasound treatment.</td>
</tr>
<tr>
<td><strong>Skill feedback: corrective</strong></td>
<td>Response to a psychomotor skill in which the intent is to correct or refine the skill</td>
<td>Clinical instructor says, “Move your thumbs up 1 inch to feel the tibial plateau,” after the athletic training student incorrectly palpates the tibial tubercle.</td>
</tr>
<tr>
<td><strong>Skill feedback: evaluative</strong></td>
<td>Response to a psychomotor skill in which the intent is to have the subject synthesize a value about the skill</td>
<td>Clinical instructor says, “Good job” after an athletic training student correctly palpatates the tibial plateau.</td>
</tr>
<tr>
<td><strong>Skill feedback: descriptive</strong></td>
<td>Response to a psychomotor skill in which the skill is described to the subject</td>
<td>Clinical instructor says, “Your thumbs are now on the insertion of the quadriceps group,” after the athletic training student incorrectly describes the tibial plateau.</td>
</tr>
<tr>
<td><strong>Accepts or uses the ideas of others</strong></td>
<td>Any behavior that demonstrates acceptance or develops or clarifies the ideas or input of another person</td>
<td>Athletic training student says, “I read that in Dr Leonard’s protocol,” after the clinical instructor explains the use of anterior cruciate ligament rehabilitation.</td>
</tr>
<tr>
<td><strong>Asks questions</strong></td>
<td>Includes asking questions that require verbal or nonverbal response</td>
<td>Clinical instructor asks, “Why would we avoid using ultrasound on this athlete?”</td>
</tr>
<tr>
<td><strong>Gives information</strong></td>
<td>Giving facts, opinions, or ideas or lecturing or asking rhetorical questions</td>
<td>Clinical instructor says, “The brachial plexus involves C5-T1.”</td>
</tr>
<tr>
<td><strong>Gives verbal directions</strong></td>
<td>Giving directions, usually skill related, that will result in immediate, observable response</td>
<td>Clinical instructor asks the athletic training student to prepare a cold whirlpool.</td>
</tr>
<tr>
<td><strong>Predictable response</strong></td>
<td>Any response that is entirely predictable and does not immediately reflect extensive higher-level thinking</td>
<td>Athletic training student says, “75%” after the clinical instructor asks, “What is the percentage of left quadriceps strength as compared with the right?” A delay occurred when the athletic training student looked at the dynamometer report.</td>
</tr>
<tr>
<td><strong>Interpretive response</strong></td>
<td>A response in which some degree of analysis, synthesis, or interpretation is required</td>
<td>Athletic training student asks an athlete, “Where is your pain?”</td>
</tr>
<tr>
<td><strong>Initiative response</strong></td>
<td>A response that is not solicited from the source but is spontaneous; this type of response may be productive or nonproductive</td>
<td>Clinical instructor says, “You stated earlier that there is pain in your arm; can you describe it?”</td>
</tr>
<tr>
<td><strong>Screening or evaluative technique: questioning</strong></td>
<td>A verbal behavior that is initiated by either the clinical instructor or athletic training student during assessment. The student-athlete is questioned on the nature, site, and severity of an injury. This category may also include determining the student-athlete’s perception of a treatment or rehabilitation.</td>
<td>Athletic training student writes SOAP notes.</td>
</tr>
<tr>
<td><strong>Screening or evaluative technique: clarifying and explaining</strong></td>
<td>A verbal behavior that is initiated by either the clinical instructor or athletic training student during assessment. This category includes verbal interactions when questions are not used.</td>
<td>Clinical instructor performs manual muscle testing.</td>
</tr>
<tr>
<td><strong>Screening or evaluative technique: documentation</strong></td>
<td>A nonverbal behavior that is initiated by either the clinical instructor or athletic training student during assessment. This may include writing Subjective, Objective, Assessment, Plan (SOAP) notes or computer documentation.</td>
<td>Time that elapses when a clinical instructor, athletic training student, and athlete remain silent while the clinical instructor turns up the intensity of a modality.</td>
</tr>
<tr>
<td><strong>Screening or evaluative technique: manipulation</strong></td>
<td>A nonverbal behavior initiated by either the clinical instructor or athletic training student during assessment. This includes the psychomotor component of assessment.</td>
<td>The wireless microphone transmission hisses when the battery is low.</td>
</tr>
<tr>
<td><strong>Silent observation</strong></td>
<td>Pauses or periods of silence in which no communication occurs</td>
<td></td>
</tr>
</tbody>
</table>
Post hoc analysis revealed differences between the novice and intermediate groups (\( P = .023 \)).

Post hoc analysis revealed differences between the novice and advanced groups (\( P = .026 \)).

Subjects.

Table 5. Frequency of Contribution and Target Behaviors by Experience Level

<table>
<thead>
<tr>
<th>Experience Level</th>
<th>Total CIs’ Contribution</th>
<th>Total Athletes’ Contribution</th>
<th>Total ATSs’ Contribution</th>
<th>Silent Observation</th>
<th>ATSs’ Use of SET</th>
<th>CIs’ Use of SF</th>
<th>CIs’ Use of Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced (n = 10)</td>
<td>3679</td>
<td>1025</td>
<td>914</td>
<td>1003</td>
<td>247</td>
<td>580</td>
<td>119</td>
</tr>
<tr>
<td>Expected†</td>
<td>3569</td>
<td>1223</td>
<td>751</td>
<td>1025</td>
<td>129</td>
<td>881</td>
<td>178</td>
</tr>
<tr>
<td>Intermediate (n = 10)</td>
<td>3448</td>
<td>1470</td>
<td>1002</td>
<td>848</td>
<td>86</td>
<td>1052</td>
<td>256</td>
</tr>
<tr>
<td>Expected†</td>
<td>3569</td>
<td>1223</td>
<td>751</td>
<td>1025</td>
<td>129</td>
<td>881</td>
<td>178</td>
</tr>
<tr>
<td>Novice (n = 10)</td>
<td>3579</td>
<td>1173</td>
<td>337</td>
<td>1224</td>
<td>55</td>
<td>1010</td>
<td>159</td>
</tr>
<tr>
<td>Expected†</td>
<td>3569</td>
<td>1223</td>
<td>751</td>
<td>1025</td>
<td>129</td>
<td>881</td>
<td>178</td>
</tr>
</tbody>
</table>

*CI indicates clinical instructor, ATS, athletic training student; SET, screening and evaluation techniques; SF, skill feedback; and n, number of subjects.
†Expected frequency was determined by dividing the total observed by 3, providing an equal distribution among groups.

3. Total athletes’ contribution was determined by the total frequency of interactions initiated by the athlete. This was calculated by summing the frequencies of columns A3 through K3.

4. Silent observation was determined by the frequency of silent observation. This was calculated by summing the frequencies of cell P.

5. Athletic training students’ use of screening and evaluative techniques was determined by the total frequency of student-initiated screening and evaluative technique interactions. This was calculated by summing the frequencies of columns L2 through O2.

6. Clinical instructors’ use of screening and evaluative techniques was determined by the total frequency of clinical instructor-initiated screening and evaluative technique interactions. This was calculated by summing the frequencies of columns L1 through O1.

7. Clinical instructors’ use of skill feedback was determined by the total frequency of clinical instructor-initiated skill feedback. This was calculated by summing the frequencies of columns B1 through D1.

8. Clinical instructors’ use of questions was determined by the total frequency of clinical instructor-initiated questions. This was calculated by summing the frequencies of cells F1 and L1.

Frequency counts from the 8 contribution and target behavior categories were calculated for each experience level.

Statistical Analysis

Using the Statistical Package for the Social Sciences (version 7.5, SPSS Inc, Chicago, IL), descriptive statistics were calculated for each independent variable (contribution and target behaviors). Separate chi-square analyses for total clinical instructors’ contribution, total athletic training students’ contribution, total athletes’ contribution, silent observation, athletic training students’ use of screening and evaluative techniques, clinical instructors’ use of screening and evaluative techniques, clinical instructors’ use of skill feedback, and clinical instructors’ use of questions on the dependent variables (novice, intermediate, and advanced clinical instructors) were conducted to reveal frequency differences. To maintain an equal distribution among the 3 experience groups, expected frequencies were set at 33.3% of the total for each of the contribution and target categories (Table 4). An alpha level of \( P < .05 \) was set a priori for all analyses.

RESULTS

Table 4 summarizes the observed and expected frequencies used to calculate the chi-square statistic. Table 5 summarizes

Table 5. Frequency of Contribution and Target Behaviors by Experience Level

<table>
<thead>
<tr>
<th>Experience Level</th>
<th>Total CIs’ Contribution</th>
<th>Total Athletes’ Contribution</th>
<th>Total ATSs’ Contribution</th>
<th>Silent Observation</th>
<th>ATSs’ Use of SET</th>
<th>CIs’ Use of SF</th>
<th>CIs’ Use of Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced (n = 10)</td>
<td>Mean 367.9</td>
<td>102.5</td>
<td>91.4†</td>
<td>100.3</td>
<td>24.7</td>
<td>58.0</td>
<td>11.9</td>
</tr>
<tr>
<td></td>
<td>SD 89.9</td>
<td>74.9</td>
<td>54.2†</td>
<td>56.9</td>
<td>38.2</td>
<td>62.2</td>
<td>7.1</td>
</tr>
<tr>
<td>Intermediate (n = 10)</td>
<td>Mean 344.8</td>
<td>147.0</td>
<td>100.2†</td>
<td>84.8</td>
<td>8.6</td>
<td>105.2</td>
<td>25.6</td>
</tr>
<tr>
<td></td>
<td>SD 61.2</td>
<td>87.4</td>
<td>61.6†</td>
<td>55.8</td>
<td>12.8</td>
<td>120.5</td>
<td>26.7</td>
</tr>
<tr>
<td>Novice (n = 10)</td>
<td>Mean 357.9</td>
<td>117.3</td>
<td>33.7†‡</td>
<td>122.4</td>
<td>5.5</td>
<td>101.0</td>
<td>15.9</td>
</tr>
<tr>
<td></td>
<td>SD 113.8</td>
<td>53.7</td>
<td>18.4‡</td>
<td>60.9</td>
<td>7.2</td>
<td>57.0</td>
<td>13.9</td>
</tr>
</tbody>
</table>

*CI indicates clinical instructor; ATS, athletic training student; SET, screening and evaluation techniques; SF, skill feedback; and n, number of subjects.
†Post hoc analysis revealed differences between the novice and advanced groups (\( P = .026 \)).
‡Post hoc analysis revealed differences between the novice and intermediate groups (\( P = .023 \)).
the frequencies, means, and standard deviations of total clinical instructors’ contribution, total athletic training students’ contribution, silent observation, athletic training students’ use of screening and evaluative techniques, clinical instructors’ use of screening and evaluative techniques, clinical instructors’ use of skill feedback, and clinical instructors’ use of questions by experience level.

Using chi-square analysis, we determined that differences occurred between clinical instructors’ experience levels in the total athletic training students’ contribution category ($\chi^2 = 9.6, P = .008$). Post hoc multiple comparisons of total athletic training students’ contribution indicates differences between the novice and intermediate ($F_{2,22} = 5.52, P = .023$) and novice and advanced ($F_{2,27} = 5.52, P = .026$) groups.

No differences existed among clinical instructors’ experience levels in total clinical instructors’ contribution ($\chi^2 = 0.80, P = .67$), total athletes’ contribution ($\chi^2 = 3.20, P = .20$), silent observation ($\chi^2 = 1.07, P = .59$), clinical instructors’ use of questions ($\chi^2 = 0.80, P = .67$), clinical instructors’ use of skill feedback ($\chi^2 = 0.80, P = .67$), clinical instructors’ use of screening and evaluation techniques ($\chi^2 = 0.80, P = .67$), or athletic training students’ use of screening and evaluation techniques ($\chi^2 = .27, P = .88$).

**DISCUSSION**

Clinical instruction is a unique component of allied health education in which students learn in a structured and supervised environment. Marrying didactic learning with a pragmatic setting allows students to practice being professionals with the safety net of supervision. The finding that athletic training student-initiated interactions are less likely to occur with novice clinical instructors is evidence that clinical instructors’ experience affects student behavior. This finding is consistent with the literature, which supports increased teaching efficacy with increased teaching experience.2–6

With respect to an athletic trainer’s entire career, an individual has few experiences to provide medical care to athletes during the first year of professional practice. With experience, one can develop an acutely accurate and discriminating perspective with respect to the nature and severity of illness and injury and appropriate intervention. A novice athletic trainer who is responsible for clinical instruction is less likely to differentiate a teaching patient case from a nonteaching patient case. This situation is likely to hinder an athletic training student from participating in activities that a more experienced clinical instructor would encourage.

Silent-observation frequencies did not differ among experience levels of the clinical instructors. Silent observation can occur passively when individuals are not engaging one another, or it can happen deliberatively when clinical instructors allow students to reflect on experiences. We did not capture the nature of silent observation. Future investigation on the appropriateness of silent observation and reflective time is warranted.

Use of screening and evaluation techniques by students and clinical instructors did not differ among clinical instructors of various experience levels. The clinical-instruction sessions were not contrived, and the types of sessions (ie, rehabilitation, evaluation, taping, or bracing) were not controlled for specific educational content. We may not have had enough sessions relating to the behaviors of screening and evaluative techniques (ie, health-history questioning, documentation, performing a manual muscle test) to find differences. This issue could easily be controlled in a subsequent study by focusing on clinical-instruction sessions that are rehabilitation, immediate care, and evaluation intensive.

Clinical instructors’ use of skill feedback was much lower than other observed behavior categories in all experience levels. Feedback is a critical aspect of skill proficiency.13,15–17 Athletic training students identified clinical instructors’ feedback as a helpful behavior.13 Surgical-skill proficiency has been measured in a computer-assisted learning group and a lecture and feedback seminar group.16 Skill performance in the lecture and feedback seminar group was better.16 Furthermore, corrective feedback is a critical variable in skill acquisition.17 Skill feedback helps students to identify successful and problematic performances. This understanding is important to the refinement of skill. Development of skill-feedback models for athletic training clinical instructors warrants further investigation.

**EDUCATIONAL APPLICATION**

In 1971, one of the routes to become a certified athletic trainer consisted of earning a minor in education.18 As our profession developed its own body of knowledge, dependence on teacher preparation waned. Certification requirements no longer included a pedagogy requirement.18 Workshops preparing Approved Clinical Instructors at CAAHEP-accredited athletic training programs are important to support the development of clinical-instruction techniques.1

It is important to note that subjects were not offered a clinical-instruction preparatory lesson before our investigation, nor did we control the content of clinical instruction. Similarly, subjects were not familiar with the CIAT-AT II instrument. This tool and evaluation process, if used in conjunction with training, can introduce a tangible, behavior-driven framework for clinical instructors.

A significant part of clinical instructors’ training, especially for inexperienced individuals, should include techniques to encourage the athletic training student to participate in learning opportunities. As program directors and clinical coordinators systematically evaluate clinical-instruction effectiveness, special attention should be given to inexperienced teachers.

**ACKNOWLEDGMENTS**

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**REFERENCES**

Athletic Training Clinical Instructors as Situational Leaders

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Duquesne University, Pittsburgh, PA

Linda Platt Meyer, EdD, ATC, provided conception and design; acquisition, analysis, and interpretation of the data; and drafting, critical revision, and final approval of the article. Address correspondence to Linda Platt Meyer, EdD, ATC, Department of Athletic Training, Duquesne University, 120 Health Sciences Building, Pittsburgh, PA 15282. Address e-mail to platt@duq.edu.

Objective: To present Situational Leadership as a model that can be implemented by clinical instructors during clinical education. Effective leadership occurs when the leadership style is matched with the observed followers' characteristics. Effective leaders anticipate and assess change and adapt quickly and grow with the change, all while leading followers to do the same. As athletic training students' levels of readiness change, clinical instructors also need to transform their leadership styles and strategies to match the students' ever-changing observed needs in different situations.

Data Sources: CINAHL (1982-2002), MEDLINE (1990-2001), SPORT Discus (1949-2002), ERIC (1966-2002), and Internet Web sites were searched. Search terms included leadership, situational leadership, clinical instructors and leadership, teachers as leaders, and clinical education.

Data Synthesis: Situational Leadership is presented as a leadership model to be used by clinical instructors while teaching and supervising athletic training students in the clinical setting. This model can be implemented to improve the clinical-education process. Situational leaders, eg, clinical instructors, must have the flexibility and range of skills to vary their leadership styles to match the challenges that occur while teaching athletic training students.

Conclusions/Recommendations: This leadership style causes the leader to carry a substantial responsibility to lead while giving power away. Communication is one of the most important leadership skills to develop to become an effective leader. It is imperative for the future of the profession that certified athletic trainers continue to develop effective leadership skills to address the changing times in education and expectations of the athletic training profession.

Key Words: leadership, Situational Leadership, teacher as leader, clinical education

DEFINING LEADERSHIP

In athletic training education programs, professional skills and abilities are refined in the clinical-education component. This educational component relies heavily on the expertise and effectiveness of clinical instructors (CIs), who serve as teachers of clinical skills, and educational leaders, who pass on leadership behaviors while teaching, supervising, and mentoring athletic training students (ATSs). Given the vast range of ATSs' behavior variables, such as level of emotional maturity, competency, and commitment, CIs need to be able to adjust their leadership styles or strategies to best fit the students' observed needs in specific situations. Furthermore, effective clinical teaching is influenced by the CIs' leadership skills and abilities.1 As in other disciplines, CIs who are effective teachers demonstrate similar attributes and characteristics as effective leaders.2-6 Therefore, CIs who play a role in educating the future protégés of the athletic training profession must also develop their leadership styles and skills.

The purpose of this article is to present a leadership model, Situational Leadership (SL), which can be implemented by CIs during clinical education. The SL model can create or enhance the CIs' leadership styles and enhance the use of their leadership skills and abilities in the clinical setting. The SL theory is based on a commonsense approach and is easily understood by all involved; thus, it is an appealing model for students and practitioners.7

Leadership involves the ability to induce others to take actions toward a common aspiration.9 Theory indicates that leadership consists of three elements: relation, leader driven, and action.9 In the relation element, more than 1 person is needed to create a leader; without followers, there is no leader. In the leader-driven element, a leader must do something or cause something to happen. The final element is that leadership requires followers to take action: leaders promote followers to increase productivity by using incentives, rewards, or team building, or conversely, by punishing.9 Finally, leadership can be defined as a relationship founded on trust and confidence that encourages people to take risks. Risks encourage change, and change keeps orga-
nizations alive. On the basis of these definitions, leaders have significant and responsible influence over followers. In the athletic training clinical-education process, CIs must assume the leadership positions as clinical teachers. Moreover, when CIs model effective teaching techniques and develop leadership expertise, they become effective teacher-leaders; they view leadership as an opportunity to positively affect their own growth and their students' learning.  

In summary, many definitions explain leadership. Each situation presents its own operational definition and description. Athletic training provides many different scenarios in which leaders emerge in various situations and positions. The focus here will be on CIs as leaders and teachers in clinical education, using the SL model.

CHARACTERISTICS OF EFFECTIVE LEADERS

For many years, researchers who studied characteristics of effective leaders have found one common theme: leaders are agents of change. In the early 1980s, Kouzes and Posner researched more than 20,000 business and government executives, asking what the subordinates and leaders valued in a leader. They identified 5 top characteristics: (1) honest, (2) forward looking or visionary, (3) inspiring, (4) competent, and (5) fair minded. The top 20 characteristics from their most recent study are presented in Table 1. Other investigations of leadership studies identified similar characteristics and attributes.

LEADERSHIP THEORIES AND SITUATIONAL LEADERSHIP

Many theories and models have emerged throughout the decades of research in leadership. The leadership model presented in this article, which is easily applied in clinical education, is SL. Since the early 1960s, Hersey has researched and developed what is known as the SL model. This model is used by leaders to recognize current behaviors of people and motivate, facilitate, and encourage them to reach their highest levels of performance and potential. Situational leadership describes the relationship and task between the appropriate behavior and response by the leader based on the follower's maturity level. Again, the key to effective leadership lies in matching the appropriate behavior or style of the leader to the follower's maturity level.

To be a good leader is to know your group and its members' abilities and willingness to perform tasks at all times. In addition, to be an effective leader, you must know how others perceive your leadership style and be aware of your own preferred style. Leadership in the clinical setting is just one aspect of leadership in athletic training educational programs. Again, effective leadership is not limited to the heads of organizations; it is employed at many levels within organizations and affects all personnel. In other words, athletic training CIs must know the skills and abilities of their entry-level ATSs to display effective leadership while they are teaching. As the students' cognitive abilities, emotional maturity, and levels of experience change, CIs should demonstrate multiple leadership practices in teachable situations and be ready to adapt their leadership style to any specific clinical situation. Furthermore, effective leaders identify the most effective leadership style for a given condition and adapt their leadership style accordingly.

There is a fine line between leadership strategies and clinical teaching methods, and parallels between leadership in the clinical setting and teaching styles can be seen. The following information is designed to lead readers to think about the leadership style and characteristics used by the CI during teachable situations. The leadership concepts that are described in the following section draw on effective leadership characteristics and behaviors and use the basic attributes of creating trust, building respect and commitment, enhancing communication skills, and demonstrating support between CIs and ATSS.

CLINICAL INSTRUCTORS AS SITUATIONAL LEADERS

Situational Leadership can be easily implemented by athletic training instructors; this model takes a commonsense approach and is easy to understand. The advantages of SL for CIs are numerous because it promotes actions that are characteristic of teachers as leaders. These effective leadership behaviors (Table 2) can be shared with and taught to ATSSs by CIs during clinical education. Many health science investigators have conducted empirical studies to review SL as an effective leadership style; however, only one study (in nursing) applied SL to clinical education.

To be effective using the SL model, CIs must have the flexibility and range of leadership skills to vary their leadership style. The SL model includes 4 leadership styles that are appropriate for CIs to use with different observed behaviors identified in students: (1) telling, (2) selling, (3) participating, and (4) delegating. A situational leader adapts his or her leadership behaviors to match the features of the situation and levels of readiness of the followers. However, before a lead-

| Table 1. Twenty Characteristics, Values, or Traits Identified in Effective Leaders in Rank Order |
|---|---|---|---|
| 1–5 | 6–10 | 11–15 | 16–20 |
| Honest | Fair minded | Cooperative | Caring |
| Forward looking | Broad minded | Determined | Mature |
| Competent | Supportive | Imaginative | Loyal |
| Inspiring | Straightforward | Ambitious | Self-controlled |
| Intelligent | Dependable | Courageous | Independent |

| Table 2. Behaviors Observed in Situational Leaders |
|---|---|---|---|
| 1) Foster creativity in their followers as part of risk-taking opportunities. |
| 2) Encourage follower participation and communication as part of effectiveness. |
| 3) Build trust, recognition, and support as part of autonomy with the followers. |
| 4) Cultivate collaboration as part of collegiality with the followers. |
| 5) Practice ethical modeling as part of honor at all times. |
Clinical Instructor’s Action

Table 3. Students’ Behavior Variables That Determine Situational Leadership Styles

1) Level of emotional maturity.
2) Level of cognitive ability.
3) Level of motivation.
4) Level of experience and confidence.
5) Level of efficacy, transference of knowledge to demonstrable application.

Leadership style can be incorporated in a clinical-education situation, the ATSS’s level of readiness should be assessed to determine the CI’s best-fit leadership style. Readiness is defined as the ability and willingness of the followers to perform a specific task.7,19 Table 3 depicts the 5 variables that determine follower readiness and should be assessed by the CI before a leadership style is implemented.19 Once the student’s level of readiness is determined, via observation or written assessment, the situational style that best fits the given situation for student readiness is then incorporated to promote growth and guide or challenge the student. Table 4 has been adapted from the works of Hersey et al19 and summarizes the 4 SL styles that match the follower’s readiness levels with the appropriate leadership style.

Telling and selling styles of the SL model may be appropriate for students who are in the beginning semesters of the athletic training education program and need strong guidance and supervision. The remaining 2 styles, participating and delegating, may be used with more experienced students because these ATSSs have a sense of confidence and a greater knowledge base.

The telling style is appropriate when the followers are new or inexperienced and need direction and guidance to complete a specific task. In this case, the leader provides detailed instructions and closely supervises the followers’ performance, all the while building trust and demonstrating straightforwardness. The leader unilaterally initiates problem-solving and decision-making processes.7,19 The telling leadership technique is most appropriate to use with beginning ATSSs because these students have a low level of experience, confidence, and knowledge and a low to moderate level of maturity.

When teaching a beginning student to administer superficial heat clinically, the CI should be explicit and directive in the instructions given to the ATS. The student does not need to think deeply about the process of acting to a command but only reacts to that command. Additionally, the CI should dialog with the student to teach the guidelines of using superficial heat to foster student growth and advance the learning process. The CI not only teaches the clinical skills in this example but also communicates effectively and listens actively, all traits of an effective leader. Even though the CI performs the telling, or problem-solving and decision-making processes, the student still learns because of the quality communication and feedback between the CI and student. It is imperative to provide useful, level-specific feedback to foster learning, create a sense of confidence in the student, and advance the student to the next level of readiness (the ability and willingness to perform a task). In summary, the telling style provides the ATS with specific instructions and close supervision to ensure that quality learning occurs, and the CI communicates to cultivate knowledge and skills in the given task.

The next level of leadership is the selling style (also known as the coaching style). This style allows the leader to provide moderate to high direction to the student and lead by example. The leader now encourages the follower to express his or her own feelings and suggestions to solve a challenge. This style encourages 2-way communication. The ATS begins to become empowered, but the final decision remains with the CI. This style is useful when students are more responsible, experienced, and willing to do the task but may lack the necessary skills needed for independence in the given situation.7,19 For example, an athlete enters the athletic training facility before practice in need of superficial heat for a chronic quadriceps muscle injury. Through previous observation, the ATS recognizes the need to retrieve a hot pack for this athlete and communicates that need to the CI. In turn, the CI challenges the student’s knowledge by asking pointed questions and suggesting several alternative treatment protocols or modalities from which the student might choose. This questioning challenges the student to decide the best method of treatment for this injury. By giving the appropriate feedback and receiving positive reinforcement from the CI, the student builds self-confidence. The CI gives moderate direction and supervision, but the student analyzes the problem, creates solutions, and ex-

Table 4. Clinical-Instructor Leadership Style Paired with Student’s Level of Readiness (adapted from Situational Leadership Model)19

<table>
<thead>
<tr>
<th>Situational Leadership Style</th>
<th>Clinical Instructor’s Action</th>
<th>Clinical Instructor’s Level of Guidance and Supervision</th>
<th>Student’s Level of Readiness</th>
<th>Student’s Level of Behavior Variables*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telling</td>
<td>Provide explicit instructions to student; no decision-making input from student</td>
<td>High; close guidance and supervision of student</td>
<td>Low; student feels insecure in ability</td>
<td>Low in most variables</td>
</tr>
<tr>
<td>Selling (coaching)</td>
<td>Explain rationale for decisions and provide opportunity for student’s clarification</td>
<td>Moderately high; high to moderate guidance and supervision of student</td>
<td>Moderate; student feels unable but willing to perform</td>
<td>Moderately low in most variables</td>
</tr>
<tr>
<td>Participating</td>
<td>Share ideas and facilitate decision-making process with student</td>
<td>Moderately low; moderate to low guidance and supervision of students</td>
<td>Moderate; student feels able but insecure in ability</td>
<td>Moderately high in most variables</td>
</tr>
<tr>
<td>Delegating</td>
<td>Give decision-making responsibility and execution to student</td>
<td>Low; little guidance of student, however always supervised</td>
<td>High; student feels able and confident in ability</td>
<td>High in most variables</td>
</tr>
</tbody>
</table>

*Refer to Table 3 for behavioral variables.
plains and defines the rationale for the solutions. The CI still takes responsibility for the student's actions by approving or denying the student's suggested protocol. In the selling style, dialog between the CI and ATS is crucial; communication enhances the student's self-confidence and motivation, ensures the development of new skills, and increases cognitive ability and refining of previously learned skills. To summarize, key communication with moderate to high direction and high guidance from the leader to the follower characterizes the selling style.7,19

Next in SL is the participating style, which moves the student toward greater independence for autonomous performance. This style is characterized by low task or direction and high relationship behavior. In other words, the day-to-day decision-making and problem-solving tasks move from the leader (CI) to the follower (ATS). This style encourages the student to use his or her ability to perform the desired task, but the student may not be committed to starting or completing the assignment. Commitment in this context is defined as the student's level of motivation and confidence.7,19 A lack of commitment at this point in the student's development may be due to insecurity or a lack of confidence in newly acquired skills. For example, an athlete with hip pain enters the athletic training facility and approaches the ATS. The ATS is reluctant to assist this athlete, based on lack of experience and lack of confidence with this particular injury. The CI directs the ATS to assist the injured athlete and encourages the ATS to use previously acquired skills and knowledge. The ATS may ask the CI if a particular method of treatment that was used on another athlete with a similar injury should be administered, thus seeking approval and building confidence. The CI quizzes the ATS regarding the previous learning and, as a result, instills in the ATS a greater sense of self-confidence. Again, communication is key to further building the rapport between the CI and ATS and improving the student's learning. The CI continues to support the student's effort to use the skills already developed and further reinforces skills that were more recently acquired. Communication, confidence building, and supportive leadership characteristics are used in this example.

The final leadership style is the delegating style. This style is used when the followers are willing and able to take responsibility for directing their own behaviors. For instance, the CI and ATS discuss the challenge or situation, and a consensus of the exact problem is defined. Once both parties agree on the task, the decision-making process is delegated totally to the student. However, entire delegation to the student does not imply lack of involvement by the CI. This style allows the leader to focus attention on the next goal-setting task or problem identification for the follower.7,19 An ATS who has developed a broad knowledge base to this point has successfully performed designated skills in front of the CI and has reached the highest maturity level is encouraged to make clinical decisions with little guidance from the CI. Furthermore, it is imperative that the CI has “tested and challenged” the knowledge base, both the cognitive and psychomotor abilities of the ATS, before allowing him or her to become semiautonomous. Because the CI still must assume responsibility for the quality of care delivered by the ATS, supervision is still required.

Situations in athletic training change frequently, as does the student's knowledge base and readiness level; therefore, CIs should use a variety of leadership practices to educate and prepare students to accomplish the day's activities. In summary, the SL style used by the CI matches the evolution and progression of the student's readiness. When the student's ability and willingness are low, the CI uses the telling or selling styles (or both) to direct and guide the student to accomplish the task. Conversely, when the student's readiness level is high, the CI uses the participating or delegating styles (or both) to decrease control and allow the student to accomplish the goal with little direction.

CONCLUSIONS

Leadership is a fundamental element in clinical instruction. Situational leaders carry a substantial responsibility to lead and give power away as they encourage their followers in attaining their greatest potential. Again, leadership is not limited to the heads of organizations but is used at many levels within organizations. In clinical education, multiple leadership activities parallel a variety of clinical-instruction teaching methods; however, the actions or behaviors performed by clinical instructors are based on effective leader characteristics. These characteristics include creating trust, building respect and commitment, enhancing communication skills, and demonstrating support between themselves and their ATSs. The 4 styles that encompass SL are telling, selling, participating, and delegating. The level of readiness of the follower determines the style employed. As the ATS's level of readiness changes, so should the clinical instructor's leadership strategy.

REFERENCES


