2020

Assessment of Student Learning Outcomes in Professional Athletic Training Programs

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Assessment of Student Learning Outcomes in Professional Athletic Training Programs

by
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A dissertation submitted to the faculty of Bethel University
in partial fulfillment of the requirements for the degree of
Doctor of Education

St. Paul, MN
2020

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Abstract

The purpose of this study was to examine the type of program-level student learning outcomes (SLOs) that athletic training programs (ATPs) are citing and how athletic training programs are assessing these student learning outcomes (assessment environment and measurement utilized for assessment). This study utilized a cross-sectional web-based survey of ATP directors to gather program-level data on the variables. Data analysis involved descriptive statistics for frequency counts of SLOs, assessment measure type, assessment environment, and related groupings of those variables. The five most frequently cited SLOs were evidence-based practice and related areas, critical thinking and related areas, Board of Certification (BOC) exam preparedness, career preparedness, and discipline-specific knowledge and skills. When examining the percentages of programs assessing each of the top five SLOs, programs are preferring to assess in both environments (51.7% for evidence-based practice and related fields, 72.4% for critical thinking and related fields, 65.4% for BOC preparedness, 72.7% for career preparedness, and 95% for discipline-specific knowledge and skills) and utilize both indirect and direct measures (62.1% for evidence-based practice and related fields, 69% for critical thinking and related fields, 54.5% for career preparedness, and 80% for discipline-specific knowledge and skills). For BOC preparedness, 50% of programs are assessing using direct measures and 46.4% are assessing using both measures. Indirect measures alone were used lesser amounts. Trends also show programs that reported assessing in both environments tend to use both measurement types. Other groupings showed less percentages overall.

Dedication

This work is dedicated to all my loved ones who have supported me, but especially my husband, Nathan. I met you at the very start of this journey and I know that I would not be at the end of it without your encouragement. Thank you for walking this path with me.

Acknowledgements

I would like to acknowledge the work of my dissertation committee members, Dr. Wallace Boeve, Dr. Marta Shaw, and Dr. Joel Frederickson. Thank you for agreeing to guide me through this process and provide your individual areas of expertise. I would also like to acknowledge the work of all the various writing specialists of the Academic Resource Center for their patient editing of this work. My colleague, Dr. Stephanie Otto, graciously reviewed my statistical analyses to calm my second-guessing mind. My other colleagues, especially Dr. Hayley Russell, Dr. Karl Larson, and Dr. Liz Drake gave me support and took other items off of my plate within our department to help me focus on finishing this achievement. Thanks, y’all!

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List of Abbreviations

AACN: American Association of Colleges of Nursing

AAC&U: American Association of Colleges and University

ACGME: American Council on Graduate Medical Education

ACIEd: Assessment of Clinical Education

AHELO: Assessment of Higher Education Learning Outcomes

APTA: American Physical Therapists Association

AssCe: Assessment form in Clinical education

ATP: Athletic Training program

BOC: Board of Certification

CAATE: Commission on Accreditation of Athletic Training Education

CAAP: Collegiate Assessment of Academic Proficiency

CAF: Common Assessment Form

CAPTE: Commission on Accreditation in Physical Therapy Education

CIET: Clinical Internship Evaluation Tool

CODA: Commission on Dental Accreditation

CPI: Clinical Performance Instrument

HFHS: High Fidelity Human Simulations

IOM: Institution of Medicine

IRB: Institutional Review Board

LEAP: Liberal Education and America's Promise

NATA: National Athletic Trainers' Association

NCLEX-RN: National Council Licensure Examination for Registered Nurses

NPTE: National Physical Therapist Examination

OECD: Organisation for Economic Cooperation and Development

OSCE: Objective Structures Clinical Examination

PA: Physician Assistant

PAEA: Physician Assistant Education Association

PPTCV: Professionalism in Physical Therapy Core Values

PT: Physical Therapy or Physical Therapist

PT MACS: Physical Therapists Manual for the Assessment of Clinical Skills

SRM: Supervisory Relationship Measure

VALUE: Valid Assessment of Learning in Undergraduate Education

Chapter 1: Introduction

Across the globe, higher education is feeling the pressure from stakeholders (governments, economists, boards, donors, accreditors, students, and others) to be able to report student learning achievement (Shahjahan & Torres, 2013; Tremblay, Lalancette, & Roseveare, 2012). The noted pressure comes for a variety of reasons. The reasons for the pressures can include to secure funding, allow consumers (students and/or families) to make informed decisions, gain external accreditation, or provide uniformity and assurance in education (Shahjahan & Torres, 2013; Stitt-Bergh, Wehlbug, Rhodes, & Jankowski, 2019; Tremblay et al., 2002).

Internationally, higher education is witnessing a push for standardization of outcomes and assessment tools in order to ease student transferability and provide a common language and tools across institutions (Shahjahan & Torres, 2013; Tremblay et al., 2012; Tuning Educational Structures in Europe, n.d.). Researchers are still calling for greater development of valid, reliable, and relevant assessment tools and measures (El-Khawas, 1998). In the United States, to this point, institutions have pushed back against standardization in favor of more flexible and individualized measurements (Fain, 2015). The emphasis appears to be on distinctiveness versus commonality in order to better market one’s institution to the consumers (Krachenberg, 1972; Leland & Moore, 2007). However, Krachenberg (1972) also explained that distinctiveness is only valuable if the public appreciates or needs the proposed distinctive areas. Yet, when looking at student learning outcomes, missions, and goals, institutions and programs probably share more commonalities than differences (Leland & Moore, 2007; Morphew & Hartley, 2006) and marketing that point might also be valuable (Krachenberg, 1972). When dealing with professional programs that have an obligation to the public to demonstrate competency of their graduates to national standards, the commonalities become even more important to understand.

While individualization has its benefits in educational programs, certain professions, such as healthcare, are promoting standardization of educational student learning outcomes (American Academy of Physician Assistants, 2012; American Association of Colleges of Nursing, 2008; American Council on Graduate Medical Education, 2016; Greiner, Knebel, & Institute of Medicine Board on Health Care Services, 2003). Standardization of outcomes is commonly due to one of several reasons, such as a desire to assure to the public that graduates (future professionals) are competent, and to ensure safety and quality in patient encounters (Fater, 2013; Greiner & Knebel, 2003; Murray, Gruppen, Catton, Hays, & Woolliscroft, 2000; Roberts, Perryman, & Rivers, 2009). The outcomes may be a group of core competencies that can be expanded upon by individual programs; or the outcomes may be prescriptive lists of standards, usually developed by external accrediting bodies in conjunction with members of the profession (American Academy of Physician Assistants, 2012; American Association of Colleges of Nursing, 2008; American Council on Graduate Medical Education, 2016; Commission on Accreditation of Athletic Training Education, 2012, 2018a; Greiner & Knebel, 2003). While most of the standardization comes in content and practical skills of the trade, some organizations have begun to include more professional skills, such as critical thinking, communication, ethical behavior, etc. (American Academy of Physician Assistants, 2012; American Association of Colleges of Nursing, 2008; American Council on Graduate Medical Education, 2016; Greiner & Knebel, 2003; Thompson, Moss, & Applegate, 2014).

Even with standardization of outcomes, many times each program is free to interpret the outcome and assess the outcome as the programs see fit for their institutions. Individualization is often still present as programs are allowed to write their own additional outcomes, perhaps tied to institutional mission or institutional student learning outcomes (Commission on Accreditation of Athletic Training Education, 2012; Greiner & Knebel, 2003). Individualization in outcomes helps promote the distinctiveness of the specific program in the market place (Krachenberg, 1972; Leland & Moore, 2007). In addition, many times once the outcomes are stated, the individual institutions and programs are free to develop their own assessment tools and implementation strategies (Commission on Accreditation of Athletic Training Education, 2012, 2018a; Greiner & Knebel, 2003). Professional programs or, even higher education as a whole, need to determine which outcomes are most important (should perhaps be standardized) and which are merely desirable (open to individualization) (Nedwek & Neal, 1994).

Without common definitions or common means to assess achievement of the outcomes, the public, the accrediting bodies, employers, and students may be left without a means of comparison and assurance between programs or graduates (Greiner & Knebel, 2003). Recently, some healthcare organizations, as exemplified by the American Council on Graduate Medical Education (ACGME) (2017), have stepped in to provide standardized outcomes a means to assess the outcomes for their member institutions. Programs still have freedom to implement their own strategies but a common tool is available to allow guidance and comparison (American Council on Graduate Medical Education, 2017). While healthcare education's evolution to more standardization is perhaps further along due to external demands, the global trends in higher education are showing that commonality might be appearing at other disciplines' doorsteps before too long (Shahjahan & Torres, 2013; Tremblay et al., 2012; Tuning Educational Structures in Europe, n.d.).

Athletic training could provide an interesting study in how a profession changes their educational practices in the current higher education environment that emphasizes assessment. Athletic training is a relatively young healthcare profession, having only formalized as a profession in 1950 (National Athletic Trainers' Association, 2017). As the profession grew and formalized their standards of practice over the years, the educational arm of the profession has been used to implement change. The latest professional evolution is again calling on education to lead the charge. According to the Athletic Training Strategic Alliance (2015), representing the four professional and educational organizational bodies of the profession, "a critical link to acceptance in the broader healthcare arena is the ATs [athletic trainers'] level of professional preparation" (p. 2). In compliance with the Athletic Training Strategic Alliance, the Commission on Accreditation of Athletic Training Education (2015) has decreed that the professional degree must be moved from a bachelor's degree for certification eligibility to a master's level by 2026. The Athletic Training Strategic Alliance (2015) stated that the educational transition to a master's degree is professionally-driven: "[this decision to shift the degree level] is essential to ensuring our future ability to meet the expectations of the health care team, to continue to improve our patient outcomes, and to keeping our profession sustainable for generations to come" (p. 2). As the profession continues to grow and clarify its professional standards, the athletic training profession appears to have evolved its educational foundations to ensure continued professionalization. During this time of transition, accreditation standards are being rewritten and curricula developed or reworked to not only meet the degree change standards but to meet current educational trends, such as assessment-driven curricular planning (Biggs & Tang, 2007; Commission on Accreditation of Athletic Training Education, 2018a).

Athletic training education and its accrediting arm, the Commission on Accreditation of Athletic Training (CAATE), are in a unique position during this transition to the master's level for entry into the profession. The CAATE can evolve the educational standards to match the current assessment environment of higher education. The transition of the degree would be a time for the CAATE to move toward standardization of student learning outcomes and development of standardized tools that would allow for a common language and of graduate achievement of certain outcomes across programs. Taking an opportunity for assessment standardization would help the profession meet the public demand for healthcare quality assurance and higher education's call for educational quality assurance.

Statement of Problem

Currently in athletic training professional education, external accreditation by the CAATE requires student learning outcomes and assessment strategies for the student learning outcomes to be part of a comprehensive assessment plan (Commission on Accreditation of Athletic Training Education, 2012; Commission on Accreditation of Athletic Training Education, 2018a); however, no stipulation exists on what student learning outcomes to include nor on how to assess the student learning outcomes. Each athletic training program is on its own to create an assessment plan, implement the plan, and show meaningful use of the results. The resulting openness creates opportunities and problems. Programs are free to be distinctive and adhere to their institution's larger mission as long as the program adheres to its stated assessment plan (Commission on Accreditation of Athletic Training Education, 2018a). However, the programs are also on their own to stay current on assessment research, on how to interpret accreditation standards into student learning outcomes, and on creating viable and helpful assessment plans.

Other healthcare professions and their organizations have developed models for standardized student learning outcomes and standardized assessment tools, such as the American Council for Graduate Medical Education (2017). Those that seem to have created a unified set of core outcomes, including the National Academy of Medicine interprofessional competencies and the Physician Assistant Education Association (PAEA), appear to have come from working groups that were created at the national organizational level (Accreditation Council for Graduate Medical Education, 2016, 2017; American Academy of Physician Assistants, 2012; Greiner & Knebel, 2003; Physician Assistant Education Association, 2011b). Currently in athletic training, individual programs are left alone in developing their own set of student learning outcomes and assessment procedures.

The independent processes across programs creates hundreds of different plans, when commonality might exist in outcomes and means of assessment. A more efficient and universal system could be created if those commonalities in outcomes and means of assessment were known. Just recently, in the field of athletic training, a working group set out to emulate the ACGME and have begun developing their own *The Milestone in Athletic Training* (Sauers, Laursen, Pecha, & Walusz, 2019). However, the tools are still in development and have not yet been implemented across several programs; and *The Milestones in Athletic Training*, due to scope, may not encompass all of the desired student learning outcomes of current athletic training programs. A desire to know what competencies (or outcomes) are essential to the profession and how to best assess the outcomes is common, even in a long-established healthcare profession, such as nursing (Fater, 2013; Morin & Bellack, 2015). Zeind, Blagg, Amato, and Jacobson (2012) called for everyone, educators and practitioners of all different healthcare professions, to be involved in determining what is important to the healthcare field and how those should be assessed. In addition, the authors made the case that those who have created outcomes and assessment plans successfully should share that information to better the entire profession (Zeind et al., 2012).

In addition, athletic training, like most healthcare professions, is different than other disciplines in their inclusion of clinical and didactic educational experiences. Didactic learning environments (consisting on traditional classroom and simulations or standardized patients) and clinical experiences (real-time with real patients) both provide opportunities for learning, and potentially, assessment (Commission on Accreditation of Athletic Training Education, 2012, 2018). The environment in which the student learns and the environment in which they are assessed may differ and could have different implications within the athletic training programs (Birenbaum, 2003). According to the literature, healthcare programs are mixed on how to assess student learning outcomes, especially in the clinical experiences (Armstrong & Jarriel, 2016; Aronson, Bowman, & Mazerolle, 2015; Birenbaum, 2003; Carwile & Murrell, 2002; English, Wurth, Ponsler, & Milam, 2004; Fero et al., 2010; Walker, Weidner, & Armstrong, 2008; Wu, Enskär, Lee, & Wang, 2015).

An understanding of what is currently being done in athletic training could help develop new tools to assist in valid and reliable assessment of student learning outcomes. Stanny et al. (2018) provided an example of how peer review of assessment plans, even across disciplines can strength assessment strategies. Middlemas and Hensal (2009) called for more development of valid and reliable assessment models for clinical education in athletic training and emphasized that the work done in athletic training could be valuable to all healthcare professions that utilize clinical experiences. Scriber, Gray, and Millspaugh (2010) also concluded that a universal system for assessing clinical performance would be more accurate and consistent than the variety of sources utilized now. Understanding how athletic training programs are currently assessing clinical performance would potentially help future researchers or workgroups develop useful assessment tools that could be shared across programs.

Finally, for most professional disciplines, the ultimate goal of an educational experience is usually to produce competent and employable graduates (Knight & Yorke, 2007). Student learning outcomes are often created and assessed in order to ensure competency. Achievement of competency in healthcare preparatory is often measured via a national and/or state-based certification board examination. Programs, their content, their curriculum, and their own student learning outcomes and assessments are usually designed with the Board of Certification, Inc. (BOC) exam in mind. In athletic training, the CAATE dictates that BOC pass rate must be included in the assessment plan (Commission on Accreditation of Athletic Training Education, 2018). Research is mixed on what attributes, especially programmatic attributes, if any, are correlated to success on certification examinations for healthcare students. There is no research on whether certain student learning outcomes cited by programs correlate to differences in program-level success on certification examinations for any healthcare profession, including athletic training (Barkley, Dufour, & Rhodes, 1998; Cone et al., 2016; Gadbury-Amyot, Krust Bray, & Austin, 2014; Luedtke-Hoffmann, Dillon, Utsey, & Tomaka, 2012; Ostrowski & Marshall, 2015; Weiss & Neibert, 2016). During a time of transition for athletic training, the athletic training profession, other healthcare professions, and, potentially, unrelated disciplines might find benefit in understanding if any correlation exists between student learning outcomes cited by programs and certification examination results for the programs.

Statement of Purpose

The purpose of this study was to examine the type of program-level student learning outcomes that athletic training programs are citing and how athletic training programs are assessing these student learning outcomes (assessment environment and measurement utilized for assessment). In addition, with the student learning outcomes identified, this study set out to investigate if any correlation exists between these student learning outcomes and Board of Certification exam three-year aggregate first-time pass rates.

Research Questions and Hypotheses

The following research questions were addressed in this study:

RQ1: What are the most prevalent program-level student learning outcomes cited by athletic training programs?

RQ2: What relationship, if any, exists between the most prevalent program-level student learning outcomes, educational environment of assessment (clinical experiences, controlled environments, or both), and type of assessment measure (direct, indirect or both)?

H_0: There will be no relationship between program-level student learning outcome, educational environment of assessment, and type of assessment measure.

H_{2a}: There will be a relationship between program-level student learning outcomes and the environment where it is assessed.

H_{2b}: There will be a relationship between program-level student learning outcomes and the measure utilized to assess it.

H_{2c}: There will be a relationship between assessment measure and environment of assessment.

RQ3: What correlation, if any, exists between the most prevalent program-level student learning outcomes and athletic training programs' Board of Certification three-year aggregate exam first-time pass rates?

H_0: There will be no relationship between the presence or absence of any of the most prevalent reported student learning outcomes and athletic training programs' Board of Certification exam three-year aggregate exam first-time pass rates.

H_3: There will be a relationship between the presence or absence of any of the most prevalent reported student learning outcomes and athletic training programs' Board of Certification exam three-year aggregate exam first-time pass rates.

Significance of the Study

If standardization of outcomes and assessment tools are to continue to be developed for the future of athletic training education, on trend with healthcare and higher education, more information is needed about the current state of assessment for athletic training programs. First, the discovery of what student learning outcomes are being cited by educational programs, and thus, what programs currently value in their educational experiences, would be valuable to develop standardized student learning outcomes. Second, information on how the student learning outcomes are being assessed, both measurement tools and type of assessment environment, would help steer the development of standardized assessment tools. Finally, since athletic training students ultimately must pass the Board of Certification examination, understanding if certain student learning outcomes correlates with Board of Certification examination results could be valuable for planning curricula in the future.

For Athletic Training programs. The most obvious significance of this study is to inform the work of current and developing athletic training programs. As the master's degree transition continues, programs will be developing or adjusting curricula to produce the most prepared certified athletic trainers possible. The independence of programs in all assessment decisions can be beneficial. However, independence in assessment decisions could also be taxing to a program's time and resources. One example of a tool that could be utilized across programs has been introduced, *The Athletic Training Milestones*; however, the *Milestones* are still in development, not widely utilized or all -encompassing of the variety of student learning outcomes being cited by programs, and have not been studied for reliability or validity (Sauers et al., 2019). Each program faculty and administration is on their own to develop student learning outcomes and accurately determine the mechanism best to assess those outcomes.

This study could provide programs the chance to learn from each other, as has been purported in other healthcare preparatory programs (American Association of Colleges of Nursing, 2008; American Council on Graduate Medical Education, 2016; Physician Assistant Education Association, 2011b). Instead of creating assessment plans in isolation, the understanding of commonality of student learning outcomes and assessment strategies can create an environment of shared knowledge. Learning from each other, athletic training programs could take common ideas and tools as a foundation, on top of which they can build their own level of distinctiveness. With no research or data currently available on what student learning outcomes that programs are citing, this study could bring that information to programs, allowing program faculty and administration to make informed decisions on their own assessment plans.

Beyond the benefits of shared knowledge of current student learning outcomes, this study aimed to fill research gaps in how student learning outcomes are assessed in athletic training programs. As noted in the problem statement above, some unique educational environmental challenges to assessing student learning outcomes in athletic training exist. The clinical experiences, where many programs put effort and emphasis on learning and growth potential, has unique challenges to assessment, mainly the use of real patients in real-time (Carwile & Murrell, 2002; Fero et al., 2010; Middlemas & Hansal, 2009; Walker et al., 2008). With such emphasis on varied education environments, athletic training programs would benefit to know which, if any, student learning outcomes are being assessed in each environment in order to better address the assessment needs of the programs or future curricular design. In addition, this study could provide insight to programs on the type of assessment (direct or indirect) most programs are utilizing in their current assessment plans. Information on the impact of educational assessment environment and assessment measurements can help direct the profession to refine the tools that are most important to the educational goals of programs.

Finally, programs could benefit from knowing which, if any, student learning outcomes, assessment environments, and assessment measurement tools correlate to higher three-year aggregate pass rates on the Board of Certification exam for programs. With only so much time to dedicate to assessment and outcomes, the opportunity to prioritize outcomes based on results on the certification exam could help programs make valuable decisions in their curricular development and planning. Since no current research has been done on the correlation between student learning outcomes and the BOC exam, this study could fill an interesting gap in the literature for athletic training programs.

For other Athletic Training interest groups. As mentioned in the statement of problem above, healthcare organizations are increasingly looking to standardize outcomes and measures in order to provide clear guidance to educational programs and the public. However, policy to be enforced across all institutions really needs to come from organizational or accreditation bodies and not on a program by program basis (Scriber et al., 2010). As was the case with graduate medical school residency's core competencies and milestone program, the work is tackled by working groups charged with the task from the larger organization (American Council of Graduate Medical Education, 2016; American Council of Graduate Medical Education, 2017; Physician Assistant Education Association, 2011a, 2011b). Movement towards some universal tools have been attempted, such as *The Athletic Training Milestones*, however, the work still is coming from an individual group of researchers and is not yet supported or endorsed by the larger organizations (Sauers et al., 2019). To inform *The Athletic Training Milestones* work, the working groups would need to lay the ground work of understanding what is valuable to the profession and educational programs. This study could provide insight for future working groups and policy makers on what current master's programs in athletic training are citing as important outcomes and how they are currently assessing the outcomes. From here, the working groups could use their expertise to create outcomes and assessment tools that could be meaningful to the profession. In addition, this study could assist in narrowing the focus of standardization work to those outcomes that potentially show a difference in certification exam results. Currently, no studies have examined if student learning outcomes or other assessment components have impact on Board of Certification results. athletic training programs would benefit in having the power of their organization behind the development of some standardized student learning outcomes and assessment procedures. A first step in the direction towards standardization would be to understand what student learning outcomes athletic training programs are citing and look for commonality.

For other healthcare professions. As healthcare is an always adapting, growing, and changing profession, educational programs will always be advancing their outcomes and assessment strategies to meet new demands. In addition, as already noted, many healthcare professions are continuing to work towards a set of common outcomes that transcend individual programs (Fater, 2013; Missen, McKenna, Beauchamp, & Larkins, 2016; Zeind et al., 2012). Some professions are well on their way or achieved common outcomes while others are in the beginning stages, like athletic training. No matter what, as the professions grow and change, outcomes may have to change as well (Murray et al., 2000). Many times, individual programs can adapt more quickly to trends in outcomes and assessments than larger organizational bodies. Thus, being able to learn from current programs and adapt can be valuable (Fater, 2013; Middlemas & Hensal, 2009; Missen et al., 2016; Murray et al., 2000; Scott et al., 2012; Zeind et al., 2012). This study can inform other healthcare professions of trends in athletic training assessment and how that information might relate to certification exam results, something that is lacking in literature for most healthcare professions.

For higher education. Demands on higher education institutions and programs to be able to assess student learning outcomes only continues to grow (Shahjahan & Torres, 2013). This study can provide a unique opportunity to assist other disciplines as they continue to develop workable assessment plans. As programs develop or rework their curricula in order to adhere to new standards and as faculty and administration take their programs through institutional review and external higher education accreditation, assessment will need to guide the process (Miller & Ewell, 2005). The reality of the current higher education landscape centers on assessment (Tremblay et al., 2002). Academic programs are expected to adhere to institutional missions and goals, discipline-specific accreditation standards, and their own points of distinctions. The higher education community could learn from the process of identifying commonality in a discipline's outcomes and how those outcomes are typically being assessed across institutions (Tuning Educational Structures in Europe, n.d.). Too often, in today's market-driven higher education system of the United States, institutions are focused on distinctiveness and institutions shun working with other institutions to identify shared goals. Yet, if a discipline can identify areas of commonality, the discipline can make informed decisions to define their expectations for their incoming professionals from all institutions while allowing individual institutions to develop their own distinctive qualities within and beyond the common core of outcomes (Fater, 2013; Zeind et al., 2012). This study and its focus on the discipline of athletic training, could provide a template for how to begin conversations about commonality among outcomes. In addition, by understanding if the presence or absence of student learning outcomes as a whole can be linked to difference in certification examination scores, other disciplines could begin to think about what outcomes truly speak to graduate preparedness in their own areas. Currently, little research has been done on current assessment strategies and outcomes of any discipline. Any new insight into current practices of assessment could have significance for higher education, institutional, and discipline leaders.

Rationale

The landscape of athletic training educational assessment is not well documented in the current research. Literature gaps revealed a lack of understanding around what student learning outcomes athletic training programs cite, how they assess those student learning outcomes, and if any commonalities between programs exist. By identifying commonalities in important outcomes, leadership organizations and individuals can work towards creating valid and reliable tools for the commonly cited student learning outcomes. Programs could know what they can cite, beyond the commonalities, to emphasize their distinctiveness. In addition, a lack of information exists about any possible correlation between student learning outcomes and Board of Certification exam pass rates. Athletic training programs administrators and professional leaders dedicated to the work of assessment in athletic training education would benefit from increased information in the assessment area. Other healthcare professions and higher education, as a whole, can potentially learn from athletic training. Assessment work is not unique to athletic training; and any information gained has potential to inform future assessment work in higher education, as a whole.

Definitions of Terms

Throughout this paper, certain terms are utilized frequently to frame the work of assessment and the research questions posed. In the field of assessment, many terms get used interchangeably, such as goals, outcomes, and objectives. The following terms are the working definitions for this paper.

Assessment plan: A description of the process used to evaluate the extent to which the program is meeting its stated educational mission, goals, and outcomes. The assessment plan involves the collection of information from a variety of sources and must incorporate assessment of the quality of instruction (didactic and clinical), quality of clinical education, student learning, and overall program effectiveness (Commission on Accreditation of Athletic Training Education, 2018a).

Athletic trainers: Health care professionals who render service or treatment, under the direction of or in collaboration with a physician, in accordance with their education and training and the state's statutes, rules, and regulations. As a part of the health care team, services provided by athletic trainers include primary care, injury and illness prevention, wellness promotion and education, emergent care, examination and clinical diagnosis, therapeutic intervention, and rehabilitation of injuries and medical conditions (Commission on Accreditation of Athletic Training Education, 2018a).

Clinical experiences: Direct client/patient care guided by a preceptor who is an athletic trainer or physician (Commission on Accreditation of Athletic Training Education, 2018a). Experiences where the student is demonstrating outcomes with real patients in real-time

Controlled environments: All other educational experiences that are not with real patients in real time.

Direct measures: Assessment tools and strategies that directly measure student achievement of the outcome.

First-time pass rate on the Board of Certification examination: The percentage of students who take the Board of Certification examination and pass on the first attempt. Programs must post the following data for the past three years on their website: the number of students graduating from the program who took the examination; the number and percentage of students who passed the examination on the first attempt; and the overall number and percentage of students who passed the examination, regardless of the number of attempts (Commission on Accreditation of Athletic Training Education, 2018a).

Framework: A description of essential program elements and how they're connected, including core principles, strategic planning, curricular design (for example, teaching and learning methods), curricular planning and sequencing, and the assessment plan (including goals and outcome measures) (Commission on Accreditation of Athletic Training Education, 2018a).

Goals: Specific statements of educational intention that describe what must be achieved for a program to meet its mission (Commission on Accreditation of Athletic Training Education, 2018a).

Indirect measures: Assessment tools and strategies that rely on perception (self or other) to determine if the student is competent in an outcome.

Outcomes: Indicators of achievement that may be quantitative or qualitative (Commission on Accreditation of Athletic Training Education, 2018a).

Preceptor: Preceptors supervise and engage students in clinical education. All preceptors must be licensed health care professionals and be credentialed by the state in which they practice. Preceptors who are athletic trainers are state credentialed (in states with regulation), certified, and in good standing with the Board of Certification. A preceptor's licensure must be appropriate to his or her profession. Preceptors must not be currently enrolled in the professional athletic training program at the institution. Preceptors for athletic training clinical experiences must be athletic trainers or physicians (Commission on Accreditation of Athletic Training Education, 2018a).

Professional program: The graduate-level coursework that instructs students on the knowledge, skills, and clinical experiences necessary to become an athletic trainer, spanning a minimum of two academic years (Commission on Accreditation of Athletic Training Education, 2018a).

Program-level student learning outcome: An objective to be achieved that is expected of every student enrolled or completing the athletic training program. Program-level student learning outcomes must be measurable (qualitative and quantitative) and must be included in the athletic training program's comprehensive assessment plan and framework.

Simulation: An educational technique, not a technology, to replace or amplify real experiences with guided experiences that evoke or replicate substantial aspects of the real world in a fully interactive manner (Commission on Accreditation of Athletic Training Education, 2018a).

Assumptions and Limitations

Capturing student learning outcomes and the means by which they are assessed can be challenging. This study assumed that athletic training programs that cite a student learning outcome in their assessment plan are actually instructing to that outcome. This study design does not ensure that programs are doing a quality job in implementing their plan to achieve the student learning outcome. In addition, the study assumed that the athletic training programs give equal credence is to each student learning outcome cited on their assessment plan. No means to ensure that all student learning outcomes are equally important and emphasized within the program's curriculum existed in this study. In this study, the mere presence of student learning outcome in the program's assessment plan would have been compared to Board of Certification Exam results without indication of how well the program is instructing or emphasizing that student learning outcome in its curriculum. A lack of consistency within the athletic training programs' ability to instruct and assess the student learning outcome could have altered any correlations. A deeper investigation into the application of the student learning outcomes within curriculums was beyond the scope of this project but should be considered for future research.

Conclusion

This chapter presented the current higher educational climate that is demanding more assessment and the additional demands of standardization of assessment for healthcare professional programs. This quantitative study investigated current program-level student learning outcomes cited by professional athletic training programs and the environment of assessment and means of assessment that is currently taking place for those program-level student learning outcomes. A review of the literature is presented in Chapter Two. Chapter

Three includes a description of the research design, methods, methodological limitations and ethical considerations.

Chapter 2: Literature Review

Introduction

In this chapter, the current state of assessment literature is reviewed. A specific focus on the assessment components of healthcare preparatory programs is covered. The theoretical, or lack thereof, of the field of assessment is addressed. The trends in assessment in higher education, the general terminology, the process of assessment, and the types of assessment, and the concerns of reliability and validity are discussed. Standardization trends, both in higher education and in healthcare programs, are reviewed and some specific examples cited. Common student learning outcomes and common means of assessment of student learning outcomes for healthcare programs are presented. Finally, any correlations between student and program characteristics and national certification and licensure examinations for healthcare programs is discussed.

Theoretical Framework

Assessment of student learning, while globally essential to education in recent years, is a phenomenon without a clear theoretical foundation (Stobart, 2008; Taras, 2010). Assessment of learning has developed out of a practical need to demonstrate student learning and to improve student learning (evidence-based practice), not out of theory (Broadfoot & Black, 2004; Tight, 2004). Differing definitions and types of assessment have been purported in the literature. Formative assessment, which calls for assessment to only exists to assist students in improving their learning, has received more positive press for its goals of improvement and growth (Black & Wiliam, 1998a; Taras, 2010). The positivity is often countered with the negative connotations of summative assessment, where a product is judged against some pre-set standards. The works of Black and Wiliam have developed much of the working knowledge of formative assessment (and by default, summative assessment) and helped establish the dichotomy (Taras, 2010). Yet, Black and Wiliam (1998a,1998b) did not begin their work on formative assessment with theory, instead opting to bring together a wide range of research findings that they deemed relevant to the concept of assessment (Black & Wiliam 2009; Taras, 2010). The foundational works were not based on theory. In fact, Black and Wiliam (2009) later published an article entitled "Developing the Theory of Formative Assessment," attempting to develop a theoretical understanding of assessment. Yet, "Developing the Theory of Formative Assessment" did very little to form a theory at all (Taras, 2010). Black and Wiliam (2009) stated it best: "...this theoretical frame was grounded in the data collected from classroom observations and interviews with teachers, and no systematic attempt was made to connect the data to work on such topics as classroom practice, or the regulation of learning" (p. 6).

In practicality, instructors have been living a more unified version of assessment regularly. Black and colleagues (2003) changed their prior statements that formative and summative assessment should be seen as different processes, and thus different theories, after observing use of summative assessment (Taras, 2010, Wiliam et al., 2004). The practical leading the theoretical is the historical norm for assessment. Observations of the use and need of assessment have been noted first, experts then assembled the best practices and commented on their efficacy, and, finally, attempted to connect the practicality and necessity to theory (Taras, 2010).

The lack of a cohesive assessment theory is concerning to some researchers of assessment and has led to looking towards outside theories, such as student learning, motivation, and feedback (Black et al., 2003; Taras, 2010). Many of the attempts to connect assessment to a theory have fallen short of a comprehensive theory. However, one student learning theory appears to take into count the role of assessment (Stobart, 2008; Taras, 2010). Social constructivism theory emphasizes the collaborative nature of learning (Vygotsky, 1978). Knowledge is co-created with a community of learners and learners experience two developmental levels, the actual level (learning the student has already achieved) and potential development (what the learner is capable of achieving) (Vygotsky, 1978). The individual understands his or her learning in context of the learning of others, past and present. Learning occurs when students move their level of actual development closer to that of experts in a field of study (the potential development level). Assessment would represent the balance between the individual learning and cultural activity of learning (Sadler, 1989; Taras, 2010). The presence of a potential development level indicates that some goals are to be reached and those goals are based on the knowledge of the disciplinary community (other learners). Assessment is the judgement that the learning is moving towards those goals (Sadler, 1989; Taras, 2010). If feedback and revision is allowed, formative assessment occurs within the summative assessment process. The divisions often drawn between formative assessment, meant to improve student learning through feedback or reflection, and summative assessment, meant to measure to outcomes, becomes nullified under the theory. Even with the social constructivism theory connection to assessment, Taras (2010) still called for a more comprehensive theoretical basis for the evidence-based practice happening in education around assessment.

Assessment has its roots in practicality, not in theory. As Stobart (2008) states, "[Assessment of student learning] is best viewed as an approach to classroom assessment to support learning, rather than as a tightly formulated theory. This does not mean that there are no theoretical underpinnings; simply that it has not been organised, and may not need to be, into a stand-alone theory" (p. 145). While social constructivism may help explain assessment,

assessment is best explained in its action. The following research study adheres to the practical history of assessment. The study is monitoring assessment in action. Assessment is best described as a cycle (Wiliam & Black, 1996).   Figure 1 shows one representation of the assessment cycle. Programs and disciplines determine outcomes or standards that need to be met by students, based on the mission and values of the institution or discipline. Administrators and faculty then determine the tools that are most appropriate to measure student progress in learning compared to the outcomes and the process by which to gather the data. The data is analyzed and interpreted within the context of the program or discipline and the results are used to make changes to better align student learning with the mission and goals. The following study seeks to understand assessment in its action within the discipline of athletic training: what outcomes are setting the standards of the discipline, how are the judgements being made (tools), and are the outcomes important to the larger learning process (connection to certification).

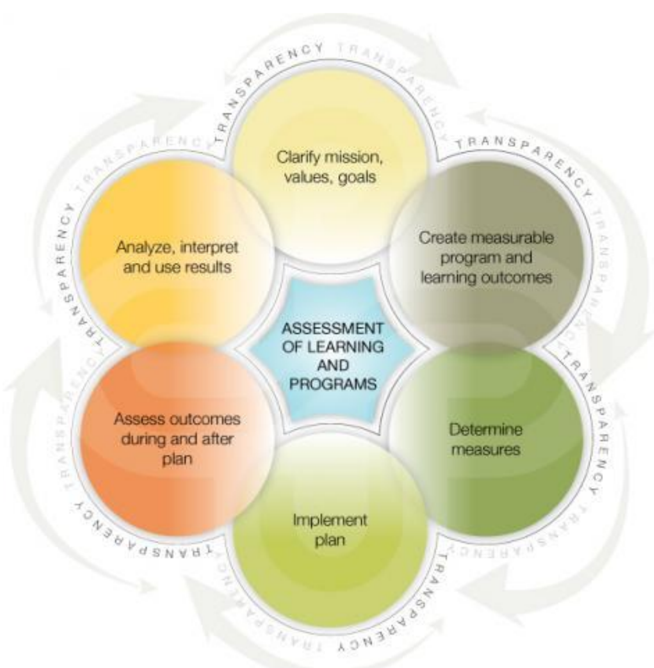

Figure 1. Assessment Cycle (Portland State University Enrollment Management and Student Affairs, 2017). A diagram of a typical assessment cycle.

Assessment in Higher Education

Assessment of knowledge is not a new concept, as assessment has historically always been part of education. What is changing is how higher education assesses knowledge, how assessment uses that information, and why. In the traditional measurement model of assessment, comparison of stable characteristics of individuals compared to each other or a national population is common, often in the form of rank lists (Barnett, 1992; Biggs & Tang, 2007). The traditional model relies on grades, especially bell-curve distributions, and pits students against one another to obtain a grade, not necessarily knowledge (Biggs & Tang, 2007). In addition, standardization of measures is difficult to transmit as a public message on quality assurance (Biggs & Tang, 2007), which has become a priority in today's society. An increased emphasis on a framework that puts defining the end goal (outcome) of education first in the planning process and then designing curriculum around achievement (and assessment) of those ends, referred to as standards model of assessment, can been found in literature (Barnette, 1992; Biggs & Tang, 2007). While a review of the literature does show that assessment of learning improves learning, Birenbaum (2003) points out that very little empirical research on the new assessment culture for learning has been conducted.

Programs undertake assessment for multiple reasons. Assessment in the United States' higher education arena is required for external accreditation, mainly due to federal laws (Banta & Palomba, 2015; Biggs & Tang, 2007; Fain, 2015; Miller & Ewell, 2005; Stitt-Bergh et al., 2019). However, in support of assessment beyond the requirement, several reported benefits of assessment have been reported (Biggs & Tang, 2007; Stitt-Bergh et al., 2019; Walvoord, 2010). The benefits include being helpful to the program, institution, or even individual student as a way to see progress or to make improvements, allow for public assurance of competence of graduates, and allow for development of faculty and staff to help continue to meet the goals of the education program (Greiner & Knebel, 2003; Tremblay et al., 2012; Walvoord, 2010). The development of a means for longitudinal study of learning that had not necessarily been supported by institutional leadership in the past is also beneficial to scholars of learning (Walvoord, 2010). Outcomes-based teaching and learning, and the assessment of those outcomes, is seen as a practical way to maintain standards and improve teaching (Biggs & Tang, 2007). If aligned with teaching, assessment reinforces learning and is a critical component of education (Biggs & Tang, 2007; Gadbury-Amyot et al., 2014). Finally, in a time where resources continue to become more limited in higher education, assessment allows for evidence-based funding decisions (Walvoord, 2010). Assessment is part of the higher education landscape and research on the process is growing to help institutions and programs meet the demand.

Assessment process and terminology. Whether for an individual student, a course, a department, a program, or an institution as a whole, the purpose of assessment is to gather and analyze credible evidence of achievement of pre-determined goals and use that information to make decisions about improvement, whether that is for resource distribution, instructional or curricular changes, or implementation of services (Banta & Palomba, 2015). At its simplest form, assessment is a means for an institution or program to demonstrate its accomplishment of its educational purposes (Lopez, 2002). Assessment in higher education takes on many different meanings, depending on how and where the assessment is being utilized. Assessment, especially in the United States and other western countries, can mean assessing individual students or assessing at the institutional or program level to ensure quality (Biggs & Tang, 2007). Walvoord (2010) defined assessment as the "systematic collection about student learning, using time, knowledge, expertise, and resources available to inform decisions that affect student learning" (p. 2). The term outcome assessment is usually used to describe individual measures being aggregated in order to determine group strengths and weaknesses in order to guide action to improve circumstance (Banta & Palomba, 2015). Student learning assessment is best described by Banta and Palomba (2015) as the "systematic collection, review, and use of information about educational programs undertaken for the purpose of improving student leaning and development" (pp. 1-2). Additionally, at the institution level, assessment is often used to describe evaluating institutional effectiveness (Banta & Palomba, 2015).

The terminology around assessment may vary slightly between programs or institutions, however, common elements exist. The first step of most assessment processes involved establishing goals (Rust, 2002; Walvorrd, 2010). Goals, outcomes, and objectives are all terms used to describe the pre-determined focus of the educational experience (Banta & Palomba, 2015). At their core, the goals, outcomes, or objectives are statements of values for that program or institution and are often derived from the vision and mission of the program or institution taking into account the opinions and expertise of faculty, staff, and other stakeholders, such as alumni, employers and students (Banta & Palomba, 2015; Principles for Effective Assessment of Student Achievement, 2013; Roberts el al., 2009). Ultimately, assessment statements tell the public what, and how well, students are able to do or know something that they were not able to do or know before their educational experience (Biggs & Tang, 2007). The standards become the guiding principles for curriculum, the benchmarks for student achievement, and the stipulation of what achievement of the degree means, as well as the unique experience attained at the specific institution or program. While standards, objectives, outcomes, and goals may subdivide into each other (i.e., objectives are more specific renditions of the outcomes), for the purposes of most literature on assessment, the words are used interchangeable (Walvoord, 2010). The term outcome was utilized in this study.

In addition, the outcomes can be labeled based on the area of higher education they are meant to describe. For example, student learning outcomes are those that describe student learning achievement goals, either at the institutional, general education, programmatic, or course-level while institutional effectiveness outcomes might describe items such as recruitment, retention, and student satisfaction with or utilization of support services (Banta & Palomba, 2015; Walvoord, 2010). For this study, the focus was on program-level student learning outcomes for professional athletic training programs. The program-level student learning outcomes focused on knowledge, skills, and abilities that students are expected to achieve upon completion of the program. Stitt-Bergh et al. (2019) describe program-level learning assessment as using course-level information from faculty or other sources of data in order to demonstrate learning that has occurred across the curriculum and where improvements and changes can occur to best help the students in their entire learning journey. Banta and Palomba (2015) put an emphasis on the drafting and clarification of the outcomes of student learning as the first step of a solid assessment purpose. Without well-defined student learning outcomes, the program cannot proceed with the rest of the assessment cycle. Banta and Palomba (2015) also explain the necessity to make the outcomes clear and public, emphasizing their use as not only internal standards, but external standards. The authors continue that for those outcomes tied to majors or programs, the outcomes should be created within standards of the profession or field in mind (Banta & Palomba, 2015). With such an emphasis on the student learning outcomes, in terms of the rest of the assessment process, a deeper understanding (through research) of the commonality and uniqueness of student learning outcomes across all professional programs is important for programs, and their host professions.

The student learning outcomes, once agreed upon by program faculty and stakeholders, must then be mapped into the curriculum to determine where they are addressed and potentially assessable (Banta & Palomba, 2015; Walvoord, 2010). Once outcomes are established, determinations can be made as to how the student learning outcomes can be assessed. One of the first decisions to be made is the philosophy of the assessment. Research suggests that the choice of assessment philosophy and types can affect student behavior and learning, known as consequential validity (Gielen, Dochy, & Dierick, 2003). Assessment can be used for improvement, accountability, or both (Banta & Palomba, 2015; Lopez, 2002; Murray et al, 2000; Walvoord, 2010). Assessment is often described as either formative or summative assessment.

Formative and summative assessment. While formative assessment is not consistently defined in literature (Black & Wiliam, 1998a), formative assessment takes place at multiple intervals within the program in order to provide feedback to students and faculty, allowing modification and improvement of the individual student work as well as the program (Banta & Palomba, 2015; Biggs & Tang, 2007; Gielen et al., 2003; Jardine et al., 2017; Martin & Vale, 2005; Rust, 2002; Sexton, 2003). Formative assessment often also involves the student in assessing their own or peer's work to provide opportunities for reflection, and potentially, even in the creation of the formative assessment criteria (Biggs & Tang, 2007; Birenbaum, 2003; Gielen et al., 2003; Jardine et al., 2017; Sexton, 2003). Formative assessment provides opportunities for faculty and peers to provide feedback, for students to engage in self-assessment based on others' feedback, and for increased engagement and motivation on the part of the students (Banta & Paomba, 2015; Gielen et al., 2003; Henning & Marty, 2008; Löfmark &

Thorell-Ekstrand, 2000; Pattalitan, 2016; Roberts et al., 2009; Tuning Educational Structures in Europe, n.d.; Ulfvarson & Oxelmark, 2012).

Feedback during the formative assessment can take the form of formal or informal feedback, from self-reflection, peer feedback, or instructor feedback (Birenbaum, 2003; Black, 2000; Jardine et al., 2017; Rust, 2002; Taras, 2005). Several authors state that the quality of formative feedback can be used to judge how effectively the teaching or learning activity addresses the outcome (Biggs & Tang, 2007; Brookhart, Achacoso & Svinicki, 2004; Pattalitan, 2016). Researchers have shown that including more formative assessment can lead to significant learning gains in all levels of education, including higher education (Black, 2000; Black & Wiliam, 1998a); though the quality of the feedback (Black & Wiliam, 1998a) and the ability of students to recognize the gaps in their current knowledge to some standard (Biggs, 1998) plays an important role in making the claims for formative assessment learning gains. The skills to be a life-long learner appears to be attained best with formative assessment and feedback (Boud & Falchikov, 2006). Students tend to prefer formative feedback, both informal and formal types, compared to relying solely on summative assessments, especially in situations of practical application, like clinical education (Harris, 1992; Hay et al., 2013; Trede, Mischo-Kelling, Gasser, & Pulcini, 2015). Formative assessment is often praised ahead of standardized testing, which most often provides no opportunities for growth and strictly focuses on summative assessment (Black & Wiliam, 2003; Entwistle & Entwistle, 1997).

Summative assessment is typically done upon completion of a program, course, or particular competency or knowledge activity (Banta & Paomba, 2015; Biggs & Tang, 2007; Birenbaum, 2003; Taras, 2005) in order to give information that is useful in final decisions, whether completion of a course, a degree, or an institution's achievement of its purpose

(Brookhart et al., 2004; Pattalitan, 2016; Taras, 2005; Tuning Educational Structures in Europe, n.d.). Summative assessment allows the program, institution, or even the student, to make a judgment about its quality or worth compared to a standard, typically called a benchmark, (Banta & Palomba, 2015; Birenbaum, 2003; Gielen et al., 2003; Jardine et al., 2017; Martin & Vale, 2005) and in most situations, is the more prominent form of assessment for higher education (Black & Wiliam, 1998a).

Summative assessment tends to have a more negative perception in academic circles and research has linked an over-reliance on summative assessment on poor learning gains (Boud & Falchikov, 2006; Taras, 2005). Summative assessment is often confused with student grades; however, student grades are not considered a quality assessment of direct student learning and often not perceived, by students or faculty, as objective or valid assessments (Harris, 1992; Rust, 2002; Scriber et al., 2010; Trede et al., 2015). In spite of some negative attitudes toward summative assessment, educators, and to a lesser extent, students, understand the importance of summative assessment for insurance of achievement of skills or qualities needed of graduates (Beer & Mårtensson, 2015; Boud & Falchikov, 2006; Trede et al., 2015). In fact, the public expectation for higher education is for summative assessment (Boud & Falchikov, 2006).

To get the most benefits out of assessment, literature calls for programs to, ideally, utilize both types of assessment; a system where formative feedback leads to improvement and attention throughout the process with summative feedback allowing the whole experience to be aggregated and compared to benchmark standards (Banta & Palomba, 2015; Biggs, 1998; Black & Wiliam, 1998a; Black & Wiliam, 2003; Boud & Falchiko, 2006; Hay et al., 2013; Ho, Whitehill & Ciocca, 2014; Jardine et al., 2017; Sexton, 2003l Weber, 2005). Taras (2005) argues that there can be no formative assessment without summative assessment, as there must be a judgment for which students and faculty can work towards and feedback on how to achieve that outcome. Formative assessment can mimic summative assessment to allow students to maximize opportunity to prepare and plan to improve (Keating, Dalton, & Davidson, 2009). Many times, for reporting purposed to accreditation bodies, programs or institutions have to report summative assessment results, but that does not preclude them from including formative experiences within their assessment plans (Birenbaum, 2003; Black & Wiliam, 2003; Hayward & Hedge, 2005; Jardine et al, 2017; Principles for Effective Assessment of Student Achievement, 2013; Rust, 2002). Some types of assessment preclude themselves better to be used for formative assessment while others are best for summative, but nothing precludes any tool from serving both purposes (Brookhart et al., 2004; Hay et al., 2013; Tuning Educational Structures in Europe, n.d.).

Direct and indirect assessment tools. The next step in assessment is to determine the tools or instruments that will be used to assess the learning and what artifacts, or proof of the learning, that will be assessed by the tools (Banta & Palomba, 2015; Biggs & Tang, 2007; Lopez, 2002; Rust, 2002). Choosing or developing the appropriate tool or tools can be a time consuming and difficult task for faculty members (Lopez, 2002). The same instruments can be used in a formative or summative fashion, depending on when they are utilized and if time for growth or improvement is allowed following the assessment (Banta & Palomba, 2015; Birenbaum, 2003; Brookhart et al., 2004; Hay et al., 2013; Tuning Educational Structures in Europe, n.d.). Tools, when used during the process of creating an artifact or educational experience, can be used formatively and then used to measure completion of the knowledge task or artifact at its completion (Biggs & Tang, 2007). Utilization of the same tool for both purposes is only possible if the student is clear about when and for what purpose the tool is being utilized (Biggs & Tang, 2007).

Instruments are often described in the dichotomous terms of direct or indirect measures (Banta & Palomba, 2015; Lindsay, Hourigan, Smist, & Wray, 2013). Direct measures require students to display their knowledge and skills and are considered authentic (Banta & Palomba, 2015; Gadbury-Amyot et al., 2014; Gielen et al., 2003; Lopez, 2002). The instruments can include objective tests, performance measures, essays, research papers, problem sets, oral examinations, presentations, projects, and portfolios created by students over time, or other capstone experiences (theses, field projects, professional practice) (Banta & Palomba, 2015; Gadbury-Amyot et al., 2014; Lopez, 2002; Martin & Vale, 2005; Zlatkin-Troitschanskaia, Shavelson, & Kuhn, 2015). Creation of objective criteria and being able to apply that criteria to student work is essential for direct assessment, especially in clinical education of healthcare programs (Banta & Palomba, 2015; Jardine et al., 2017). Biggs and Tang (2007) make the argument that students should be involved in setting the criteria to encourage more connection between outcomes and the learning process for students. At its basic level, assessment is telling students what the program wants the students to be able to do, teaching them those concepts, and then seeing if they can demonstrate that knowledge (Biggs & Tang, 2007; Lindsay et al., 2013). Direct assessment measures are considered more valuable for improving programs or teaching processes and is more appreciated by external accreditation organizations (Gadbury-Amyot et al., 2014; Gielen et al., 2003; Lopez, 2002).

Standardized testing is one mechanism of direct assessment that can be utilized locally or nationally (Banta & Palomba, 2015; Biggs, 1998; Gadbury-Amyot et al., 2014; Lopez, 2002; Walvoord, 2010; Zlatkin-Troitschanskaia et al., 2015). One such example is the Student

Performance Measure, created locally by the Indiana University, Bloomington, which demonstrates what students can do in multiple disciplines such as social and physical sciences and the humanities (Lopez, 2002). Even though the creation and utilization (administration and scoring) of standardized direct measures is often very labor intensive, students and faculty often agree that their results give meaningful information to the assessment process and are thus worth the time (Lopez, 2002). Standardized testing, such as the Major Field Achievement Tests in disciplines such as biology, business, literature, psychology, sociology, math, and history, the ACT's Collegiate Assessment of Academic Proficiency, the Collegiate Learning Assessment, or the Educational Testing Service's Academic Profile for General Educational skills, and other licensure or certification exams, is also often cited in accreditation self-studies (Lopez, 2002; Walvoord, 2010).

When using standardized tests, administrators should be cautious to only use ones that are appropriate to the specific learning outcomes their program cites and that have been found valid and reliable for their student population (Lopez, 2002; Tremblay et al., 2013). The cost of tools can sometimes be prohibitive to their implementation and use, especially if the information gleaned from their use has limited application and students do not feel compelled to perform their best without a direct tie to course or program outcome (Lopez, 2002). Concerns over standardized testing often lead to programs and faculty creating local assessments, but those have their own areas of concern, including not being able to benchmark outside the institution, time and cost of development, congruency with student learning outcomes, and reliability and validity testing is often not completed with the same thoroughness as standardized testing (Lopez, 2002; McCarthy & Murphy, 2007).

Indirect measures ask the students or others to reflect on the learning rather than demonstrate the learning, i.e., questionnaires, interviews, focus groups, reflective journaling, or graduation or alumni surveys or interviews (Banta & Palomba, 2015; Biggs & Tang, 2007; Jardine et al, 2017; Lindsay et al., 2013; Lopez, 2002; Martin & Vale, 2005; Tremblay et al., 2012; Walvoord, 2010; Zlatkin-Troitschanskaia, et al., 2015). Almost every institution uses some form of survey during the educational process; common standardized surveys include the Cooperative Institutional Research Program survey, the Entering Student Survey, the ACT Student Opinion Survey, the College Outcomes Survey, the National Survey of Student Engagement, the Community College Survey of Student Engagement and First Year Initiative (Lopez, 2002; Tremblay et al., 2012). Institutions or programs creating their measures is common (Lopez, 2002; Zlatkin-Troitschanskaia et al., 2015).

Bowman (2010) demonstrated a concern about over-relying on student perception of learning achievement when he found that student self-reports poorly correlated with objective measures of learning. Zlatkin-Troitschanskaia et al. (2015) warn that individuals can always over- or underestimate their own competence and that indirect measures are more limited in their suitability. Authors often make the case that programs need to triangulate, meaning they should utilize direct assessment measures as much as possible to increase the credibility of the process, while using indirect assessment measures to supplement the direct information and possibly give reasoning behind the results seen from the direct measures (Banta & Palomba, 2015; Gadbury-Amyot et al., 2014; Lindsay et al., 2013; Lopez, 2002; Marchigiano, Eduljee, & Harvey, 2011; Martin & Vale, 2005). Often, a student can use the same tool to self-assess (an indirect measure) that the faculty will use to directly assess the student work (Jardine et al., 2017; Lindsay et al., 2013). The direct assessment by trained faculty members is often essential for setting up effective indirect assessment by students; students need to know the standards and how to understand the learning process in order to improve over time (Lindsay et al., 2013).

Whether direct or indirect, all measures should be tied to the specific student learning outcomes of the program or institution, providing a means to determine if the student learning outcome has been achieved (Biggs & Tang, 2007; Lopez, 2002; Rust, 2002; Tremblay et al., 2012). Typically, the artifacts, or work evaluated, should be work already developed by the students or incorporated into the classroom in order to ease the process for both students and faculty assessors (Banta & Palomba, 2015; Walvoord, 2010). Classroom artifact usage has one major limitation, compared to standardized assessment measures, such as standardized testing, that is the ability to compare to a national average or to other similar institutions, also known as benchmarking (Birenbaum, 2003; Gadbury-Amyot et al., 2014; Lopez, 2002; Walvoord, 2010). No matter the type of assessment tool chosen, training on creation and utilization of the tools is important as is understanding the validity and reliability of the tool (Banta & Palomba, 2015; Biggs & Tang, 2007; Lopez, 2002). Clarity, as in the student learning outcomes themselves, is key in the assessment criteria (Biggs & Tang, 2007).

Validity and reliability of tools. The results achieved from a tool are only as good as the measure and how the measure is used (Banta & Palomba, 2015; Biggs & Tang, 2007; Brookhart et al., 2004; Keating et al, 2009; Pellegrino, 1999). Each type of measure and each philosophy of assessment would have their own means of establishing validity and reliability, in order to ensure fairness and consistency of assessment (Biggs & Tang, 2007; Thompson et al, 2014; Wu et al., 2015). However, some general definitions are available. Validity is the degree to which the evidence supports the interpretation of the measurement scores or results (Banta & Palomba, 2015; Brookhart et al., 2015; Gielen et al., 2003). Validity can also be described as how well the tool covers the appropriate content (Banta & Palomba, 2015; Gielen et al., 2003; Wu et al., 2015). Validity is most often utilized when discussing the direct and accurate assessment of the learning described in the student learning outcome (Biggs & Tang, 2007; Gielen et al., 2003; Thompson et al., 2014). Validity relates to the ability to make inferences on learning based on the scores of assessments (Birenbaum, 2003). Biggs and Tang (2007) state that a valid assessment must be the total of a performance, not simply one aspect. Ideally, tools should be validated against some external criterion and/or aligned to the student learning outcomes and teaching context (Biggs & Tang, 2007; Carwile & Murrell, 2002; Thompson et al., 2014).

Validity of a measurement relates directly to whether the function of the assessment (summative or formative) matches its use and is made clear to student and reviewer (Gielen et al., 2003). Criterion validity describes how the assessment predicts future performance and has two types: predictive and concurrent (Carwile & Murrell, 2002; Gielen et al, 2003; Wu et al., 2015). Predictive validity is defined as how well the tool will predict future performance (Carwile & Murrell, 2002). Concurrent validity (sometimes referred to as construct validity) refers to the extent to which the results of a measurement correspond to a previously established measurement for the same outcome or construct (Carwile & Murrell, 2002; Wu et al., 2015). Content validity of measures, how the material relates to the specifications, is often based on the work of focus-groups and content experts that verify the objectives of the tool (Gielen et al., 2003; Thompson et al., 2014; Tremblay et al., 2012). The tool is then tested (Tremblay et al., 2012). Content validity, as a sole form of validity verification, is debated in literature (Gielen et al., 2003).

Assessment tools should also be able to demonstrate validity across diverse cultures, languages, and higher educational type or programs if they are to be able to be used for large-scale assessment (Banta & Palomba, 2015; Tremblay et al., 2012). Determining the validity of an instrument, no matter the type or types of approaches of validity, takes many steps and many revisions of the product before the instrument can be used effectively on a student population (Löfmark & Thorell-Ekstrand, 2000; Sowter, Cortis, & Clark, 2011; Thompson et al., 2014). While previous literature may imply that researchers can choose the type of validation most appropriate or convenient for their tool, Thompson et al. (2014) call for a more accurate view of establishing validity consisting of not different kinds of validity but various types of evidence to support a test's intended use or interpretation. Thompson et al believe that authors need to utilize as much evidence as possible to validate their tool. Wu et al. (2015) call for more researchers to report more of the various evidence of validity to help with consistency in the language of assessment.

The reliability is typically described in terms of consistency and stability of the student scores or results (Banta & Palomba, 2015; Biggs & Tang, 2007; Brookhart et al., 2015; Carwile & Murrell, 2002, Coates, 2016; Keating et al., 2009). A tool is considered stable if the tool comes to the same result on different occasions independently of who was conducting or scoring the tool (test-retest reliability) (Biggs & Tang, 2007). Stability is often discussed as inter-rater reliability, when utilizing rubrics or other assessment measures by multiple individuals and the consistency of their scoring (Banta & Palomba, 2015; Biggs & Tang, 2007; English et al, 2004; Tremblay et al., 2012), or intra-rater reliability, when the same individual would make the same judgment when using the tool multiple times (Biggs & Tang, 2007; Tremblay et al., 2012). Tools would be considered to have dimensionality if they measure the same characteristic, which is usually measured as internal consistency (Cronbach alpha) (Biggs & Tang, 2007). Accuracy of the assessment scores also tends to be defined as reliability (Birenbaum, 2003) and can be seen as an arm of construct validity (Khan, Ramachandran, Gaunt, & Puschkar, 2013). Biggs and Tang (2007) make the point that when functional knowledge needs to be assessed, as is the case with preparatory healthcare programs, the assessment measures need to allow assessment that replicates authentic circumstances in order to best demonstrate application to real life. Coming up with criteria that is suitable for the type of knowledge needed beyond the education experience is important for quality control (Biggs & Tang, 2007; Birenbaum; 2003).

According to research, newer forms of assessment are not comparing well, with respects to validity and reliability, to standardized testing where psychometrics are more easily studied (Birenbaum, 2003). However, Biggs and Tang (2007) emphasize that being able to quantify reliability and validity is not the final decision on the usefulness of an assessment tool. The alignment to the student learning outcomes and the usefulness of the information may not always be able to be quantified (Hay et al., 2013). Finally, no matter the reliability and validity, the feasibility and utility of the measurement is as important to consider (Brookhart et al., 2004). If the tool is too difficult or time-consuming to use or not able to be generalizable to a larger population, the tool most likely is not going to be beneficial to the assessment process (Brookhart et al., 2004; Thompson et al., 2014). Standardization of tools and scales, while often will increase numerical reliability or validity, can risk the generalizability and applicability of the measurement, especially in the unpredictable nature of patient care for preparatory healthcare programs (Thompson et al., 2014). In terms of assessment of student learning, just like with combining indirect and direct measures, a mix of assessment tools can often help to increase the reliability and validity of the overall assessment experience as different aspects of the outcomes can sometimes be best captured by different tools (Löfmark & Thorell-Ekstrand, 2000;

Pellegrino, 1999). Specific types of assessment instruments, especially those common to healthcare preparatory programs, will be discussed further later in this literature review.

Analysis of assessment. Once the data is collected, those involved are expected to analyze the data in order to determine where strengths and areas of improvement are present for the program or institution (Banta & Palomba, 2015; Biggs & Tang, 2007; Lopez, 2002). The data can be represented in qualitative or qualitative means, or a combination of both (Banta & Palomba, 2015). Data about achievement of student learning outcomes, while ultimately about the individual students' achievements, will often be aggregated for purposes of providing information for the program or institution in order to help contribute to improved teaching and learning on the whole (Banta & Palomba, 2015; Lopez, 2002). For institutional or programmatic assessment purposes, the assessment is often of randomized samples of student work to give a snapshot of the program's effectiveness in succeeding to facilitate their students' achievement of the outcomes (Biggs & Tang, 2007).

The results of an assessment should be shared with stakeholders, both internal and external, and those that can help implement an improvement plan and would have an interest in the results, such as classroom instructors, department or program administrators and faculty, general education coordinators, faculty committees, governance bodies, institutional administrators, external accreditations, students, alumni, and the general public (Walvoord. 2010). How much and what part of the assessment data gets reported to the different groups will vary based on what each need to and want to know. Many authors emphasize that good assessment is meant to be actionable (Banta & Palomba, 2015; Walvoord, 2010).

In order to be actionable, assessment needs credibility in its methods and conception, truthfulness in its process, to be locally grounded within the program or institution, have faculty buy-in, and be driven by a genuine desire to answer real questions about student learning (Banta & Palomba, 2015). Typical actions included changes to curriculum, requirements, programmatic structures, policies, funding, planning that supports learning, or faculty development (Lopez, 2002; Walvoord, 2010).

Global and national trends. Assessment has become the favorable tool for attempting to measure the nebulous nature of the value of higher education in the United States of America (Banta & Palomba, 2015; Biggs & Tang, 2007; Ewell, 2984; Fain, 2015; Miller & Ewell, 2005; Roberts et al., 2009). Assessment is part of a national reform to the general public's concerns over the perceived shortcomings of current college graduates (Walvoord, 2010). The public is asking for accountability and proof of student achievement of learning, not just the learning that institutions or programs claim occur within their confines (Clark, 1983; Tremblay et al., 2012; Walvoord, 2010). In response, external accreditation bodies that are staples of the United States' higher education system, require the reporting of assessment data in order to provide evidence of "success with respect to student achievement in relation to the institution's mission" (Principles for Effective Assessment of Student Achievement, 2013; p. 1). The accrediting bodies that developed the Principles for Effective Assessment of Student Achievement (2013) emphasize that institution (and thus program) autonomy is key, as the assessment process should be mission-specific. However, the accrediting bodies also call for evidence of student learning experience, evaluation of student academic performance, and post-graduation outcomes to be reported at the institutional level, yet the relevant kinds of data may vary based on mission and values of each individual institution. Above all, the accrediting bodies call for the assessment process to be integrated into all aspects of the college's teaching and administration, analyzed annually, and summarized for accreditation. Issues with student learning outcomes assessment are the most common citation in regional accreditors' evaluations of institutions (Provezis, 2010). The emphasis on assessment for institutions, and trickling down to their programs, especially those also externally accredited, is clear.

Government funding has been shrinking, internationally, while higher education costs are growing across the globe creating new pressure for accountability (Bernasek, 2005; Lederman & Fain, 2017; Tremblay et al., 2012). Institutions have to prove their effectiveness to retain funding, even in countries that have previously had strong national control over higher education (Altbach, 2013; Clark, 1983; Rust, 2002; Shahjahan & Torres, 2013; Tremblay et al., 2012). In the United States, the Return on Education initiative by the Obama administration, which created a consumer-facing tool to allow students to make informed decisions on affordability and performance, requires institutions to post assessment information (Fain, 2015). Even with roll backs and regime changes, the emphasis of public accountability and a means to quantify educational outcomes is a part of the current higher education landscape in the U.S.A.

Internationally, a similar pressure is felt from governmental and non-governmental agencies, from the Higher Education Funding Council for England and the Quality Assurance agency in the U.K., the Australian Learning and Teaching Council, the Quality Assessment of Undergraduate Education project in China, or the European Standards and Guidelines for Quality Assurance in European Higher Education Areas, just to name a few (European Association for Quality Assurance in Higher Education et al., 2015; European Students' Union, 2016; Rust, 2002; Shahjahan & Torres, 2013). External accreditation and their power is on the rise as more countries try to emulate the U.S. system (Kivinen & Rinne, 1996).

Assessment of student learning is taking many forms internationally. Standardized testing is spreading in Latin America, and Asian governments are utilizing testing as a means to claim their place in the higher education market ("The World is Going to University", 2015). In other places, like the U.S., institutions have fought back against government standardization and have been trying to implement more flexible and individualized measurements of our assessment policies (Fain, 2015). Overall, governments are interested in their higher education system, as an educated population is still seen as an economic stimulus (Bevitt, 2015; Lederman & Fain, 2017).

Higher education has experienced growth on all the continents and includes many institutions tangent to the traditional systems (Tremblay et al., 2012). The culture of higher education, however, tends to value traditional settings (i.e.,, Bachelors in the USA), leading to difficultly in judging quality across such disparate arenas (Lederman & Fain, 2017; Tremblay et al., 2012). Of the 18 countries that belong to the Organisation for Economic Cooperation and Development (OECD), 31% of students who enter higher education do not graduate from a program equivalent to the level of education that was begun by the student (Tremblay et al., 2012). Since institutions have to track completion rates, assessment can put pressure on institutions to create equity ("Excellence v Equity", 2015; Shahjahan & Torres, 2013; Tremblay et al., 2012).

The OECD has spearheaded an international project, the Assessment of Higher Education Learning Outcomes (AHELO) to gauge the possibility of developing reliable, valid, and useful comparisons of learning outcomes across countries, cultures, and languages (Lederman, 2010; Tremblay et al., 2012). Seventeen countries are involved with over 30,000 students and are financially supported by various countries and private organizations (Shahjahan & Torres, 2013). The international effort demonstrates that the push for assessment is global, even if debates continue on if the AHELO is the best approach (Wolf, Zahner, & Benjamin, 2015; Zlatkin-Troitschanskaia et al., 2015).

Today's knowledge economy is obsessed with statistics. Consumers, as students are now considered, want more information without over-standardization or lack of choice (Shahjahan & Torres, 2013). In order to process all the available information, individuals tend to want rankings ("Excellence v Equity", 2015; Tremblay et al., 2012). Rankings in higher education, while common, benefit the elite and harm others ("Excellence v Equity", 2015). Locally and abroad, concern about overuse of rankings in making decisions, not just by consumers, but by governments and agencies dolling out resources has been reported (Barnett, 1992; Shahjahan & Torres, 2013). Institutions are competing for tuition, philanthropy, or government money and assessment is a tool in the competition (Clark, 1983; Tremblay et al., 2012).

Higher education is a critical factor in sustaining the knowledge economy, creating innovation and developing human capital (Tremblay et al., 2012). Even economists have difficulty quantifying the impact of education, yet nations and institutions tout impacts of higher education (Bernasek, 2005). International higher education is increasingly market-driven and sees students as consumers, leading to students demanding the ability to compare institutions and assess their future learning and earnings (Bevitt, 2015; "Excellence v Equity", 2015; "The World is Going to University", 2015).

A global economy is creating more competition among citizens of different countries for jobs (Bernasek, 2005; Knight & Yorke, 2007) and for tuition monies as individuals cross boarders for education and employment (Altbach, 2013; Kivinen & Rinne, 1996; Tremblay et al., 2012). The need for a universal mean to demonstrate competence and knowledge from higher education will continue increasing (Kivinen & Rinne, 1996). Assessment, and potentially an international set of assessment tools, such as AHELO, become more important to the economics of a country importing a workforce.

Assessment of student learning takes on different forms in different countries, depending on many of the historical, political, cultural, and economic background previously discussed. In many counties, especially those prescribing to the Bologna Process, assessment of student learning is only one piece in a larger quality assessment undertaking (European Commission, n.d.). Everyone is jumping into the assessment pool at different times and with different backgrounds, making comparisons more difficult. Some countries, like Turkey, are trying to adapt another country's quality assessment plan, such as the United Kingdom's, (Billings & Thomas, 2000); while others, like Estonia, have developed a strong system of their own (Vilgats & Heidmets, 2011). A history of external accreditation within a system appears to be a contributing factor to the success of implementation of the Bologna Process's assessment arm (European Commission, n.d.; Vilgats & Heidmets, 2011). In addition, especially in post-communist Europe, where mistrust of government or external ministries tends to be more rampant, assessment in higher education, and especially how that data is utilized, is met with more suspicion (Billings & Thomas, 2000).

In the United States, where assessment is required from external accreditation, universities have emphasized outcomes that can be easily assessed, most often declarative knowledge which only scratches the surface of what graduates really need to know to function in the professional world (Entwistle & Entwistle, 1997). A rich learning and assessment experience is rarely being witnessed in the current assessment atmosphere (Biggs & Tang, 2007). Biggs and Tang (2007) call for an increased focus on transferability of knowledge and skills across circumstances, educational and real-life, across higher education, especially within professional programs, often as part of outcomes-based education. Birenbaum (2003) states that the trend for quality outcomes assessment has been growing over the last 30 years with new forms of assessment and the assistance of information communication technology that have been introduced to higher education. The author also calls for more efforts to understand the opportunities and challenges of outcome-based assessment (Birenbaum, 2003).

The phenomenon in the United States is mirrored internationally where, despite the AHELO and other quality assurances becoming the norm for the last 20 years, their actual impact has still not been satisfactorily studied (Bevitt, 2015; Tremblay et al., 2012). While the perspective of outcome achievement is growing, the emphasis of grades and grand point average, instead of outcome achievement, is by far the most prevalent system in the United States currently (Biggs & Tang, 2007; Birenbaum, 2003). The historical emphasis on declarative knowledge and the growth into more transferrable learning is seen in healthcare education assessment as well.

Historically, medical education focused on medical knowledge while the patient care skills, that are now emphasized, were much more limited and were left to chance of the instructors regarding whether they were taught, much less assessed (Jardine et al., 2017). Without easy-to-use tools that can be utilized in busy clinical environments, clinical experiences were often not emphasized. Norm-based assessment, comparison between the student's performance and an "ideal" or "typical example", was the dominate form of assessment, introducing more potential for bias. The trend persists unless assessment tools, training, and policies have been put into place to counter the trend.

Standardization attempts. Outcome assessment has become the newest form of standardization in education (Bennet & Brady, 2012). In higher education, there have been a handful of prime examples of organizations attempting to standardize either the outcomes or the tools of measurements utilized in assessment. Several studies have shown that a collective reform movement should begin with defining a shared set out outcomes and a common language (Greiner & Knebel, 2003). Organizations, often in the form of workgroups or research consortiums, have attempted to create qualification-level outcomes, including the European Qualifications Framework, the United Kingdom's Qualifications and Credit Framework, and the Australian Qualifications Framework (Coates, 2016).

In the United States, the Degree of Qualifications profile, which aims to set a level of expectation in 5 learning areas – specialized knowledge, broad integrative knowledge, applied learning, civic learning, and intellectual skills for three degree levels (association, bachelor's, and master's) - exemplifies a standardization attempt (Banta & Palomba, 2015; Coates, 2016; Grouling, 2017). Standardizing a set of outcomes would allow institutions, and the public, to know what every graduate of every degree program should know and be able to do. However, the high level of autonomy between institutions of higher education, and even within the various departments and disciplines within an institution, inhibits the process of getting the standardized outcomes accepted on a large scale (Coates, 2016).

One of the largest attempts to develop a common set of outcomes comes from the American Association of Colleges and University's Liberal Education and America's Promise (LEAP) project. The LEAP project was established in 2005 to determine the essential student learning outcomes for a liberal arts education (American Association of Colleges and Universities, 2007; Banta & Palomba, 2015; Grouling, 2017; Tremblay et al., 2012). The LEAP project published four broad categories with subtopics, including knowledge of human cultures and the physical and natural world, intellectual and practical skills, personal and social responsibilities, and integrative learning (American Association of Colleges and Universities, 2007). As stated earlier, the United States has considered the idea of a set of standardized outcomes for institutions of higher education regulated by the federal government, but as of yet, the system has not come to pass (Fain, 2015; Leaderman, 2010; Leaderman & Fain, 2017).

On a discipline-specific level, the Tuning Process encourages academics to discover commonalities in generic and discipline-specific learning outcomes (Coates, 2016). Currently, Canada and Australia have both attempted to utilize the Tuning Process, but limitations of its implementation have still hindered the process (Coates, 2016). Melguizo and Wainer (2016) utilized data from the Exame Nacional de Desempenho dos Estudantes, a Brazilian college exit examination given to first years and seniors to develop common student learning outcomes for the higher education system in Brazil, specifically in science, technology, engineering and math, social sciences, and biological sciences.

The work to provide valid and reliable tools for a pre-determined set of common outcomes typical to institutions is occurring for a variety of reasons, including benchmarking capabilities, support for individual institutions and programs, and ensuring that outcomes are measured with the best possible (Tremblay et al., 2012). Large scale attempts at validation and reliability is usually easier to implement, as compared to individual programs trying to take on the large-scale studies needed to validate their own tools. Large scale attempts might be at the state, country or union level, where governments create a state-wide assessment program to help standardize the measurements utilized for quality assurance (Miller & Ewell, 2005; Tremblay et al., 2012). Standardization helps the state, country or union interpret the information and establish external benchmarks. AHELO is the quintessential international example of a large-scale attempt to determine standardized outcomes and develop tools to be utilized across countries and institutions (Shajahan & Torres, 2013; Tremblay et al., 2012).

Researchers have called for more multi-perspective analyses in order to develop a best-practices tool kit for assessment at an international scale (Zlatkin-Troitschanskaia, Pant, & Coates, 2016). Higher education institutions tend to be highly autonomous, but they should share some common outcomes (Tremblay et al., 2012). Funding, the needed time commitment, consistent long-term support from the state, country, or union to develop and test tools, and track benchmarking are all limitations to the process (Tremblay et al., 2012). In addition, when dealing with international or cultural differences, testing the process to ensure the process is applicable and understandable in the host context is important (Billings & Thomas, 2000). Differences in the follow-through between requirements from a government (Miller & Ewell, 2005) and a set of guiding principles recommended by an organization in implementation and follow-through is reality (European Association for Quality Assurance in Higher Education et al., 2015). The international collaborative consortium Performance Assessment of Learning (iPAL) projects focus on the development and testing of performance assessments, striving for a high level of reliability, validity, efficacy, and feasibility of being used across international borders (Zlatkin-Troitschanskaia & Shavelson, 2019).

The University of Wisconsin system is an example of an institution utilizing standardized math and writing assessments across the system in order to benchmark outcomes, provide feedback to programs for curricular development, and ensure student learning (Lopez, 2012). A variety of international graduate standardized tests have also been implemented recently, including the International Association for the Evaluation of Education Achievement Teacher Education and Development Study, the HEIghten Assessment, and a cross-national assessment of engineering competence (Coates, 2016). On a larger scale, the development of standardized tools such as the College Learning Assessment, which was recommended as part of the AHELO international project, has been developed to measure a common set of higher-level skills that graduates should process such as analytical reasoning and evaluation, problem solving, and written communication (Wolf et al., 2015). The tools recommended as part of AHELO have some concerns when applying them internationally such as language and cultural differences or barriers and the ability to benchmark the results, but the AHELO project is working to minimize these issues (Wolf et al., 2015).

The American Association of Colleges and University's Liberal Education and America's Promise (AAC&U's LEAP) project, discussed earlier, evolved into an additional project to develop valid and reliable rubrics to assess the predetermine outcomes that are accessible to all institutions, programs, and individual faculty members (American Association of Colleges and Universities, 2015; Banta & Palomba, 2015; Coates, 2016). The Valid Assessment of Learning in Undergraduate Education (VALUE) rubrics were then developed to provide valid and reliable measurement tools to assess the LEAP's essential student learning outcomes, including rubrics for written and oral communication, civic engagement, creative thinking, ethical reasoning, global learning, informational literacy, inquiry and analysis, integrative learning, intellectual knowledge and competence, foundations and skills for lifelong learning, problem solving, quantitative literacy, reading, and teamwork (American Association of Colleges and Unviersities, 2015; Banta & Palomba, 2015; Grouling, 2017; McConnell & Rhodes, 2017; Tremblay et al., 2012; Turbow & Evener, 2016; Zlatkin-Troitschanskaia et al., 2015).

The LEAP process was praised by academics and researchers as a means to define quality and commonality among institutions without utilizing rankings or other standardized testing and now has over 3300 institutions using them at some level (Banta & Palomba, 2015; Grouling, 2017; Zlatkin-Troitschanskaia et al., 2015). The power behind the AAC&U's LEAP and VALUE initiatives is the large-scale attempt to validate and implement the rubrics by partnering with multiple consortiums (McConnell & Rhodes, 2017). Rubrics, intended to show progression over a degree, allowed for institutions to modify the rubrics for their own local needs (Banta & Palomba, 2015; Goruling, 2016; Turbow & Evener, 2016). In addition, the rubric levels (Capstone, Milestones, and Benchmark) were not meant to be numerically significant (Grouling, 2017; McConnell & Rhodes, 2017). The VALUE rubrics were not created with the intention of utilizing them for institutional comparisons or to validate graduates' degrees although they have morphed into that role (Grouling, 2017). In fact, the AAC&U recently announced a new initiative, the VALUE Institute, that would continue to move the rubrics towards a role of national usage and comparison and external validation (American Association of Colleges and Universities, 2017; Grouling, 2017).

Other projects, lesser known in the United States, which have also attempted standardization work are as follows: the U.K.'s external examiner system, the Quality Verification System and the Learning and Teaching Standards Project in Australia (Coates, 2016). Even though the previously mentioned projects and the VALUE rubrics are at a multi-institutional level, a lot of isolation in their use still occurs (Coates, 2016). Several projects are attempting to implement the VALUE rubrics at a larger scale (Melguizo & Wainer, 2016). The Netherland's medical progress testing, the Australian Medical Assessment Collaboration (AMAC), Germany's Modelling and Measuring Competencies in Higher Education, the Higher Education Funding Council for England's collaborative projects for assessing learning gains in higher education, and the European Commission's Measuring and Comparing Achievements of

Learning Outcomes in Higher Education all include projects to determine commonality in outcomes and develop tools in an effort to standardize assessment of those outcomes (Coates, 2016). As Zaltkin-Troitschanskaia and Shavelson (2019) stated "The next generation of standardized assessments is currently being developed and validated for use in higher education in various countries" (p. 283) and it continues to grow and gain momentum.

The challenge with any standardization attempt is how to ensure reliability and validity across the wide-variety of assessment conditions within which the instruments will be expected to function (Coates, 2016). Regardless of the above-mentioned attempts, only a small body of evidence of organizations, institutions, or governments to successfully create a comprehensive model to measure student learning outcomes currently exists; yet, multiple calls for organizations, institutions, and governments to pair with researchers to develop a set of tools for a common set of outcomes have been made (Coates, 2016; Melguizo & Wainer, 2016; Office of Learning and Teaching, 2015). The unlikelihood that any one individual institution would have the time or resources to do the large-scale work needed is important to consider.

Healthcare Education Assessment

As previously discussed, assessment is fast becoming a necessity for higher education in the United States and abroad. The need for programs to be able to identify areas of improvement, prove student learning, and thus be accountable to students, families, and the public is changing how all of higher education structures their curriculum and report their value. In healthcare preparatory programs, the need for demonstrating achievement of learning of its graduates takes on additional importance (Fater, 2013; Murray et al., 2000). The most prominent reason for the added pressure is a push for transparency and accountability to the public that their healthcare providers are competent and well-trained to ensure quality and safety (Fater, 2013;

Greiner & Knebel, 2003). Biggs and Tang (2007) discuss that being able to assess "functional knowledge" takes on added importance for professionally-oriented programs, such as healthcare, to not only assess for skill-based achievement but for professionally-oriented qualities needed for long-term success in a field, such as problem solving, creativity, and life-long learning (p. 217). Healthcare educational organizations appear to agree with Biggs and Tang (2007). Programs need to ensure that students are ready to take the skills, knowledge, and abilities refined in the classroom and during clinical experiences and apply them to the complexities of the healthcare system (American Association of Colleges of Nursing, 2008). Alignment of the preparatory educational programs and future practice environments is essential in producing quality professionals (American Association of Colleges of Nursing, 2008). Currently, the means to demonstrate alignment and preparedness is through assessment.

Standardization attempts in healthcare programs. While to some areas of higher education, especially in the United States, standardization of student learning and programmatic outcomes may seem like a stifling of program and faculty autonomy and distinctiveness (Fain, 2015; Krachenberg, 1972; Leland & Moore, 2007), in healthcare preparatory programs, standardization is well accepted as necessary (American Association of Colleges of Nursing, 2008; American Academy of Physician Assistants, 2012; American Council on Graduate Medical Education, 2016; Fater, 2013; Greiner & Knebel, 2003). Since healthcare professions have an obligation to produce professionals with certain skills and aptitude for patient care and safety assurance (Fater, 2013; Fero et al., 2010), organizations must try to standardize the definitions of being a successful doctor, nurse, or athletic trainer across the board and let programs determine how to achieve the required outcomes in their graduates (Greiner & Knebel, 2003). The standardization of student learning outcomes, programmatic outcomes, and even assessment tools aids healthcare professions in monitoring the quality of the incoming professionals to their ranks and maintaining public transparency and trust (Greiner et al, 2003). Even within different healthcare professions, commonality of outcomes for all future healthcare professionals is needed (Greiner & Knebel, 2003). A review of current literature shows that the best-case scenario for healthcare education reform is a collective effort to define standard outcomes (Greiner & Knebel, 2003).

In 1998, the Association of American Medical Colleges initiated the use of common outcomes with their consensus statement that physicians must be altruistic, knowledgeable, skillful, and dutiful (Harden, Crosby, & Davis, 1999). From the relatively vague statements above has grown a variety of attempts to define the outcomes of healthcare professions across preparatory programs. The National Academy of Medicine, formerly known as the Institute of Medicine Board of Health Care Services (IOM), called for all healthcare professions to embrace five core competencies: to deliver patient-centered care, work as interprofessional teams, utilize evidence-based practice decision-making, incorporate quality improvement approaches, and perform healthcare informatics (Greiner & Knebel, 2003). The core competencies were considered the core knowledge that all healthcare professionals would need moving into the future of healthcare in the country. The IOM's document seemed to usher in standardization attempts in healthcare as programs and organizations were determined to show alignment to the IOM's five core competencies can be seen in the fabric of most standardized healthcare outcome attempts (American Association of Colleges of Nursing, 2008).

Programs as varied as nursing, graduate medical residencies, athletic training, and medical laboratory sciences professionals should be able to demonstrate mastery of the IOM's core competencies in their graduates (American Association of Colleges of Nursing, 2008;

American Council on Graduate Medical Education, 2016; Commission on Accreditation of Athletic Training Education, 2018a; Golemboski, Otto, & Morris, 2013). The potential continuity between various healthcare professions can "reduce [healthcare and education] costs as a result of better communication and coordination, with the process being streamlines and redundancies reduced" (Greiner & Knebel, 2003, p. 5).

While the IOM's core competencies call for some commonality in outcomes in order to ensure improved safety and competency in the healthcare system, they are meant to be a core list, but not exhaustive (Greiner & Knebel, 2003; Sauers et al., 2019). Each individual profession should have additional outcomes, labeled as competencies, essentials, or standards, that speak to the unique needs of that profession (Commission on Accreditation of Athletic Training Education, 2012, 2018a; Greiner & Knebel, 2003; Sauers et al., 2019). Even more individuality within standardization is added when each individual program is encouraged to create additional outcomes, perhaps tied to institutional and programmatic mission as well as to determine how content is delivered and assessed (American Association of Colleges of Nursing, 2008; Commission on Accreditation of Athletic Training Education, 2012, 2018a; Evans, 2010; Harden et al., 1999). Concerns over the strain on individual programs, financially or other, when attempting to fully implement the IOM's core competencies or other standardized outcomes still needs to be considered (Evans, 2010). Each profession has taken a unique approach to standardization of outcomes and the assessment of those outcomes, some of which are explored below.

ACGME. American Council on Graduate Medical Education (ACGME, 2016) has set up standardized student learning outcomes for their residency programs. ACGME outcomes are stated as part of the common program requirements and must be contained within the curriculum. Documentation of the alignment between competencies and assignments must be made available to residents (students) and the faculty. The competencies include medical skill-based competencies as well as professional development competencies, such as communication and professionalism. More of the specifics will be discussed in later sections of this literature review. The core competency document also specified the process by which assessment of the outcomes are to be performed, including formative and summative evaluation (American Council on Graduate Medical Education, 2016). ACGME also developed outcomes-based milestones that can be used to assess residents on their performance within the six ACGME core competencies. The inclusion of standardized assessment tools and criteria is taking the standardization of assessment one step further than some other areas of healthcare.

ACGME utilized the strength of their higher organizational influence and access to experts and stakeholders to offer standardization across the board. The document calls the outcomes milestones. The milestones were developed for each specialty in graduate medical education and were created by working groups convened by ACGME and representatives from the specialty boards American Board of Medical Specialties (ABMS), program directors, specialty college members, review committee members, residents, and others (American Council on Graduate Medical Education, 2017). By putting together working groups, the larger organization was able to conduct high level analyses and product design that individual institutions would not necessarily have been able to complete on their own.

ACGME (2017) developed the milestones to allow for the continual monitoring of programs, assisting the current site review processes as well as making public accountability a priority at the national level. In addition, the standardized milestones allow for the larger organization to assist programs in developing programmatic and curricular improvement tools by creating a community of research and practice that, again, individual programs would not necessarily be able to harness on their own (American Council on Graduate Medical Education, 2017). Since each specialty had the opportunity to develop their own working groups, including program administrators from across the nation, a level of expertise and individualization that is inherent in the standardized milestones was created (Jardine et al., 2017). Not only does standardization benefit individual programs, but allows for the overall strengthening of graduate medical education as a whole.

ACGME milestones are founded on the concepts of competency-based education, which have existed for decades in a variety of venues, such as business, industry, and teacher education (Jardine et al., 2017). Competency-based education is where measurement towards specific competencies, along with their knowledge, skills, and attitudes, is monitored through longitudinal assessment with opportunities for feedback and growth imbedded in the process (Jardine et al., 2017). ACGME began transitioning to competency-based education in 2009; through that process, they determined that milestones would help programs develop frameworks that could better ensure graduates provide high-quality care for their future patients (Jardine et al., 2017). ACGME believes that by standardizing their outcomes and assessment criteria, they can make better evidence-based educational improvement, which mirrors what individual healthcare professionals should be doing for their patient care. In addition, by standardizing assessment criteria, an additional layer of accountability to the public about the quality of graduate medical education is ensured (American Council on Graduate Medical Education, 2017). Since milestones are utilized by all ACGME-accredited programs, added guidance for programs to ensure high level of competence with the six ACGME core competencies is present.

ACGME also gives programs specifications regarding how to use the milestones to ensure compliance and continuity of interpretation across programs and specialty areas (Jardine et al., 2018). ACGME call for residents to perform self-assessment and the program to assess student progress over various points in their academic career in order for students to take ownership over their learning progression toward the various milestone levels. Students were an essential part of the creation of the milestones on the front end and are integrated in the assessment process through self-evaluations (Jardine et al., 2017). Competency-based education changes the focus from generalizations about student progress based on the level of the student in the program to the achievement of outcomes and puts the student at the center of the process.

Published for its residents and faculty, the ACGME's *Milestones Guidebook for Residents and Fellows* (Jardine et al., 2017) clearly articulates the goals of the standardized core competencies and how the milestone program affects several different stakeholders. To the students, the milestones provide a roadmap for the educational journey of the residency or fellowship, increase transparency of performance requirements, encourage self-assessment and self-directed learning, and facilitate better interaction with faculty for feedback opportunities by providing guidance on how to request such feedback and what feedback should focus on. To programs, the milestones should serve as a curricular and assessment development tool, guide the assessment committees (known as the Clinical Competency Committee's) on how to evaluate residents, lay out expectations of the program to students, support the program in their assessment endeavors, and provide opportunities to identify those students who are in danger of underperforming and allow for earlier intervention.

ACGME also recognizes how the milestones help themselves as an organization. Reporting of the milestone status by programs allows for continuous accreditation monitoring, allowing for lengthened site visit cycles, reducing workload and costs. They also allow the ACGME to be transparent with the public about their programs' competency outputs along with allowing for national-level quality improvement through evaluation and research. Finally, the milestones allow certification boards, separate organizations from the accrediting body of the ACGME, to enable research to improve education programs. Many healthcare accreditation and professional organizations are striving for multi-level goals, and the ACGME, with its national-level standardization attempts, has become a model for many.

Athletic Training. The CAATE has a set of educational standards that must be included in athletic training programs (Commission on Accreditation of Athletic Training Education, 2018a). The IOM's core competencies are incorporated into the CAATE standards, along with athletic training specific skills and other qualities or professional skills that are considered to be essential for a professional-level athletic trainer. The program administration must demonstrate that they include the fifty educational standards. The standards are not necessarily meant to all be programmatic level student learning outcomes, which is similar in other healthcare preparatory programs that have a high number of competencies. More information about the profession and educational experience of athletic training will be discussed later in this review.

Following the work of the ACGME, a research group recently published *The Milestones in Athletic Training* (Sauers et al., 2019). The group originally set out to define standards for residency programs in athletic training, but through their work, determined that *The Milestones* would be beneficial across all levels of athletic training education, including professional levels. The researchers utilized the ACGME *Milestones* as a template for the competencies to include in consideration with the CAATE *Standards* (2018a). While many are still in development, the researchers have created milestones for six general competencies, including sub-competencies, and eight specialty areas, based on residency specialties (Sauers et al., 2019). The competencies consist of patient care and procedural skills, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, as well as systems-based practice. The eight specialty competencies include prevention and wellness, urgent and emergent care, primary care, orthopaedics, rehabilitation, behavioral health, pediatrics, and performance enhancement. The authors state that *The Milestones in Athletic Training* are "designed for programs to use in ongoing review of individual (student, resident, fellow) performance…and describe the development of competence from an early learner up and beyond that expected for unsupervised, advanced, and aspiration practice" (p. 4). More on the structure of *The Milestones in Athletic Training* will be discussed later in this review. One major difference between the ACGME and *The Milestones in Athletic Training* is that *The Milestones in Athletic Training* are "not a required element of the CAATE standards for professional, post-profession, or residency programs" (p. 9). The authors do state that the document is one manner for programs to ensure student progression through the educational standards as the competencies and sub-competencies of *The Milestones in Athletic Training* have been matched to the education standards' core competencies. Table 1 (below) demonstrates the mapping of the core competencies of the CAATE.

Table 1

*The Athletic Training Milestones Mapped to CAATE Core Competencies (*Sauers et al., 2019)

CAATE Core Competencies	AT Milestones Competencies and Sub-competencies
Patient-centered care	Patient-Care and Procedural Skills (PC-1,2) Interpersonal and Communication Skills (ICS-1,2)
Evidence-Based Practice	Practice-Based Learning and Improvement (PBLI-1) Medical Knowledge (MK-3)
Health Care Informatics	Interpersonal and Communication Skills (ICS-4) Systems-Based Practice (SBP-6)
Interprofessional Practice and Education	Patient-Care and Procedural Skills (PC-7) Interpersonal and Communication Skills (ICS-3) Professionalism (PROF-2) Systems-Based Practice (SBP-1,2,3,4)
Quality Improvement	Practice-Based Learning and Improvement (PBLI-2,3,4) Systems-Based Practice (SBP-1,2,3,4)
Professionalism	Professionalism (PROF-1,2,3,4)

Nursing. Nursing has many levels, certifications, and areas of expertise. One of the largest healthcare professions also has one of the strongest examples of standardized student learning outcomes, namely undergraduate nursing education (American Association of Colleges of Nursing, 2008). The Essentials of Baccalaureate Education for Professional Nursing Practice (2008) created a framework for all baccalaureate nursing programs to follow in determining their individual curriculum. At its heart are the recommendations from the IOM's core competencies (Morris & Hancock, 2013). In addition, the American Association of Colleges of Nursing (AACN) considered stakeholders' recommendations of what nursing education in the 21st century should look like and how education can translate those goals into reality. The document is intended to provide programs with the expected outcomes of their graduates. Programs are charged with developing curricula that will lead to the development and eventual achievement of their outcomes.

The AACN is leading the effort by promoting and leading the dialogue on how to continue to adapt the educational preparatory program to the complexity seen in nursing practice. The AACN's leadership role in "crafting a preferred vision for nursing education" (American Association of Colleges of Nursing, 2008, p. 6) allows individual programs to benefit from the time and manpower of a larger organization in setting the outcomes that are most essential to the profession and provides a wider view of the nursing profession. The AACN is in a position to see how baccalaureate, master's, and doctoral nursing program curricula can scaffold each other to produce professionals who have distinctive outcomes that build on the previous level. Individual programs would not necessarily be able to see the larger picture of the profession as well if left to establish their own student learning outcomes (Raup, King, Hughes, & Faidley, 2010). The document is built to provide rationale for each outcome and present the skills, knowledge, and abilities needed for the entry-level nursing graduate. In addition, this document allows programs to develop their own outcomes and course objectives that align to the professional outcomes and assists faculty in making them measurable and specific. The specific essentials will be discussed further in this literature review regarding student learning outcomes cited by healthcare preparatory programs.

On a national scale, in response to the IOM's core competencies, the Qualities and Safety Education for Nurses initiative was developed, including all five IOM's core competencies in addition to safety, as the sixth competency (Fater, 2013). Individual state nursing boards, such as Massachusetts, have also created their own standards based on the national initiatives and education accreditation standards, but specifically targeting the needs of their unique populations. The state licensing board standards are not only for students in education programs, but also for preceptorships and training/support programming for new hires, including skills, knowledge, and attitudes tied to each competency. Fater (2013) found that inadequate opportunities existed within curricula of programs to develop strengths in all the domains of the Massachusetts Department of Higher Education Nurse of the Future Nursing Core Competencies. The concern over trying to implement standardized competencies, especially with several layers of administration and a lack of specific guidance on how to implement, is one seen in many professions (Morin & Bellack, 2015).

Other countries have also implemented standardized competencies for their nursing programs. Ireland has competencies in five domains (professional and ethical practice, holistic approaches to care, interpersonal relationships, organization and management of care, and personal and professional development) for their Bachelor of Science nursing program (McCarthy & Murphy, 2007). Each university has the ability to determine how and when to assess the five domains. Sweden has also developed nursing clinical education standards based on higher education regulations and international guidelines (Löfmark & Thorell-Ekstrand, 2000; Wu et al., 2015). Scotland and Australia have standards as well (Missen et al., 2016); however, even with the standards, Australia was seeing a variation in the range of clinical skills taught in programs, leading to discrepancies in graduate preparedness and calling for an increased standardization in the *means of assessing* the outcomes rather than in the outcomes themselves (Missen et al., 2016). Signapore also has standard outcomes for both students and current nursing professionals to maintain their competence (Wu et al., 2015).

In a study on the implementation of the IOM's core competencies in one U.S. curricular program, Morris and Hancock (2013) found that the IOM's core competencies were evident (56% of course objectives, 60% of classroom objectives, and 51% of clinical objectives related to a core competencies), yet there was a disconnect between faculty and students' perspectives on their use and integration. Students saw barriers in implementing the competencies, while faculty cited opportunities. Morris and Hancok (2013) demonstrated that even when standardized outcomes are present, their use and impression of use might vary depending on perspective. When relying on site visits and interviews for external accreditation, all stakeholders must be able to determine the inclusion and assessment of outcomes, whether those outcomes are the IOM's core competencies or individual professional or programmatic outcomes (Morin & Bellack, 2015; Morris & Hancock, 2013).

Physician Assistant. The physician assistant (PA) profession is a great demonstration of an organizational-level standardization of outcomes. The National Commission on Certification of Physician Assistants, in collaboration with the Accreditation Review Commission on Education for the Physician Assistant (ARC—PA), American Academy of Physician Assistants (AAPA), and the PAEA, defined the physician assistant competencies in response to similar efforts in other healthcare professions for the educational programs (American Academy of Physician Assistants, 2012). The *Competencies for the Physician Assistant Profession* is a document to be utilized by physician assistant organizations and individual physician assistants to map competency in the profession (American Academy of Physician Assistants, 2012). One uniqueness about the *Competencies for the Physician Assistant Profession* is that the achievement of the competencies is not necessarily just within the educational programs, but it is expected to be developed and mastered when in practice (American Academy of Physician Assistants, 2012). The PAEA Assessment's Core Tasks and Learning Objectives are seen as an over-arching set of outcomes, with individual programs expected to have additional objectives (Physician Assistant Education Association, 2018a). Programs are encouraged to tie the Core Tasks and Learning Objectives to individual program-level student learning objectives.

Not only have the physician assistant professional organizations defined standardized outcomes with the Core Tasks and Learning Objectives and Competencies for the PA Profession, they have also worked to create tools to assess the progress of their students into professionals. The PAEA Assessment team is involved with the Association of Test Publishers, a nonprofit membership organization that represents “providers of assessment, selection, certification, licensing, and educational and clinical tools” (Ziegler, 2018, p. 1). The PAEA has published several versions of a self-assessment tool (Physician Assistant Education Association, 2018b; Ziegler, 2018). The success of the PAEA’s tools are attributed to the national-level support and the recruitment of many volunteers (Ziegler, 2018). The PAEA is also adding new tools, specifically the End of Curriculum™ and the End of Rotation™ in 2020 (Physician Assistant Education Association, 2018b; Ziegler, 2018). Currently, the PAEA’s tools are intended for self-assessment and not for programs to utilize as summative assessment tools. Along with the PAEA’s tools, a Sample Competency Tool was developed and distributed to partner with the Competencies for the PA Profession (American Academy of Physician Assistants, 2014). The Competencies for the PA Profession document sets milestones of unacceptable, poor, satisfactory, very good, or excellent. The tool could be utilized in a variety of settings, including simulations, standardized patients, direct patient care, or didactically with case studies or other techniques.

In addition, the PAEA sends out a didactic curriculum survey every several years to monitor the courses and material taught in the didactic portion of physician assistant programs and how the information is assessed (Physician Assistant Education Association, 2018a). The following areas are taught and assessed at various levels in physician assistant programs: basic medical sciences (i.e., anatomy, genetics, medical terminology, microbiology, molecular basis of disease, pathophysiology, pharmacology), clinical medicine skills (i.e., history or interview skills, laboratory medicine or diagnostics, physical assessment skills, technical skills or procedures, and clinical decision-making), behavioral and social sciences (i.e., counseling, psychological development, and psychological and cultural health factors), health policy and professional practice topics (i.e., coding and billing, cultural and socioeconomic issues, medical ethics, professional issues, public health topics and quality improvement and patient safety), and research-based information (i.e., evidence-based medicine, epidemiology, and research methodology).

Through clinical skills labs, patient or case-based learning, simulations, and/or preceptor interaction, the survey data provides an interesting look at the location of teaching and assessment of many subjects between didactic and clinical education (Scott et al., 2012). According to the 2010 and 2016 surveys, certain topics, especially clinical skills, lend themselves more appropriately to teaching and assessment in clinical education (Physician Assistant Education Association, 2018a; Scott et al., 2012). As the professional education of physician assistants have continued to grow, the organization continues to update the didactic curriculum survey in order to gain more information about current practice across all programs and share that information with their stakeholders (Scott et al., 2012). Understanding didactic topic trends can help the PAEA and other physician assistant working groups to develop tools to assess the most frequently cited areas that will work in the most common environments.

Dental Hygiene. Dental hygiene preparatory programs have implemented a competency-based curriculum since 2000 with their own accrediting body, the Commission on Dental Accreditation (CODA) (Gadbury-Amyot et al., 2014). The standards put out by CODA include skills, knowledge, and professional values required of entry-level professionals. Some examples of the professional values cited are critical thinking, self-assessment, and ethical reasoning. In addition, the American Dental Education Associations' Commission on Change and Innovation in Dental Education outlines eight core principles to help move the development of curriculum forward.

Pharmacy. The work in pharmacy education to define competencies for accreditation purposes has revealed an overlap with the medical field; in fact, the IOM's core competencies were created from monitoring how pharmacy and the medical field were incorporating competency assessment into their programs (Greiner & Knebel, 2003). In 1997, the American Council on Pharmaceutical Education (ACPE) defined 18 professional competencies after a decade of rethinking how they prepared their professionals for practice. Even with the early induction into competency-based education and standardization, Zeind et al. (2012) found that pharmacy programs, in the post-IOM's core competencies era, needed to have a more unified commitment to incorporating all of the IOM's core competencies equally. Evidence-based practice and patient-centered care were well entrenched; while health informatics, interdisciplinary teaming, and quality improvement were implemented less.

Zeind et al. (2012) also compared the desire to incorporate the IOM's core competencies with actual inclusion and found that over 80% of the programs surveyed desired to incorporate each of the competencies, but a significantly lower percentage of programs were incorporated them for each of the competencies. The authors attributed the variations identified in the pharmacy programs to a lack of national-level guidance in incorporating the IOM's core competencies. The authors called for the national organization to help to weed out unnecessary variations and duplications across programs to streamline the assessment processes. In addition, the variability of the clinical educational experiences for pharmacy students, as with other healthcare preparatory programs, complicates the standardized incorporation of the competencies and programs could use assistance in developing instructional mechanisms and assessment tools that can be flexible enough to adjust to the clinical environment. As discussed in other healthcare areas, sharing and promoting successful models to other programs can help the entire profession grow and develop. A limitation to the Zeind et al. (2012) study, and many similar studies within other healthcare programs, is that the survey just asked about the incorporation of the competencies and not a true assessment.

Physical Therapy. Physical therapy (PT), similar to other healthcare preparatory programs, includes didactic and clinical experiences to ensure competency in their graduates (Luedtke-Hoffmann et al., 2012). PT, which is one of the closest related healthcare professions to athletic training, has made some strides in reporting outcomes and utilizing those outcomes to develop standardized and tested tools for all their programs (English et al., 2004). The American Physical Therapists Association (APTA) and the Commission on Accreditation in Physical Therapy Education (CAPTE) have created several documents to determine standards for their graduates in clinical skills and professional skills (McCallum, Mosher, Jacobson, Gallivan, & Giuffre, 2013). For clinical skills, the APTA released the Guidelines and Self-Assessments for Clinical Education, meant to help lead development, implementation, and assessment of clinical education in PT preparatory programs. The APTA created seven core values to underpin the professional skills of the Doctorate of PT degree, accountability, altruism, compassion and caring, excellence, integrity, professional duty, and social responsibility (Hayward & Blackmer, 2010).

The Physical Therapy Clinical Education Principles document, by the APTA, is also meant to help consensus standards for clinical education (McCallum et al., 2013). The CAPTE ultimate defines the minimum set of education standards, both didactically and clinically. The PT profession also incorporates the IOM's core competencies into their educational programs (Golemboski et al., 2013). Multiple studies have shown that, even with some standard guidelines in place, variation in the implementation across programs still occurs (Golemboski et al., 2013; Hayward & Blackmer, 2010; McCallum et al., 2013). As with other healthcare preparatory programs, the ultimate outcome of PT programs is for students to pass the national certification exam, the National Physical Therapist Examination (NPTE) (Luedtke-Hoffmann et al., 2012).

The APTA developed the Clinical Performance Instrument (CPI) in 1997; this tool is available nationally to their preparatory programs, and was created due to the reported variability in types and quality of assessment tools that were being utilized across the physical therapy programs (English et al., 2004). In 2000, 89.6% of the programs that responded to a survey (75% of all PT programs) were utilizing the CPI; the use was regionally dependent. Even with a standardized tool, programs vary in how they tie the CPI to grades and in the environments in which they utilize the CPI. Of the respondents, about two-thirds were satisfied with the CPI; the dissatisfied respondents requested clarification on definitions for outcomes and the assessments. The Physical Therapist Manual for the Assessment of Clinical Skills, developed by the Texas Consortium for Physical Therapy Clinical Education, was created to guide programs in assessing the standards of their students; as of 2012, this manual was utilized in three states (Luedtke-Hoffmann et al., 2012). The APTA also developed the Professionalism in Physical Therapy Core Values (PPTCV) instrument in order to allow self-assessment of the seven core values (Luedtke-Hoffmann et al., 2012).

Even with the many attempts to provide guidance and tools to programs, McCallum et al. (2013) still call for the development of national research agendas to facilitate the development of outcomes and assessment strategies across programs. Future studies of assessment standards and tools in any related healthcare field would help preparatory healthcare programs to be more thorough and accurate in their assessment plans.

Physiotherapy. Physiotherapy is an international profession of evaluation and treatment of musculoskeletal and neurological conditions; it has many similarities with PT and athletic training. Physiotherapy training programs aim to develop and measure skills, knowledge, and professional qualities, both didactically and in clinical education (Jones & Sheppard, 2012). Considerable differences exist in training programs across the world. However, some countries, such as Australia and Italy, have standardized the outcomes of the profession's preparatory programs, and some have developed assessment tools (Jones & Sheppard, 2012; Trede et al., 2015). In Italy, a core curriculum has been designed that includes prevention, treatment and rehabilitation, therapeutic education, training and self-development, evidence-based practice, professional responsibility, leading and managing, and communication and relationship building (Trede et al., 2015). Some standardized tools developed for physiotherapy preparatory programs include the CPI, Clinical Internship Evaluation Tool (CIET), Assessment of Physiotherapy Practice (APP), and Common Assessment Form (CAF) (Keating et al., 2009). Keating et al. (2009) utilized the development of the APP as an example of a thorough process for creating and vetting a standardized assessment instrument; once again, more work should be done for other preparatory healthcare programs in the development of valid and reliable tools.

Speech Pathology. The field of speech pathology has also developed some standardized tools for competency assessment in clinical education environments, consisting of seven occupational clinical skills and four generic professional skills (lifelong learning, communication, clinical reasoning, and professionalism) (Ho et al., 2014; Keating et al., 2009).

Mastery of the four generic professional skills are essential to successfully completing the clinical skills. The Competency Assessment in Speech Pathology (COMPASS), developed in Australia but applied globally, has been found valid and reliable. In addition, the results of the COMPASS have been correlated with the results of another common assessment method, problem-based learning tutorials. The correlation between the two tools has helped to validate the use of the standardized problem-based learning tutorials in a Hong Kong speech pathology program (Ho et al., 2014).

Outcomes of healthcare programs. Within healthcare preparatory programs, students are expected to attain many clinical skills ("technical skills"), as well as develop professional behaviors and attitudes ("nontechnical skills") (Missen et al., 2016) that will lead to them being productive, successful professionals upon degree completion. Many student learning outcomes are inherent within the didactic and clinical education components of preparatory healthcare programs. The varied student learning outcomes can be linked specifically to classroom or clinical experiences or linked to overall educational experience, either to both didactic and clinical experiences or without being designated to either. Some of the student learning outcomes have been defined due to standardization attempts (i.e., the IOM's core competencies), while others have been attributed through research or current practice.

Appendix A features a table of possible student learning outcomes that preparatory healthcare programs cite based on the literature. Additional student learning outcomes might be developed by individual programs. However, the outcomes reviewed in Appendix A are based on a thorough review of literature, and most other possible student learning outcomes could be considered to fit in the categories described in Appendix A. The student learning outcomes of preparatory healthcare programs tend to fall into these general categories: Acceptance of

Criticism/Feedback, Adaptability/Resilience, Altruism/Honesty/Integrity, Career Preparedness/Employability, Certification/Licensure Exam Preparedness, Clinical Skills Development, Confidence, Confidentiality/Privacy, Critical Thinking/Problem Solving/Decision-Making/Clinical Reasoning/Clinical Judgement, Cultural Sensitivity/Competence, Discipline-Specific Knowledge/Medical Knowledge, Education of Others, Empathy/Compassion/Caring, End of Life Care, Evidence-Based Practice/Information Literacy, Genetic and Genomics, Healthcare Informatics, Initiative, Interpersonal and Communication Skills (written, oral, nonverbal), Interprofessional Practice and Education/Working in Interdisciplinary Teams/Team Work, Leadership, Legal/Ethical Practice, Life-long Learning/Personal Development, Patient-Centered Care, Patient Safety, Practice Across the Lifespan, Prevention of Injury/Illness and Health Promotion, Professionalism, Quality Improvement, Self-Efficacy/Self-Reflection, and Systems-based Practice/Healthcare Systems Knowledge.

Assessment measures in healthcare programs. Healthcare preparatory programs take a variety of approaches to assessment of their students. The goal of assessment is usually to ensure competency of graduates, which includes the knowledge, skills, attitudes and performance needed for independent practice (American Council on Graduate Medical Education, 2017; Middlemas & Hensal, 2009; Murray et al., 2000; Thompson et al., 2014). As stated earlier, external accreditation or national organizations will often stipulate the assessment processes, with the goal of increasing transparency in expectations, supporting self-directed learning, and improving feedback for professional growth and life-long learning (American Council on Graduate Medical Education, 2017). Organizations might dictate the required procedure; for example, the American Council on Graduate Medical Education (2016) stipulates that assessment should utilize a clinical competency committee composed of three faculty members who have directly observed the residents providing patient care. The clinical competency committee is responsible for reviewing the residents' formative and summative assessments and advising the program director on resident progress. Professional and educational organizations can also give guidance on the type of content that should be included in the curriculum (American Association of Colleges of Nursing, 2008).

Another area that organizations may include the type of experiences and educational opportunities required to become competent for independent practice. The type of experience may include clinical immersion experiences, which provide opportunities for clinical reasoning and utilizing skills, or other opportunities to apply declarative knowledge to real clinical situations, thus enhancing functional knowledge (American Association of Colleges of Nursing, 2008; Biggs & Tang, 2007). Other areas that organizations may stipulate would be to allow for program individuality and simply recommend a plan of assessment, execution of that plan, and improvements made based on the results (Commission on Accreditation of Athletic Training Education, 2012).

Healthcare preparatory programs typically provide opportunities for formative assessment, often completed during or at the end of clinical or other educational experiences (American Council on Graduate Medical Education, 2016; Sauers et al., 2019). Formative assessment is usually based on specific program objectives for that educational segment; it usually includes both skills and professional development qualities, such as interpersonal skill, communication skills and professionalism. The formative assessments allow feedback to the students, a check-in for the program faculty, and an opportunity for diverse feedback of the for the student (usually utilizing multiple faculty evaluators, patients, peers, and the student him or herself) (American Council on Graduate Medical Education, 2016, 2017; Sauers et al., 2019).

The tools utilized by preparatory healthcare programs can be standardized for all programs from an external source, be designed by the program but standardized across all students and all experiences, and/or be more flexible in nature (such as conversations, interviews, open-ended surveys or 360-degree feedback experiences).

In addition, due to the nature of external accreditation, as a means to ensure patient safety, programs typically are required to submit summative evaluations. The summative requirements also may be standardized by the organizations, such as the ACGME Milestones (2016, 2017), or be stipulated by the program but documented and reported to stakeholders (Commission on Accreditation of Athletic Training Education, 2012; Sauers et al., 2019). Usually, summative assessments are to ensure that that student is competent to enter practice without direct supervision (American Council on Graduate Medical Education, 2016; Sauers et al., 2019). Many times, the formative assessment (i.e., feedback) can be looped into the summative assessment; this can be done by showing growth on student learning outcomes throughout the student's experience while building to the summative assessment of the student's abilities, knowledge, and attitudes (Biggs & Tang, 2007).

Many healthcare preparatory programs follow the theory of competency-based education, where progress is documented toward specific competencies, including requisite knowledge, skills, and attitudes (Jardine et al., 2017; Sauers et al., 2019). Competency-based education was first promoted by the World Health Organization in 1978 and has become a model for healthcare education. Even within competency-based education, the specific measures and tools utilized to document the attainment of competencies may or may not be specified by an external source (Murray et al., 2000). The measurements differ widely based on the program's philosophy of learning and teaching, the formative or summative goal of the assessment, or the nature of the student learning outcome (Biggs & Tang, 2007).

As previously stated, assessment strategies can be indirect (e.g., assessment of perceptions via self-reflection, peer feedback, and preceptor/supervisor evaluation) (Carwile & Murrell, 2002; English et al., 2015; Trede et al., 2015) or direct (e.g., learning inventories or assessment of student reflection products [journaling or portfolios]) (Cone et al., 2016; Marchigiano et al., 2011; Mazerolle et al, 2015). The assessment of more subjective outcomes, common in the "art of healthcare" is especially challenging (Raup et al., 2010, p.2). Various authors call for some combination of objective and subjective assessment in clinical education, which can allow for the unpredictability of patient care (McCarthy & Murphy, 2007; Thompson et al., 2009; Ulfavarson & Oxelmark, 2012). Clinical competency, a high order goal for preparatory healthcare programs, is being assessed with a variety of approaches such as observed clinical situations, simulated patients, patient management problems (problem-based learning and/or case studies), checklists, written and objective exams, and oral examinations (McCarthy & Murphy, 2007; Middlemas & Hensal, 2009; Ulfavarson & Oxelmark, 2012). Direct and indirect approaches have their own reliability, validity, and generalizability advantages and concerns (McCarthy & Murphy, 2007; Middlemas & Hensal, 2009). The varying types of measurements are discussed below.

Practicums or direct patient care. Clinical experiences are a necessary part of healthcare education and offer an opportunity to assess students in an authentic environment; however, assessment in the clinical environment is incredibly difficult (Biggs & Tang, 2007; Cunningham, Wright, & Baird, 2015; McCarthy & Murphy, 2007; Thompson, et al., 2014). Trede et al. (2015) speculated three reasons for the difficulty of assessing during clinical experiences: (1) what is being practiced is usually not academic knowledge; instead it is situational and not consistent, (2) preceptors are really practitioners and not educators or assessors by trade, and (3) the program administrators and faculty are not present in the clinical experience environments to perform assessments and they have to rely on the practitioners for assessment. Programs cannot ensure identical clinical experiences for all of their students, and the unpredictability leads to difficulty in ensuring reliable and valid assessment tools (Cunningham et al., 2015; Middlemas & Hensal, 2009; Thompson et al., 2014). The combination of patient, student, educator, the unique and complex nature of the patient circumstances, and the students' past experience with the particular case collectively influence student performance and complicate the assessment process (Keating et al., 2009).

In clinical education, judgements are made based on limited number of observations or moments in time and may or may not be representative of actual clinical practice. The randomness of clinical encounters makes the validation of measures even more crucial (McCarthy & Murphy, 2007; Thompson et al., 2014). Traditionally, validity is established for an assessment tool by one of four mechanisms – content (professional or stakeholder experience on how the items are interpreted by assessors), internal structure (pattern of scores such as factor analysis, item correlations, Cronbach alpha, etc.), relationship to other variables (comparing total scores to some global rating), and professional feedback (graduates' or employers' opinions correlate to scores on the tool) (Keating et al., 2009). However, the typical validity and reliability measurements of assessment tools may be inaccurate for the clinical environment, ignoring the foundational need of preparatory healthcare programs to combine psychomotor skills with cognitive skills of clinical decision-making or critical thinking (Thompson et al., 2014).

Students and preceptors both understand and feel the complexity of assessment and feedback. Students want not only consistent feedback and assessment from their preceptors, but also flexibility and role-modeling (Aronson et al., 2015; Harris, 1992; Trede et al., 2015). Feedback can be experienced as critical or negative (Beer & Mårtensson, 2015; Trede et al., 2015). In addition, if a grade is given for a clinical experience, along with qualitative feedback, students often focus on the grade over the feedback (Scriber et al., 2010); they commonly have a harder time identifying the expectations for the grade (Trede et al., 2015). Although preceptors want standardized assessment forms, they also state they would rather provide unstructured feedback to students than be responsible for assessment (Carwile & Murrell, 2002; Cunningham et al., 2015; Trede et al., 2015). Students also appreciate knowing the objectives ahead of time. Having foreknowledge of objectives can improve the interactions students have with their evaluators during the assessment and throughout the clinical experience (Carwile & Murrell, 2002; Cunningham et al., 2015). Preceptors also find that objectively assessing clinical skills is easier than assessing professional qualities or other more holistic approaches. When asked to assess both clinical skills and the professional qualities of students, preceptors tend to focus more on the professional qualities, such as timeliness, being engaged, and likability, than the clinical skills (McCarthy & Murphy, 2007; Middlemas & Hensal, 2009; Scriber et al., 2010; Thompson et al., 2014). At the extreme, some preceptors and educators believe that any form of student assessment results in power imbalances in relationships that are unproductive for learning; however, the need for some sort of assessment in clinical practice is usually acknowledged (Trede et al., 2015).

With any of the direct observation assessments, attempting to remove the human aspects of the student/preceptor relationship, even with standardized objectives, can be difficult

(Cunningham et al., 2015). Through their research on Occupational Therapy programs in Australia, Beer and Mårtensson (2015) found that supervisors tend to underrate high performing students and overrate low performing students when utilizing such preceptor evaluations. Preceptors are also in split roles, serving as teachers and clinicians. Preceptors, as healthcare providers, need to give the priority to patient care, which can cause variations in their evaluative abilities (Cunningham et al., 2015; Middlemas & Hensal, 2009). Gauthier (2019) calls for preceptors and educators to use the tools that are part of patient care for assessment, such as reviewing patient notes and discharge summaries, in order to assess the medical student's skills but also communication and care plan development. The author calls for the validation of the authentic patient care documentation as a form of student learning assessment. "By understanding and validating these assessment opportunities, we stand to drastically strengthen our programmes of assessment. What supervisors observe matters, but what they assess while observing matters more" (Gauthier, 2019, p. 643).

Keating et al. (2009) categorized six bias concerns with individual evaluation during clinical experiences: low levels decision rules, devil effect, halo effect, confirmation bias, anchoring bias, and outcome bias. Low levels decision rules occur when supervisors take a position without reflecting on the specific goals of the situation. The devil effect is when a negative view about a trait in a student influences the preceptor's approach to the student in all interactions and evaluations. On the opposite end of the spectrum, the halo effect is when the preceptor has a positive view of the student without taking into account the student's strength as a clinician. The halo effect would bias the preceptor to positive evaluations of the student despite the student's skill level. Confirmation bias sustains the devil or halo effect. When evaluating, the tendency is to confirm the existing belief, which makes breaking the cycle more difficult. Anchoring bias occurs when the evaluator, trying to define reference points to make evaluation easier, compares students with others instead of comparing the skill or quality to a target. Finally, outcome bias is when a preceptor is more apt to evaluate a student harshly if they are aware of a negative outcome, even if it is unrelated to the current assessment (Keating et al., 2009).

Middlemas and Hensal (2009) found several examples of bias in clinical education assessment. Preceptor development, where preceptors are trained on assessment, teaching, and mentoring skills, seems to be key in allowing a program to be able to use the preceptor as the assessor of student learning during clinical experiences (Beer & Mårtensson, 2015; Bomar & Mulvihill, 2016; Cunningham et al., 2015; Löfmark & Thorell-Ekstrand, 2000; McCarthy & Murphy, 2007; Middlemas & Hensal, 2009; Nottingham, 2014, 2015; Trede et al., 2015). However, the amount and means of training required for quality assessment is not agreed upon (Trede et al., 2015). Many of the studies that examine evaluation in direct patient care are qualitative with small and convenience samples, so generalization should be done cautiously (McCarthy & Murphy, 2007; Trede et al., 2015).

Most healthcare preparatory programs create some tool for supervisors or preceptors to assess students in order to limit as many biases as possible. The tools are often created locally and not always studied for reliability, validity or generalizability (Carwile & Murrell, 2002; English et al., 2004; Ho et al., 2014; Keating et al., 2009; Middlemas & Hensal, 2009; Thompson et al, 2014; Wu et al., 2015). Literature on assessment in clinical education demonstrates that the process to establish validity of such tools is usually time- and resource-consuming, requiring gathering stakeholders for focus groups, analyzing patterns of scores for cohorts in order to run factor analyses, and comparing to other validated tools (Keating et al., 2009; McCarthy &

Murphy, 2007). Preceptor evaluation, usually administered at a mid-point and end-point of a clinical experience or practicum, requires preceptors to reflect on student skills and/or qualities (Aronson et al., 2015; Carwile & Murrell, 2002; Harris, 1992; Keating et al., 2009; Löfmark & Thorell-Ekstrand, 2000; Middlemas & Hensal, 2009; Scriber et al., 2010; Thompson et al., 2014; Wilkinson, Schafer, Hewett, Eley, & Swanson, 2014).

Competency assessment tools are usually pre-determined rubrics or other scales to assess skills, both patient-care and professional skills and qualities, like decision-making, professionalism, or communication skills in the moment of demonstration (American Academy of Physician Assistants, 2014; Löfmark & Thorell-Ekstrand, 2000; Luedtke-Hoffmann et al., 2012; McCarthy & Murphy, 2007; Middlemas & Hensal, 2009; Thompson et al, 2014). In direct patient care situations, standardized assessments of clinical skills and professional skills/qualities, such as clinical decision-making and problem-solving, are also known as the behavioral approach to performance assessment. The behavioral approach to performance assessment serves as an attempt to reduce bias into the evaluation, though as previously discussed, this does not always occur as theorized (Thompson et al., 2014). One lesser utilized form of assessment in clinical experiences is patient assessment of student performance, which has been shown to be a viable form of formative feedback from a stakeholder (Keating et al., 2009; Murray et al., 2000).

Little current evidence in the effectiveness of utilizing any of the above approaches in clinical education exists, especially during direct patient care (McCarthy & Murphy, 2007; Middlemas & Hensal, 2009). In order to ease the workload on individual programs and to allow for benchmarking attempts across programs, several organizations and researchers have started developing more standardized tools meant to be utilized across programs (American Academy of

Physician Assistants, 2014; English et al., 2004; Ho et al., 2014; Keating et al., 2009; McCarthy & Murphy, 2007; Wu et al., 2015).

In a study within one AT educational program, preceptors and faculty members were trained on utilizing a four-point clinical skill assessment form, which had been validated with content validity (Nottingham, 2014). The preceptors and faculty members were then asked to assess student videos of them performing clinical skills at two different time points to check for reliability. Nottingham (2014) found that the interrater reliability was poor while intrarater reliability was good. The preceptors and faculty members had a harder time assessing students on skills they don't utilize regularly in their clinical practice. Nottingham (year), as a result of his study, calledfor clear evaluation guidelines, training, and familiarity of the preceptors with the students' knowledge and academic level to accurately evaluate student performance.

In a study on learning styles of athletic training students, researchers found that students are predominately Divergers, meaning that they need concrete experiences and reflective observation to learn best (Thon & Hansen, 2015). Due to the predominance of Divergers in the athletic training programs, clinical experiences appear to be essential in athletic training education. Clinical experiences allow students to work in a team environment and learn from one another and their supervisors, while being exposed to mentors (Thon & Hansen, 2015). Walker et al (2008) found in a survey of athletic training program directors and clinical education coordinators (59.19% response rate) that 89.4% of programs evaluated at least one clinical proficiency (a cumulative psychomotor skill and professional quality assessment of athletic training students) in real time. However, only 27.0% of programs evaluated as many as 50% of the clinical proficiencies in real time. The results of this survey demonstrate that many programs are utilizing some form of simulation (95% of programs) or standardized patients (56%

of programs) to assess the skills. Some reasons for not utilizing more real-time assessments included the timing of the clinical experiences with the student's education, the availability of experiences and patients during which students can take a lead role, the content of the clinical proficiency not regularly appearing in real-time clinical experiences (i.e., fitness and nutritional counseling/planning, psychosocial interventions and referral), and limitations of patient populations and clinical sites to give a wide-variety of experiences.

ACGME (2016) provides clear instructions to their programs in how and when to evaluate residents. The purpose of utilizing the Milestones evolution approach is multifaceted (Jardine et al., 2017). For the students, the Milestones provide a transparent plan for development and encourage feedback-seeking behaviors in the students, both by themselves and from their supervisors. For program administers and faculty, the Milestones guide the curriculum and allow for better assessment and recognition of students in need for more support. For the ACGME, they enable continuous monitoring of their programs and allow for accountability to the public of outcome achievement of graduates. Finally, for the certification boards, the Milestones allow for research to improve the educational programs and tie certification to skills achieved in residency.

For formative and summative evaluation of the Milestones, faculty are required to evaluate the resident's performance during each clinical experience or other similar educational assignment (especially in the final experience for the summative evaluation) and document the progress (American Council on Graduate Medical Education, 2016). Programs must provide objective assessments of competence in the Milestone categories – patient care and procedural skills, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice (specific to specialty). The

Milestones have five levels of development, ranging from beginning learner to stretch goals of proficiency (aspirational) (Jardine et al., 2017). A level 4 is considered to be competence in the skills, knowledge, or attitudes that a resident should achieve upon graduation. Every rater should be able to directly observe the student's interaction with patients in order to assess each of the competencies.

Each program has a committee that must collate and review all the Milestone assessments for a resident, meeting twice a year to discuss the ratings and ensure proper progress. The emphasis on the ability to assess students during residency with patient care is vital to verify that the "resident has demonstrated sufficient competence to enter practice without direct supervision" (American Council on Graduate Medical Education, 2016, p. 14).

As stated previously, a recent addition to the athletic training assessment literature includes the development of *The Milestones in Athletic Training*, mirroring the ACGME *Milestones* (Sauers et al., 2019). *The Milestones in Athletic Training* aim to assess the six general competency areas and the eight specialty competencies. *The Milestones in Athletic Training* are structured to allow for the assessment of students and professionals of all levels of practice from critical deficiencies to professional students' development levels (level 1 [early learner] and 2 [advancing learner]) to ready for unsupervised practice (level 3 [graduate of professional program]) to ready for advanced practice (level 4[graduate of post-professional program]) and aspirational (level 5). Figure 2 shows the general structure of the milestones and what each level entails. Figure 3 displays an example of a milestone, specifically assessing the competency of "Patient-Care and Procedural Skill" and the sub-competency of "Gathers and synthesizes essential and accurate information to define each patient's clinical problem(s)" (Sauers et al., 2019p. 12).

<table>
<tr><th colspan="6">General Competency (e.g., Medical Knowledge): Sub-Competency Stated (Reference to corresponding ACGME milestone)</th></tr>
<tr><th>Critical Deficiencies</th><th>Level 1</th><th>Level 2</th><th>Level 3
(Ready for Unsupervised Practice)</th><th>Level 4
(Ready for Advanced Practice)</th><th>Level 5
(Aspirational)</th></tr>
<tr><td>Behaviors are not within the spectrum of developing competence

Significant deficiency in learner performance</td><td>What are the expectations for a beginning learner?</td><td>What are the milestones for a learner who has advanced beyond beginner, but is not performing at a level sufficient for unsupervised practice?

What should the learner be able to do well at this point in their training?</td><td>What does a graduate of a professional program look like?

What additional knowledge, skills, and attitudes have they obtained?

Are they ready for BOC certification?</td><td>What does a graduating resident look like?

What additional knowledge, skills, and attitudes have they obtained?

Are they ready for specialty certification?</td><td>What does clinical expertise look like?

What are stretch goals to encourage continued progression towards mastery?</td></tr>
<tr><td colspan="6">☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐</td></tr>
<tr><td colspan="6">Comments:</td></tr>
</table>

Figure 2. The Athletic Training Milestones Structure (Sauers et al., 2019, p. 6). This figure illustrates how each Athletic Training Milestone has been developed and formatted.

Patient-Care and Procedural Skills (PC-3): Diagnosis and Management: Gathers and synthesizes essential and accurate information to define each patient's clinical problem(s). (Internal Medicine PC-1)					
Critical Deficiencies	**Level 1**	**Level 2**	**Level 3** **(Ready for Unsupervised Practice)**	**Level 4** **(Ready for Advanced Practice)**	**Level 5** **(Aspirational)**
Does not collect accurate historical data Does not use physical exam to confirm history Relies exclusively on documentation of others to generate own database or differential diagnosis Fails to recognize patient's central clinical problems Fails to recognize potentially life threating problems	Inconsistently able to acquire accurate historical information in an organized fashion Does not perform an appropriately thorough physical exam or misses key physical exam findings Does not seek or is overly reliant on secondary data Inconsistently recognizes patients' central clinical problem or differential diagnoses	Consistently acquires accurate and relevant histories from patients Seeks and obtains data from secondary sources when needed Consistently performs accurate and appropriately thorough physical exams Uses collected data to define a patient's central clinical problem(s)	Acquires accurate histories from patients in an efficient, prioritized and hypothesis-driven fashion Performs accurate physical exams that are targeted to the patient's complaints Synthesizes data to generate a prioritized differential diagnosis and problem list Effectively uses history and physical examination skills to minimize the need for further diagnostic testing	Obtains relevant historical subtleties, including sensitive information that informs the differential diagnosis Identifies subtle or unusual physical exam findings Efficiently utilizes all sources of secondary data to inform differential diagnosis Role models and teaches the effective use of history and physical examination skills to minimize the need for further diagnostic testing	Publishes clinical case reports on unique clinical problems Collaborates in practice-based research efforts to gather, aggregate, and synthesize patient data to enhance diagnostic and management efforts Generates and disseminates new knowledge pertaining to diagnoses and management

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Comments:

Figure 3. The Athletic Training Milestones Sample (Sauers et al., 2019, p. 12). This figure illustrates an example of the descriptors of the assessment of an Athletic Training Milestone.

The Athletic Training Milestones document does not dictate when in the educational process or where in the education environments *The Athletic Training Milestones should* be utilized; however, the developers recommend every five to six months and a combination of didactic and clinical education (controlled environments and real-time patient experiences) as possibilities for its use (AT Milestones Project, 2019b). The creators recommend that *The Milestones* be used as a formative assessment, though they can be utilized as a summative assessment if the final evaluation, along with the progressive assessments, is reported and the levels are benchmarked. The use of *The Milestones* potentially provides an opportunity to standardized across programs, but has yet to be implemented in that manner. Currently, *The Milestones* tool is not validated with any specific populations, besides its similarity with the ACGME model. This is a result of the development process of the document. An independent group of educators and instructors were developing a tool for their own residency program and expanded the scope when they realized the strength of use a tool. *The Milestones* tool could be utilized as the rubric or evaluation tool for many of the assessment types that will be discussed later in this literature review for a universal assessment of a students.

In physical therapy, the Clinical Performance Instrument (CPI) is one such tool developed by the APTA (English et al., 2004). The CPI was designed to measure cognitive and noncognitive factors in students' clinical education, consisting of performance criteria with a Visual Analog scale to assess students on a spectrum from "novice clinical performance" to "entry level performance" (English et al., 2004, p. 87). The CPI has been found to have good interrater reliability (intraclass correlation coefficient = .87) and the construct validity was supported (English et al., 2004) due to consistent training via a web-based protocol (Scriber et al., 2010). The CPI is currently utilized nationally, though not universally, even if its use varies between programs (English et al., 2004). Scriber et al. (2010) even called for the CPI model to be mimicked in athletic training education, where currently no universally-accepted assessment tool, for clinical experience or otherwise, has been developed and studied for effectiveness. The closest example is *The Athletic Training Milestones* (Sauers et al., 2019). However, even with such a heralded tool as the CPI, researchers still call for continual improvement and development in the CPI's use and viability (English et al., 2004).

Another physical therapy assessment tool developed in Texas, the Physical Therapists Manual for the Assessment of Clinical Skills (PT MACS), is utilized to assess professional practice (twelve skills based on APTA's generic abilities and two skills of assessing safety in patient care and education), patient management (twenty-eight skills recognized by the APTA's Guide, including evaluation, diagnosis, prognosis, interventions, and outcomes measures), practice management (two skills in supervision and administrative tasks), and site-specific skills (Luedtke-Hoffmann et al., 2012). At the end of each clinical experience, a clinical instructor summarizes the student's performance on the above areas using a visual analog scale. The PT MACS should also be used as a self-assessment tool.

Physiotherapy also has some examples of standardizing tools for used in assessment. In Australia and New Zealand, a group of researchers agreed to help create a single national assessment tool, the Australian Physiotherapy Practice Instrument, and do the heavy lifting of validating the instrument and assessing reliability (Keating et al., 2009). Other physiotherapy tools for assessment of students in clinical experiences have been developed at various organizational levels, including CPI, CIET, APP, and the CAF. Utilization of forms, such as the ones mentioned previously, is often through observed behavior with multiple patients over a period of 4-12 weeks, providing for formative feedback opportunities during the clinical experience and a summative assessment at the end of the experience by a trained supervisor/preceptor.

The American Academy of Physician Assistants (2014) has developed sample competency measures to be utilized across physician assistant programs, utilizing the *Competencies for the PA Profession* document. The *Competencies for the PA Profession* rubric sets a 5-point competency measure scale from unacceptable to excellent. The rubric is for all physician assistants, regardless of specialty. The rubric can be utilized throughout a program, by various assessors: self, peer, instructor, and/or physician, based on occasional encounters, weekly encounters, or daily encounters. In speech pathology, the COMPASS is utilized in clinical experiences for a similar purpose (Ho et al., 2014; Keating et al., 2009). In medicine, students are observed working with patients and assessed by their preceptor during what is known as the direct observation of procedural skills and the mini clinical evaluation exercise (Keating et al., 2009).

In clinical psychology, Pearce, Beinart, Clohessy, and Cooper (2013) investigated the effectiveness of the supervisory relationship measure (SRM) in the clinical environment. While the SRM is used to measure the supervisory relationship, the "trainee contribution" component centers around the quality of work, professional values, and integration of the trainee or student into the clinical team (Pearce et al., 2013). The SRM would be considered a preceptor evaluation form, relying on the supervisor to assess the student upon reflection, not in the moment of patient interaction. The SRM has high test-retest reliability, internal consistency, and convergence and divergent validity. The SRM's subscale for "trainee contribution" was found to be a good predictor of trainee clinical competence. However, an important limitation of the

SRM is that there was not much variation among the outcome scores, indicating that supervisors tended to score most of the supervisory relationship experiences similarly. The lack of variation in scores can be an indication of some of the bias concerns stated earlier and should be investigated with many assessment tools that are being utilized.

Ulfavarson and Oxelmark (2012) set out to create a new tool to measure clinical practice knowledge and competence in nursing, the Assessment of Clinical Education (ACIEd). Validity was ensured through student, preceptor, nurse, clinical lecturer, and university teacher review and scrutiny to develop the criterion-referenced tool. The ACIEd is created to be a template to be tailored to objectives, level, and criteria for a course (Ulfavarson & Oxelmark, 2012; Wu, et. al., 2015). The ACIEd is one example of criterion-referenced assessment which is common in nursing clinical education. “The objectives, or learning outcomes, state what the student is supposed to know after the course. The grading scale used has the marks passed with distinction, passed or failed” (Ulfavarson & Oxelmark, 2012, p. 704). The CPI can be utilized as formative and summative assessment. One important note was that the preceptor’s assessment utilizing the ACIEd was seen as one piece of the assessment puzzle. Students were also assessed in class using other forms, such as standardized patients, exams, etc.

Other nursing organizations have also created clinical performance tools (Löfmark & Thorell-Ekstrand, 2000; McCarthy & Murphy, 2007). One such tool, the Assessment form in Clinical education (AssCe), which was developed through stakeholder analysis, was studied by Löfmark and Thorell-Ekstrand (2000) and found to be useful for students as a mark of progress and for faculty and administration as a means of summative assessment for the majority of the outcomes, but not for all. “Inform and teach co-workers and students; plan, conduct and distribute tasks; use knowledge from research and developmental work; and inform and teach patients and relatives" (p. 92) were found either irrelevant or unable to be assessed in the clinical experience by clinical preceptors, students, and/or faculty. Qualitative feedback was mixed, with some saying the document was too complex to utilize effectively in complex clinical settings and others stating that the AssCe was valuable to have as a standardized form and outcomes. The Löfmark and Thorell-Ekstrand study (2000) also found results that quantify what many clinicians and educators have stated about assessment of clinical experiences: that preceptor bias or assumptions can cause a lack of differentiation within results, especially in upper level students.

Ulfvarson and Oxelmark (2012) found the AssCe to be geared toward traditional professional expectations but not necessarily the outcomes of the clinical courses in which the nursing students were enrolled. They created a new three-graded criterion tool, the Assessment of Clinical Education tool (AClEd), that was used to assess specific course level student learning outcomes during clinical experiences. The ACIEd was utilized as one of several different assessment measures within the course (including standardized patient exams) and was not used as a sole measure for determining course grade. The AClEd is essentially a rubric with criteria for each learning objective and milestones. The milestones are labeled as pass with distinction, pass, or fail. Preceptors are to be trained on using the ACIEd prior to assessing students. The tool appears to be best used as a discussion tool and experienced similar limitations as other tools in terms of determining true competence in direct patient care moments. Both the Löfmark and Thorell-Ekstrand (2000) and Ulfvarson and Oxelmark (2012) studies demonstrate that a tool is only as good as the ability to use the tool effectively and without bias.

Another example in nursing education assessment is the Adapted Steinaker and Bell Experiential Taxonomy (ASBET) framework, which was developed to provide four levels of clinical learning that must be achieved sequentially throughout an undergraduate nursing curriculum, from exposure to internalization (McCarthy & Murphy, 2007). Three interviews between preceptors and student are utilized to assess the student. The first interview identifies the learning objectives for the clinical. During the middle interview, the student self-assesses and discusses progress towards the benchmark statement and the preceptor provides feedback on the student's performance. The final interview is directed toward summative assessment by the preceptor on the agreed upon clinical competencies or skills. McCarthy and Murphy (2007) found that the process, when completed well, was effective; however, only 66.8% of respondents that were utilizing the system were using all aspects of the assessment.

Wu et al. (2015)., in their review of clinical education assessment strategies in nursing education programs, found several more examples from thirty-three different studies, including: The Structured Observation and Assessment of Practice, the Shared Specialists Placement Document, the Competence Assessment Tool, the Competency Inventory of Nursing Students, and several others. Wu et al. (2015) also found that the previously mentioned tools used a variety of methods to declare validity, with content validity through a review of an expert panel being most common (14 studies). Thirteen studies reported criterion validity and two studies shared construct validity via factor analysis. In terms of reliability, three studies reported a Cronbach alpha. With all the variability in what is reported, Wu et al. (2015) call for the development of a more holistic assessment tool for clinical experiences with reliability and validity established through large cohort studies and extensive training for students and preceptors on the tool and its uses.

Self-regulated microanalysis is a tool utilized in real-time patient care situations to assess students' abilities in clinical decision making in medical education (Patel, Sandars, & Carr, 2015). During the task, a preceptor or other evaluator asks targeted questions to identify the thought process behind a clinical decision. The theory is to understand the appropriateness of the chosen approach of the student. Conversations can then occur about all steps of the process of making a decision, not just the final result, empowering students to apply similar strategies in the future.

When surveying all physician assistant programs, the PAEA found that some programs (between 8.2% and 12.2%) tie teaching of basic medical science concepts (i.e., anatomy, physiology, pathophysiology, etc.) and behavioral and social sciences (i.e., counseling skills, psychological/interpersonal/cultural health factors, etc.) to interaction with preceptors in clinical experiences (Scott et al., 2012). A larger number of programs (41.8% to 43%) teach clinical assessment and history skills within clinical experiences (Scott et al., 2012). small percentage of programs (1.3 to 5.5%) rely on interaction with preceptors during clinical education to incorporate research-based skills (such as research methods and evidence-based medicine) into the education. Finally, ethics, professional issues, cultural and socioeconomic issues, quality improvement, coding/billing, and public health are taught during clinical experiences with preceptors in 13.2% to 16.4% of programs.

Due to the variability of the clinical education environment, some programs or researchers have attempted to correlate the results of standardized competency assessments or preceptor evaluations utilized in clinical experiences with more controlled methods, such as problem-based learning tutorials, pen and paper assessments, and/or standardized exams, with mixed results (English et al., 2004; Ho et al., 2014; Holland, Grinberg, & Tabby, 2014). Trede et al. (2015) recommend that tools utilized for assessment in clinical experiences are created with partnerships between academics and those practicing healthcare in order to have a shared language and shared standards while creating ownership over the tool for both parties and opportunities for continual improvement of the forms.

Traditional school-based athletic training settings allow for more direct patient care assessment than other clinical experiences in athletic training programs, thus, those programs that diversify their clinical experiences may have less exposure to assessable experiences (Walker et al., 2008). In addition, an inadequate volume of injuries or conditions adds to the limitations of assessment in direct patient care. Even then, the unpredictable nature of the direct patient care environment leaves much to be desired for some educators and preceptors in terms of assessment. Many of the assessment strategies of clinical-based outcomes come from simulated and controlled environments in order to counter such unpredictability (Armstrong & Jarriel, 2016; Fero et al, 2010; Holland et al., 2014; Walker et al., 2008) or are assessed in the classroom instead of during clinical experienes (Cone et al., 2016). Walker et al. (2008) found that programs were more likely to use mock patients (simulations) or standardized patients than real time in evaluating clinical proficiency. To date, no research has been done showing if what is being tested or shown in literature is mirrored in the actual practice of preparatory healthcare programs, specifically master's professional programs in athletic training (Scriber et al., 2010). In addition, a lack of depth and breadth of research exists on assessment of student learning during real-time, real-patient clinical experience, also called workplace learning, clinical placements, or clinical practicums, in preparatory healthcare programs (Scriber et al., 2010; Trede et al., 2015).

Standardized patients. The use of standardized patients in healthcare education has a strong history in nursing education and has been growing in other professions as an alternative to "mock injury scenarios" where evaluators or other students act out a scenario without any real training or standardization, which has been noted in athletic training education (Sexton, 2003). Standardized patients involve a trained individual acting out a scenario and interacting with the students to allow for a more realistic, consistent simulated clinical patient encounter (Armstrong & Jarriel, 2016; Keating et al., 2009; Middlemas & Hensal, 2009; Walker et al., 2008). The consistency across students allows standardized patients to be a formative and summative assessment tool for the same clinical encounter (Armstrong & Jarriel, 2016). Using standardized patients or simulations can also be utilized to directly assess students' clinical skills along with professional skills, such as critical thinking or decision-making or indirectly through assessing students' confidence with those same clinical or professional skills following the simulations (Armstrong & Jarriel, 2016; Fero et al., 2015; Middlemas & Hensal, 2009; Thompson et al., 2014; Walker et al., 2008).

Walker et al. (2008), when surveying athletic training education programs, found that the use of standardized patients was the lowest utilized option, between standardized patients, real-time, and simulation, for clinical proficiency with only 56.8% of programs surveyed utilizing them. Of those programs utilizing standardized patients, 35.4% utilized them for more than half of their skill clinical proficiencies assessments. The work of Walker et al. (2008) was one of the first to evaluate standardize patients in athletic training and the authors were surprised to see as many programs using standardized patients as they found. They attributed the high number of programs utilizing standardized patients to perhaps a misunderstanding of the difference between simulation (which they defined as "mock" scenarios with untrained patients) and standardized patients. The authors did expect more growth in the profession with the continued emphasis of the techniques in peer healthcare professions, such as medicine, nursing, and physical therapy programs. Walker et al. (2008) found that over 40% of respondents stated that there were not sufficient opportunities to assess all of the different clinical proficiency areas, especially the nutritional aspects of injury and illness and the psychosocial intervention and referral items, with real patients in clinical experiences. Standardized patients offer an opportunity to supplement those areas that students may not be exposed to during real-time, real-patient experiences.

Armstrong and Jarriel (2016) found the use of a clinical performance checklist to be reliable between academic faculty observers and provided beneficial feedback to students during a standardized patient experience in one athletic training program. Standardized patients (trained actors given a prompt, essentially) provide real-time patient experience, but still in a controlled environment, so patient safety is not an issue. The fact that the study only utilized one athletic training program and only 35 students is a limitation to take into consideration. More studies and studies that incorporate multi-site analysis and larger subject numbers need to be conducted to confirm the results of Armstrong and Jarriel (2016). The authors also note that certain clinical scenarios provided better reliability than others, so the design and structure of the scenario given to the training actors affects the outcomes. Walker et al. (2008) and Armstrong and Jarriel (2016) both determined the importance of an expert or panel of experts creating the scenario, proper training of the standardized patient actors, and a standardized rubric in order to assess the students' work in the effectiveness of the technique.

The Objective Structures Clinical Examination (OSCE), originally described in 1975 by Haden, was created to improve validity and reliability of assessment performance as compared to case examinations in preparatory health programs' curricula (Khan et al., 2013; Löfmark & Thorell-Ekstrand, 2000; Middlemas & Hensal, 2009). The OSCE is designed to move students through stations with a variety of case situations or sequential parts of case situations presented to them by standardized patients (Khan et al., 2013; Löfmark & Thorell-Ekstrand, 2000, McCarthy & Murphy, 2007; Murray et al, 2000). The OSCE can consist of short case and long case forms, depending on the amount of information the student needs to derive from the patient or patients and the amount of decision making required (Khan et al., 2003). Reliability was increased, according to researchers, through creating the ideal test length, standardizing scoring rubrics and training of the evaluators on the rubrics, and standardizing the performance of the patient-actor. The OSCE allows for a more holistic approach to assessing patient care skills and the contributing qualities to good patient care, including attitudes and problem-solving abilities (Khan et al, 2013; McCarthy & Murphy, 2007; Physician Assistant Education Association, 2017). OSCEs could also utilize high fidelity human simulation (HFHS) in their stations, if the program has the capability (Khan et al., 2013).

The Physician Assistant Education Association (2017) endorsed the use of OSCEs in their education programs, but only if they are done well. The organization, in order to take some of the workload demands off individual program directors to defend a "subjective exam," promote the development of OSCEs that can be standardized and utilized across programs. The OSCEs are also utilized as a final assessment of medical students at the University of Queensland, Australia to determine the ability to graduate (Wilkinson et al., 2014). Murray et al. (2000), in their review of clinical education, found that literature supported the reliability and validity of OSCEs for assessment clinical skills. However, Murray et al. (2000) also found that research on assessing cultural competency with OSCEs has mainly focused on the OSCEs as a teaching tool, not as an assessment.

When surveying all physician assistant programs, the PAEA found that some programs (between 1.9% and 16%) tie teaching of basic medical science concepts (i.e., anatomy, physiology, pathophysiology, etc.) to OSCEs or other standardized patient experiences (Scott et al., 2012). The percentage of programs utilizing OSCEs and standardized patients increases (between 2.7% and 28.8%) when incorporating behavioral and social sciences (i.e., counseling skills, psychological/interpersonal/cultural health factors, etc.). Ethics, professional issues, cultural and socioeconomic issues, quality improvement, coding/billing, and public health are taught in OSCEs or standardize patient experiences in 1.3% to 6.8% of programs. Between 53.3% and 72.2% of programs utilize OSCEs or standardized patients to teach history and assessment skills. Less than 2% of programs reported teaching research-based skills (such as evidence-based medicine and research methodology) utilizing standardized patients or OSCEs.

In the PAEA follow-up survey from 2016, the organization changed how they presented their data. OSCEs or practical exams (which were not specified as to the mechanism of which the exam was conducted) were utilized as either a primary or secondary mode of assessment for anatomy, histology, other basic medical sciences, clinical medicine, history and interview skills, laboratory medicine and diagnostics, physical assessment, technical skills, electrocardiology, emergency medicine, surgery, other clinical preparatory sciences, counseling skills, human sexuality, psychological development, psychological/interpersonal/cultural health factors, and psychiatry (Physician Assistant Education Association, 2018a). Overall, an increase in the use of OSCEs and practical exams in PA programs for a wider variety of curricular areas is noted from the 2010 survey to the 2016 survey.

In their 360-degree assessment model for doctor of physical therapy students, Hayward and Blackmer (2010) include standardized patients along with self-assessment, peer assessment, reflection, and internet-based communities of practice. The standardized patient cases are developed by faculty (via focus groups with clinical education instructors/preceptors) and posted online to allow students to prepare by responding to questions in a discussion forum, building a community of practice. The standardized patient interactions are recorded and then are graded using customized rubrics by the standardized patient, faculty, peers, and the students themselves. The benefit of utilizing the standardized patients is the ability to complicate the cases with ethical dilemmas, cultural considerations, and communication issues that would not be easily expressed in a written experience or would not be able to be guaranteed in real-life patient encounters. The training of the standardized patients requires time commitment for the actors and the faculty and, perhaps, payment for the actors, which has been reported in other literature as well (Hayward & Blackmer, 2010; Middlemas & Hensal, 2009). In qualitative feedback from the students who engaged in the 360-degree assessment model, students expressed the increased need for prioritization and planning along with the added focus on communication that they don't experience from other assessment techniques (Hayward & Blackmer, 2010).

More research is needed on whether the student learning outcomes assessed during standardized patient experiences correlate to student learning outcomes in clinical experiences or if clinical experiences provide equal or better experiences for students to gain the student learning outcomes (McCarthy & Murphy 2007). Proctored clinical examinations that utilize standardize patients were better predictors of neurology clerkship students' competence than shelf examinations or subjective preceptor/site director evaluation. However, concerns about the cost, time commitment of exams, and the difficulty implementing them across multiple sites exist (Holland et al., 2014). Without further research, programs may not be able to justify clinical experiences over something standardized like simulation or standardized patients, in today's higher education landscape that emphasizes outcome assessment and achievements.

Another form of assessing practical skills that straddles the line between standardized patients and simulations is utilizing video-taped patient vignettes or scenarios (Fero et al, 2010, Hay et al., 2013). Video-taped vignettes were shown to be effective in assessing students critical thinking in patient interactions (Fero et al, 2010) and eCAPS, a specific web-based video technology for medical students, supported student skill develop in knee joint examinations (Hay et al., 2013). The eCAPs system was created to provide an alternative to OSCEs, the traditional assessment tool for medical students in Queensland and students reported that the two different assessment strategies tested them in similar manners.

Simulation. Simulation, or often called Human Patient Simulation or HFHS, utilizes life-like mannequins and other technology and devices to allow students to practice and be assessed on clinical skills and clinical decision-making in an environment where no patients are at risk and variables can be controlled by faculty and/or preceptors (American Association of Colleges of Nursing, 2008; Fero et al., 2010; Keating et al., 2009; Middlemas & Hensal, 2009; Shelestak, Meyers, Jarzembak, & Bradley, 2015). With the growth of simulation, especially in the nursing profession, the International Nursing Association for Clinical Simulation and Learning created standards for best practice; and other researchers and organizations have taken these standards and developed instruments (i.e., rubrics) to be utilized to assess students during the simulations (Shelestak et al., 2015). Shelestak et al. (2015) found that clinical skills and critical thinking and/or clinical decision-making are the outcomes most often assessed utilizing simulations and that, when compared to other means of assessment, the simulations are often equal or better at measuring the outcome. Murray et al. (2000) found that literature supported the reliability and validity of simulations for assessment clinical skills. However, other researchers also determined that the instruments utilized often do not demonstrate strong reliability or validity or are not effectively reported by the authors (Shelestak et al., 2015). In areas of cultural competency, simulation has been reported in the literature for teaching but not for assessment, according to Murray et al. (2000).

In nursing students, critical thinking, as measured by pen and paper assessments, such as the California Critical Thinking Disposition Inventory and the California Critical Thinking Skills, was improved with simulated clinical scenarios, both videotaped vignettes and HFHS, (Fero et al., 2010). HFHS appeared to approximate scores on the critical thinking assessments better than the video-taped vignettes. There was no statistically significant difference between the performance of the students on the video-taped vignettes and high-fidelity human performance. While Fero et al. (2010) used HFHS instead of real-time clinical experiences, the time spent performing clinical skills, in this case on simulations, can result in critical thinking increases in students and the assessment of simulations can replace pen and paper assessments, which do not have the added benefit of skill assessment or application. The ability to tie improvements in critical thinking to real-time clinical experience still needs to be further studied. In fact, the authors specifically mention real-time experiences as being too unpredictable and limited in opportunities to allow significant development of critical thinking.

Researchers called for the need for real patient interactions or simulation in preparatory healthcare programs. Real patient interactions allowed better assessment clinical decision making and application of critical thinking skills and were used to supplement multiple-choice exams, writing care plans from written scenarios, and certification exams (Del Bueno, 2005; Middlemas & Hensal, 2009). Del Bueno (2005), in a powerful quote about nursing education which would apply to all preparatory health programs, states, “Knowing about does not equal making clinical decisions. Nursing is a practice art that requires the use of knowledge within a specific set of circumstances” (p. 281). Nursing education research demonstrates simulation is often used to assess application of knowledge and skills (including critical thinking in the application), but its strength is also reliant on the amount of feedback and debriefing that occurs after the simulation (American Association of Colleges of Nursing, 2008). There are mixed findings concerning the connection between performance on HFHS and translation of skills into clinical practice across healthcare programs. Nursing education research reveals no consensus (Fero et al., 2010) while medical education research has shown a connection between the use of simulation and higher self-efficacy in clinical placement (Jones & Sheppard, 2012).

When surveying all physician assistant programs, the PAEA found that a very small number of programs (between 1.3% to 3.7%) tie teaching of basic medical science concepts (i.e., anatomy, physiology, pathophysiology, etc.) to simulations (Scott et al., 2012). Between 2.6% and 15.1% of programs utilize simulation to assess behavioral and social sciences (i.e., counseling skills, psychological/interpersonal/cultural health factors, etc.) with the largest percentage appearing in counseling skills. A larger percentage of programs (between 10.5% and 45.6%) utilized simulations in teaching assessment and history skills. However, less than 2% of programs teach research-based skills (such as research methodology or evidence-based medicine) with simulations. Ethics, professional issues, cultural and socioeconomic issues, quality improvement, coding/billing, and public health are taught in simulation in 1.3% to 8.2% of programs. In the next follow-up PAEA survey of programs, they did not have simulation as an option, the closest options being OSCEs or practical examinations, which may include use of simulation (Physician Assistant Education Association, 2018a).

In a survey of all athletic training program directors (59.6% response rate), simulation was the most often cited form of assessment of students' clinical proficiency in skills (including the cognitive and professional skills that are incorporated into patient care) (Walker et al., 2008).

However, in the survey, simulation was defined as using a mock patient, with no training (contrary to a standardized patient) and thus does not fit the definition utilized in many of the other studies on simulation that typically describe HFHS. In the 2020 standards for athletic training programs, simulation is defined as an educational technique, not a technology, meant to replicate for real experiences in an interactive manner (Commission on Accreditation of Athletic Training Education, 2018). Defining the type of simulation utilized in assessment would be important in establishing reliability, validity, and other aspects of the tool

Case studies. Case studies provide the opportunity to assess a student's patient management skills and decision making without the involvement of any real or simulated patients, where written information is revealed to students through material, either mocked or utilizing patient charts (Keating et al., 2009). Case studies were often cited as a means to combine theoretical background, clinical application, and professional skills in a controlled environment in nursing programs (McCarthy & Murphy, 2007) and other competency-based programs (Tuning Educational Structures in Europe, n.d.) or clinical education programs (Murray et al., 2000). Case studies are often implemented in order to try to mitigate some the uncertainty of direct patient care, costs and time commitments of simulations or standardized patients while still allowing assessment of patient-care skills and decision making (Ramekers et al., 2010). Analysis of a case study can be used as part of a project or portfolio and usually utilizes a rubric for assessing the responses and actions to the case (Biggs & Tang, 2007). A case study provides the opportunity to assess individual skill, especially essential actions, along with a holistic view of the student's performance.

Murray et al. (2000) found that literature supported the reliability and validity of long and short cases for assessment clinical skills. The approach utilized to introduce and progress students through the case may have an effect on the outcomes. Marchigiano et al. (2011) found that nursing students had more confidence in their patient care decisions when they were guided through patient care-related questions and reflection than following a strict case-study approach. The Marchigiano et al. (2011) study was limited to 51 nursing students, leading to concerns about the transferability of the results. The script concordance test (SCT) is a form of case studies that was developed to assess problem solving, under circumstances of uncertainty; and it utilizes problems that are chosen to match the issues and challenges of real practice (Ramaekers et al., 2010). The SCT has been constructed for various domains within medicine where expert panels create the case studies and the assessment using concurrence rates on the items.

In a study of utilizing the SCT in veterinary medicine, Ramaekers et al. (2010) found that there was strong internal consistency of the cases, students and experts both agreed on the authenticity of the cases, the test was able to monitor clinical reasoning, and it had high generalizability of results. One key point that the authors reported was that the SCT was utilized for formative assessment, and, if used in a summative manner in the future, students may not be as open to accepting some of the ambiguity that are inherent in the cases. Currently, no findings in literature about the inclusion of case studies, or a form of case studies, in program assessment plans has been reported.

Gauthier (2019) observed that while case study presentations are often utilized in competency-based medical education, case study presentations should not be the only tool. Combining prepared knowledge, like a case study presentation, with direct observation in clinical experience and patient care or reviewing authentic documentation, like discharge notes, provide a much clearer view of the medical student's communication skills and patient care skills.

Written work. The use of written essays is a common assessment strategy across higher education. Preparatory healthcare programs are also utilizing them, though usually for theoretical background only; and the programs are not linking written essays necessarily to clinical competence of the students (Banta & Palomba, 2015; Keating et al, 2009; McCarthy & Murphy, 2007; Tuning Educational Structures in Europe, n.d.). Written work can assess multiple levels of learning based on the prompt. Written work could ask for simply declarative knowledge or could be expanded to reflection or application if asked to analyze, argue, apply, or compare (Biggs & Tang, 2007; Tuning Educational Structures in Europe, n.d.; Walvoord, 2010). Depending on the outcome being assessed, students may be given time constraints to write the essay (such as during an examination) with or without access to notes or texts or could be prepared over time (such as a paper) with access to sources (Biggs & Tang, 2007). The access to sources or notes usually takes the burden off of the student to memorize detail in order to allow application, analysis, or comparison of the topic or originality and creativity. Writing assignments were common assessment strategies in physician assistant programs in their 2016 report, for most areas of study, besides physical assessment skills and specialty skills (Physician Assistant Education Association, 2018a).

One of the major concerns when utilizing written work is the reliability of the assessment due to reviewers not using consistent criteria (Biggs & Tang, 2007). To counter the reliability issue, rubrics are often created. However, rubrics for written work need to be developed properly to ensure criterion validity and interrater- and intrarater-reliability. The process of developing a rubric should include multiple experts to determine criterion and multiple trials to ensure matching. The process of ensuring reliability is often done through “norming,” where reviewers use the rubric on samples and compare and discuss their scoring in order to come to consensus within one level/point (Biggs & Tang, 2007; Grouling, 2017; Hildenbrand & Schultz, 2012). Following the norming steps, the AAC&U has created several VALUE rubrics to be used with written work based on the outcome to be assessed, such as written communication, intercultural knowledge, cognitive thinking, etc. (Banta & Palomba, 2015; Turbow & Evener, 2016). For literacy skills, Turbow and Evener (2016) found that the AAC&U rubric, when applied to the work of graduate health science students, had a high level of consistency in scoring following norming workshops for a peer-review paper but had low inter-rater agreement in a case report assignment. Part of ensuring validity is that the tool can be utilized without bias of the rater towards the student, often known as the halo effect (Biggs & Tang, 2007). Controlling the halo effect with blinding of the student's name when possible is preferred.

In a study of the use of a rubric to assess student papers for critical thinking in a lower-level anatomy course and higher-level motor learning course, the norming panel found 94% agreement for a "poor" paper, 90.5% for an "average" paper, and 89% for an "excellent paper" (Hildenbrand & Schultz, 2012). Hildenbrand and Schultz (2012) determined that the rubric had strong interrater reliability and strong validity, since its use could distinguish between various paper strengths consistently. The authors reported that the rubric was best at distinguishing between high and low scoring papers and not as strong comparing low and medium scoring papers. One reason for achieving strong reliability and validity results was due to utilizing a previously validated rubric as inspiration and then utilizing a panel of stakeholders for the two courses to develop the criteria. Hildenbrand and Schultz (2012) also demonstrated that a student learning outcome, in this case critical thinking, can be assessed in very different courses with different levels of students utilizing the same rubric.

As with other assessment strategies that focus on a student's higher cognitive level of learning, the time to thoroughly assess the work, through all the proper channels from development of the prompt and rubric to the time to evaluate each student, is a limitation of large-scale implementation of written work (Biggs & Tang, 2007). In addition, unless a program can benchmark to some standards, the program will need a way to measure prior knowledge compared to gain knowledge to demonstrate learning occurred (Lopez, 2002).

Reflection. The use of reflection is an important aspect of assessment, especially formative assessment, and is usually a part of another activity (i.e., students reflect on the process or their experience with doing another assignment or experience) (Banta & Palomba, 2015; Biggs & Tang, 2007). Having students reflect on the process provides assessors with an insight into the mental processes students are going through to complete an assignment or experience or the parts of the experience that are not easy to visualize and assess, such as ethical reasoning (Banta & Palomba, 2015; Biggs & Tang, 2007; Hayward & Blackmer, 2010). The use of a reflective journal is most useful in professional programs to assess student learning outcomes that relate to applying knowledge, professional judgment, and understanding the decision-making or problem-solving process (Biggs & Tang, 2007; Hayward & Blackmer, 2010).

Nursing, athletic training, physical therapy and other healthcare fields often utilize some form of reflection, usually to focus on the performed or observed patient care in clinical experiences, as a means of assessment (Biggs & Tang, 2007; Hayward & Blackmer, 2010; McCarthy & Murphy, 2007; Stupans et al., 2013). Students report that they learn more in clinical experiences if required to reflect because they are more motivated to critique themselves and others (Biggs & Tang, 2007; Hayward & Blackmer, 2010). Transfer of learning to different environments and circumstances appears to be enhanced through reflection (Cunningham et al., 2015; Hayward & Blackmer, 2010). In a case study of pharmacy students providing counseling to patients, reflection that was targeted with clear guidelines (sharing the rubric) or pointed reflection questions resulted in better scores on the rubric of both the interaction and the reflection (Stupans et al., 2013). As with most assessment modes, the rubric development is important for the possible standardization of the technique.

In nursing literature, critical thinking has been linked to reflective journaling and should be utilized not only in the educational experience, but during the first years of clinical practice to improve critical thinking skills (Turkel, 2016). Reflection-on-practice is used as a clinical assessment tool where students write a reflection on how they have achieved each competency and the preceptor assesses the student reflection and its connection to the achievement of the competency (McCarthy & Murphy, 2007). Preceptors have reported reflection-on-practice as an effective tool but also acknowledge difficulties with interpretation and the reflection correlating with patient care.

In a pilot study, Marchigiano et al. (2011) set out to compare two different assignments to be completed during clinical experiences on students' perceived level of confidence in using critical thinking skills in a nursing program. The same valid confidence assessment instrument was used to compare care plan design (assessment, diagnosis, goal-setting, intervention, and evaluation and their prioritization) and journaling (structured questions on the occurrences of a care plan and explaining their decisions/priorities). Journaling resulted in more confidence in critical thinking skills. Marchiagiano et al.'s (2011) pilot study warrants additional investigation due to its small, convenient, and homogenous sample.

Hayward and Blackmer (2010) developed a 360-degree assessment model for doctor of physical therapy students and included self-assessment and reflection as an integral part of the model. In the 360-degree assessment model, after completing a standardized patient experience, the student completes a reflective paper and then discussed their performance with faculty and peers. In a study on speech-language pathology students, there was a correlation between students' performance on reflective journaling and their clinical performance on non-standardized clinical evaluation form, named COMPASS (Ho et al., 2012). The authors attributed the correlation of reflective journaling to the development of skills of self-reflection, independent learning, and good written communication skills.

In an athletic training program, journaling was also utilized to help students identify the effectiveness of observational learning in clinical experiences (Mazerolle et al., 2015). In a separate study on athletic training students, Thon and Hansen (2015) found that most athletic training students were diverger learners, meaning those who benefit most from concrete experiences and reflective observations. Faculty and administrators can capitalize on the tendency of students to be divergers by structuring reflection into clinical experiences. Consistent with the theories on subjective and objective assessment, reflection should not be used as the sole form of assessment (Biggs & Tang, 2007).

Portfolios. Portfolios, where students gather artifacts of their learning, either determined by faculty or student choice, are often used as capstone assignments to demonstrate growth and learning throughout a program (Banta & Palomba, 2015; Biggs & Tang, 2007; Black & Wiliam, 1998a; Keating et al., 2009; Lopez, 2002; Walvoord, 2010). Portfolios have the capability to allow students freedom to demonstrate competence in their own forms, requiring reflection on learning, understanding of context, and knowledge of the subject matter (Banta & Palomba, 2015). Since the products can be student-driven, faculty and administrators might often learn about outcomes that were not preconceived by the program (Biggs & Tang, 2007).

Like most assessment tools, portfolios can only be considered quality if the developers and reviewers go through the proper channels to ensure reliability and validity. In a dentistry program, portfolios were validated for their interpretation and the reliability was found to have an intra-class coefficient of 0.69 (Gadbury-Amyot et al., 2014). However, the authors noted that if moving the use of portfolios to more high stakes situations, norming reviewers further will be required to increase the reliability. Nursing education literature also reveals that portfolio use is relatively common for assessment purposes (McCarthy & Murphy, 2007). Portfolios offer a great opportunity for healthcare preparatory programs to assess students' growth over time in knowledge, clinical skills and professional values through the accumulation of evidence (Gadbury-Amyot et al., 2014). Portfolios can be used to log clinical competence, but they should be verified by preceptor or faculty direct observation (Sowter et al., 2011).

In a pilot study utilizing a bachelor's of science program in radiography, Clark, Cortis, and Sowter (2011) created evidence-based guidelines to help students and assessors of clinical experience portfolios. Through a survey, the authors were able to determine that students better understood the purpose and expectations of the portfolio but that did not alone translate into better matches between artifact submissions and assessment requirements or better marks on the portfolios. The authors also stated that if the analysis focused too much on guidelines for assessment purposes, there is a risk of losing the creativity and individuality of the students.

One tension that exists when utilizing portfolios for summative assessment in preparatory healthcare programs is that the educational value of the portfolio, which is often the openness and creativity allowed for students to determine the contents, can be at odds with the strict necessity of the professional bodies or external accreditors to demonstrate consistent comparable measures (Sowter et al., 2011). To allow for multiple sources of evidence, the program would need to provide more verification and standardization of the tool used to measure the evidence, which is not occurring at levels sufficient to make strong statements on the strength of the tools. In addition, if students can self-select, the program runs the risk of students over or under submitting, possibility creating more work for reviewers than necessary or more difficult in determining benchmarks (Biggs & Tang, 2007; Lopez, 2002). Reviewers would need to be very clear on the submission requirements, what student learning outcomes are to be assessed, what is open to interpretation and what is not, and the means of assessment (i.e., rubrics) utilized (Biggs & Tang, 2007; Walvoord, 2010).

Another concern, as is common with many program-level assessments, is the student buy-in (Walvoord, 2010). If the portfolio is not tied to a class with a grade, students may not be engaged in the submission selection or completion of the portfolio. In their 2016 survey of physician assistant programs, the PAEA (2018a) found that portfolios were not commonly utilized across programs for assessment in courses. Between zero and four percent of programs utilizing portfolios as a primary form of assessment for basic medical sciences, clinical preparatory sciences, behavioral and social sciences, PA professional issues, public health topics, coding and billing, and cultural and socioeconomic issues. Portfolios were only used in greater than ten percent of programs as secondary assessment techniques for quality improvement, patient safety and medical ethics, areas that would perhaps require more student reflection on clinical experience.

As with other forms of assessment, portfolio assessment strategies are often created in-house, not allowing any benchmarking or comparison across programs (Walvoord, 2010).

Consolidating strengths of many institutions and organizations in order to develop stronger guidelines for outcomes and assessment of e-portfolios is valuable. The Quality Assurance Collaborative (QAC) consists of six institutions funded by the PEW Charitable Trusts to develop student portfolios and share assessment data (Lopez, 2002). The QAC is aimed at ensuring student development and improved student learning and utilizes the e-portfolio as its assessment tool across curricular and extra-curricular experiences. The QAC is just one example of utilizing the same assessment tool across multiple institutions in order to allow for benchmarking and student learning improvement.

Rubrics. One component that most of the assessment strategies already discussed have in common is the use of a pre-determined rubric in order to standardized the assessment criteria across students. Whether standardizing within a class or program or across multiple programs, like the ACGME (American Council on Graduate Medical Education, 2017) or the PAEA (American Academy of Physician Assistants, 2014) has developed, well-developed rubrics, where the phenomenon being assessed is broken down into the essential components and the level of skill needed to be achieved, are one of the keys to reliability and validity (Khan et al., 2013; Raup et al., 2010; Trubow & Evener, 2016). The rubric (also known as analytical scoring, checklist scale, or matrix) can be binary (yes and no, competent and incompetent) or utilize a rating scale, usually between three to seven levels and can look at individual criteria or be a global rating on the experience (Khan et al., 2013; Raup et al., 2010; Scriber et al., 2010; Sexton 2003).

Even when well developed, the rubrics are only as good as the training of those utilizing them (Khan et al., 2013; Sexton, 2003; Trubow & Evener, 2016). One way to increase the inter-rater reliability of the rubric is to go through a norming session, where all evaluators practice utilizing the rubric on samples and discussion occurs as to why decisions were made, resulting in a consistent understanding of the criteria across evaluators (Trubow & Evener, 2016). Trubow and Evener (2016) found that while inter-rater reliability was high for the type of assignment on which norming occurred, the inter-rater reliability dropped if the evaluators were asked to use the rubric on a different type of assignment or interaction. Rubrics are so integral in many aspects of healthcare preparatory program assessment that Raup et al. (2010) published an evidence-based approach to develop rubrics for doctoral nursing program faculty that explains step-by-step the process from conceptualization to writing to testing of the rubric.

Rubrics can be utilized to grade a single assignment or skill or to assess a learning outcome that probably includes multiple quantitative and qualitative components (Raup et al., 2010; Trubow & Evener, 2016). Rubrics can also be used to assess course level student outcomes or program level learning outcomes (Raup et al., 2010). One potential pitfall of using a rubric, or more specifically a checklist, is that the use of the rubric could create a situation where students simply recall criteria and have not actually integrated learning and application, which is why, when assessing over time, the complexity and reality of the scenario being assessed should be advanced (Sexton, 2003). Rubrics can be part of summative or formative assessment, depending on how they are used or who is the assessor (Stupans et al., 2013).

Inventories or questionnaires. Inventories are a commonly utilized assessment tool in research, especially around the more subjective, professional skills. Usually inventories or questionnaires are focused on a single construct (or student learning outcome) such as critical thinking, problem-solving, ethical decision making, etc. (Murray et al., 2000). Many researchers utilize inventories to measure critical thinking, such as the Health Sciences Reasoning Test, California Critical Disposition Inventory, California Critical Thinking Skills Test, or the

Collegiate Learning Assessment (Cone et al., 2016; Cox, Perksy, & Blalock, 2013; Fero et al., 2105; Golemboski et al., 2013; Heidari & Ebrahimi, 2016; Kabay, 2013; Wolf et al., 2015).

Discipline specific critical thinking tools have also been utilized to assess healthcare professionals, such as the Critical Thinking Diagnostic Tool for nurses (Turkel et al., 2016). Decision making has also been measured in research using questionnaires in emergency medical students (Heidari & Ebrahimi, 2016) and veterinary students (Ramaekers, Kremer, Pilor, BeU.K.elen, & van Keulen, 2010). Légaré, Moher, Elwyn, LeBlanc, and Gravel (2007) found that "out of 3431 records identified and screened for evaluation, 26 potentially relevant instruments were assessed; 11 met the inclusion criteria. Five instruments were published before 1995. Among those published after 1995, five offered a corresponding patient version" (p. 1). The authors still called for more research into the reliability and validity of the instruments, especially across populations (Légaré et al., 2007).

Self-efficacy is another construct that is often measured utilizing research-developed inventories (Jones & Sheppard, 2012). The Diagnostic Thinking Inventory has been used to measure clinical reasoning in decision making in medical students and has been successfully modified to be able to apply to athletic training (Kicklighter et al., 2016). Inventories, such as those mentioned above, often offer reliable and valid tools to measure professional skills, desirable in research (Cone et al, 2016; Cox et al., 2013; Fero et al., 2015; Heidari & Ebrahimi, 2016; Kabay, 2013; Kicklighter et al., 2016). However, they take a significant amount of time for a single student learning outcome and have low buy-in from students since they are not usually tied directly to courses or clinical experiences (Cone et al, 2016; Fero et al., 2015; Heidari & Ebrahimi, 2016). Hinyard et al. (2019) created and validated a self-assessment invenvtory for interprofessional collaboration that they named the Self-Assessed Collaboration Skills measure to be used in an interprofessional education course.

Most of the use of inventories in literature is to measure the effectiveness of curricula changes in improving a construct, such as critical thinking (Cone et al., 2016), to tie in the results on another assessment tool, such as HFHS, video-taped vignettes or grades/GPA, to the specific construct (Fero et al., 2015; Jones & Sheppard, 2012), or to connect two student learning outcomes together, such as critical thinking and decision-making skills (Heidari & Ebrahimi, 2016). Fero et al. (2015) found that scores of a HFHS correlated to scores on the California Critical Disposition Inventory and California Critical Thinking Skills Test for nursing students. The correlation would potentially allow programs to only use the HFHS, which would also be able to assess clinical skill and other student learning outcomes in one assessment versus many individual assessments using inventories.

The APTA chose to adopt the PPTCV instrument, which is meant to assess students core values awareness, personal growth and strengths and when testing its validity and reliability compared the PPPTCV to the Work Self-Efficacy Inventory (Hayward & Blackmer, 2010). Another use is to assess applicants prior to their enrollment in the construct in order to potentially predict success on the certification exam, such as pharmacy and nursing programs utilizing inventories to measure critical-thinking skills (Cox et al., 2013; Turkel et al., 2016). Researchers have also utilized inventories to show whether students in a preparatory health program, have achieved a certain level of competence in a construct (Heidari & Ebrahimi, 2016; Ramaekers et al., 2010). While the use to demonstrate competency in research is the closest to using the tools in an assessment plan, little to no research exists on programs actually utilizing inventories within their assessment plans.

Standardized assessment forms developed by specific programs or organizations vary between those that are preceptor evaluation of professional qualities to those designed to assess clinical skills (English et al., 2004; Trede et al., 2015). A concern with the utilization of standardized assessment forms for clinical skills is that preceptors vary their expectations and consistency in assessment (English et al., 2004). Another concern with inventories is that the commercially- or research-developed inventories have not been tested for reliability and validity with the particular population of students or healthcare field with whom the administration might want to utilize the inventory (Jones & Sheppard, 2012). The inventory may have been developed for professionals and not for students (Turkel, et al., 2016). The possible lack of transferability may result in programs adapting current measures or creating their own and not demonstrating the new reliability and validity (Jones & Sheppard, 2012; Ramaekers et al., 2010).

With each program usually developing their own tools, questions exist on whether they have been tested for reliability or validity. For example, Jones and Sheppard (2012) developed a questionnaire to assess physiotherapy students' self-efficacy, and they stated that their major limitations were the sample size being too small to thoroughly report reliability numbers and the need to limit its application to just preparatory healthcare programs due to their unique hands-on educational model. The inconsistency that Jones and Sheppard (2012) noted could be addressed by a healthcare organization developing and testing inventories specific to their population of student and sharing with their member institutions.

Surveys. Many preparatory healthcare programs, and educational entities in general, utilize surveys from students, alumni, or employers to ensure outcome achievement (Banta & Palomba, 2015). Surveys are considered indirect assessment tools. Surveys can only give information of perception of achievement of outcomes and cannot be directly linked to student learning (Lopez, 20002). Survey research is one of the most utilized for large-scale educational assessment that can act as a supplement to direct methods (Black, 2000; Lopez, 2002). In preparatory healthcare programs, surveys have also been used to gauge patient satisfaction with student interactions, but feasibility and affordability are limitations to widespread and repeated use (Murray et al., 2000). Surveys are a popular means of assessing student skills and qualities during clinical experiences by preceptors (Murray et al., 2000). Finally, surveys are one type of tool that are utilized for peer or self-assessment (Lopez, 2002).

Peer and/or self-assessment. Self-assessment is a form of formative assessment and often tied to life-long learning skills (Black & Wiliam, 1998a; Carwile & Murrell, 2002; Löfmark & Thorell-Ekstrand, 2000; Office of Learning and Teaching, Victoria, 2015; Stupans, March, & Owen, 2013; Weber. 2005). Self-assessment instruments can include surveys, inventories or questionnaires, or use of rubrics with indications of levels of achievement (Banta & Palomba, 2015; Stupans et al., 2013).

Black and Wiliam (1998) found that self-assessment produced positive improvements on objective examinations and assignments and students reported more in-depth understanding of their own learning and progress. Self-assessment can encourage students to be independent learners (Gielen et al., 2003) and reflection is critical in preparing professionals to be able to adapt and adjust to new situations (Hayward & Blackmer, 2010; McCarthy & Murphy, 2007). Self-assessment instruments are not immune to concerns over reliability and validity and should go through development and testing to ensure they accurately measure student progress (Carwile & Murrell, 2002).

There are a couple of examples of healthcare preparatory programs utilizing self-assessments. For radiology students, a self-assessment tool was shown to have a Cronbach alpha of .8137, indicating moderately high level of reliability over the course of two semesters (Carwile & Murrell, 2002; Lovrić et al., 2015). The same self-assessment was also shown to correlate positively and moderately highly with clinical instructor assessment of the students. Thus, the self-assessment tool could have predictive validity in their performance in clinical experiences. In this case, the self-assessment, where goals are well developed and clearly stated and easily measured, can be considered a valid and reliable clinical education assessment tool. As discussed previously, the APTA's PPTCV instrument is an example of a standardized self-assessment tool for the seven core values of Doctorate of PT programs (Hayward & Blackmer, 2010). The PPTCV involves 68 questions and a 5-point Likert scale.

Concerns exist about students being able to accurately reflect on their own learning, especially in clinical education and students are often overly critical in comparison to their preceptors or supervisors (Carwile & Murrell, 2002; Löfmark & Thorell-Ekstrand, 2000; Trede et al., 2015). However, reflection and self-assessment are critical to a career in healthcare, so many programs make sure to include it in the curriculum (Carwile & Murrell, 2002; Trede et al., 2015). Despite some of the concerns, Carwile and Murrell (2002) found that students and preceptors had positive attitudes toward the self-assessment process in clinical education. The assessment tool, created by the Physician Assistant Education Association, is another "highly successful" example of an organization recognizing the importance of self-assessment in preparatory healthcare programs in preparing for the profession's certification examination (Ziegler, 2018, p. 1).

Peer assessment is also utilized to allow assessment of student learning, though peer assessment is often not relied upon for summative assessment (Banta & Palomba, 2015; Gielen et al., 2003; Henning & Marty, 2008; Li, Xiong, Hunter, Guo, & Tywoniw, 2020; Marty, Henning, & Willse, 2010; Pattalitan, 2016). Peer assessment has been shown to benefit students' critical thinking, learning of material, confidence, and team work (Marty et al., 2010). Peer assessment not only benefits the student receiving feedback, peer assessment can enhance the assessor's self-awareness of their own skills (Henning & Marty, 2008).

Marty et al. (2010) demonstrated that for clinical skills, athletic training students' peer assessments were highly accurate compared to "expert" assessment; however, reliability was reliant on the video recording quality of the skill. Any variance changed the reliability significantly. In addition, the authors acknowledge that a larger scale implementation study would allow for more generalization across athletic training programs. Peer assessment by fellow students, at least for clinical skills, is more reliable when students have multiple times to assess their peers (Henning & Marty, 2008). In addition, peer assessment appears to be a bridge in student understanding between formal instruction and formal (preceptor- or faculty-conducted) assessment. Black and Wiliam (1998) also reviewed several studies on peer assessment and found that students, when allowed to develop their own criteria, were quite accurate compared to teacher assessment.

Peer assessment can have a positive influence on students' intrinsic motivation (Gielen et al., 2003). However, peer-assessment can also be stressful to the students performing the assessment (Biggs & Tang, 2007). Training should be provided along with pairing students appropriately based on skill level and availability in order to ease the stress associated with peer-assessment (Henning & Marty, 2008). Clear criteria, in the form of a tool or survey, is also helpful in ensuring quality peer-assessment and easing the stress on the students (Henning & Marty, 2008).

Despite the positivity of peer assessment's values in assessment circles, the actual research results can be mixed on effectiveness. In a meta-analysis by Li et al (2020), the authors synthesized the results of over 134 effect sizes of 58 studies and found that those who participate in peer assessment were more likely to increase their performance by 0.291 standard deviation units. The authors also investigated the most critical factors in influencing student success and found that rater training was most vital and that computer-mediated peer assessment was also more effective than paper-based.

Sometimes, the same tool or survey utilized by the preceptors or supervisors during direct patient care can be utilized for student self -or peer-assessment as well (American Academy of Physician Assistants, 2014; Löfmark & Thorell-Ekstrand, 2000). The AAPA (2014), for example, has a competency measure tool that can be utilized by preceptors or supervisors, peers, or students themselves. The tool utilizes a 5-point scale, from unacceptable to excellent, on a variety of competency measure areas: patient care, medical knowledge, patient-based learning and improvement, professionalism, interpersonal and communication skills, systems-based practice, and specialty-specific areas, such as x-ray interpretation, assistant at surgery, etc. Each area has sub-points as well (American Academy of Physician Assistants, 2014).

In another professional program, the *Milestones* of the Accreditation Council for Graduate Medical Education are intended to be utilized as self-assessment tools every six months and then compared to the evaluations, utilizing the same forms, of the Clinical Competency Committee meetings (Jardine et al., 2017). The *Milestones Guidebook for Residents and Fellows* provides advice to residents on how to critically self-evaluate and questions to ask themselves for both reflection and to ask for feedback from preceptors (Jardine et al., 2017).

Peer- and self-assessment tools are often helpful in reducing the workload to the faculty or administration, while allowing students the opportunity to verbalize what is important to their learning process and outcomes (Biggs & Tang, 2007). Students can learn to determine value in their education and how to judge achievement.

Despite benefits, several areas of concern have been found with utilizing self- or peer-assessment. Research has shown that well-performing students tend to under assess themselves compared to their peers, while poor-achieving students tend to over assess themselves compared to their peers. Determining which assessment is giving the program the true value of student achievement or performance can become difficult. When comparing self- and peer-assessment with instructor-assessment, the best agreement is with upper-level and advanced students and with tools that utilize the most explicit criteria and training. McCarthy and Murphy (2007) found that many preceptors were not familiar with the concept of reflection-on-practice and thus were unable to best evaluate if student learning occurred from the reflection journals of the students and/or peers. Murray et al. (2000) determined that previous studies on self-assessment resulted in inaccurate assessments of life-long learning skills.

The strongest benefits to self- and peer-assessments appear to be as a compliment to other assessment tools (Gadbury-Amyot et al., 2014; Hayward & Blackmer, 2010; Lovrić et al., 2015). The 360-degree model developed by Hayward and Blackmer (2010) for doctorate of physical therapy programs combines self-assessment, peer-assessment, reflection, standardized patients, and communities of practice. All of these different types of assessment build on each other to provide a total picture of student knowledge, skills, and abilities. In Norway, peer- and self-assessment have been incorporated into their national assessment plans in order to give a more holistic view of students besides just relying on objective examinations (Black & Wiliam, 1998b).

Certification and other objective exams. Preparatory healthcare programs often rely on objective examinations in some manner for assessment (Keating et al., 2009; Middlemas & Hensal, 2009; Murray et al., 2000). Fero et al. (2010) found that majority of nursing programs they surveyed utilized multiple choice examinations in the classroom by faculty while clinical situations were assessed in clinic by supervising nurses. In their 2016 survey of physician assistant programs, the PAEA (2018a) found that for every area of study, programs are utilizing multiple choice examinations to assess knowledge. For many of the areas, multiple choice examination is utilized by the majority of programs.

One of the strengths of objective examinations is the ability to allow for easier benchmarking (Black, 2000; Lopez, 2002; Wilkinson et al., 2014). If locally created, the examinations can compare across students (Walvoord, 2010). Standardized examinations allow for comparison across institutions (Walvoord, 2010) and even internationally (Wilkinson et al., 2014). Being able to get a single or set of numbers to describe a student's achievement, often with less individual faculty or administration workload, is helpful for large cohorts and across cohorts (Biggs & Tang, 2007; Black, 2000; Lopez, 2002). With objective examination, reliability is relatively easy to measure and is straightforward to understand. Organizations or research groups more easily can develop something that can be used across programs and institutions (Black, 2000). However, the main reliability and validity concerns in objective testing shift from scoring the item to choosing the items and writing the alternative choices, making objective testing not automatically stronger, as may be assumed (Biggs & Tang, 2007; Birenbaum, 2003; Lopez, 2002). The use of standardized objective exams is cautioned unless the selected exam has been shown valid and reliable for the particular outcome and population (Lopez, 2002). Improving reliability by limiting the range of outcomes to be tested could compromise the validity (Black, 2000).

Objective exams often are not able to assess higher level thinking skills (Biggs & Tang, 2007; Birenbaum, 2003; Black, 2000; Lopez, 2002; Middlemas & Hensal, 2009). Standardized testing appears to be best when utilized as pre- and post-testing to demonstrate learning growth on specific skills, especially if benchmarking is not available (Lopez, 2002; Middlemas & Hensal, 2009; Murray et al., 2000). In addition, some concerns have been raised about whether objective examinations really correlate to student performance in the preparatory healthcare program, especially performance in clinical experiences (Gadbury-Amyot et al., 2014; Holland et al., 2014) or to future employability in the workplace (Black, 2000).

Many students do not believe that examinations, especially multiple-choice questions, truly demonstrate their learning (Biggs & Tang, 2007; Entwistle & Entwistle, 1997). The environment that objective examinations create is often one of stress for the students. Unlike other forms of assessment where scoring criteria and outcomes to be assessed are often made available ahead of and during the creation of the learning artifact, examinations are often timed and without true knowledge of expectations and inclusion (Birebaum, 2003). Examinations put students on the spot to demonstrate learning in a pre-determined manner compared to other assessment forms where students can develop their own artifact over time and with careful thought (Birenbaum, 2003; Entwistle & Entwistle, 1997).

Objective testing is also often a one-shot experience, providing only summative assessment (Black & Wiliam, 1998b). Students may utilize practice examinations to receive formative assessment in preparation for the summative examination, but that needs to be built in to the curriculum of the program and is not inherent in the concept of examinations (Black & Wiliam, 1998b; Holland et al., 2014). Holland et al. (2014) found that the inclusion of a clinical quiz during the clinical experiences improved results on the National Board of Medical Examiners neurology shelf examination and their scores on the site director's subjective examination.

When comparing in-house objective examinations and the use of standardize testing, programs are more likely to choose creating their own. Programs are more likely to create their own examinations so that they can tailor the test to their own program goals, can ensure student motivation since the test is tied to the course, can eliminate the costs of implementing standardized testing, and can gather more relevant data about their students' learning (Lopez, 2002). Programs often chose to use locally created examinations for these positives even at the expense of reliability and validity assurances. Even with the concerns about objective examinations shared above, accreditation teams report that programs are satisfied utilizing standardized testing as a mechanism of demonstrating learning.

Many preparatory healthcare professions are required to monitor the results of programs' graduates on state or national certification exams, such as graduate medical education (American Council on Graduate Medical Education, 2016), athletic training (Commission on Accreditation of Athletic Training Education, 2018a), neurology clerkships (Holland et al., 2014), and nursing (Lopez, 2002; Turkel et al., 2016). Several programs utilize performance on practice examinations to ensure student preparation for certification examinations. One such example is the NCLEX-RN Risk Appraisal Instrument utilized by nursing educators (Barkley et al., 1998). Beyond certification examinations, other objective examinations are utilized to assess overall competence or individual outcomes, such as topic areas for medical students (Wilkinson et al., 2014). Drexel's clerkship in neurology utilized a shelf examination for the National Board of Medical Examiners neurology examination as a program-level assessment strategy (Holland et al., 2014). The PAEA has created practice examinations for programs to utilize in their programs to prepare students for the certification examination and that could be used as an assessment tool for the program (Physician Assistant Education Association, 2018b).

Oral examinations. Oral examinations are actually quite common in medical training, where panel of assessors interview the students using a standardized and structured tool (Cunningham et al., 2015; Middlemas & Hensal, 2009). The oral examinations can improve verbal communication and reasoning for an action while providing immediate feedback for the student and the educator on learning (Keating et al., 2009). The viva voce assessment is one type of oral examination where students are given some clinical material to review and then, after a period of time, the student is questioned by a panel of examiners about theoretical clinical application by student (Keating et al., 2009; Khan et al., 2013). Middlemas and Hensal (2009) discovered that oral examinations among certification bodies and preparatory healthcare programs is shrinking, most likely due to research that shows that oral examinations scores typically have low generalizability and reliability.

Marking/grades. A debate exists on the appropriateness of assessment being tied to marking or grading. Biggs and Tang (2007) defined marking as "quantifying learning performances, either by transforming them into units, or by allocating ratings or 'marks' on a subjective if not arbitrary basis" (p. 174). The need to standardize assessment between students has created a connection between assessment of learning and marking, for better or worse. Alignment between the emphasis of learning and the focus of testing and marking is crucial.

Examinations to be marked could consist of multiple choice, essays, problems to solve, case or data analysis, literature reviews; they could also be oral examinations via questioning or practical skill demonstrations (Biggs & Tang, 2007; Tuning Education Structures in Europe). When using marking or grades as the demonstration of learning, the amount of points each question or form of assessment is worth becomes very important to the validity of the strategy (Brookhart et al., 2004). Unfortunately, the assignment of grades is usually done arbitrarily or approximately based on convenience of the instructor or constraints of the course, such as the length of time an exam would take. Other forms of marking, such as giving clinical experience grades, have questionable validity (Scriber et al., 2010). The validity is questionable if the grade does not measure the same criteria across all evaluators or preceptors and if the amount of emphasis of each criterion of the total grade is not kept consistent across students or experiences.

Others. Other types of assessment strategies for preparatory healthcare programs may be present in assessment plans. Examples include cognitive mapping (Patel et al., 2015) and patient or clinic statistics and patient satisfaction, usually assessed via a survey (Murray et al., 2000). The generic term "projects" is also utilized in assessment, often to refer to some activity focusing on functional knowledge in combination with research on a topic (Biggs & Tang, 2007). The term project can sometimes be used in the realm of capstone projects, where student learning outcomes can be assessed that were maybe not captured in an individual course. One specific type of project that has not yet been discussed in this review is a dissertation, thesis, or other research project, which are usually utilize as a summative assessment of a program, needing to demonstrate multiple competences, student learning outcomes, and knowledge (Tuning Educational Structure in Europe).

Projects can be individual, or more commonly completed in groups, in order to mimic working with a team in the real world (Biggs & Tang, 2007). Projects, no matter what the term means, does require a mechanism to assess the work, which is most often a form of a rubric. One concern with utilizing group projects for assessment is the correlation of the rubric or grading mechanism with the desired outcomes of the project. If collaboration is a key reason to utilize the group project, then the collaboration needs to be able to be assessed via the rubric and not just focus on components or the final outcome. The concept of defining the outcomes and matching the outcomes to the rubric, is true for other types of assignments that might be utilized for assessment as well, such as documentation assignments (Cone et al., 2016).

Oral presentations are another form of assessment, especially good at targeting processing and dissemination of information and oral communication (Biggs & Tang, 2007; Keating et al., 2009). Oral presentations can be formal, one such example being research poster presentations, or informal, such as classroom projects, or practical, such as communicating information to a patient or presenting a patient's information to a preceptor or other healthcare professional (Banta & Palomba, 2015; Biggs & Tang, 2007). The AAC&U has developed rubrics to be used in assessment of a variety of oral presentations depending on the student learning outcome the presentation is aimed at demonstrating (Banta & Palomba, 2015).

In their survey of all physician assistant programs in 2016, the PAEA (2018a) found that programs, when they do utilize oral presentations, used them as a secondary form of assessment and most often for the following areas: counseling skills (13%), human sexuality (16.4%), psychological development (14.7%), psychological/interpersonal/cultural health factors (16.4%), behavioral medicine (33.3%), cultural and socioeconomic issues (19.4%), medical ethics (33.3%), PA professional issues (36.9%), public health topics (33%), and quality improvement and patient safety (24.1%). Allowing programs to develop and justify their own tools or approaches should be part of assessing assessment, as long as common language and understanding of validity and reliability are adopted, which is where a governing body or organization can be helpful.

Problem-based learning (PBL) is utilized in preparatory healthcare programs due to the high degree of alignment between the assessment and the outcomes of the program, which usually include professional knowledge and skills to problem solve (Biggs & Tang, 2007; Cunningham et al., 2015; Golemboski et al, 2013; Ho et al., 2014; Middlemas & Hensal, 2009). PBL in preparatory healthcare programs is often structure where students deal with the initial problem (diagnosing, hypothesizing checking data), review the knowledge they have on the topic, and then formulate the solution or action (synthesizing concepts, applying the knowledge to the problem, and respond to feedback) (Biggs & Tang, 2007; Golemboski et al., 2013; Ho et al., 2014). The ability to assess multiple student learning outcomes, such as critical thinking and teamwork skills along with knowledge, is a valuable point of PBL (Golemboski et al., 2013; Ho et al., 2014). PBL utilizes a rubric for assessment, as does many other assessment methods (Golemboski et al., 2013). The rubrics are used for summative assessment by the program and for students to self-evaluate for formative assessment opportunities.

In their study of speech language pathology programs in Hong Kong, Ho et al. (2014) set out to see if scores on PBL tutorials could predict clinical performance (as measured by a non-standardized preceptor evaluation form and the standardized COMPASS). The authors found that the reflective journal portion of the PBL and the actual participation in the PBL correlated to performance on their clinical performance on the non-standardized preceptor evaluation form (Ho et al., 2014). In addition, participation in the PBL was correlated to the generic and occupational competencies and overall score on the COMPASS. The ability to correlate PBL, which can be conducted in a controlled environment, to clinical performance is beneficial to preparatory healthcare programs; however, the generalizability of the Ho et al. study is limited due to subject numbers and limitation to one institution and one program. Even with evidence showing the benefits of PBL in assessing student learning outcomes, athletic training education programs are still finding difficultly with implementing the techniques regularly into their assessment plans (Thompson et al., 2014).

In addition, for indirect assessment, some programs utilize interviews or focus groups in order ask students about their learning, similar to the use of a graduation survey (Biggs & Tang, 2007). Finally, while not assessing student learning directly, many preparatory healthcare programs will report graduation, retention, and placement rates in order to demonstrate program competency (Campbell & Dickson, 1996; Knight & Yorke, 2007). An indirect or inferred connection can be made between successful progression through the program and employability of students and student learning (Knight & Yorke, 2007). For athletic training programs, the current CAATE 2012 standards and the new 2020 standards require programs to report graduation, retention, and placement rates (Commission on Accreditation of Athletic Training Education, 2012, 2018).

The use of monitoring patient encounter experiences as a means of formative and summative assessment was studied by Cavallario et al. (2018). The authors examined student reports of their inclusion of the five core competencies, patient-centered care, evidence-based practice, interprofessional education or practice, quality improvement, and healthcare informatics, in their patient encounters during clinical experiences. Students were trained on the five core competencies and how to recognize their presence in a patient encounter through reflective reading and writing sessions. Students then completed their clinical experiences and reported each patient encounter and the inclusion of any of the five core competencies along with their role in the interaction (observation, assistance, or primary performance). Tracking patient encounter and the inclusion of SLOs (in this case the core competencies) could be an effective tool in monitoring assessment in clinical education.

Athletic Training Education

Background on profession and educational programs.

There are several definitions of athletic training in the public and from the organizational bodies of the profession. However, the CAATE (2012) has perhaps the most inclusive definition:

> Athletic Trainers are healthcare professionals who collaborate with physicians to optimize activity and participation of patients and clients. Athletic training encompasses the prevention, diagnosis, and intervention of emergency, acute and chronic medical conditions involving impairment, functional limitations, and disabilities. Athletic training is recognized by the American Medical Association as a healthcare profession. (p.1)

In addition, the CAATE states that the professional preparation of the athletic trainers is based on developing the knowledge, skills, and abilities that are determined by the CAATE (Commission on Accreditation of Athletic Training Education, 2012). The *5th Edition of the National Athletic Trainers' Association (NATA) Athletic Training Education Competencies* encompasses eight content areas: evidence-based practice, prevention and health promotion, clinical examination and diagnosis, acute care of injury and illness, therapeutic interventions, psychosocial strategies and referral, healthcare administration, and professional development.

Athletic training, the profession and the preparatory education, is regulated by three major organizations. NATA is a membership organization, through which the majority of athletic trainers join forces the accomplish several goals, including representation, engagement, and continued growth and development of the profession and professionals (National Athletic Trainers' Association, 2017). NATA is responsible for the agenda of the membership, namely promotion of the profession to the public, legislative efforts, working with other healthcare organizations, and promoting best practices through working groups and committees. One such committee is the Executive Committee on Education (NATA-ECE) that helps frame the membership's priorities for the education of athletic trainers, helping set standards and competencies of the preparatory, post-professional, and continuing education programming. NATA-ECE works with the CAATE.

The CAATE is an external body that accredits athletic training programs, both professional and post-professional (Commission on Accreditation of Athletic Training Education, 2018b). The CAATE is responsible for defining, measuring, and continually improving athletic training education. The CAATE is the body that is responsible for the implementation of standards needed for programs to maintain accreditation and, thus, allow their students to be eligible for the Board of Certification (BOC) exam (Commission on Accreditation of Athletic Training Education, 2012).

The BOC is a credentialing agency that establishing the standards for athletic training practice and the continuing education requirements to maintain certification (the ATC credential) (The Board of Certification for the Athletic Trainer, 2018b). The BOC determines the certification standards, including developing, implementing, and scoring the national certification exam, the BOC exam. Only students that graduate from a CAATE-accredited athletic training program are eligible to take the BOC exam, and thus become certified athletic trainers in the United States of America. Thus, the BOC works closely with NATA-EC and the CAATE to align the education, certification, and professional responsibilities of the athletic training profession.

Athletic Training accreditation requirements for assessment. As part of the accreditation standards of athletic training professional programs, the CAATE delineates that assessment plans and adherence to the assessment plans are required by programs to maintain good standing in accreditation (Commission on Accreditation of Athletic Training Education, 2012). Specifically, standards four through thirteen require the creation, implementation, and utilization of an assessment plan. Programs must create a comprehensive assessment plan to evaluation all aspects of the educational program. The assessment measures utilized can vary, but must include BOC examination aggregate data for the most recent three test cycle years. The data that must be posted on the programs' websites includes the number of students graduating from the program who took the BOC examination, the number and percentage of students who passed the examination on the first attempt, and the overall number and percentage of students who passed the examination regardless of the number of attempts. Other possible measures include clinical site evaluations, preceptor evaluations, completed clinical proficiency evaluations, academic course performances, retention and graduation rates, graduating student exit evaluations, and alumni placement rates one-year post graduation. The plan must be ongoing and the program must document regular assessment of the educational program.

Currently, the specific details of the plan, with the exception of the use of BOC exam data, is up to the program (Commission on Accreditation of Athletic Training Education, 2012). In fact, the CAATE calls for the assessment plan to be related to the program's stated educational mission, goals, and objectives and to measure the individual quality of instruction, student learning, and overall program effectiveness. The outcomes of the program, the choice of the assessment measures, with the exception of BOC exam results, the collection of the data, the analysis of the data and the action to be take based on the results is all individually created by the program.

The CAATE requires each program to have outcomes and an assessment plan, which must include data collection, data analysis to determine the extent to which the program is meeting its own stated mission, goals, and objectives, and action taken on results of the data analysis (Commission on Accreditation of Athletic Training Education, 2012). The plan must include developed targeted goals and actions plans if the program and student learning outcomes are not met, timelines for reaching those outcomes, person or persons responsible for reaching those outcomes, and evidence of periodic updating of action steps as they are met or circumstances change. Finally, if the program is found to be below a seventy percent three-year aggregate BOC first-time pass rate, the program must provide an analysis of deficiencies and develop an action plan to correct the deficiencies. BOC first-time three-year aggregate pass rate is, currently, the only benchmark stipulated by the CAATE. However, as of July 1, 2018, the CAATE also requires retention and graduation rates for the most recent three academic years and employment/placement rate for the most recent three graduating cohorts within six months of graduation. No benchmark has been stipulated by the CAATE for the employment/placement rate and graduation rate assessment measures, only that they be reported and available on the programs' homepages.

Factors Affecting Certification Exam Results

Since research specific to the athletic training Board of Certification exam is limited, this literature review will look at that body of literature as well as other professional certification exams and the factors and may or may not affect results on those. Those factors can be divided into those that are considered to be student-based, such as qualities and previous preparation or achievements, and those that are programmatic, such as curricular and clinical experiences and assessments. Understanding the student-based and programmatic factors is important for the healthcare preparatory program in order to best prepare students for success on certification or licensure exams as well as identifying those students who will most likely succeed and those that might not or might need additional assistance through the educational process (Barkley et al., 1998). In addition, when developing assessment measures, programs may need to know if a correlation exists between the achievement of certain outcomes as assessed by the tools and the certification exams (Luedtke-Hoffmann et al., 2012).

Student factors. The National Council Licensure Examination for Registered Nurses (NCLEX-RN) is used to certify registered nurses. Several studies have examined hypothesized variables that would predict student success on the NCLEX-RN. Grades or GPA in science course pre-admission (Wall, Miller, & Winderquist, 1993) or during the program (Waterhouse, Caroll & Beeman, 1993) appear to predict NCLEX-RN scores. Grades or GPA at specific points in the nursing program or during specific nursing courses has also been shown to be indicative (Barkley et al., 1998; Campbell & Dickson, 1996; Waterhouse et al., 1993). Scores on preparation, practice, and achievement exams were also indicative of future success on the NCLEX-RN (Barkley et al., 1998; Wall et al., 1993). SAT or ACT scores have also been predictive in several studies as reported in a meta-analysis by Campbell and Dickson (1996).

Test anxiety propensity, self-esteem or self-concept, and support groups have also been found predictive (Campbell & Dixson, 1996).

Most studies that look at predictors finds that the variables are better at predicting success than failure on the NCLEX-RN (Barkley et al., 1998; Wall et al., 1993). Those variables that were best at predicting failure involved Cs or lower in program nursing classes, with those with three or more Cs being more at risk than those with only one (Barkley et al., 1998). Some of the above studies utilized single site samples, which limit the generalizability of the results (Barkley et al., 1998; Wall et al., 1993); others looked at national examination results for one year (Waterhouse et al., 1993) or was a meta-analysis of several studies to increase their sample and power (Campbell & Dickson, 1996).

Program factors. Since performance (grades) in specific nursing curricular courses has been shown to predict NCLEX-RN results, the program could affect student success in the courses by how they design the courses (Barkley et al., 1998). A slight correlation was found between performance on the PT Manual for the Assessment of Clinical Skills, which is based on the educational experience of the program, and the NPTE (Luedtke-Hoffmann et al., 2012).

Conclusion

Assessment is prominent in higher education, especially in preparatory healthcare programs. Assessment of student learning grew from practicality and outside demands, not necessarily theory, and thus research into assessment tends to have a practical nature. Due to a variety of reasons, both internal and external, programs find themselves needing to define learning outcomes for their students and means to measure the achievement of those outcomes. Preparatory healthcare programs have the additional need to meet public expectations of their graduates' competence, which leads to a need for standardization of some outcomes across programs. This review of literature reveals a wide variety of student learning outcomes of preparatory healthcare programs and even more diverse means of assessment, yet some common themes emerge. The literature provides a foundation to develop a study that examines what commonality exists between athletic training programs in the student learning outcomes they assess and the mechanism for the assessment, in the hopes of providing information to working groups or organizations who might develop standardized tools for the profession.

Chapter 3: Methodology

Introduction

The purpose of this study was to examine the type of program-level student learning outcomes that athletic training programs are citing and how athletic training programs are assessing these student learning outcomes (assessment environment and measurement utilized for assessment). In addition, with the student learning outcomes identified, this study intended to investigate if any correlation exists between these student learning outcomes, their associated educational experience, assessment measures utilized and Board of Certification exam three-year aggregate pass rates. The following research questions were studied.

RQ1: What are the most prevalent program-level student learning outcomes cited by athletic training programs?

RQ2: What relationship, if any, exists between the most prevalent program-level student learning outcomes, educational environment of assessment (clinical experiences, controlled environments, or both), and type of assessment measure (direct, indirect, or both)?

RQ3: What correlation, if any, exists between the most prevalent program-level student learning outcomes and athletic training programs' Board of Certification three-year aggregate exam first-time pass rates?

This chapter describes the methods that were utilized to study the research questions. In addition, this chapter discusses the limitations and delimitations of the study methods and the ethical considerations of this study.

Research Design Strategy

This study was a correlative cross-sectional and descriptive statistical survey design utilizing quantitative methodology to gather and analyze the data. This study utilized a survey sent to athletic training program directors that set out to quantify the categories of program-level student learning outcomes that the programs include in their assessment plans, the environment in which these student learning outcomes are assessed (clinical experiences, controlled environments, or both), and the type of assessment measure utilized (direct or indirect). The survey also included the athletic training programs' three-year aggregate first-time pass rate on the BOC exam.

Theoretical Framework

Assessment of student learning is, at its core, an applied phenomenon without a strong theoretical foundation (Taras, 2010). Assessment grew out of a practical need to demonstrate student learning and authors have since been attempting to apply theories onto the assessment framework (Black et al, 2003; Black & Wiliam, 1998a, b; Black & Wiliam, 2009; Stobart, 2008; Taras, 2010; Wiliam et al., 2004). One such attempt tied the learning theory of social constructivism and its actual and potential developmental learning levels to the goals of assessment (Sadler, 2008; Stobart, 2008; Taras, 2010; Vygotsky, 1978). If students can strive for new knowledge (their potential development level) with help of instruction, then assessment is the means to measure the progress towards the goal. While social constructivism may help explain assessment, assessment is best explained in its action. The following study is a monitoring of assessment in action of athletic training programs, a nod to the practical nature of assessment.

Variables

The independent variables for this study were the student learning outcomes cited by athletic training programs. For research question two, dependent variables included assessment measure type (direct, indirect, or both, if more than one strategy is utilized) and assessment environment (clinical experiences, controlled environment, or both if assessment occurs in more than one area) and the independent variable was each of the most prevalent student learning outcomes. The number of the most prevalent student learning outcomes were established from the median number of SLOs cited by programs. For research question three, the information gathered from the survey on the most prevalent student learning outcomes would have been utilized as the independent variables. Athletic training programs' three-year aggregate Board of Certification Exam first-time pass rates would have been utilized as the dependent variable; however, the response rate of eligible programs was not high enough to allow analysis.

Instrumentation and Measures

A survey, sent to the program directors of the eligible athletic training programs, was utilized to gather demographic information along with the data for the analysis. The survey can be seen in Appendix B. Following demographic questions about the program and the director's experience with assessment, the program directors were asked how many student learning outcomes their program cites. The median number of SLOs cited by programs was used to set the number of the most prevalent SLOs that were analyzed for research questions two and three. The survey then asked about the assessment strategies of the programs. The survey utilized categories of student learning outcomes that have been established by the Commission on Accreditation of Athletic Training Education (Table 2) (2017b) for tracking during its annual report process along with the National Academy of Medicine's, formerly the IOM, five core competencies (Table 3) (Greiner & Knebel, 2003) and other items discovered during the literature review (Appendix A). In addition, program directors could write in their own categories if the survey options did not satisfy all of their programs' student learning outcomes. The survey also collected the environment of assessment (clinical experiences, controlled environment, or both) and the type of assessment measure (direct, indirect, or both). Program directors were asked to report the written copy of the student learning outcome and the specific type of measure (i.e., exams, inventories, preceptor evaluation, etc.). The open comment allowed for additional review of the categories to ensure proper categorizing for data entry. All information was self-reported by the program director. Categories for assessment measure type were based on literature review of tools and strategies that directly measure student achievement of the outcome (i.e., rubric assessment of a project or paper) and those that indirectly measure student achievement (i.e., student, peer, or other perception of achievement) (Biggs & Tang, 2007). This data was recorded per student learning outcome, as well as per program. Responses about the educational environment (clinical experiences, controlled environments, or both) within which the assessment of the student learning outcomes occur were used as additional data for analysis. The responses were recorded per student learning outcome theme as well as per program (response).

Table 2

*CAATE Pre-established Themes of Student Learning Outcomes (*Commission on Accreditation of Athletic Training Education, 2018c)

Student Learning Outcome Theme
Critical Thinking
Research/EBP [a]
Communication
Knowledge/Skills
Problem Solving
Creative Thinking
Board of Certification Preparedness
Retention/Graduation
Career Preparedness

[a] Crossover of theme category with Core Competencies (Table 3)

Table 3

*The Core Competencies Needed for Health Care Professionals (*Greiner & Knebel, 2003)

Core Competency
Provide Patient-centered Care
Work in Interdisciplinary Teams
Employ Evidence-based practice [a]
Apply Quality Improvement
Utilize Informatics

[a] Crossover of theme category with CAATE Themes (Table 2)

Field test. The survey instrument was shared with the dissertation committee in order to gauge the structure, grammar, and appropriateness of the survey questions. Revisions were made to ensure the ease of completion for the subjects in order to ensure standardized results and assist in increases response rate.

Expert panel review. An expert panel review of the survey instrument was conducted with five current undergraduate athletic training programs. The undergraduate athletic training programs were not eligible for inclusion within the sample, yet they are required by the Commission on Accreditation of Athletic Training Education to also have the assessment plans.

The five programs were chosen from the Commission on Accreditation of Athletic Training Education program search (https://caate.net/search-for-accredited-program/). Criteria for inclusion were professional programs at the bachelor's level and an "Active-in good standing" program status. The programs were solicited in alphabetical order. The sample consisted of the first five responses received. The program directors were asked to complete the survey and then complete a follow-up survey asking for feedback on the clarity of format and language of the survey along with the ease of completing the survey. Program directors appreciated the Carnegie classification website link in order to determine their institutions' classification. Suggestions included to provide clearer instructions for the SLO chart and to include an example of how to complete the survey. In addition, allowing program directors just to copy in or write in all the SLOs without having to match them to the boxes was suggested. Program directors also wanted more consistent language in the survey, including removing program-level student learning outcomes for just student learning outcomes. This feedback was used to refine the survey to its current form (Appendix B) before the instrument was approved by the Institutional Review Board and sent out for data collection.

Sampling Design

The population for this study included all professional athletic training programs at the master's level, due to the impending transition of athletic training programs strictly to the master's level by 2026 (Commission on Accreditation of Athletic Training Education, 2015). Only programs in good standing with the CAATE were utilized as this ensured that the program was compliant with accreditation standards concerning their assessment plans. As of the start of data collection in August 2019, 121 athletic training programs were at the master's level and in good standing according to the CAATE website (https://caate.net/search-for-accredited-program/). At the time of data collection, all master's athletic training programs were considered viable subjects for the study. The survey instrument was distributed to the program directors of all master's athletic training via email. The list of the eligible programs was gathered from the CAATE website (https://caate.net/search-for-accredited-program/) which is housed under their "Public" page. From the list of eligible programs, program directors' names and email addresses were gathered from program websites. Permission was not required since no private information is requested. Even so, permission was granted and the letter can be seen in Appendix C.

In addition, the sample was further limited to those programs that have graduated at least three cohorts at the master's level to ensure three years of BOC exam data at the master's level for research question three. The data on number of years as a master's program are not publicly available. A survey question about how many cohorts the program has graduated at the master's level was included on the instrument (Appendix B) in order to narrow the sample down. Programs that have not graduated at least three cohorts will be removed from the sample for research question three only. After the culling of programs with less than three graduated cohorts, a possible sample size of 60 programs was expected.

Data Collection Procedures

First in the data collection procedure was to seek approval from Bethel University's Institutional Review Board (IRB) (Appendix D). Once approval was garnered, the study proceeded. Email contacts for program directors of eligible programs were gathered from the programs' websites. Two weeks prior to data collection, program directors of athletic training programs at the master's level were initially contacted with an email stating the purpose of the study and the benefits of participation. This teaser email asked for program directors to be on the lookout for the survey in two weeks. At the start of the data collection window, an introduction email with the link to the survey was sent to the program directors. Follow up emails were sent every two weeks over the course of 10 weeks of data collection to participants to improve response rate on the survey. To improve response rate, those that completed the survey had the chance to enter a drawing for a VISA gift card in the amount of a certified member registration fee to the 2020 National Athletic Trainers' Association Annual Clinical Symposium and Expo (value of $250). The individual received a link upon completion of the survey to be able to enter their email address in a separate document. This ensured that no identifiable data was connected to the survey. All of the contact emails for the program directors can be seen in Appendix E.

After six weeks of data analysis, response rate was low. The researcher attended the 2019 CAATE conference with many of the program directors. The researcher made several announcements at the conference during free response time and sent out one of the reminder emails during the conference to engage those program directors. Responses ticked up after that announcement. Additional emails were tagged with the subject line of needing twenty or ten more participants to try and entice more of a response rate to ensure statistical power. Eventually, responses flattened out and no new additional emails were eliciting more subjects. The final response rate was set after November 1, 2019 and the survey was closed.

The survey for this study was generated using Qualtrics software, Version 3. Copyright © 2018 Qualtrics. Qualtrics and all other Qualtrics product or service names are registered trademarks or trademarks of Qualtrics, Provo, UT, USA. https://www.qualtrics.com

Data Analysis

All data was loaded into SPSS Statistics for Mac, Version 26.0. A p-value ≤ 0.05 was set a priori. For research question one, the frequency counts of each category of student learning outcomes was utilized. The median number of SLOs cited by programs was set as the number of

SLOs utilized for research questions two and three. For example, if programs cited a median of five SLOs, the five most prevalently selected SLOs were used for analysis for research questions two and three.

For research question two, the information gathered from the frequency counts of the most prevalent student learning outcomes and the frequency of assessment measure type (direct, indirect, or both) and frequency of assessment environment (clinical experience, controlled environment, or both) were utilized. Since the variables were categorical of a single population, Chi-square tests for association (5 x 3) were originally intended to be conducted between the five SLOs and environment type and the five SLOs and measurement type. To further determine if there was any association between assessment environment and measure type for each of the top five most prevalent SLOs five additional Chi Square tests for association would have been performed (3 x 3). Finally, in order to assess if there was an overall relationship between measure type and assessment environment, regardless of SLO, a Chi-square test for association (3x3) was intended to be performed using all the responses for environment location (clinical experience, controlled environment, or both) and assessment measure type (direct, indirect, or both). Post hoc analysis would have been used to determine the specific associations. Unfortunately, during the analysis process, the low response rate caused violations of the Chi-square assumptions. Instead, frequency counts of each category were reported and were still considered valuable to informing the research question.

Each of the most prevalent SLOs was also assessed for relationship with each type of environment (clinical experience, controlled environment, or both). Again, a Chi-square test for association (5x3) was intended to be conducted with post hoc analysis. However, as stated above, the low response rate caused violations of the Chi-square assumptions so frequency counts of each category were reported instead and still considered valuable to informing the research question.

For research question three, the information gathered from the survey on the most prevalent student learning outcomes was intended to be utilized as the independent variable. The athletic training programs' three-year aggregate Board of Certification Exam first-time pass rates would have been utilized as the dependent variable (also gathered on the survey). A multiple linear regression was intended to be used to determine if any correlation exists between the presence or absence of the most prevalent student learning outcomes cited by programs (independent variable, multi-level) and programs' Board of Certification exam three-year aggregate first-time pass rates (dependent variable). However, following data collection, only seven of the participants were at an institution that had graduated 3+ cohorts, which would have allowed for accurate Board of Certification exam three-year aggregate first time pass rates. Power analysis revealed this would not be an effective sample size, so the third research question must be thrown out.

Limitations of Methodology

Within any methodology, certain limitations are inevitable within the design and delimitations are purposefully created to control the study's outcomes. Both need to be made clear and considered in order for the study to move forward successfully.

Delimitations. This study only sampled those CAATE-accredited professional athletic training programs that are master's level in good standing with the CAATE. In addition, for research question three, the sample was further limited to those programs that have at least three graduating cohorts, which ensured that the three-year aggregate Board of Certification Exam first-time results are for master's level students only. The delimitation could possibly have led to sample size that is small. With only 121 programs available to fit the inclusion criteria for questions one and two an estimated 60 programs for research question three, the sample number is limited and might affect statistical analysis. This delimitation did ultimately affect the analysis, resulting in an inability to run statistics for question three.

Limitations. This study assumed that programs that cite a student learning outcome in their assessment plan are actually instructing to that outcome. The study design did not allow any means to ensure that programs are doing a quality job in implementing their plan to achieve the student learning outcome. In addition, the study assumed that the program gives equal credence to each student learning outcome cited on their assessment plan. In this study, ensuring that all student learning outcomes are equally important and emphasized within the programs' curricula was not possible within the scope. A more in-depth investigation into the application of the student learning outcomes within curriculums was beyond the scope of this project.

Another limitation in this study was the free response by the program directors. The program directors were responsible for self-reporting their student learning outcomes, the environment in which the student learning outcomes are assessed, and the type of measure utilized for assessment. The program directors may have categorized their programs' assessment plans and student learning outcomes differently than others or left out information based on their perceptions.

Another statistical limitation could have occurred in the variability of the Board of Certification exam three-year aggregate first-time pass rates. Athletic training programs with three-year aggregate first-time Board of Certification exam scores below seventy percent are put on probation or lose their accreditation (Commission on Accreditation of Athletic Training Education, 2012). With a range of scores most likely only between seventy percent and one hundred percent, the range of scores could have been too constrained to show true differences between the variables. While concerning, the research question was considered valuable enough to investigate and any lack of statistical power would have been discussed post-data analysis. However, since the response rate was too low for adequate statistical power, the research question was thrown out.

As is common with most survey research, the participation and response rates could have been a limitation. Since the sample size is already limited, response rate was crucial to statistical power. In addition, the program directors were being asked to submit information on behalf of the program, not to participate on their own accord. Program directors could have seen the student learning outcome information as proprietary and feel that they are not at liberty to share for research purposes. The survey introduction letter explained the study and its purpose. The study included follow up via email once every two weeks for the data collection window.

Ethical Considerations

Every research project has ethical considerations that need to be addressed during the planning and implementation of the study. This study's design adhered to the Belmont report of ethical principles for the protection of all human subjects involved in the study (United States Department of Health & Human Services, 1979). This study was vetted by the Institutional Review Board of Bethel University and a dissertation committee of experts in the fields. All efforts were made to determine the probability, and if needed, magnitude of any possible harm and benefits to the potential subjects (United States Department of Health & Human Services, 1979).

In this study, since the data being gathered was at the program level and not the personal level, many of the ethical concerns relayed by the Belmont Report were mediated (United States

Department of Health & Human Services, 1979). The survey did not collect any identifiable data for the individual not the program. The program directors were asked to complete information for their program without identifying the program. No email addresses or contact information were collected on the survey. Following the survey completion, participants were provided a link to provide an email address if they would like to enter the raffle. The identifiable information was stored separately from the survey data and was not traceable to any of the data.

The procedure for security was explained to the program directors during the informed consent process (Appendix F). The Qualtrics survey allowed for the survey to be blocked from indexing on search engines, keeping the survey private to only those who receive the survey link. In addition, the Qualtrics survey had anonymized responses where no personal information was recorded and any contact association will be removed (Qualtrics, Provo, UT). Survey responses did not have a traceable IP address in order to protect identity of research subjects (Martinez, 2015). The email addresses collected were destroyed once a winner was identified and contacted. Data collected was stored securely on an external drive and personal computer of the single researcher. No identifying information was stored with the data.

Beneficence is an important construct of the Belmont Report (United States Department of Health & Human Services, 1979). Beneficence was assured during this study in several ways. The subjects' voluntary participation was respected. While follow up contact occurred, at any point if a subject would have wanted removal from the contact list or removal from the study, his or her decision would have been respected. This never occurred. In addition, the distribution of the survey was to all eligible programs based on inclusion criteria set a priori. No bias of inclusion or distribution occurred. Results were disseminated to all programs that were initially contacted, unless specifically asked to be removed from contact list, in order to ensure that all programs could benefit from any knowledge gained from the study. Data was also shared, upon request, with athletic training governing bodies in order to assist all programs and the profession in developing future assessment outcomes and tools.

The informed consent is a vital part of ensuring the wellbeing of research participants (United States Department of Health & Human Services, 1979). This study included informed consent before beginning the survey. Failure to complete the informed consent resulted in subject's data from being removed from collection. Information was clearly stated on the informed consent so that the participants understood any known risks and their own rights to voluntarily participate. Acknowledgement of agreement and comprehension of the informed consent was collected before proceeding with the survey. The informed consent is available in Appendix E.

Another ethical consideration is the bias of the researcher. Continual examination of bias and training in ethical principles of research helped to minimize the researcher bias factor. All involved in the study completed CITI Training in ethical research practice (CITI Program, 2017) and the study was approved by the Institution Review Board at Bethel University. The oversight of the IRB and dissertation committee, along with the CITI Training helped ensure ethical practice within this project.

Chapter 4: Results

Overview

As stated in Chapter Three, the study was conducted via survey to program directors about the assessment of student learning outcomes in their programs. Descriptive statistics were run on the type of student learning outcomes most commonly cited by the program directors. Chi-Square analyses were not able to be conducted to examine associations between type of student learning outcome, the environments of the assessment, and methods of assessment. Instead descriptive statistics of frequency were reported for each category and grouping of assessment environment and assessment measure type. This chapter describes the results of the statistical analysis of the survey results. The chapter is organized according to the research questions of the study, beginning with a description of the sample.

Population and Sample

The original population for this survey consisted of all the program directors of athletic training programs at the master's level and in good standing with the Commission on Accreditation of Athletic Training Education (CAATE) which ensured that the program had a comprehensive assessment plan as part of the accreditation process of the CAATE. At the beginning of sampling in September 2019, one hundred twenty-one programs were identified as viable subjects. The program directors of all one hundred twenty-one programs were contacted and invited to be subjects in the study. At the beginning of November 2019, the survey was closed and a sample of 35 subjects with completed surveys was confirmed for a response rate of 29%. All 35 of the surveys were completed fully, so no missing data needed to be reported.

In order to assess the validity of the sample compared to the general population, the demographics on Carnegie classification of the institutions was collected. The sample population's classification profile was compared to the larger population's classification profile utilizing a nonparametric Kolmogorov-Smirnov Test of independent samples. The number of each Carnegie classification category of the sample was compared to the number of each Carnegie classification category of the population (Table 4). The null hypothesis was retained for all classifications, demonstrating that no significant difference between the sample and the population in distribution of classifications of institutions was present (Figure 4). The population distribution was found by using the population list from the CAATE website and then checking each school on the Carnegie classification Institution Lookup website (https://carnegieclassifications.iu.edu/lookup/lookup.php). One anomaly to note is that the sample had a larger number of Master's 3: Master's Colleges and Universities – smaller programs (n=6) than the population does (n=4). The anomaly can most likely be attributed to the fact that the program director could answer the question without looking up his or her institution's data on the website, even though the website link was provided in the survey (Appendix B).

Table 4

Sample Versus Population Institutional Carnegie Classification

Carnegie Classification	Sample (n; %)	Population (n; %)
Research 1: Doctoral University – very high research activity	7; 20%	18; 14.9%
Research 2: Doctoral University – high research activity	7; 20%	24; 19.8%
Doctoral/Professional University	9; 25.7%	21; 17.4%
Masters 1: Master's College and University – larger programs	4; 11.4%	26; 21.5%
Masters 2: Master's College and University – medium programs	1; 2.9%	13; 10.7%
Masters 3: Master's College and University – smaller programs	6; 17.1%	4; 3.3%
Bachelors: Art and Science	1; 2.9%	4; 3.3%
Bachelors: Diverse Fields	0; 0%	10; 8.3%
Other	0; 0%	1; 0.8%
Totals	35	121

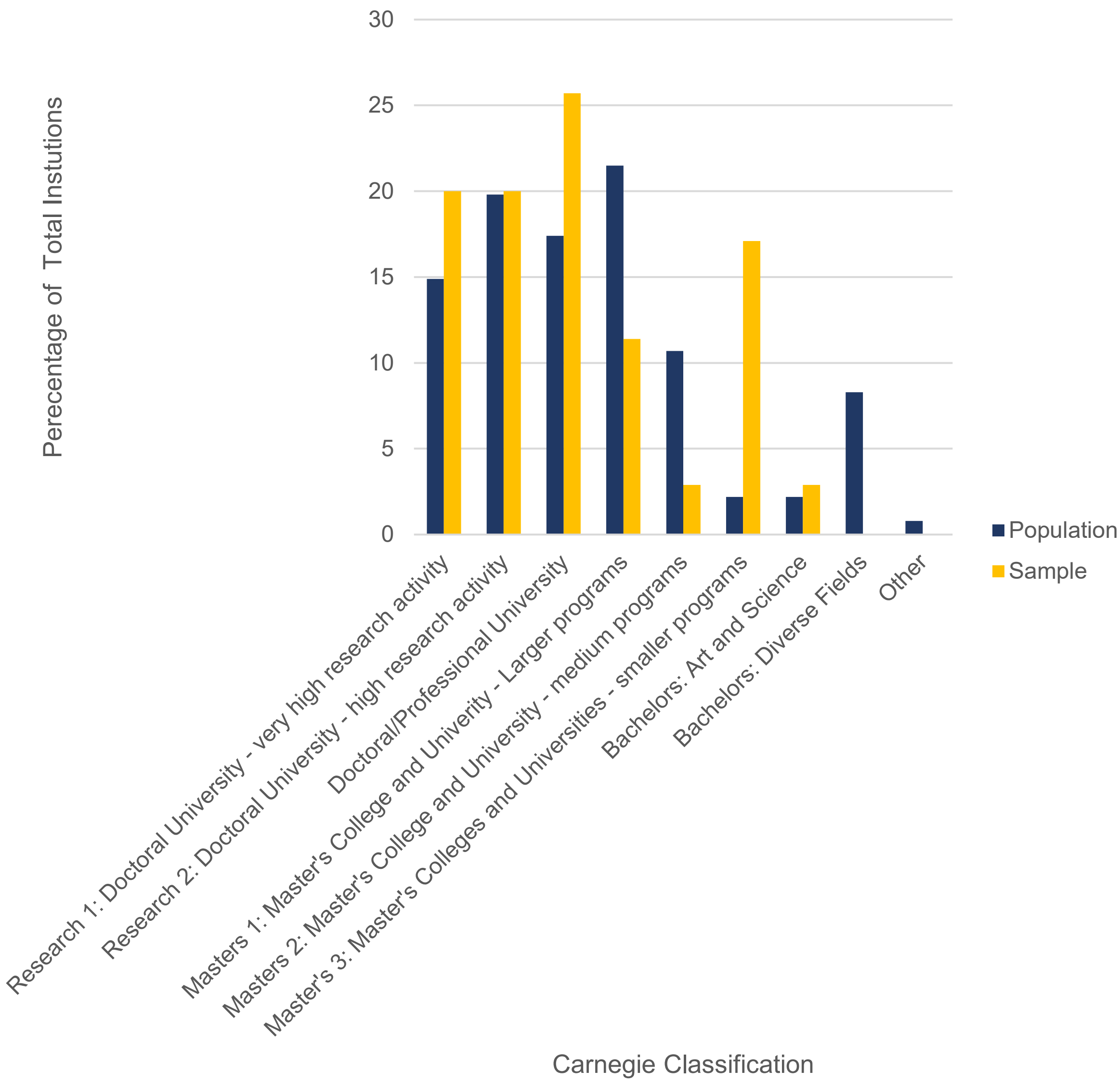

Figure 4. Comparison of Population and Sample Carnegie Classifications. This figure demonstrates the percentage of programs in each Carnegie Classification for the population and the sample. Note that no significant difference was calculated between these groups ($p = 0.699$).

Descriptive Demographic Data

In the sample, a majority (n=28; 80%) of the program directors that responded stated that their institutions provided some form of assessment support to them. The program directors also provided free response of the type of support and training received (Table 5). Beyond the assessment support currently available at the institution, program directors were asked about their training with assessment either at the current institution or prior to this position. Of the 35 participants, 28 (80%) also had received training on assessment while 20% (n=7) did not have any current or prior assessment training. Those program directors that received training on assessment were then asked what type of training they had received (Table 6). The predominance of programs with institutional assessment support could indicate an inclusion bias that programs that are supported in their assessment efforts or have previous training in assessment felt more comfortable with the topic and, thus, were more likely to complete the survey. Since data is not available on the number of institutions that support assessment with training or resources, no comparison the sample to the population can be made.

Table 5

Free Responses to Types of Institutional Assessment Support

Location	Frequency	Type	Frequency
Office or Center of Teaching and Learning	3	Writing SLOs, objectives	2
		Assessment Plan Development	1
		Workshops and Open Forums	2
		Help Design Measures	1
Assessment Dean, Director, or Coordinator	9	Consultation of Planning and Data Collection	1
		Requirement of Plan	1
		Feedback in Formal Meeting Annually	1
		Assessment Plan Development	2
		Review of Assessment Plan	2
		Have Not Used (Not Well Informed)	1
		Unspecified	4
Assessment Committee	5	Review Assessment Plans Annually	1
		Provide Rubrics	1
		Unspecified	2
Office of Institutional Research,	13	Workshops or Summer Fellowship	3
Office of Institutional Effectiveness,		Whatever is requested	1
Office of Assessment,		Requirement of a Plan but No Specifications	1
Office of Outcomes,		Student Performance and Demographic Reports	1
and/or Office of Accreditation		Assessment Plan Development	5
		Support in Contacting Parties	1
		Data Collection	2
		Assurance of Compliance with Accreditation and Board of Governors and Requirements	2
		Curriculum Mapping and SLO or Objectives Development	1
		Review and Give Input	3
		Unspecified	1
Alumni Office	1	Alumni Lists and Data	1
Administration (Chairs/Deans/Provost)	2	Review of Practices	2
Athletic Training Faculty	1	Unspecified	1
Technology Team	1	Measuring Data	1
External Consultants	1	Develop SLOs and Programmatic Objectives	1
		Assessment Plan Development	1
		Performing Assessment	1
Location unspecified	3	Writing SLOs and Program Outcomes	1
		University and College Budgets	1
		Assessment Plan Development	1
		Student Ratings Gathered and Analyzed	1
		Alumni and Employer Survey	1
		Have Not Used Yet	1

Table 6

Types of Assessment Training Received

Type	Frequency [a]	Percentage
During your education (Masters, Doctorate Certificate)	20	29.9%
Programming provided by your institution or prior institution	23	34.3%
Programming provided by an athletic training organization	19	28.4%
Programming provided by an educational organization	4	6.0%
Other [b]	1	1.5%

[a] out of 28 respondents that selected they had received assessment training
[b] Free response: During undergraduate degree in education

During the time of transition for the athletic training profession via degree change from bachelor's and master's programs to master's programs only, examining the origins of these programs is of note. Table 7 further breaks down the demographics of the programs including if the program transitioned from undergraduate or if the program is housed with other healthcare programs, both of which are common demographics that are collected by the CAATE when discussing the transition. Of the 35 respondents, 26 (74.3%) of them transitioned from a bachelor's program, while 25.7% (n=9) were introduced at the master's level (Table 7). In addition, 68.6% (n=24) of the athletic training programs were housed in departments, colleges, or divisions with other healthcare programs, with 31.4% (n=11) housed with other majors or departments (Table 7).

Table 7

Demographic Information About the Programs

Demographics	Frequency	Percentage
Transitioned from Bachelor's to Master's Level	26	74.3%
Always at Master's Level	9	25.7%
Totals	35	100%
Housed with Other Healthcare Programs	24	68.6%
Not Housed with Other Healthcare Programs	11	31.4%
Totals	35	100%

Prevalence of Student Learning Outcomes

The first research question to be assessed was RQ1: What are the most prevalent program-level student learning outcomes cited by athletic training programs? This research question has no real hypothesis as this was an investigative frequency question. The options available to the participants were the categories of student learning outcomes that have been established by the Commission on Accreditation of Athletic Training Education (Table 2) (2017b) for tracking during its annual report process along with the National Academy of Medicine, formerly the Institute of Medicine Board of Health Care Services, five core competencies (Table 3) (Greiner & Knebel, 2003) and other items discovered during literature review (Appendix A). In addition, program directors could write in their own categories if the survey options did not satisfy all of their programs' student learning outcomes.

While all the frequency of student learning outcomes that were cited are shared in Table 8 and Figure 5, to ease further analysis, the median number of SLOs that program respondents cited was gathered. The median number of SLOs that the subjects reported in their assessment plans was five SLOs. Programs reported a range between three and eleven plus SLOs in their assessment plans (Figure 6). With a median number of SLOs set at five, the five most prevalent SLOs was then studied in the following research questions.

Table 8

Frequency of Citation of All Student Learning Outcomes

SLO	Frequency [a]	Percentage
Acceptance of Criticism/Feedback	7	20%
Adaptability or Resilience	10	28.6%
Altruism, Honesty, or Integrity	11	31.4%
Apply Quality Improvement	6	17.1%
BOC Preparedness [b]	26	74.3%
Career Preparedness [b]	22	62.9%
Confidence	10	28.6%
Creative Thinking	6	17.1%
Confidentiality or Privacy	10	28.6%
Critical Thinking, Problem Solving, Decision-Making, Clinical Reasoning, or Clinical Judgement [b]	29	82.9%
Cultural Sensitivity/Competence	18	51.4%
Education of Others	12	34.3%
Empathy, Compassion, or Caring	10	28.6%
Evidence-Based Practice, Research, Information Literacy [b]	29	82.9%
Initiative	9	25.7%
Interpersonal and Communication Skills (including Written, Oral, or Nonverbal)	16	48.6%
Knowledge/Skills [b]	20	57.1%
Leadership	13	37.1%
Legal or Ethical Practice	16	45.7%
Life-long Learning or Personal Development	16	45.7%
Patient-Centered Care	16	45.7%
Patient Safety	6	17.1%
Prevention of Injury/Illness or Health Promotion	11	31.4%
Professionalism	16	45.7%
Retention/Graduation	14	40%
Self-efficacy or Reflection	7	20%
Systems-based Practice or Healthcare Systems Knowledge	4	11.4%
Utilize Informatics	4	11.4%
Work in Interdisciplinary teams, Interprofessional Education/Practice, Teamwork	17	48.6%
Other		

[a] Out of 35 participants

[b] Indicated top 5 most prevalent SLOs

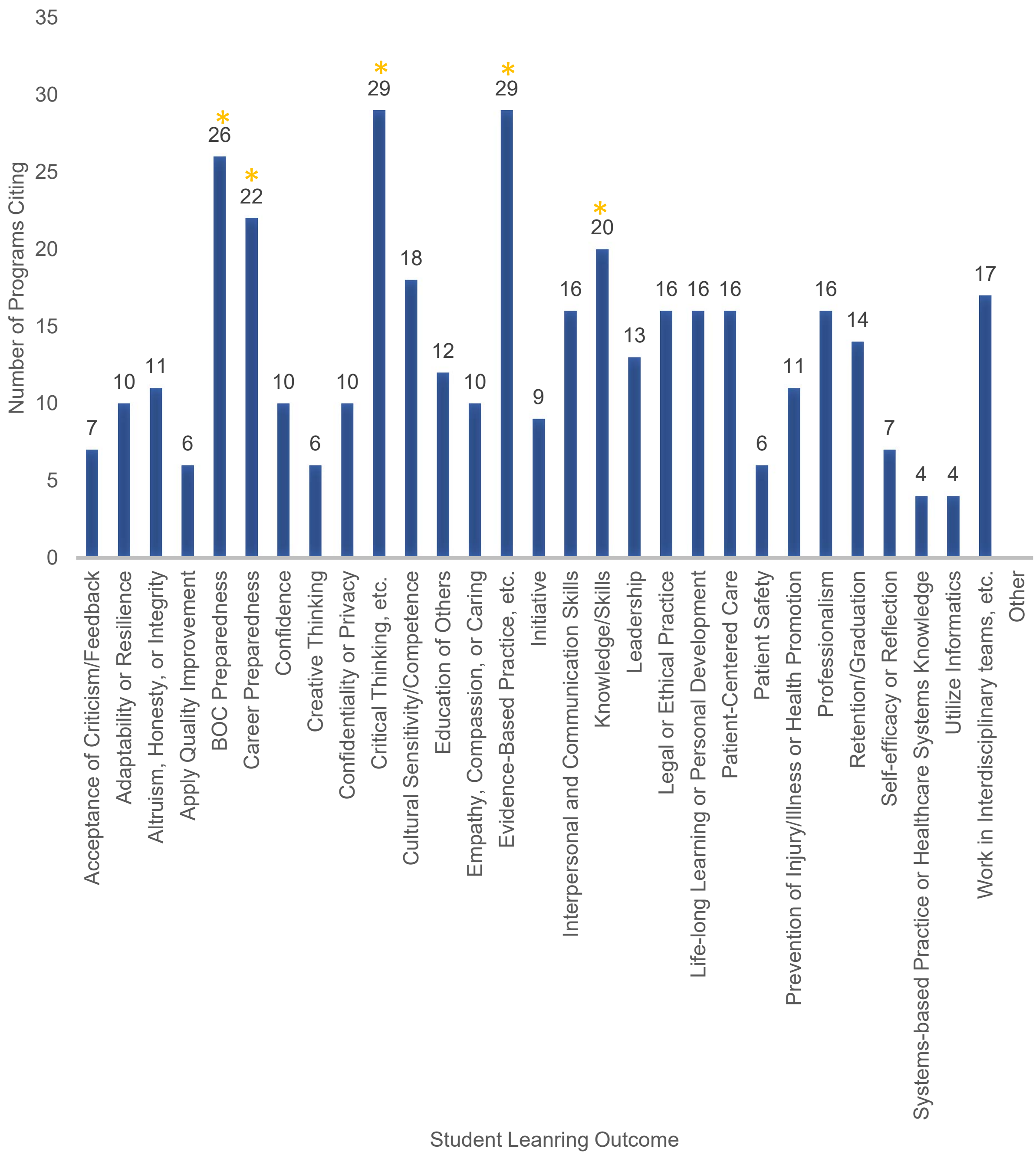

Figure 5. Frequency of Student Learning Outcomes Cited by Programs. This figure illustrates the number of programs from the sample that cited each student learning outcome category. *Top five most prevalent student learning outcome.

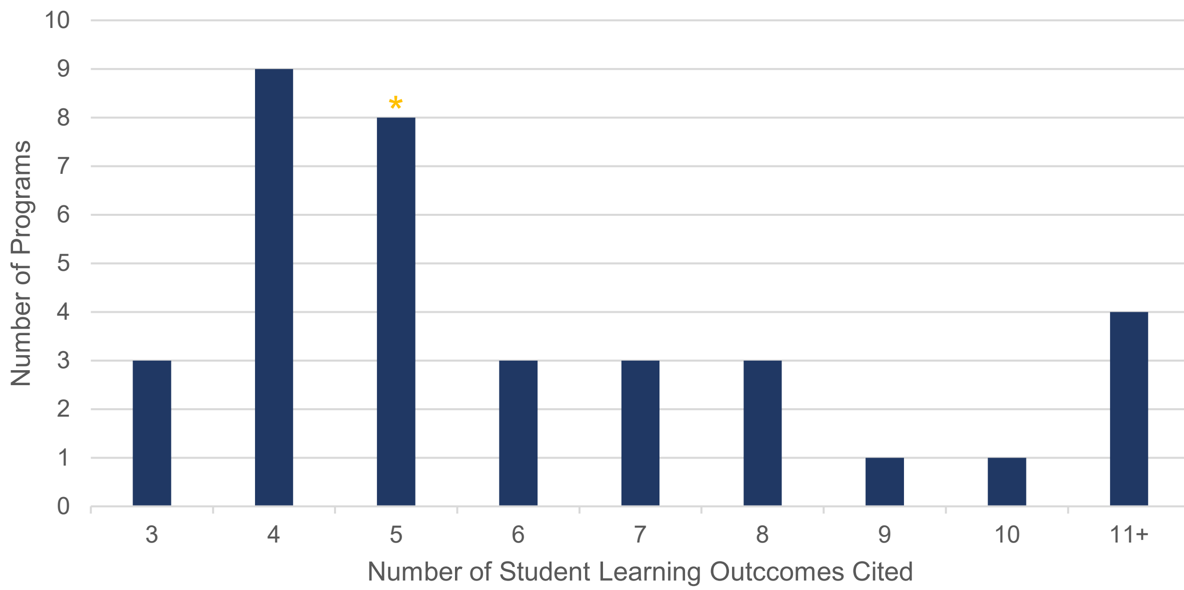

Figure 6. Number of Student Learning Outcomes Cited by Programs. This figure illustrates the number of student learning outcomes that programs reported they cite as part of their assessment plans.
*The median number (5) was utilized to determine the number of most prevalent student leaning outcomes to report in later data analysis.

The two most frequently selected student learning outcomes were "Evidence-Based Practice, Research, or Information Literacy" and "Critical Thinking, Problem Solving, Decision-Making, Clinical Judgement, or Clinical Reasoning" (n=29, 82.9% for each outcome). "BOC Preparedness" (n=26, 74.3%), "Career Preparedness" (n=22, 62.9%), and "Knowledge/Skills" (n=20, 57.1%) round out the top five most prevalent SLOs. All of the frequency distributions are reported in Table 8 and Figure 5.

Relationships Between SLO, Environment, and Measure

Research question two, what relationship, if any, exists between the most prevalent program-level student learning outcomes, educational environment of assessment (clinical experiences, controlled environments, or both), and type of assessment measure (direct, indirect, or both), involved several levels of analysis The three hypotheses related to this research question are discussed below.

The first hypothesis about the relationship was that a relationship between program-level student learning outcomes and the environment where the SLO is assessed would be found. The data set violated some of the assumptions of Chi-Square analyses due to the low response rate and distribution into each group. Due to this, the frequency of programs that reported each student learning outcome in each environment (clinical experiences alone, controlled environments alone, or both) were reported (Figure 7). For those programs that cited "Evidence-based Practice, Research, or Information Literacy" as an SLO (n=29), 20.7% (n=6) assessed in clinical experiences alone, 27.6% (n=8) assessed in controlled environments alone, and 51.7% (n=15) assessed in both environments. For those programs that cited "Critical Thinking, Problem Solving, Decision-Making, Clinical Judgement or Clinical Reasoning" as an SLO (n=29), 17.2% (n=5) assessed in clinical experiences alone, 10.3% (n=3) assessed in controlled environments alone, and 72.4% (n=21) assessed in both environments. For those programs that cited "BOC Preparedness" as an SLO (n=26), 23.1% (n=6) assessed in clinical experiences alone, 11.5% (n=3) assessed in controlled environments alone, and 65.4% (n=17) assessed in both environments. For those programs that cited "Career Preparedness" as an SLO (n=22), 13.6% (n=3) assessed in clinical experiences alone, 13.6% (n=3) assessed in controlled environments alone, and 72.7% (n=16) assessed in both environments. Finally, for those programs that cited "Knowledge/Skills" as an SLO (n=20), 5% (n=1) assessed in clinical experiences alone, 0% (n=0) of programs assessed in controlled environments alone, and 95% (n=19) assessed in both environments.

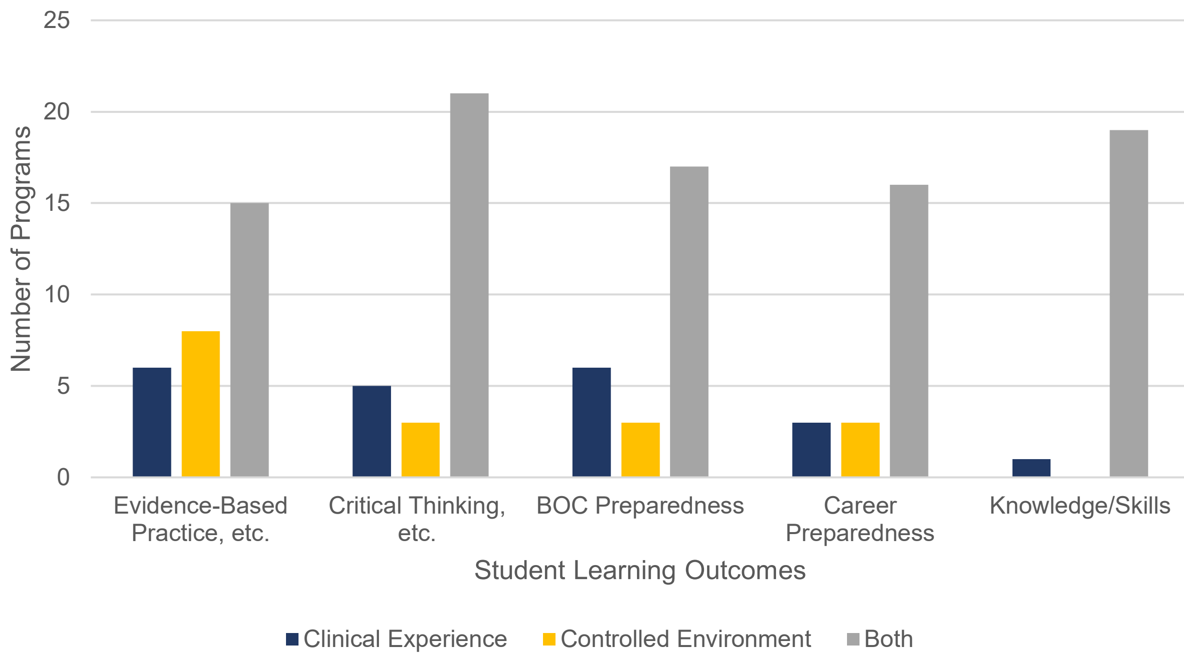

Figure 7. Frequency of Assessment Environment per Student Learning Outcome. This figure illustrates the number of programs that assess in each environment (clinical experience alone, controlled environment alone, or both) for each of the most prevalent student learning outcomes that programs reported they cite as part of their assessment plans.

The second hypothesis for the second research question was that a relationship between program-level student learning outcomes and the measure utilized to assess the SLO would be found. Again, the data set violated some of the assumptions of Chi-Square analyses due to the low response rate and distribution into each group. Due to this, the frequency of programs that reported each student learning outcome in each measure type (direct measures alone, indirect measures alone, or both) were reported (Figure 8). For those programs that cited "Evidence-based Practice, Research, or Information Literacy" as an SLO (n=29), 37.9% (n=11) assessed the SLO using direct measures alone, 0% (n=0) assessed the SLO using indirect measures alone, and 62.1% (n=18) assessed the SLO using both measures. For those programs that cited "Critical Thinking, Problem Solving, Decision-Making, Clinical Judgement or Clinical Reasoning" as an SLO (n=29), 17.2% (n=5) assessed the SLO using direct measures alone, 11.4% (n=4) assessed the SLO using indirect measures alone, and 57.1% (n=20) assessed the SLO using both measures. For those programs that cited “BOC Preparedness” as an SLO (n=26), 50 (n=13) assessed the SLO using direct measures alone, 3.8% (n=1) assessed the SLO using indirect measures alone, and 46.2% (n=12) assessed the SLO using both measures. For those programs that cited “Career Preparedness” as an SLO (n=22), 36.4% (n=8) assessed the SLO using direct measures alone, 9.1% (n=2) assessed the SLO using indirect measures alone, and 54.5% (n=12) assessed the SLO using both measures. Finally, for those programs that cited “Knowledge/Skills” as an SLO (n=20), 20% (n=4) assessed the SLO using direct measures alone, 0% (n=0) of programs assessed the SLO using indirect measures alone, and 80% (n=16) assessed the SLO using both measures

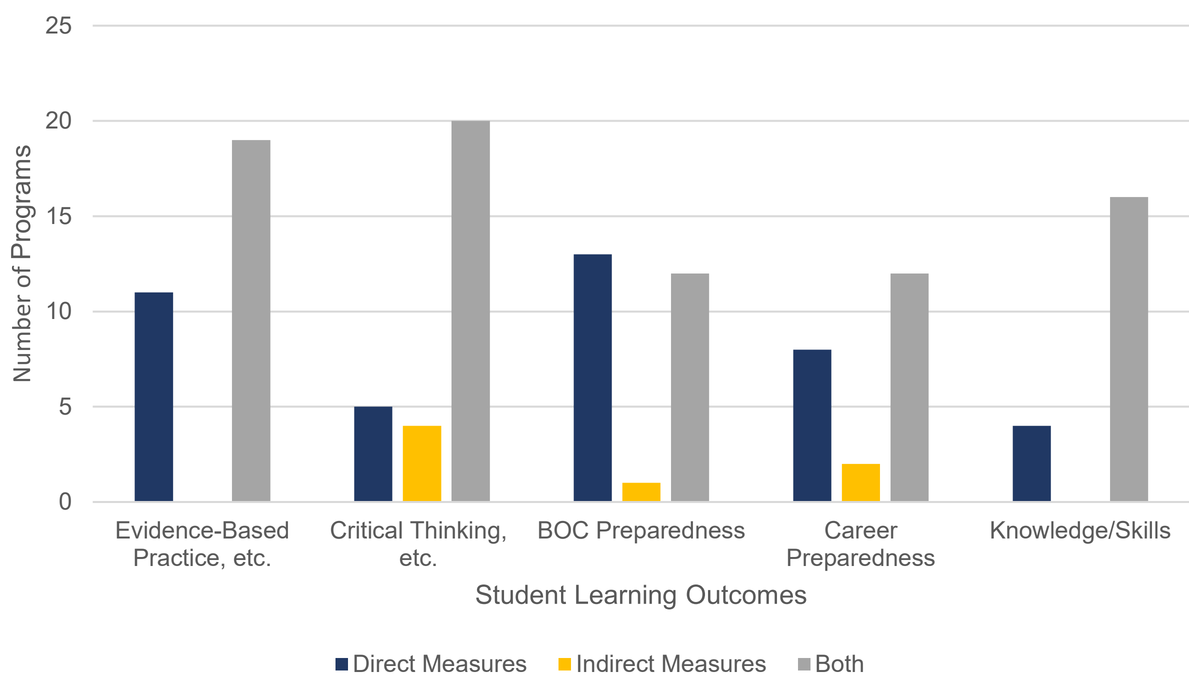

Figure 8. Frequency of Assessment Measure per Student Learning Outcome. This figure illustrates the number of programs that use each measure type (direct measures alone, indirect measures alone, or both) for each of the most prevalent student learning outcomes that programs reported they cite as part of their assessment plans.

Finally, the third hypothesis for the second research question was that a relationship between assessment measure and the environment of assessment would exist. Once again, the distribution of the small sample size violated the assumption of Chi-Square analyses. Thus, the frequency count of each program that used each measure type per environment setting for each of the five most prevalent SLOs was reported.

Of the programs that cited “Evidence-Based Practice, Research, or Information Literacy” as an SLO (n=29), 3.4% (n=1) assessed in clinical experiences alone using direct measures and 17.2% of programs (n=5) assessed in clinical experiences alone using both measures. Four programs (13.8%) assessed in controlled environments alone and used direct measures. The same number assessed in controlled environments alone and used both measures. Of the programs that cited “Evidence-Based Practice, Research, or Information Literacy” as an SLO, 20.7% (n=6) assessed in both environments using direct measures and 31% (n=9) assessed in both environments using both measures. No programs (0%, n=0) used only indirect measures as an assessment measure type for “Evidence-Based Practice, Research, or Information Literacy.” Figure 9 displays the breakdown of each measure type and assessment environment for “Evidence-Based Practice, Research, or Information Literacy.”

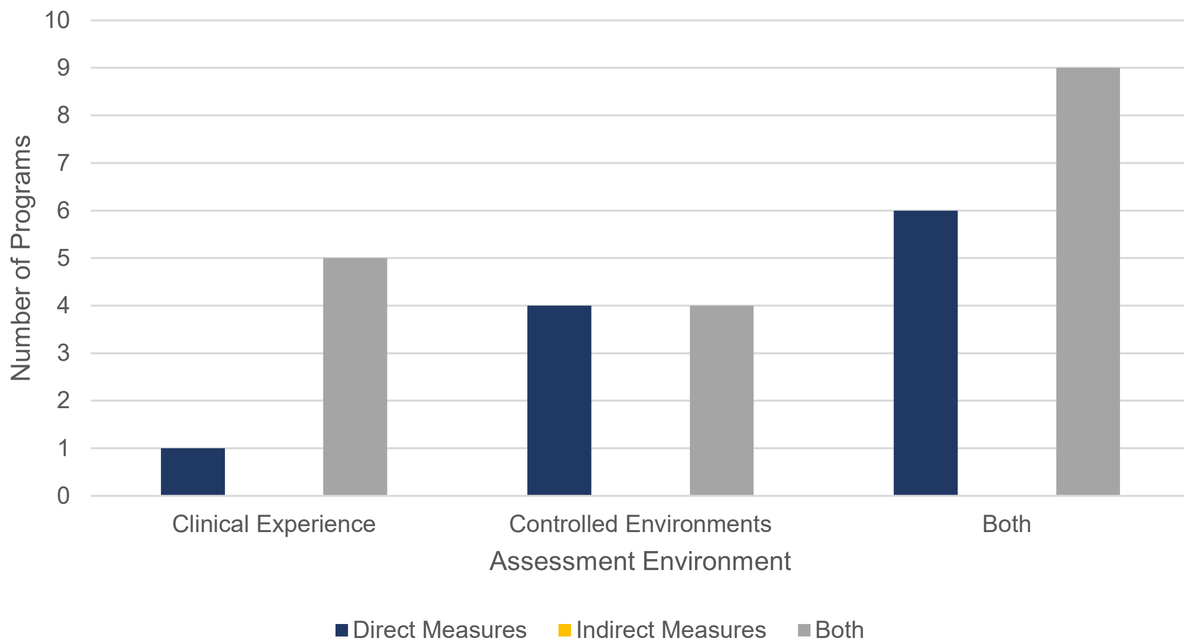

Figure 9. Frequency of Assessment Measure by Environment for the Evidence-Based Practice SLO. This figure illustrates the number of programs that are citing "Evidence-based Practice, Research, or Information Literacy" in each environment per each measure type.

"Critical Thinking, Problem Solving, Decision-Making, Clinical Judgement or Clinical Reasoning" was tied as one of the most prevalent cited SLO (n=29). Of the programs that assessed the "Critical Thinking, Problem Solving, Decision-Making, Clinical Judgement, or Clinical Reasoning" SLO, 6.9% (n=2) assessed during clinical experiences alone and used direct measures alone, 0% (n=0) assessed during clinical experiences alone and used indirect measures, and 10.3% (n=3) assessed during clinical experiences alone and used both measures. One program that assess "Critical Thinking, Problem Solving, Decision-Making, Clinical Judgement, or Clinical Reasoning" (3.4%) assessed in controlled environments alone with direct measures. Also, one program (3.4%) assessed in controlled environments alone with indirect measures and one program (3.4%) assessed in controlled environments alone with both measures. Finally, for those programs that cited the "Critical Thinking, Problem Solving, Decision-Making, Clinical Judgement, or Clinical Reasoning" SLO, 6.9% (n=2) assessed in both environments using direct measures alone, 10.3% (n=3) assessed in both environments using indirect measures, and 55.2% (n=16) assessed in both environments using both measures. Figure 10 illustrates the breakdown of programs citing the "Critical Thinking, Problem Solving, Decision-Making, Clinical Judgement, or Clinical Reasoning" SLO per environment per measure type.

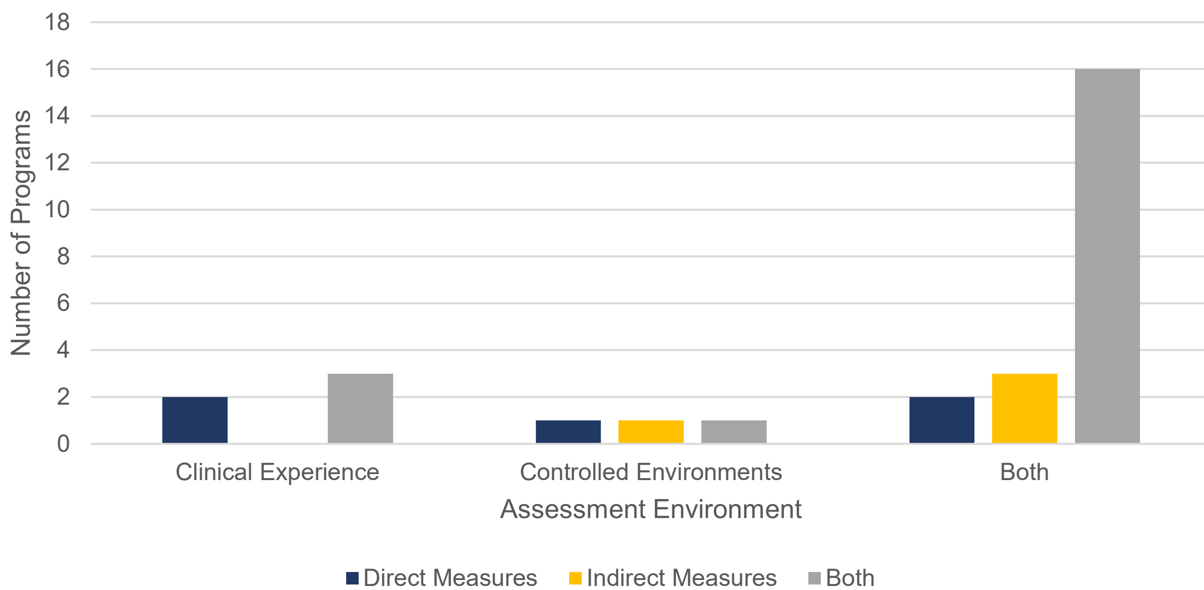

Figure 10. Frequency of Assessment Measure by Environment for the Critical Thinking SLO. This figure illustrates the number of programs that are citing "Critical Thinking, Problem Solving, Decision-Making, Clinical Reasoning, or Clinical Judgement" in each environment per each measure type.

Of the programs that cited "BOC Preparedness" as an SLO (n=26), 23% (n=6) assessed in clinical experiences alone using direct measure and no programs (0%) that assessed "BOC Preparedness" in clinical experiences alone using indirect measures alone or both measures. Two programs (7.7%) assessed in controlled environments alone and used direct measures. One program (3.8%) assessed in controlled environments using indirect measures alone and no programs (0%, n=0) assessed in controlled environments alone and used both measures. Of the programs that cited "BOC Preparedness" as an SLO, 19.2% (n=5) assessed in both environments using direct measures and no programs (0%) assessed in both environments using indirect measures alone. Twelves programs (46.2%) that assessed "BOC Preparedness" in both environments utilized both measures. Figure 11 displays the breakdown of each measure type and assessment environment for "BOC Preparedness."

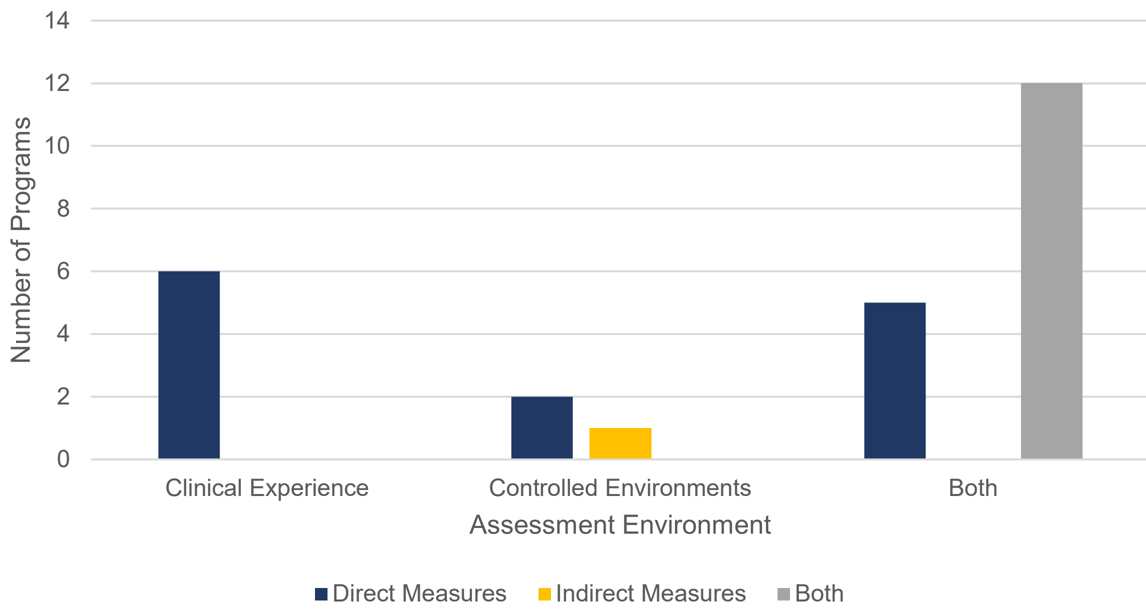

Figure 11. Frequency of Assessment Measure by Environment for the BOC Preparedness SLO. This figure illustrates the number of programs that are citing "BOC Preparedness" in each environment per each measure type.

"Career Preparedness" was the fourth-most cited SLO (n=22). Of the programs that assessed the "Career Preparedness" SLO, 4.5% (n=1) assessed during clinical experiences alone and used direct measures alone, 9% (n=2) assessed during clinical experiences alone and used indirect measures, and 0% (n=0) assessed during clinical experiences alone and used both measures. Two programs that assess "Career Preparedness" (9%) assessed in controlled environments alone with direct measures. No programs (0%, n=0) assessed in controlled environments alone with indirect measures and one program (4.5%) assessed in controlled environments alone with both measures. Finally, for those programs that cited the "Career Preparedness" SLO, 22.7% (n=5) assessed in both environments using direct measures alone, 0% (n=0) assessed in both environments using indirect measures, and 50% (n=11) assessed in both environments using both measures. Figure 12 illustrates the breakdown of programs citing the "Career Preparedness" SLO per environment per measure type.

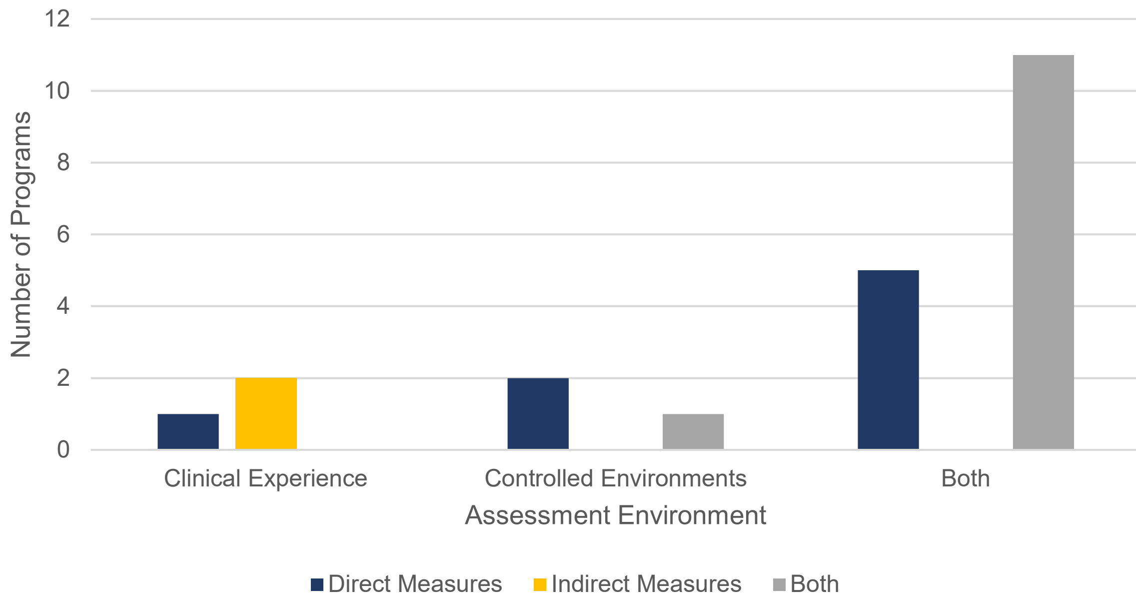

Figure 12. Frequency of Assessment Measure by Environment for the Career Preparedness SLO. This figure illustrates the number of programs that are citing "Career Preparedness" in each environment per each measure type.

The fifth most prevalent SLO cited by the sample was "Knowledge/Skills" (n=20). Those programs citing a "Knowledge/Skills" SLO did not utilize indirect measures alone nor did they assess only in a controlled environment alone. One program (5%) assessed "Knowledge/Skills" with direct measures alone in clinical experiences, no program (0%, n=0) assessed with both measures in clinical experiences. Three programs (13.6%) that assess the "Knowledge/Skills" SLO assessed in both environments utilizing direct measures and the majority of programs (80%, n=16) assessed in both environments using both measure types. Figure 13 illustrates the breakdown of programs citing the "Knowledge/Skills" SLO per environment per measure type.

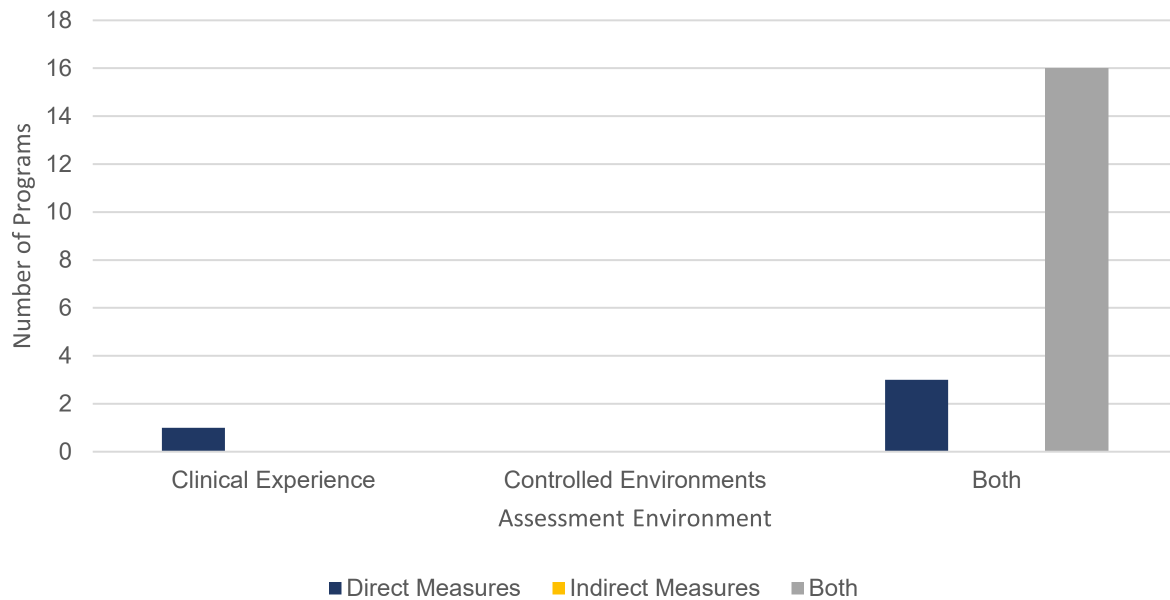

Figure 13. Frequency of Assessment Measure by Environment for the Knowledge/Skills SLO. This figure illustrates the number of programs that are citing "Knowledge/Skills" in each environment per each measure type.

In addition to the individual SLO assessments, the percentage and number of programs utilizing each environment and measure type regardless of SLO are noted in Table 9. When taking into account all selections of all SLOs from the 35 programs, there were 384 total SLO selections. Of those 384 selections, 46 selections (12%) were assessed in clinical experiences alone with direct measures alone. Thirteen selections (3.9%) were assessed in clinical experiences alone using indirect measures, and 24 (6.3%) were assessed in clinical experiences alone with both measures. For all of the SLOs that were assessed only in controlled environments, 25 selections (6.5%) were assessed using direct measures, 14 selections (3.6%) were assessed using indirect measures, and 27 selections (7%) were assessed using both measures. Finally, 235 selections were assessed in both environments, with 40 of those selections (10.4%) assessed using direct measures, 25 (6.5%) using indirect measures, and the largest percentage, 170 selections (44.2%), were assessed in both measures. Figure 14 illustrates the breakdown of all selections of SLOs and their assessment environment by their assessment measure type.

Table 9

Distribution of Assessment Environment and Assessment Measure of Prevalent SLOs

	Environments				Measures			
SLO	Clinical (n; %)	Controlled (n; %)	Both (n; %)	Total (n)	Direct (n; %)	Indirect (n; %)	Both (n; %)	Total (n)
Evidence-Based Practice, Research, Information Literacy	6 20.7%	8 27.6%	15 51.7%	29	11 37.9%	0 0%	18 62.1%	29
Critical Thinking, Problem Solving, Decision-Making, Clinical Reasoning, or Clinical Judgement	5 17.2%	2 10.3%	22 72.4%	29	5 17.2%	4 13.8%	20 69.0%	29
BOC Preparedness	6 23.1%	3 11.5%	17 65.4%	26	13 50%	1 3.8%	12 46.2%	26
Career Preparedness	3 13.6%	3 13.6%	15 72.7%	22	8 26.4%	2 9.1%	12 54.5%	22
Knowledge / Skills	1 5%	0 0%	19 0%	20	4 20%	0 0%	16 80%	20
Regardless of SLO	86 22%	69 17.6%	236 60.4%	391	112 28.7%	54 13.8%	224 57.4%	625

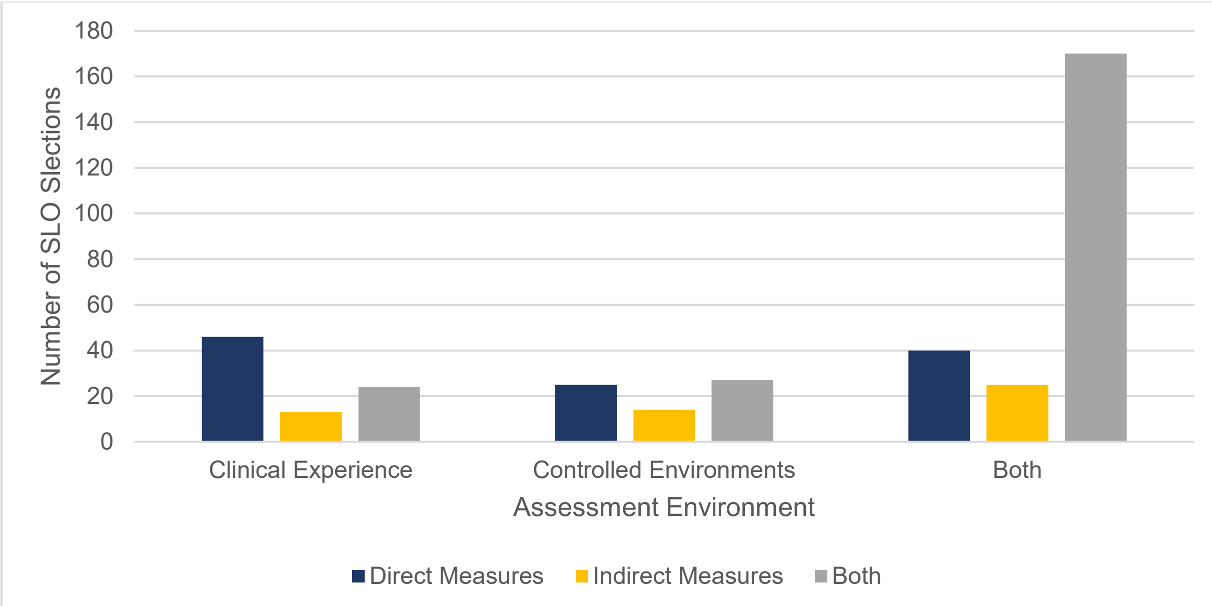

Figure 14. Frequency of Assessment Measure Type by Environment Regardless of SLO. This figure illustrates the number of SLOs that are being cited using each measure type per environment regardless of the SLO that programs are citing.

Since the original hypothesis was based on association type, to be analyzed using the Chi-Square tests, and the assumptions of the Chi-Square tests were violated, the question cannot be answered and no hypothesis accepted or rejected.

In addition, program directors were asked to share the specific types of measures that they utilized to assess the various SLOs. For the top five most prevalent SLOs, Table 10 displays the write in examples of types of measures used by the sample of programs.

Table 10

Free Responses to Types of Measures Utilized

Type of Measure	Evidence-Based Practice, etc.	Critical Thinking, etc.	BOC Preparedness	Career Preparedness	Knowledge/Skills
AAC&U Rubric	1	1	-	-	-
Alumni Surveys	1	1	2	2	2
Athletic Training Milestones	1	1	3	-	2
BOC Exam Rates	-	-	2	1	1
BOC Self-Assessments or Practice Exams	-	-	3	-	-
Case Studies	1	-	-	-	-
Check Sheets	1	1	-	-	1
Clinical Performance Instrument	-	1	-	-	-
Clinical Proficiencies	-	1	-	-	2
Clinical Reasoning and Decision-Making Scenarios	1	-	-	-	-
Comprehensive Exams	-	-	1	-	1
EBP Project	2	-	-	-	-
Employer Surveys	-	-	1	2	1
Exams	4	6	7	4	6
Exit Interviews or Surveys	2	4	3	3	3
Final Defense	1	1	-	-	-
In-class or written assignments	5	3	-	2	4
Journal Club	1	-	-	-	-
OSCE	1	2	-	-	-
Paper	-	1	-	-	-
Placement Rates	-	-	-	1	-
Practical Exams	1	6	3	1	7
Preceptor Evaluations	5	12	5	5	9
Presentations	3	-	-	1	1
Projects		1	-	-	-
Research Project or Capstone Research	5	2	-	-	-
Self-Reflection	2	3	-	-	2
Signature Assignment	1	-	-	1	1
Simulations	-	3	2	1	2
Standardized Patients	-	3	1	-	1

Relationship Between SLOs and the Board of Certification Exam Results

Finally, the study attempted to examine the third research question: what correlation, if any, exists between the most prevalent program-level student learning outcome and athletic training programs' Board of Certification three-year aggregate exam first-time pass rates? The hypothesis stated that a relationship between the presence or absence of any of the most prevalent reported student learning outcomes and athletic training programs' Board of Certification exam three-year aggregate exam first-time pass rates would exist. For the third research question regarding the three-year aggregate first-time pass rate on the BOC exam, the population was going to be limited to only those programs that responded that they had graduated three cohorts at the master's level. The sample would have been limited to approximately 60 programs, which was concerning for statistical power already. The final sample consisted of only seven programs that had graduated three cohorts at the master's level, for a response rate of only 12% of eligible programs (only seven programs that graduated three cohorts or more at the master's level). This resulted in statistical power that was too low to be able to run a multiple linear regression between student learning outcomes and BOC exam results. The third research question was removed from analysis due to a lack of statistical power.

Conclusion

The results of this study showed that programs cite a mean of five student learning outcomes. The five most prevalent SLOs included: "Evidence-Based Practice, etc.," "Critical Thinking, etc.," "BOC Preparedness," "Career Preparedness," and "Knowledge/Skills." Trends of frequency demonstrate that programs prefer to assess in both environments and using both measures for the top five SLOs. Direct measures were also popular for "Evidence-Based Practice, etc.," "BOC Preparedness," and "Career Preparedness." Programs citing the top 5

SLOs, were assessing in controlled environments and clinical experience alone less than in both environments. Very few programs assessed the top 5 SLOs using indirect measures alone. All of hypotheses can be seen in Table 11 along with the status of the retention or rejection of the null hypotheses. Chapter Five discussed these results and any connections or lack thereof with the current literature and state of assessment in healthcare and athletic training, specifically.

Table 11

Status of Hypotheses

Research Question	Hypothesis	Retain the Null	Reject the Null
RQ1: What are the most prevalent program-level student learning outcomes cited by athletic training programs?	None	N/A	N/A
RQ2: What relationship, if any, exists between the most prevalent program-level student learning outcomes, educational environment of assessment (clinical experiences, controlled environments, or both), and type of assessment measure (direct, indirect or both)?	H_{2a}: There will be a relationship between program-level student learning outcomes and the environment where it is assessed. [a]	?	?
	H_{2b}: There will be a relationship between program-level student learning outcomes and the measure utilized to assess it. [a]	?	?
	H_{2c}: There will be a relationship between assessment measure and environment of assessment. [a]	?	?
RQ3: What correlation, if any, exists between the most prevalent program-level student learning outcomes and athletic training programs' Board of Certification three-year aggregate exam first-time pass rates?	H_3: There will be a relationship between the presence or absence of any of the most prevalent reported student learning outcomes and athletic training programs' Board of Certification exam three-year aggregate exam first-time pass rates. [a]	?	?

[a] Not enough statistical power to run analysis to test the null hypothesis

Chapter 5: Discussion and Recommendations

Overview of the Study

The assessment of student learning outcomes is a requirement for external accreditation of athletic training programs and many other preparatory healthcare programs, yet very little research done on the current environment of assessment in athletic training has been reported. Understanding what student learning outcomes are being cited by athletic training programs and the environments and measures of the assessment could assist many stakeholders in creating more efficient, valid, and reliable assessment plans.

The purpose of this study was to examine the type of program-level student learning outcomes that athletic training programs are citing and how athletic training programs are assessing these student learning outcomes.

RQ1: What are the most prevalent program-level student learning outcomes cited by athletic training programs?

RQ2: What relationship, if any, exists between the most prevalent program-level student learning outcomes, educational environment of assessment (clinical experiences, controlled environments, or both), and type of assessment measure (direct, indirect, or both)?

RQ3: What correlation, if any, exists between the most prevalent program-level student learning outcomes and athletic training programs' Board of Certification three-year aggregate exam first-time pass rates?

The results of this study were presented in Chapter Four. Of the sample, programs cited a mean of five student learning outcomes. Using this mean value, the five most prevalent were and "Evidence-Based Practice, Research, or Information Literacy," "Critical Thinking, Problem

Solving, Decision-Making, Clinical Judgement, or Clinical Reasoning," "BOC Preparedness," "Career Preparedness," and "Knowledge/Skills." The implications of the results of the study are discussed below.

Discussions

Introduction. The assessment of student learning has become the mechanism to show return on investment of higher education for students, families, accreditors, and the general public (Shahjahan & Torres, 2013; Stitt-Bergh et al., 2019; Tremblay et al., 2002). Internationally and in certain fields, like many healthcare preparatory professional programs, standardization of student learning outcomes and assessment measures of the SLOs has been growing in popularity (American Association of Colleges of Nursing, 2008; American Academy of Physician Assistants, 2012; American Council on Graduate Medical Education, 2016; Greiner & Knebel, 2003; Kivinen & Rinne, 1996; Shahjahan & Torres, 2013; Tremblay et al., 2012; Tuning Educational Structures in Europe, n.d.). Attempts to standardize could allow for the transferability of student skills across programs and insurance of competence and quality patient care in graduates (Fater, 2013; Greiner & Knebel, 2003; Murray et al., 2000; Roberts et al., 2009; Shahjahan & Torres, 2013; Tremblay et al., 2012; Tuning Educational Structures in Europe, n.d.). Athletic training programs are currently provided curricular content standards by the CAATE, their accrediting body, but are still individually responsible for writing program-level student learning outcomes and developing an assessment plan (Commission on Accreditation of Athletic Training Education, 2018a).

The lack of standardization in athletic training outcomes and the lack of availability of valid and reliable tools applicable to both didactic and clinical experience environments being shared across the programs could be inhibiting the assurance of quality assessment of student learning in the profession. This study aimed to take a snapshot of the current assessment environment of athletic training programs and allow stakeholders to learn from each other to create more valid, reliable, and efficient assessment measures to be shared across programs (Middlemas & Hensal, 2009; Scriber et al., 2010; Stanny et al., 2018; Stit-Berg at al., 2019; Zeind et al., 2012). The following discussion is organized based on the demographics of those participating in the study, the most frequently cited student learning outcomes by athletic training programs, and finally some additional points of discussion.

Demographics. The demographic information about participants provides some insight into the results of the study. Athletic training program directors who responded to this survey were supported in their assessment endeavors by their institution and had previous training on assessment. The results may be skewed as those who feel comfortable with assessment through prior training and institutional support may have been more likely to participate in this study. The possible inclusion bias could be skewing the results of the type of SLOs and environment of assessment being utilized in athletic training programs. Lopez (2002) found that some major barriers to implementing solid assessment plans was a lack of expertise or knowledge about assessment and not knowing how to access valid and reliable measures. Program directors who have been trained on assessment might be more likely to know the benefits of a well-rounded assessment plan. Thus, trained program directors may rely more on direct measures or both types of measures than indirect alone and the need to be assessing in both environments.

The majority of programs which participated in this study had transitioned from the bachelor's level to the master's level and were housed with other healthcare programs. Many other healthcare preparatory programs, such as medical education, physician assistant programs, and nursing have a more storied history of standardizing outcomes and assessment tools. Stanny et al. (2018) found that learning from peers, even if not in the same field of study, can be beneficial in improving the assessment strategies employed. The authors also found that faculty would prefer to meet with others from “like-minded” disciplines, such as would be present between individuals who teach in other healthcare program. Those athletic training programs that are closely associated with other healthcare preparatory programs could be more likely to have the opportunity to discuss assessment strategies with colleagues in other health fields, potentially helping those program directors feel more comfortable with assessment measures in the two environments of healthcare education, didactic and clinical education.

Critical thinking. According to this study, athletic training programs are most frequently assessing a student learning outcome based on critical thinking, problem solving, decision-making, clinical reasoning, or clinical judgement. Based on the literature, athletic training programs are on par with many other healthcare preparatory programs, such as medicine, dental hygiene, occupational therapy, veterinary, radiologic technology, nursing, physician assistant, medical laboratory science, speech pathology, and pharmacy that value critical thinking or a related quality in their preparatory education (American Association of Colleges of Nursing, 2008; American Academy of Physician Assistants, 2012; Beer & Mårtensson, 2015; Carwile & Murrell, 2002; Chamberland et al., 2015; Cone et al., 2013; Cox, 2014; Gadbury-Amyot et al., 2014; Golemboski et al., 2013; Harden et al., 1999; Heidari & Ebrahimi, 2016; Ho et al., 2014; Löfmark & Thorell-Ekstrand, 2000; Marchigiano et al., 2011; McCarthy & Murphy, 2007; Patel et al., 2015; Physician Assistant Education Association, 2018a; Ramaekers et al., 2010; Raup et al., 2010; Shelestak et al., 2015; Weber, 2005; Wu et al., 2015). The predominance of critical thinking as an outcome is also in accordance with the CAATE’s pre-established themes of student learning outcomes. Program directors are asked to select the areas from the list that their programs are assessing on annual accreditation reports (Commission on Accreditation of Athletic Training Education, 2018a, 2018c) and various authors' work on athletic training education (Aronson et al., 2015; Hildenbrand & Schultz, 2012; Kabay, 2013; Kicklighter et al., 2016; Middlemas & Hensal, 2009; Sauers et al., 2019; Thompson et al., 2014; Walker et al., 2008).

In this study, the majority of programs that cite critical thinking or related areas are assessing this SLO in both controlled environments and clinical experiences (72.4%) and are utilizing both direct and indirect measures (51.7%). Literature demonstrated a wide variety of measures being used for critical thinking, from direct measures like inventories, the AAC&U rubrics, or standardized patients and simulations to indirect measures including self-reflection and preceptor evaluation (Cone et al., 2016; Cox, Perksy, & Blalock, 2013; Fero et al., 2105; Golemboski et al., 2013; Heidari & Ebrahimi, 2016; Hildenbrand & Schultz, 2012; Ho et al., 2014; Kabay, 2013; Légaré et al., 2007; Marchigiano et al., 2011; Ramaekers et al., 2010; Shelestak et al., 2015; Turkel, 2016; Wolf et al., 2015). The multitude of measures is mirrored in the results of this study with over nineteen different mechanisms of assessment being shared in free response.

Evidence-based practice. Tied with critical thinking, evidence-based practice, or the related areas of research or information literacy, were the most frequently cited SLO of the responding programs. The CAATE supports evidence-based practice as an important SLO to assess, offering it as an option as one of the pre-established themes of student learning outcomes during annual accreditation reports and as one of the core competencies of the 2020 curricular content standards (Commission on Accreditation of Athletic Training Education, 2018a, 2018c). In addition, since evidence-based practice is one of the core competencies of the IOM that is recommended for all healthcare providers, the predominance of it as an SLO in athletic training programs is in agreement with literature (Greiner & Knebel, 2003).

However, evidence-based practice was the only core competency to make the top five most frequently cited SLOs of this study. The priority of evidence-based practice as the most popular SLO of the IOM's core competencies is mirrored in the fact that evidence-based practice was the only cross-over theme category noted between the IOM core competencies and the pre-established themes for student learning outcomes from the CAATE (Tables 2 and 3) (Commission on Accreditation of Athletic Training Education, 2018c). According to literature, many other healthcare professions utilize and assess evidence-based practice in their curriculum or it is considered an important part of a practitioner's practice. Physician assistant programs and practice, nursing practice and programs, graduate medical residencies, medical schools, physicians' practices, physical therapy programs and practice, pharmacy, medical laboratory science, physiotherapy, health sciences, and even athletic training programs and practice have all discussed the use of evidence-based practice in current literature (American Academy of Physician Assistants, 2014; American Association of Colleges of Nursing, 2008; American Academy of Physician Assistants, 2012; American Council on Graduate Medical Education, 2016; Cavallario et al., 2018; Commission on Accreditation of Athletic Training Education, 2018a, 2018c; Fater, 2013; Golemboski et al., 2013; Greiner & Knebel, 2003; Hayward & Blackmer, 2010; Hildenbrand & Schultz, 2012; Keating et al., 2018; Löfmark & Thorell-Ekstrand, 2000; Morris & Hancok, 2013; Murray et al., 2000; Parsons et al., 2008; Physician Assistant Education Association, 2018a ; Sauers et al., 2019; Scott et al., 2012; Trede et al., 2015; Turbow & Evener, 2016; Zeind et al., 2012).

Cavallario et al. (2018) noted that other healthcare professions have documented their attempts to incorporate the IOM's core competencies more readily than athletic training. The lack of the other IOM's core competencies in the most frequently cited SLOs would seem counter to the literature purporting the importance of all healthcare providers being prepared to implement the five core competencies (American Association of Colleges of Nursing, 2008; American Council on Graduate Medical Education, 2016; Commission on Accreditation of Athletic Training Education, 2018a; Golemboski, Otto, & Morris, 2013).

In support of the findings of this study, Zeind et al. (2012) reported that pharmacy programs were more apt to incorporate evidence-based practice and patient-centered care over the other IOM's core competencies, health informatics, interdisciplinary teaming, and quality improvement. The authors attributed the lack of universal implementation of all of the IOM's core competencies to a lack of national-level guidance in how to incorporate all of them into curricula. Also, Evans (2010) expressed concerns that individual nursing programs would have difficultly including and assessing all of the IOM's core competencies due to financial, time, and expertise strains placed on programs functioning independently of support of professional organizations. Neither Evans (2010) nor Zeind et al. (2012) were looking at assessment of the IOM's core competencies, but rather the inclusion in curricula.

However, since assessment of student learning of as an outcome can only happen if inclusion of the outcome is present in the program, assessment would most likely be as, if not more, limited than inclusion. Evidence-based practice is a relatively easy core competency to include in athletic training programs, as the resources are often already present at the institutions of higher education such as libraries, databases, articles, and textbooks. Evidence-based practice has a longer history of inclusion in athletic training education, dating back to the *5th Edition of*

NATA Athletic Training Education Competencies of 2012 (Commission on Accreditation of Athletic Training Education, 2012). The remaining IOM's core competencies have not been part of the CAATE's documents using their exact terminology and titles until the more recent 2020 Curricular Standards (Commission on Accreditation of Athletic Training Education, 2018c). The lack of the other IOM's core competencies in athletic training programs' assessment plans noted in this study could be due to such constraints noted by Evans (2010) or simply be on par with the struggles of other healthcare professions early in their implementation of the core competencies, like pharmacy was in 2012, to implement and assess some of the IOM's core competencies due to lack of national-level organization and support at this time (Zeind et al., 2012).

No matter the reasoning for the lesser numbers of programs citing the other IOM's core competencies, the inclusion of assessment of the IOM's core competencies as part of the 2020 curricular content standards is now mandated, even if the program does not cite them as program-level student learning outcomes (Commission on Accreditation of Athletic Training Education, 2018a). Programs are now required to show assessment of the core competencies in both didactic and clinical experiences as part of accreditation (Commission on Accreditation of Athletic Training Education, 2020). However, the CAATE does not dictate that any of the core competencies be considered program-level student learning outcomes included in the program's official assessment plan (Commission on Accreditation of Athletic Training Education, 2018a). Whether assessment of the IOM's core competencies comes a part of program's assessment plan or a part of their accreditation reports for the CAATE, the need for valid and reliable assessment tools is still needed across programs.

Similar to critical thinking, programs are assessing evidence-based practice in both environments more (51.7%) than in clinical experience (20.7%) or controlled environments alone (27.6%). Athletic training programs assessing in both environments for evidence-based practice, etc. is a promising finding for the future of assessment for the CAATE. As stated above the CAATE has included the IOM's core competencies into the 2020 Curricular Content Standards, including evidence-based practice (Commission on Accreditation of Athletic Training Education, 2018a). The CAATE has recently clarified that athletic training programs must be able to demonstrate the inclusion and assessment of each of the 2020 Curricular Content Standards in both didactic and clinical experiences, including evidence-based practice (Commission on Accreditation of Athletic Training Education, 2020). Athletic training programs that are already assessing evidence-based practice in both environments will be ready for the implementation of this clarification. Those athletic training programs that are not will need to adapt their curricula and assessment plans. Even though the stipulation from the CAATE applies to the 2020 Curricular Content Standards and not the athletic training programs' student learning outcomes, there more than likely will be some overlap between the two and administrators should be prepared to assess in both environments.

Athletic training programs assessing evidence-based practice, etc. in both environments follows closely to literature on other healthcare preparatory programs, like physician assistant, nursing, pharmacy, physical therapy, and graduate medical residency programs, where there are tools to be used in both types of environments (American Academy of Physician Assistants, 2014; American Association of Colleges of Nursing, 2008; American Council on Graduate Medical Education, 2016; Fater, 2013; Hayward & Blackmer, 2010; Morris & Hancok, 2013; Physician Assistant Education Association, 2018a; Scott et al., 2012; Turbow & Evener, 2016;

Zeind et al., 2012). Clinical experiences can be especially difficult to assess student learning outcomes (Armstrong & Jarriel, 2016; Aronson et al., 2015; Birenbaum, 2003; Carwile & Murrell, 2002; English et al., 2004; Fero et al., 2010; Walker et al., 2008; Wu et al., 2015). The use of the *Athletic Training Milestones* during clinical experiences could become the tool that helps make assessment of evidence-based practice, and other SLOs, during clinical experiences more accessible (Sauers, 2019). However, that tool needs to be studied for reliability and validity in different clinical settings to ensure proper assessment.

Another opportunity for assessment in the clinical experience comes from Cavallario et al. (2018), who studied the use of documenting of patient encounters during clinical experiences. Through their literature review, the authors found that other healthcare preparatory programs that deliberately tied the IOM's core competencies into patient encounters to the benefit of students and as a means of summative assessment of the clinical experiences. The authors decided to recreate the study with one athletic training program that was tracking patient encounters. Cavallario et al. (2018) found that students at one athletic training program were more likely to document patient-centered care and professionalism during patient encounters, though evidence-based practice was documented in 59.9% of the 2,744 encounters. Students were more likely to implement evidence-based practice if they were observing the encounter than those who assisted or were primary on the encounter and those encounters that took place at a high school were more likely to include evidence-based practice than those at a college or university. The results of Cavallario et al. (2018) demonstrated that using patient encounter documentation might be helpful to assessment in the clinical experience but noted many limitations to their study, especially the ability to expand the results to multiple programs since it only studied one program. More investigation into the use of patient encounters documentation as an assessment tool should be done.

One unique finding for the measures reported to assess evidence-based practice was discovered. In this study, zero athletic training programs who are assessing evidence-based practice are doing so with indirect measures alone, relying instead on either direct measures alone or both measures. Literature would agree that direct measures or using both direct and indirect measures are the most effective means of demonstrating student learning (Banta & Palomba, 2015; Gadbury-Amyot et al., 2014; Gielen et al., 2003; Lopez, 2002). Direct measures are considered more authentic and students and faculty have reported more meaningful information about the achievement of the outcome when utilizing direct measures (Lopez, 2002). Using both measures allows indirect measures to supplement the information provided by the direct measures, providing reasoning or insight into the findings (Banta & Palomba, 2015; Gadbury-Amyot et al., 2014; Lindsay et al., 2013; Lopez, 2002; Marchigiano et al., 2011; Martin & Vale, 2005). Considering the concrete nature of evidence-based practice and using research or information to inform clinical practice, it could be one of the easier SLOs to be measured directly. Thus, indirect measures would not be needed as a primary form of assessment of evidence-based practice, etc. Indirect measures, such as the preceptor evaluations, self-reflections, and exit or alumni interviews or surveys noted in the free-responses of the participants, would support the direct measures, including AAC&U rubrics, the *Athletic Training Milestones*, case studies, evidence-based practice projects, presentations, exams, assignments, OSCEs and other practical exams (Table 10).

BOC preparedness. With 26 of the 35 respondents citing BOC preparedness as an SLO, the importance of preparing students to the national Board of Certification exam is evident.

These results appear to be supported by the CAATE's preestablished themes of student learning outcomes that the CAATE asks program directors to complete during annual reports (Table 2) (Commission on Accreditation of Athletic Training Education, 2018c). Athletic training programs are required to publicly post three-year aggregate first-time pass rates on the BOC exam to be in accord with the CAATE accreditation standards and is one of the only assessment requirements stipulated by the CAATE, along with graduation and retentions rates and post-graduation placements (Commission on Accreditation of Athletic Training Education, 2012, 2018a). Considering the requirement for BOC pass rates has been in effective by the CAATE since 2012 while the other requirements for graduation, retention, and placement rates have only been stipulated since 2018, it would be logical to see BOC preparedness being one of the most prevalent SLOs being assessed above some of the other stipulated areas. In fact, it is surprising that not every program has BOC preparedness as an SLO. In the *2012 Standards for the Accreditation of Professional Athletic Training Programs*, the CAATE states: "The program's assessment measure must include those stated in…Standard 7 [The program's BOC examination aggregate data for the most recent three test cycle years] in addition to any unique metrics that reflect the specific program, department, or college" (Commission on Accreditation of Athletic Training Education, 2012, p. 2).

However, the lack of unanimous assessment as a student learning outcome could be due to the fact that athletic training programs publish the results of the BOC exam as part of program effectiveness assessment and not student learning assessment. Little et al. (2008) discussed the use of licensure exams as the epitome of assessment. However, the authors also recognized that program assessment might be considered different than student learning outcome assessment and that licensure exams may be used in either capacity. Athletic training is not unique in need to prepare students for a certification or licensure exam. Many preparatory healthcare programs have advocated the importance of being prepared for state or national certification or licensure examinations. Athletic training, graduate medical education, physical therapy, neurology clerkships, and nursing all are required to monitor certification or licensure exam results (American Council on Graduate Medical Education, 2016; Commission on Accreditation of Athletic Training Education, 2018a; Holland et al., 2014; Lopez, 2002; Luedtke-Hoffmann et al., 2012; Turkel et al., 2016).

When examining the type of measures utilized for assessing BOC preparedness, the trend was for athletic training programs to be assessing with direct measures (50% of applicable programs) or with both indirect and direct measures (46.2%). Since the BOC exam is an objective measuring tool is a direct measure. Using the BOC exam as an assessment tool would easily allow the athletic training program to directly assess students' readiness for the BOC exam. Considering the metrics completed on the BOC exam, institutions can be mostly assured on impartiality, validity, and reliability of the exam, aspects that may be lacking in other assessment measures (Castle Worldwide, Inc., 2017). BOC readiness is primed to be assessed directly by athletic training programs (Board of Certification for the Athletic Trainer, 2020; Commission on Accreditation of Athletic Training Education, 2019) due to the requirement by the CAATE for all program's to have a first-time three-year aggregate pass rate of 70% or higher (Commission on Accreditation of Athletic Training Education, 2012,2018a). In addition, BOC exam results are shared to program directors on an annual basis form the BOC and the CAATE, making it an easy metric to utilize (Board of Certification for the Athletic Trainer, 2020).

Assessing with both measures would appear to be supported by Black and Wiliam (1998) who, in their review, found that self-assessment (an indirect measure) improved results on objective examinations (a direct measure). Ziegler (2018) reported the strength of using the Physician Assistant Education Association assessment tool as a self-assessment device in preparing students for the certification exam. Interestingly, even though 26 respondents reported BOC preparedness as an SLO, only two program directors reported using BOC exam rates as their assessment measure tool. In this study, program directors could opt in to provide free response to the type of measure utilized, which could attest for the seemingly low free-response rate for BOC exam rate for assessing BOC preparedness.

The trends showed 65.4% of programs that are assessing BOC preparedness are doing so in both environments. When examining the specific groupings of assessment strategies, more programs (46.1%) were assessing in both environments using both measures. Only one of the 22 programs citing "BOC Preparedness" reported using indirect measures, and that program was using the indirect measures in controlled environments alone. If programs were assessing "BOC Preparedness" in clinical experiences alone, they were only using direct measures.

Those athletic training programs assessing in both environments were more likely to utilize direct measures or both types of tools. Such results appear to be counter to the literature that finds that many healthcare preparatory programs utilize objective examinations to assess student learning, including certification or licensure exams (Fero et al., 2010; Keating et al., 2009; Middlemas & Hensal, 2009; Murray et al., 2000; Physician Assistant Education Association, 2018a). Considering most of the preparation for these exams occurs in the classroom, a controlled environment, and the exam is taken in a controlled environment, literature would appear to support using the direct measure of the BOC exam to assess BOC readiness in a controlled environment. However, literature does reveal some backlash against examinations, especially multiple-choice examinations, in higher education literature for not being able to fully demonstrate learning or higher-level thinking (Biggs & Tang, 2007; Birenbaum, 2003; Black, 2000; Entwistle & Entwistle, 1997; Gadbury-Amyot et al., 2014; Holland et al., 2014; Lopez, 2002; Middlemas & Hensal, 2009; Ostrowski & Marshall, 2015). Athletic training program directors, who are tuned into assessment literature through training or other means, may not like to rely on an objective exam alone as a means to show readiness, even if that readiness is for the exam itself.

Career preparedness. Twenty-two athletic training programs in this study reported assessing career preparedness. As with the previous student learning outcomes, career preparedness is also one of the pre-determined themes of assessment from the CAATE that programs are asked about during their annual report (Commission on Accreditation of Athletic Training Education, 2018c). In the literature review for this study, several sources noted the need to ensure career readiness and employability in athletic training students (Aronson et al., 2015; Commission on Accreditation of Athletic Training Education, 2018a, 2018c; Hildenbrand & Schultz, 2012; Mazerolle & Dodge, 2015; Ostrowski & Marshall, 2015). The need to ensure career readiness is not limited to healthcare fields. Higher education, domestically and globally, continues to feel the pressure to ensure students are prepared to enter a career and be able to demonstrate that to the public (Bernasek, 2005; Fain, 2015; Knight & Yorke, 2007; Lederman & Fain, 2017; Principles for Effective Assessment of Student Achievement, 2013; Tremblay et al., 2012).

In accordance with the other student learning outcomes discussed previously, career preparedness showed the trends towards assessment in both environments (72.7%) and to assess with both measures (69%). Literature about transition to independent practice of athletic training students has supported the importance of learning in both clinical experiences and didactic environments to make students feel ready for practice (Mazerolle, Eason, Clines, & Pitney, 2010; Mazerolle, Kirby, & Walker, 2018; Mazerolle, Walker, & Kirby, 2016; Mazerolle, Walker, & Thrasher, 2015; Walker, Thrasher, & Mazerolle, 2016). Athletic training programs that are monitoring the effectiveness of learning in clinical experiences and didactic environments, such as the majority of programs in this study, appear to be making strong decisions for their students and their career preparedness moving forward.

When examining the groupings of assessment measure type and assessment environment for the career preparedness student learning outcome, it is of note, that three programs assessed in clinical experience alone, with two programs assessed using direct measures versus one using direct measures and none using both measures. Using indirect measures to assess in clinical experiences appears to follow the literature. The unpredictability of the patient encounter types during clinical experiences makes direct assessment more difficult and thus would support the findings of this study (Cunningham et al., 2015; McCarthy & Murphy, 2007; Middlemas & Hensal, 2009; Thompson et al., 2009; Ulfavarson & Oxelmark, 2012). With less control over the situations that students may find themselves in and a lack of readily available direct measures, programs only assessing in clinical experience environments may rely on perceptions of preceptors or the students themselves, to determine if the student is ready for independent practice based on the clinical experience (Jardine et al., 2017; Middlemas & Hensal, 2009; Scriber et al., 2010). The connection between indirect assessment measures and the clinical experience environment was expected across the board based on the literature, however, it only manifested with the career preparedness SLO. Considering the majority of programs were not assessing only in the clinical experience, the connection between clinical experiences with indirect measures may only be relevant for a small number of programs.

Free responses revealed programs utilized a wide variety of tools, including alumni surveys, employer surveys, BOC exam rates, other examinations, exit interviews or surveys, placement rates, practical exams, preceptor exams, presentations, and simulations to assess career preparedness. Some literature on career preparedness assessment reveal programs using job placement rates (Commission on Accreditation of Athletic Training Education, 2018a; Principles for Effective Assessment of Student Achievement, 2013) or certification/licensure exams (Ostrowski & Marshall, 2015) as means for direct assessment of career preparedness. However, research also shows that transition to practice and being ready for entry-level employment is multifaceted and often incorporates many of the other SLOs, such as critical thinking and self-efficacy (Mazerolle et al., 2010; Mazerolle et al., 2018; Mazerolle et al., 2016; Mazerolle et al., 2015; Mirza, Manankil-Rankin, Prentice, Hagermon, & Draenos, 2019; Walker et al., 2016). As found in this study, using a variety of sources and educational environments to ensure student readiness would be beneficial. Based on the literature for career preparedness and transition to practice, this SLO may be the most important to utilize student perception and self-reflection. Believing in one's preparation may be the key component to feeling competent in one's profession (Mirza et al., 2019).

Knowledge and skills. The final student learning outcome of the top five most frequently cited SLOs is discipline-specific knowledge and skills, another of the pre-determined themes of assessment from the CAATE (Commission on Accreditation of Athletic Training Education, 2018c). Of the 35 respondents, 20 of them are assessing knowledge and skills. Knowledge and skills are possibly the largest and most diverse of the SLOs. Each program may define knowledge and skills differently and it is open to interpretation. The inclusion of knowledge and skills as an SLO was inspired by the CAATE and its pre-determined themes of

SLO that it asks about during annual reports (Commission on Accreditation of Athletic Training Education, 2018c). In reality, everything that a preparatory healthcare program, including athletic training, teaches or assesses could be defined as knowledge and skills (American Association of Colleges of Nursing, 2008; American Council on Graduate Medical Education, 2017; Commission on Accreditation of Athletic Training Education, 2018a; Fater, 2013; Gadbury-Amyot et al., 2014; Harden et al., 1999; Jardine et al., 2017; Jones & Sheppard, 2012; Raup et al., 2010; Sauers et al., 2019; Trede et al., 2015). Even with the potential for broad interpretation, the SLO was only noted as the fifth-most-assessed SLO.

Ninety-five percent of the programs who assess knowledge and skills are doing so in both environments and 80% of them are assessing with both measures. No programs utilized indirect measures alone nor assessed in controlled environments alone. Much of the literature on assessing discipline-specific knowledge and skills in preparatory healthcare programs, demonstrate a balance of teaching and assessing student learning in both didactic environments and clinical experiences (American Academy of Physician Assistants, 2012; American Council on Graduate Medical Education, 2016; Fater, 2013; Greiner & Knebel, 2003; Harden et al., 1999; Physician Assistant Education Association, 2018a). Very few sources focus on didactic educational components of discipline-specific knowledge and skills alone (Hildenbrand & Schultz, 2012). However, a substantial portion of the literature is focused strictly on how to assess knowledge and skills and specific measures to utilize during clinical experiences (American Academy of Physician Assistants, 2014; American Association of Colleges of Nursing, 2008; Jardine et al., 2017; Keating et al., 2018; Löfmark & Thorell-Ekstrand, 2000; McCarthy & Murphy, 2007; Sauers et al., 2019; Trede et al., 2015; Ulfvarson & Oxelmark, 2012).

The emphasis on the literature for clinical experiences is more likely a result of the need to develop and validate clinical tools, due to the barriers and difficulty in implementing sound assessment in clinical experiences, than due to a desire to only assess in the clinical experience. Free responses revealed a wide variety of assessment measures being utilized with employer surveys, practical exams, and preceptor evaluations leading the list in frequency. Considering the wide variety of interpretations that discipline-specific knowledge may encompass, the finding of both environments, both measure types, and a wide variety of tools is not surprising.

Regardless of student learning outcome. As part of the data analysis of this study, the researcher added the examination of any preferences for programs to group assessment environment and measure regardless of student learning outcome. Athletic training programs that to assess a student learning outcome only in clinical experience tended to use direct measures (12%). If a program was assessing in controlled environments, it tended to use both measures (7%) and direct measures alone (6.5%). Finally, athletic training programs that assess in both experiences tended to assess using both direct and indirect measures (44.2%). The findings of this study demonstrate that athletic training programs appear to be aligned with a best practice of assessment literature, using either direct measures or a combination of direct and indirect measures to triangulate the educational experience with students', peers' and others' perceptions of learning (Banta & Palomba, 2015; Gadbury-Amyot et al., 2014; Gielen et al., 2003; Lindsay et al., 2013; Lopez, 2002; Marchigian et al., 2011; Martin & Vale, 2005).

Gauthier (2019), when discussing medical competency-based education, observed that no one form of assessment can be used to achieve every goal. A wide variety of tools that can be applied in direct observation (clinical experiences) or in controlled environments, such as oral case presentations should be considered by programs (Gauthier, 2019) Effective assessment cannot be achieved in only one environment or one classroom, programs should be utilizing as much and as varied of information as possible to get a complete picture of student learning (Stitt-Berg et al., 2019). Since the study did ask about the quality, validity, or reliability of the assessment tools being utilized, it cannot be said whether the process of assessment in the various environments and with the types of tools are matching best practices for quality of the assessment tools. Future studies should examine the quality of the tools being utilized for both direct and indirect assessment in both environments, which appears to be the preference of current athletic training programs.

Use of preceptor evaluations. Preceptor evaluations are being used frequently according to free responses of the participants for many of the SLOs, including being the most frequent free-response for the top five student learning outcomes assessed in this study. Considering there is no real research on the effectiveness of using preceptor evaluations as assessment tools for any of the student learning outcomes, the use of preceptor evaluations is more likely due to convenience, ease, and ability to be used across circumstances rather than documented effectiveness. Literature has reported that no matter the reliability and validity, the feasibility and utility of the tool is likely to dictate its use in assessment (Brookhart et al., 2004; Thompson et al., 2014). Indirect measures, such as preceptor evaluations, are easier to implement but often do not give the full picture of assessment (Zlatkin-Troitschanskaia et al., 2015). Scriber, Gray, and Millspaugh (2010) also concluded that a universal system for assessing clinical performance would be more accurate and consistent than the variety of sources utilized now. Other professions, such as physical therapy, nursing and physician assistant, have developed tools to be used across programs, such as the CPI (English et al., 2004), the PT MACS (Luedtke-Hoffmann et al., 2012), the ACIEd (Ulfavarson & Oxelmark, 2012; Wu, et. al., 2015);

or the *Competencies for the PA Profession* rubric (American Academy of Physician Assistants, 2014), may be used by preceptors of clinical instructors to assess entry-level performance of students in clinical experiences.

In athletic training, there have not been any documented attempts to universalize a preceptor evaluation. The *Athletic Training Milestones* (Sauers et al., 2019) may be a tool to utilize as or in replace of preceptor evaluations; however, the device still needs to be studied further for validity and reliability. Even if a universal measure were to be implemented, the use would only be as good as the training of the evaluator(s). In athletic training literature, preceptor development, where preceptors are trained on assessment, teaching, and mentoring skills, seems to be key in allowing a program to be able to use the preceptor as the assessor of student learning during clinical experiences (Beer & Mårtensson, 2015; Bomar & Mulvihill, 2016; Cunningham et al., 2015; Löfmark & Thorell-Ekstrand, 2000; McCarthy & Murphy, 2007; Middlemas & Hensal, 2009; Nottingham, 2014; Nottingham, 2015; Trede et al., 2015). The *Athletic Training Milestones,* and the ACGME *Milestones* on which they are modeled, try to limit some of this bias by recommended or requiring a committee of assessment (American Council on Graduate Medical Education, 2016; AT Milestones Project, 2019b). This study did not ask about the implementation of the preceptor evaluations or any specifics about the training or development of the evaluations, so a wide-variety of devices and systems might be grouped under the report of "preceptor evaluation."

Recommendations

The small sample size of athletic training programs has limited the applicability of the results. Future research into student learning outcomes and assessment would be best with a larger sample of programs, if not all programs, such as can be undertaken during annual reporting of accreditation by the CAATE. The results of such findings should be readily shared with researchers in order to be available to study assessment in athletic training more thoroughly. This study also did not ask specifically about the type of assessment tools utilized, besides in optional free response. Future research should investigate the specific tools being utilized and if the program tracks of the validity and reliability of the devices and their overall satisfaction with their measures.

Following this study's investigation into the current environment of assessment in athletic training, the researcher is advocating for the development or endorsement tools that can and will be used across athletic training programs for each of the most assessed student learning outcomes. The measurements for these student learning outcomes should be applicable to controlled or didactic environments and the clinical experience. Future researchers should validate and test reliability of these endorsed assessments. Athletic training programs tend to be relying on preceptor evaluations, examinations, and practical examinations for many of their assessment strategies. If such assessment tools are the preference of programs, those should be the first investigated, and if possible standardized and validated. As presented earlier, some attempts to provide universal tools, such as *The Athletic Training Milestones*, have begun. However, the work still is coming from an individual group of researchers and is not yet supported or endorsed by the larger organizations (Sauers et al., 2019). To inform *The Athletic Training Milestones* work and any standardization of a tool, future researchers should use the information found in this study to lay the ground work for development and testing of current or new assessment tools.

For example,12 programs, of the 29 that are assessing critical thinking, etc. as an SLO, are utilizing preceptor evaluations as an indirect measure. Yet, there are no studies that correlate preceptor evaluation of critical thinking observed during clinical experiences to a known valid and reliable mechanism of assessing critical thinking, such as an inventory like the California Critical Thinking Disposition Inventory or the California Critical Thinking Skills. Such association work has been done between inventories and high-fidelity human simulations with nursing students (Fero, et al., 2010). A standardized preceptor evaluation document and process would be more efficient and could be validated against proven measures for a variety of SLOs. The evaluation could then be made available for all programs for use. Currently, most programs create their own evaluation, making it difficult to measure validity and reliability due to small sample sizes and limited experience and time.

More research should be done to determine the reasoning programs are not citing all of the IOM's core competencies as program-level student learning outcomes. Understanding if there are barriers in assessing the core-competencies, such as Evans (2010) was concerned about within nursing education, or if programs assess them as required 2020 curricular content standards and not student learning outcomes, would help future researchers determine if there can be any service given to programs to overcome barriers to ensure the implementation of all of the IOM's core competencies.

With the CAATE stipulation that all of the 2020 curricular content standards be assessed in both environments, it would be advantageous for future researchers to develop or validate tools that can be assuredly effective in both environments, but particularly during clinical experiences. Even though the dictation of citing in both environments applies to the standards and not necessarily to SLOs, programs will be more apt to raise up some of the most important and universal of the standards to the level of SLO if they can be assured of effective means to assess and track student learning in those areas in both environments. Biggs and Tang (2007) emphasized in their work the need to assess in environments the mimic authentic situations that students may find themselves in post-graduation. Clinical experiences in athletic training programs are used to replicate post-graduate clinical practice (Commission on Accreditation of Athletic Training Education, 2018a) and thus measures need to developed or validated to be applicable and easy to use within clinical experiences.

Overall, as athletic training continues to move in the direction of education transition and reform, the profession can learn from other healthcare professions. In accordance with what has been seen in physical therapy, graduate medical residences, nursing, and physician assistant programs, educational and professional organizations, in consort with researchers in the field, should take the lead in developing direct measure tools in the areas of critical thinking, evidence-based practice, BOC preparedness, career preparedness, and knowledge and skills that are apt to be used in both didactic and clinical experiences, as those are the outcomes that are most important to athletic training programs currently. Finally, if the organizations wish to see an increase in the assessment of another student learning outcomes beyond these more frequently cited ones, such as the rest of the IOM's core competencies, they should offer development of direct measures that are available for use in both environments.

Conclusion

The opportunity to learn from each other can be essential to continuing to assess student learning effectively and efficiently (Stanny et al., 2018). Across preparatory healthcare programs, there has not been a study to that looks specifically at the assessment processes of programs. This study provided the opportunity to examine the current processes of assessment of athletic training programs as a starting point for future development of assessment tools for Athletic training along with providing an example to other healthcare programs and other educational researchers about the current practices of assessment. Athletic training programs are most often assessing in both controlled and clinical environments with both direct and indirect measures. Athletic training programs that responded to this survey were most likely to be assessing the student learning outcomes of Evidence-Based Practice, Research, Information; Critical Thinking, Problem Solving, Decision-Making, Clinical Reasoning, or Clinical Judgement Literacy; BOC Preparedness; Career Preparedness; and Knowledge and Skills. These SLOs align with some of the most important outcomes of other preparatory healthcare programs and the most important qualities of healthcare professionals. Future researchers and educational organizations should poll their resources and use this information to study and/or develop reliable, valid, and efficient tools for the most frequently cited SLOs that can be applied to clinical and controlled environments in order to meet the needs of currently athletic training programs. A call for institutions and programs to adopt an "assessment-for-learning-improvement" mindset and the collaboration of experts in subject areas and the field of assessment is a common refrain from the assessment experts in order to achieve the most measurable improvement of learning (Stitt-Bergh et al., 2019). Athletic training programs and the organizations of the profession can take this opportunity to learn from each other and support each other in strengthening all of their assessment plans.

References

Altbach, P. G. (2013). *The international imperative in higher education*. Rotterdam, Netherlands: Sense.

American Academy of Physician Assistants (2012). *Competencies for the physician assistant profession*. [document] Retrieved from: https://www.aapa.org/wp-content/uploads/2017/02/PA-Competencies-updated.pdf

American Academy of Physician Assistants. (2014). *Sample competency assessment tool.* Retrieved from: https://www.aapa.org/wp-content/uploads/2017/02/Sample_Competency_Assessment_Tool_2014.pdf

American Association of Colleges and Universities, National Leadership Council. (2007a). *College learning and the new global century*. Washington, DC: AAC&U.

American Association of Colleges and Universities. (2015). *General education maps and markers: Designing meaningful pathways to student achievement.* Washington, DC: AAC&U.

American Association of College and Universities. (2017). *AAC&U receives $1.7M grand from Lumina Foundation to support the launch of the VALUE Institute* [press release]. Retrieved from https://www.aacu.org/press/press-releases/2017/lumina-value-institute

American Association of Colleges of Nursing (2008). *The essentials of baccalaureate education for professional nursing practice.* Retrieved from: http://www.aacn.nche.edu/education-resources/BaccEssentials08.pdf

American Council on Graduate Medical Education (2016). *ACGME common program requirements.* Retrieved from: http://www.acgme.org/Portals/0/PFAssets/ProgramRequirements/CPRs_2017-07-01.pdf

American Council on Graduate Medical Education (2017). *Milestones.* Retrieved from: http://www.acgme.org/What-We-Do/Accreditation/Milestones/Overview

Armstrong, K. J., & Jarriel, A. J. (2016). Standardized patients provide a reliable assessment of athletic training students' clinical skills. *Athletic Training Education Journal*, *11*(2), 88-94. doi: 10.4085/110288

Aronson, P.A., Bowman, T. G., & Mazerolle, S. M. (2015). Evaluating perceptions of culminating clinical education experiences of senior athletic training students. *Athletic Training Education Journal, 10(3)*, 219-226. doi: 10.4085/1003219

AT Milestones Project. (2019a). *History*. Retrieved from: http://www.atmilestones.com/history.html

AT Milestones Project. (2019b). *Implementation.* Retrieved from: http://www.atmilestones.com/implementation.html

AT Strategic Alliance. (2015). *Joint Statement from the Strategic Alliance.* Retrieved from: *https://caate.net/wp-content/uploads/2015/05/Strategic-Alliance-CCATE-email-pdf.pdf*

Banta, T.W., & Palomba, C.A. (2015). *Assessment essentials: Planning, implementing, and improving assessment in higher education*. San Francisco, CA: Jossey-Bass.

Barkley, T. J., Dufour, C. A., & Rhodes, R. S. (1998). Predictors of success on the NCLEX-RN among baccalaureate nursing students. *Nursing and Health Care Perspectives*, *19*(3), 132-37.

Beasley, T.M., & Schumacker, R.E. (1995). Multiple regression approach to analyzing contingency tables: Post hoc and planned comparison procedures. *The Journal of Experimental Education, 64(1),*79-93. doi: 10.1080/00220973.1995.9943797

Beer, M., & Mårtensson, L. (2015). Feedback on students' clinical reasoning skills during fieldwork education. *Australian Occupational Therapy Journal, 62*(4), 255-264. doi-10.1111/1440-1630.12208

Bennet, M, & Brady, J. (2012). A radical critique of the learning outcomes assessment movement. *Radical Teacher, 94*, 34-44.

Bernasek, A. (2005, December 11). What's the return on education? *The New York Times.* Retrieved from: http://www.nytimes.com/2005/12/11/business/yourmoney/whats-the-return-on-education.html?_r=0

Bevitt, S. (2015). Assessment innovation and student experience: A new assessment challenge and call for a multi-perspective approach to assessment research. *Assessment & Evaluation in Higher Education*, *40*(1), 103-119. doi:10.1080/02602938.2014.890170

Biggs, J. (1998). Assessment and classroom learning- a role for summative assessment? *Assessment in Education, 5*(1), 103-110.

Biggs, J., & Tang, C. (2007). *Teaching for quality learning at university.* Maidenhead, England: McGraw-Hill.

Billings, D. & Thomas, H. (2000). The international transferability of quality assessment systems for higher education: The Turkish experience. *Quality in Higher Education, 6*(1): 31-40. doi: 10.1080/13538320050001054

Birenbaum, M. (2003). New insights into learning and teaching and their implications for assessment. In Segers, M., Dochy, F., & Cascallar, E. (Eds). *Optimising new modes of assessment- In search of qualities and standards* (pp.13-36). New York, New York: Kluwer Academic Publishers.

Black, P. (2000). Research and the development of educational assessment. *Oxford Review of Education*, *26*(3&4), 407-419.

Black, P., Harrison, C., Lee, C., Marshall, B., & Wiliam, D. (2003). *Assessment for learning. Putting it into practice.* Maidenhead, England: Open University Press

Black, P., & Wiliam, D. (1998a). Assessment and classroom learning. *Assessment in Education, 5*, 7-73.

Black, P., & Wiliam, D, (1998b) Inside the black box: Raising standards through classroom assessment. *PHI Delta Kappan, 80*(2), 139-44.

Black, P., & Wiliam, D. (2003). In praise of Educational Research- formative assessment. *British Educational Research Journal, 29*(5), 623-637.

Black, P. & Wiliam, D. (2009) Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability, 21*(1), 5-31.

Broadfoot, P. & Black, P. (2004) Redefining assessment? The first ten years of assessment in education. *Assessment in Education, 11*(1), 7-27.

Board of Certification for the Athletic Trainer. The (2018a). *What is an athletic trainer?* Retrieved from: http://bocatc.org/about-us#what-is-an-athletic-trainer

Board of Certification for the Athletic Trainer. The (2018b). *What is the BOC?* Retrieved from: http://bocatc.org/about-us#what-is-the-boc

Board of Certification for the Athletic Trainer. The (2020). *BOC Certification Exam Candidate Handbook.* Retrieved from: https://online.flowpaper.com/7f6907b2/202021BOCCertificationExamCandidateHandbook/#page=1

Bomar, R. E., & Mulvihill, T. (2016). Educating educators: Perceptions of preceptors and clinical education coordinators regarding training at a Division II athletic training program. *Athletic Training Education Journal, 11*(1),10-17. doi: 10.4085/110110

Boud, D., & Falchikov, N. (2006). Aligning assessment with long-term learning. *Assessment & Evaluation in Higher Education, 31*(4), 399-413.

Bowman, N. (2010), Can 1st year college students accurately report their learning and development? *American Educational Research Journal, 47*(2), 466-496.

Brookhart, S., Achacoso, M. V., & Svinicki, M. D. (2004). Assessment theory for college classrooms. *New Directions for Teaching and Learning, 100*, 5-14.

Campbell, A. R., & Dickson, C. J., (1996). Predicting student success: A 10-year review using integrative review and meta-analysis. *Journal of Professional Nursing, 12*(1), 47-59.

Carwile, L., & Murrell, J. (2002). Student self-evaluation in clinical education. *Radiologic Technology, 73*(5), 415-422.

Castle Worldwide, Inc. (2017). *Item Analysis Explanation*. Retrieved from: https://bocatc.org/system/document_versions/versions/1/original/castle-item-analysis-explanation-20170523.pdf?1495566366

Cavallario, J.M., Van Lunen, B.L., Hock, J.M., Hock, M., Manspeaker, S.A., & Pribesh, S.L. (2018). Athletic training student core competency implementation during patient encounters. *Journal of Athletic Training, 53*(5), 282-291. doi: 10.4085/1062-6050-314-16

CITI Program (2017, January). CITI program basic course. Retrieved from: https://www.citiprogram.org

Commission on Accreditation of Athletic Training Education (2012). *Standards for accreditation of professional athletic training programs.* Retrieved from: https://caate.net/wp-content/uploads/2017/01/2012-Professional-Standards.pdf

Commission on Accreditation of Athletic Training Education. (2015). *Standard for athletic training degree and implementation timeline.* Retrieved from: http://caate.net/standard-for-athletic-training-degree-and-implementation-timeline/

Commission on Accreditation of Athletic Training Education (2018a). *2020 Standards for accreditation of professional Athletic Training programs: Master's degree programs.* Retrieved from: https://caate.net/wp-content/uploads/2018/02/2020-Standards-for-Professional-Programs-copyedited-clean.pdf

Commission on Accreditation of Athletic Training Education (2018b). *About.* Retrieved from: https://caate.net/about/

Commission on Accreditation of Athletic Training Education (2018c). *Annual report.* Retrieved from: https://www.e-accred.caate.net/programs/111/annual_report/page/5

Commission on Accreditation of Athletic Training Education (2019). *Program Outcomes.* Retrieved from: https://caate.net/program-outcomes/#Pass-Rate

Commission on Accreditation of Athletic Training Education (2020). *2020 Professional Curricular Content Standards Clarification.* Retrieved from: https://caate.net/wp-content/uploads/2020/01/2020-Professional-Curricular-Content-Standards-Clarification-.pdf

Cone, C., Godwin, D., Salazar, K., Bond, R., Thompson, M., & Myers, O. (2016). Incorporation of an explicit critical-thinking curriculum to improve pharmacy students' critical-thinking skills. *American Journal of Pharmaceutical Education*, *80*(3), 1-5.

Cox, W. C., Persky, A., & Blalock, S. J. (2013). Correlation of the health sciences reasoning test with student admission variables. *American Journal of Pharmaceutical Education*, *77*(6), 1-4.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Thousand Oaks, CA: Sage.

Cunningham, J., Wright, C., & Baird, M. (2015). Managing clinical education through understanding key principles. *Radiologic Technology, 86*(3), 257-271.

El-Khawas, E. (1998). Accreditation's role in quality assurance in the United States. *Higher Education Management,* 10(3), 43-56.

English, M. L., Wurth, R. O., Ponsler, M., & Milam, A. (2004). Use of the physical therapist clinical performance instrument as a grading tool as reported by academic coordinators of clinical education. *Journal of Physical Therapy Education, 18*(1), 87-92.

Entwistle, N., & Entwistle, A. (1997) Revision and the experience of understanding, in F. Marton, D. Hounsell, & N. Entwistle (Eds). *The Experience of Learning*. Edinburgh, Scotland: Scottish Universities Press.

European Association for Quality Assurance in Higher Education, European Students' Union, European University Association, European Association of Institutions in Higher Education, Education International, BUSINESSEUROPE, and European Quality Assurance Register for Higher Education (2015). *Standards and guidelines for quality assurance in the European higher education area (ESG).* Retrieved from: https://revisionesg.files.wordpress.com/2015/05/revised_esg_2015_adopted.pdf

European Commission. (n.d.). The Bologna Process and the European higher education area. Retrieved from http://ec.europa.eu/education/policy/higher-education/bologna-process_en

European Students' Union (2016, July 25). *PASCL explores implementation and assessment procedures.* Retrieved from: https://www.esu-online.org/?news=pascl-explores-implementation-and-assessment-procedures

Evans, M. (2010). Implementation of IOM recommendations. *Nursing Outlook, 58*(2), E10.

"Excellence v Equity". (2015, March 28). *The Economist*, 414(8931), 3. Retrieved from: http://www.economist.com/printedition/specialreports?year[value][year]=2015&category=769 82

Fain, P. (2015, June 25). Education department says rating system will be consumer tool rather than comparison of colleges. *Inside Higher Ed.* Retrieved from: https://www.insidehighered.com/news/2015/06/25/education-department-says-rating-system-will-be-consumer-tool-rather-comparison

Fater, K. H. (2013). Gap analysis: A method to assess core competency development in the curriculum. *Nursing Education Perspectives, 34*(2), 101-5.

Fero, L. J., O'Donnell, J. M., Zullo, T. G., Dabbs, A. D., Kitutu, J., Samosky, J. T., & Hoffman, L. A. (2010). Critical thinking skills in nursing students: comparison of simulation-based performance with metrics. *Journal of Advanced Nursing*, *66*(10), 2182-2193. doi:10.1111/j.1365-2648.2010.05385.x

Gadbury-Amyot, C., Krust Bray, K., & Austin, K. J. (2014). Fifteen years of portfolio assessment of dental hygiene student competency: Lessons learned. *Journal of Dental Hygiene, 88*(5), 267-274.

Gauthier, S. (2019). Aligning direct observation and assessment. *Medical Education, 53*, 642-651. doi: 10.1111/medu.13903

Gielen, S., Dochy, F., & Dierick, S. (2003). Evaluating the consequential validity of new modes of assessment: The influence of assessment on learning, including pre-, post-, and true assessment effects. In M. Segers, F. Dochy, E. Cascallar (Eds.), *Optimising new modes of assessment: In search of qualities and standards* (37-54). Dordrecht, England: Kluwer Academic

Golemboski, K., Otto, C., & Morris, S. (2013). Using performance tasks employing IOM patient safety competencies to introduce quality improvement processes in medical laboratory science education. *Clinical Laboratory Science, 26*(4), 205-11.

Greiner, A., & Knebel, E. (2003). *Health professions education a bridge to quality* (Quality chasm series). Washington, D.C.: National Academies Press.

Grouling, J. (2017). The path to competency-based certification: A look at the LEAP challenge and the VALUE rubric for written communication. *The Journal of Writing Assessment, 10*(1).

Harden, R., Crosby, J., & Davis, M. (1999). AMEE guide no. 14- Outcome-based education-Part 1--an introduction to outcome education. *Medical Teacher, 21*(1), 7-14.

Harris, D. (1992). Case study: Learner physiotherapists' perceptions of clinical education. *Educational and Training Technology International, 29*(2), 124-131.

Hay, P. J., Engstrom, C., Green, A., Friis, P., Dickens, S., & Macdonald, D. (2013). Promoting assessment efficacy through an integrated system for online clinical assessment of practical skills. *Assessment & Evaluation in Higher Education, 38*(5), 520-535.

Hayward, L. M., & Blackmer, B. (2010). A model for teaching and assessing core values development in doctor of physical therapy students. *Journal of Physical Therapy Education, 24*(3), 16-26.

Hayward, L., & Hedge, N. (2005) Travelling towards change in assessment: policy. practice and research in education. *Assessment in Education: Principles, Policy & Practice, 12*(1), 55-75 doi: 10.1080/0969584042000333913

Heidari, M., & Ebrahimi, P. (2016). Examining the relationship between critical-thinking skills and decision-making ability of emergency medicine students. *Indian Journal of Critical Care Medicine, 20*(10), 581-586. doi:10.4103/0972-5229.192045

Henning, J.M., & Marty, M.C. (2008). A practical guide to implementing peer assessment in athletic training education. *Athletic Therapy Today, 13*(3), 30-33.

Hildenbrand, K. J., & Schultz, J. A. (2012). Development of a rubric to improve critical thinking. *Athletic Training Education Journal, 7*(3), 86-94 doi: 10.5608/070386

Hinyard, L., Tommey, E., Eliot, K., & Breitbach, A. Student perceptions of collaboration skills in an interprofessional context: Development and initial validation of the self-assessed collaboration skills instrument. *Evaluation & the Health Professions, 42*(4), 450-472. doi: 10.1177/0163278717752438

Ho, D. L., Whitehill, T. L., & Ciocca, V. (2014). Performance of speech-language pathology students in problem-based learning tutorials and in clinical practice. *Clinical Linguistics & Phonetics, 28*(1-2), 83-97 doi: 10.3109/02699206.2013.812146

Holland, N. R., Grinberg, I., & Tabby, D. (2014). A standardized online clinical education and assessment tool for neurology clerkship students assigned to multiple sites. *Perspectives on Medical Education, 3*, 41-45 doi: 10.1007/s40037-013-0097-5

Jardine, D., Deslauriers, J., Kamran, S.C., Khan, N., Hamstra, S., & Edgar, L. (2017). *Milestones guidebook for residents and fellows.* Accreditation Council for Graduate Medical Education. Retrieved from: http://www.acgme.org/Portals/0/PDFs/Milestones/MilestonesGuidebookforResidentsFellows.pdf?ver=2017-06-29-090859-107

Kabay, M. R. (2013). *The relationship between athletic training student critical thinking skills and clinical instructor supervision: A pilot study* (Doctoral dissertation). Retrieved from: http://digital.library.duq.edu/cdm

Keating, J., Dalton, M., & Davidson, M. (2009). Assessment in clinical education. In C. Delaney, & E. Molloy (Eds.), *Clinical education in the health professions* (pp. 147-172). Sydney, Australia: Elsevier

Khan, K.Z., Ramachandran, S., Gaunt, K., & Pushkar, P. (2013). The Objective Structured Clinical Examination (OSCE): AMEE Guide No. 81. Part II: Organization and administration. *Medical Teacher,* 35(9), e-1447-e1463. doi: 10.3109/0142159X.2013.818635

Kicklighter, T., Barnum, M., Geisler, P. R., & Martin, M. (2016). Validation of the quantitative diagnostic thinking inventory for athletic training: A pilot study. *Athletic Training Education Journal, 11*(1), 58-67. doi: 10.4085/110158

Kivinen, O., & Rinne, R. (1996). Changing higher education policy: Three Western models. In Z. Morsy, & P. G. Altbach (Eds.), *Higher education in international perspective* (pp. 421-178). New York, New York: Garland. Retrieved from https://www.researchgate.net/publication/44816244_Changing_higher-education_policy_Three_Western_models

Knight, P., & Yorke, M. (2007). *Assessment, learning and employability*. Maidenhead, England: McGraw-Hill Education.

Krachenberg, A. (1972). Bringing the concept of marketing to higher education. *The Journal of Higher Education, 43*(5), 369-380. doi:10.2307/1980714

Lederman, D. (2010, January 28). Measuring student learning, globally. *Inside Higher Ed.* Retrieved from: https://www.insidehighered.com/news/2010/01/28/measuring-student-learning-globally

Lederman, D., & Fain, P. (2017, January 19). The higher education president. *Inside Higher Ed.* Retrieved from: https://www.insidehighered.com/news/2017/01/19/assessing-president-obamas-far-reaching-impact-higher-education?width=775&height=500&iframe=true

Légaré, F., Moher, D., Elwyn, G., LeBlanc, A., & Gravel, K. (2007). Instruments to assess the perception of the physicians in the decision-making process of specific clinical encounters- a systematic review. *BMC Medical Informatics and Decision Making*, *7*(30), 1-16. doi:10.1186/1472-6947-7-30

Leland, D., & Moore, J. (2007, September/October). Strategic focusing: Securing competitive advantage. *Public Purpose,* 10-13.

Li, H., Xiong, Y., Hunter, C.V., Guo, X., & Tywoniw, R. (2020). Does peer assessment promote student learning? A meta-analysis. *Assessment & Evaluation in Higher Education, 45*(2), 193-211. doi: 10.1080/02602938.2019.1620679

Lindsay, N., Hourigan, A., Smist, J., & Wray, L. (2013). “Let me be direct”: Using direct assessments with student leaders. *About Campus,* 30-32. doi: 10.1002/abc.21103

Little, T., Badway, N., & Hargis, J. (2008). Student learning outcomes assessment in allied health education: Déjà vu. *The Journal of Faculty Development, 22*(2), 89-95.

Löfmark, A., & Thorell-Ekstrand, I. (2000). Evaluation by nurses and students of a new assessment form for clinical nursing education. *Scandinavian Journal of Caring Sciences, 14*, 89-96.

Lopez, C. L. (2002). Assessment of student learning: Challenges and strategies. *Journal of Academic Librarianship, 28*(6), 356-367.

Luedtke-Hoffmann, K., Dillon, L., Utsey, C., & Tomaka, J. (2012). Is there a relationship between performance during physical therapist clinical education and scores on the national physical therapy examination (NPTE)? *Journal of Physical Therapy Education, 26*(2), 41-49.

Marchigiano, G., Eduljee, N., & Harvey, K. (2011). Developing critical thinking skills from clinical assignments: A pilot study on nursing students' self-reported perceptions. *Journal of Nursing Management*, *19*(1), 143-152. doi:10.1111/j.1365-2834.2010.01191.x

Martin, M., & Vale, D. (2005). Developing a program-assessment plan. *Athletic Therapy Today, 10*(5), 40-42.

Martinez, A. (2017, January). *Internet-based Research* [Course module]. CITI Program. Retrieved from https://www.citiprogram.org/

Marty, M. C., Henning, J. M., & Willse, J.T. (2010). Accuracy and reliability of peer assessment of athletic training psychomotor laboratory skills. *Journal of Athletic Training, 45*(6), 609-614.

Mazerolle, S. M., Bowman, T. G., & Benes, S. S. (2015). Reflective observation in the clinical education setting: A way to promote learning. *Athletic Training Education Journal. 10(1)*, 32-38. doi: 10.4085/100132

Mazerolle, S.M., & Dodge, T. (2015). Role of clinical education experiences on athletic training students' development of professional commitment. *Athletic Training Education Journal, 10*(2), 138-145. doi:10.4085/1002138

Mazerolle, S. M., Eason, C. M., Clines, S., & Pitney, W. A. (2010). The professional socialization of the graduate assistant athletic trainer. *Journal of Athletic Training, 50*(5), 532-541. doi: 10.4085/1062-6050-50.1.03

Mazerolle, S. M., Kirby, J. L., & Walker, S. E. (2018). A narrative analysis: examining the transition to practice for the full-time secondary school athletic trainer. *Journal of Athletic Training, 53*(3), 330-311. doi: 10.4085/1062-6050-45-17

Mazerolle, S. M., Walker, S. E., & Kirby, J. L. (2016). Support received during the transition to practice for the secondary school graduate-assistant athletic trainer. *Journal of Athletic Training, 5*(10), 780-788. doi: 10.4085/1062-6050-51.12.10

Mazerolle, S. M., Walker, S. E., & Thrasher, A. B. (2015). Exploring the transition to practice for the credentialed athletic trainer: A programmatic view. *Journal of Athletic Training, 50*(10), 1042-1053. doi: 10.4085/1062-6050-50.9.02

McCallum, C. A., Mosher, P. D., Jacobson, P. J., Gallivan, S. P., & Giuffre, S. M. (2013). Quality in physical therapist clinical education: A systematic review. *Physical Therapy Journal, 93*, 1298-1311. doi: 10.2522/ptj.20120410

McCarthy, B., & Murphy, S. (2007). Assessing undergraduate nursing students in clinical practice: Do preceptors use assessment strategies? *Nursing Education Today, 28*, 301-313.

McConnell, K. D., & Rhodes, T. L. (2017). *On solid ground: VALUE report 2017*. Retrieved from http://www.aacu.org/sites/default/files/files/FINALFORPUBLICATIONRELEASEONSOLIDGROUND.pdf

Melguizo, T., & Wainer, J. (2016). Toward a set of measures of student learning outcomes in higher education: Evidence from Brazil. *Higher Education, 72*, 381-401. doi: 10.1007/s10734-015-9963-x

Middlemas, D. A., & Hensal, C. (2009). Issues in selecting methods of evaluating clinical competence in the health professions- Implications for athletic training education. *Athletic Training Education Journal, 4*(3), 109-116.

Miller, M.A. & Ewell, P.T. (2005). *Measuring upon college level learning*. San Jose, CA: National Center for Public Policy in Higher Education. Retrieved from: http://www.highereducation.org/reports/mu_learning/Learning.pdf

Mirza, N., Manakil-Rankin, L., Prentice, D., Hagerman, L-A., & Draenos, C. (2019). Practice readiness of new nursing graduates: A concept analysis. *Nurse Education in Practice, 37*, 68-74. doi: 10.1016/j.nepr.2019.04.009

Missen, K., McKenna, L., Beauchamp, A., & Larkins, J. (2016). Qualified nurses' rate new nursing graduates as lacking skills in key clinical areas. *Journal of Clinical Nursing, 25*, 2134-2143.

Morin, K. H., & Bellack, J. P. (2015). Student learning outcomes. *Journal of Nursing Education, 54*(3), S3-4.

Morphew, C. C., & Hartley, M. (2006). Mission statements: A thematic analysis of rhetoric across institutional type. *Journal of Higher Education, 77*(3), 456-71.

Morris, T. L., & Hancock, D. R. (2013). Institute of medicine core competencies as a foundation for nursing program evaluation. *Nursing Education Perspectives, 34*(1), 29-33

Murray, E., Gruppen, L., Catton, P., Hays, R., & Woolliscroft, J.O. (2000). The accountability of clinical education: Its definition and assessment. *Medical Education, 34*, 871-879.

National Athletic Trainers' Association (2017). *About.* Retrieved from: https://www.nata.org/about

Nedwek, B.P, & Neal, J.E. (1994). Performance indicators and rational management tools: A comparative assessment of projects in North American and Europe. *Research in Higher Education*, 35(1), 75-103.

Nottingham, S. (2015). Preceptors' perceptions of the preparation and qualifications for the preceptor role. *Athletic Training Education Journal. 10(4)*, 302-314. doi: 10.4085/1004302

Nottingham, S.L. (2014). The reliability of faculty and preceptors' evaluations of athletic training students' clinical skills. *Journal of Athletic Training, 49*(3), S22.

Office of Learning and Teaching, Victoria (2005). *Current perspectives on assessment.* Retrieved from: http://www.eduweb.vic.gov.au/edulibrary/public/teachlearn/student/assessment_current_per.pdf

Ostrowski, J.L, & Marshall, B. (2015). Master's professional athletic training programs: program characteristics, graduation requirements, and outcomes measures. *Athletic Training Education Journal, 10*(1), 25-31. doi: 10.4085/100125

Patel, R., Sandars, J., & Carr, S. (2015). Clinical diagnostic decision-making in real life contexts- A trans-theoretical approach for teaching- AMEE Guide No. 95. *Medical Teacher, 37*(3), 211-227. doi-10.3109/0142159X.2014.975195

Pattalitan Jr., A.P. (2016). The implications of learning theories to assessment and instructional scaffolding techniques. *American Journal of Educational* Research, 4(9), 695-700. doi: 10.12691/education-4-9-9

Pearce, N., Beinart, H., Clohessy, S., & Cooper, M. (2013). Development and validation of the supervisory relationship measure A self-report questionnaire for use with supervisors *British Journal of Clinical Psychology, 52*, 249-268. doi:10.1111/bjc.12012

Pellegrino, J.W. (1999). The evolution of educational assessment: Considering the past and imagining the future. Proceedings from *Sixth Annual William H. Angoff Memorial Lecture.* Princeton, NJ: Educational Testing Service.

Physician Assistant Education Association. (2011a). *Core tasks and objectives.* Retrieved from: https://paeaonline.org/assessment/core-tasks-and-objectives/

Physician Assistant Education Association. (2011b). *PAEA assessment.* Retrieved from: https://paeaonline.org/assessment/

Physician Assistant Education Association. (2018a). *By the numbers: Curriculum report 2: Data from the 2016 didactic curriculum survey*. Washington, DC: PAEA. Retrieved from: https://paeaonline.org/wp-content/uploads/2018/01/CR2_2018.pdf doi: 10.17538/CR2.2018

Physician Assistant Education Association. (2018b). *PAEA assessment.* Retrieved from: https://paeaonline.org/assessment/

Portland State University Enrollment Management and Student Affairs. (2017). *Assessment Planning and Practice.* Retrieved from: https://www.pdx.edu/studentaffairs/assessment-planning-and-practice

Principles for Effective Assessment of Student Achievement. (2013). [document] Retrieved from: https://www.wscuc.org/files/principles_for_effective_assessment_of_student_achievement.pdf

Provezis, S. (2010). Regional accreditation and student learning outcomes: Mapping the territory. *National Institution for Learning Outcomes Assessment.* Retrieved from: http://www.learningoutcomeassessment.org/documents/Provezis.pdf

Ramaekers, S., Kremer, W., Pilot, A., van Beukelen, P., & van Keulen, H. (2010). Assessment of competence in clinical reasoning and decision-making under uncertainty: The script concordance test method. *Assessment & Evaluation in Higher Education, 35*(6), 661-673.

Raup, G., King, J., Hughes, R., & Faidley, N. (2010). Using learning outcome measures to assess doctoral nursing education. *Journal of Visualized Experiments, 40*(e2048), 1-3. doi: 10.3791/2048

Roberts, V., Perryman, M., & Rivers, P. A. (2009). A discussion paper on the assessment of student learning outcomes for healthcare management. *Health Education Journal, 68*(2), 140-148

Rust, C. (2002). The impact of assessment of student learning: How can the research literature practically help to inform the development of departmental assessment strategies and learner-centered assessment practices? *Active: Learning in Higher Education, 3*(2), 145-158.

Sadler, D. R. (1989). Formative assessment and the design of instructional systems. *Instructional Science, 18*, 145-165.

Sauers, E.L., Laursen, R.M., Pecha, F., & Walusz, H. (2019). *The Athletic Training Milestones.* Retrieved from: http://www.atmilestones.com/support-files/at_milestones.pdf

Scott, C., Bouchard, G., Brock, D., Davison, M., Dehn, R., Hegmann, T., Link, M., Morgan, P., & Niebuhr, B. (2012). *Physician Assistant Education Association 2010 Curriculum Survey.* Retrieved from: https://paeaonline.org/wp-content/uploads/2016/10/Curriculum-Survey-2010.pdf

Scriber, K., Gray, C., & Millspaugh, R. (2010). Should athletic training educators utilize grades when evaluating student clinical performance? *Athletic Training Education Journal, 5*(3), 126-132.

Sexton, P.J. (2003). A perspective on student assessment. *International Journal of Athletic Therapy Training, 8*(6), 6-10.

Shahjahan, R. A., & Torres, L. E. (2013). A 'global eye' for teaching and learning in higher education: A critical policy analysis of the OECD's AHELO student. *Policy Futures in Education, 11*(5), 606-620.

Shelestak, D. S., Meyers, T. W., Jarzembak, J. M., & Bradley, E. (2015). A process to assess cinical decision-making during human patient simulation: A pilot study. *Nursing Education Perspectives (National League for Nursing), 36*(3), 185-187. doi:10.5480/13-1107.1

Sowter, J., Cortis, J., & Clarke, D.J. (2011). The development of evidence-based guidelines for clinical practice portfolios. *Nurse Education Today, 31*, 872-876. doi:10.1016/j.nedt.2010.12.027

Stanny, C. J., Stone, E. W., & Mitchell-Cook, A. (2018). Evidence-based discussions of learning facilitated through a peer review of assessment. *New Directions for Teaching and Learning, 155*, 31-38. doi: 10.1002/tl.20300

Stitt-Bergh, M., Wehlburg, C.M., Rhodes, T., & Jankowski, N (2019). Assessment for student learing and the public good. *The Magazine of Higher Learning, 51*(2), 43-46. doi: 10.1080/00091383.2019.1569972

Stobart, G. (2008). *Testing times: The uses and abuses of assessment*, New York, New York: Routledge.

Stupans, I., March, G., & Owen, S. M. (2013). Enhancing learning in clinical placements- reflective practice, self-assessment, rubrics and scaffolding. *Assessment & Evaluation in Higher Education, 38*(5), 507-519. doi: 10.1080/02602938.2012.658017

Taras, M. (2010). Assessment for learning: Assessing the theory and evidence. *Procedia Social and Behavioral Sciences, 2,* 3015-3022. doi:10.1016/j.sbspro.2010.03.457

Thompson, G.A., Moss, R., & Applegate, B (2014). Using performance assessments to determine competence in clinical athletic training education: How valid are our assessments? *Athletic Training Education Journal, 9*(3), 135-141. doi: 10.4085/0903135

Thon, S., & Hansen, P. (2015). Preferred learning styles of professional undergraduate and graduate athletic training students. *Athletic Training Education Journal, 10*,159-163. doi: 10.4085/1002159

Tight, M. (2004) Research into higher education: An a-theoretical community of practice? *Higher Education Research and Development, 23*(4), 395-411.

Trede, F., Mischo-Kelling, M., Gasser, E. M., & Pulcini, S. (2015). Assessment experiences in the workplace: A comparative study between clinical educators' and their students' perceptions. *Assessment & Evaluation in Higher Education, 40*(7), 1002-1016. doi:10.1080/02602938.2014.960363

Tremblay, K., Lalancette, D., & Roseveare, D. (2012). *Assessment of higher education learning outcomes: Volume 1: Design and implementation.* Retrieved from: http://www.oecd.org/education/skills-beyond-school/AHELOFSReportVolume1.pdf

Tuning Educational Structures in Europe (n.d.). *Approaches to teaching, learning and assessment in competence-based degree programmes.* Retrieved from: http://www.unideusto.org/tuningeu/images/stories/archivos/TLA%20PARA%20LA%20PAGINA.pdf

Turbow, D. J., & Evener, J. (2016). Norming a VALUE rubric to assess graduate information literacy skills. *Journal of The Medical Library Association, 104*(3), 209-214. doi: 10.3163/1536-5050.104.3.005

Turkel, M. C., Marvelous, J., Marrison, D., & Singletary, B. (2016). Describing self-reported assessments of critical thinking among practicing medical-surgical registered nurses. *MEDSURG Nursing, 25*(4), 244-250

Ulfvarson, J., & Oxelmark, L. (2012). Developing an assessment tool for intended learning outcomes in clinical practice for nursing students. *Nurse Education Today, 32*(6), 703-708. doi:10.1016/j.nedt.2011.09.010

U.S. Department of Health & Human Services (1979, April 18). *The Belmont Report* [Report] Retrieved from http:// www.hhs.gov/ohrp/humansubjects/guidance/belmont.html

Vilgats, B., & Heidmets, M. (2011). The impact of external quality assessment on universities: The Estonian experience. *Higher Education Policy, 24*, 331-346.

Vygotsky, L (1978). *Mind in society*. London, England: Harvard University Press.

Walker, S. E., Thrasher, A. B., & Mazerolle, S. M. (2016). Exploring the perceptions of newly credentialed athletic trainers as they transition to practice. *Journal of Athletic Training, 5*(8), 601-612. doi: 10.4085/1062-6050-51.9.12

Walker, S. E., Weidner, T. G., & Armstrong, K. J. (2008). Evaluation of athletic training students' clinical proficiencies. *Journal of Athletic Training, 43*(4), 386-395.

Wall, B. Miller, D. E., & Widerquist, J. G. (1993). Predictors of success on the newest NCLEX-RN. *Western Journal of Nursing Research, 15*, 628-643.

Walvoord, B. E. (2010). *Assessment clear and simple: A practical guide for institutions, departments, and general education*. San Francisco, CA: Jossey-Bass.

Waterhouse, J. K., Caroll, M. C., & Beeman, P.B. (1993). National Council Licensure Examination success: Accurate prediction of student performance on the post-1988 examination. *Journal of Professional Nursing, 9*, 278-283.

Weber, S. (2005). Measuring quality in clinical education. *Journal of the American Academy of Nurse Practitioners, 17*(7), 243-244.

Weiss, W. M., & Neibert, P. J. (2016). Athletic training program commitment: Four-year analysis of behavioral outcomes. *Athletic Training Education Journal, 11*(2), 103-109. doi: 10.4085/1102103

Wilkinson, D., Schafer, J., Hewett, D., Eley, D., & Swanson, D. (2014). Global benchmarking of medical student learning outcomes? Implementation and pilot results of the International Foundations of Medicine Clinical Sciences Exam at the University of Queensland, Australia. *Medical Teacher, 36*, 62-67. Doi:10.3109/0142159X.2013.849331

Wiliam, D & Black, P, (1996) Meanings and consequences: A basis for distinguishing formative and summative functions of assessment? *British Educational Research Journal, 22*(5), 537-48.

Wiliam, D., Lee, C., Harrison, C., & Black, P. (2004). Teachers developing assessment for learning: impact on student achievement. *Assessment in Education 11*, 49-65.

Wolf, R., Zahner, D., & Benjamin, R. (2015). Methodological challenges in international comparative post-secondary assessment programs: Lessons learned and the road ahead. *Studies in Higher Education*, *40*(3), 471-481. doi:10.1080/03075079.2015.1004239

"World is going to university. The" (2015, May 26). *The Economist.* Retrieved from: http://www.economist.com/news/leaders/21647285-more-and-more-money-being-spent-higher-education-too-little-known-about-whether-it

Wu, X. V., Enskär, K., Lee, C. C. S., & Wang, W (2015). A systematic review of clinical assessment for undergraduate nursing students. *Nurse Education Today, 35*, 347-359. doi: 10.1016/j.nedt.2014.11.016

Zeind, C., Blagg, J., Amato, M., & Jacobson, S. (2012). Incorporation of institute of medicine competency recommendations within doctor of pharmacy curricula. *American Journal of Pharmaceutical Education, 76*(5), 83

Ziegler, O. (2018). PAEA's assessment team leading the conversation. *Physician Assistant Education Association.* Retrieved from: https://paeaonline.org/paea-assessment-team-leading-conversation/

Zlatkin-Troitschanskaia, O., Pant, H. A., & Coates, H. (2016). Assessing student learning outcomes in higher education: challenges and international perspectives. *Assessment & Evaluation in Higher Education*, *41*(5), 655-661. doi:10.1080/02602938.2016.1169501

Zlatkin-Troitschanskaia, O., Shavelson, R.J. (2019). Advantages and challenges of performance assessment of student learning in higher education. *British Journal of Educational Psychology, 89,*413-415. doi: 10.1111/bjep.12314

Zlatkin-Troitschanskaia, O., Shavelson, R. J., & Kuhn, C. (2015). The international state of research on measurement of competency in higher education. *Studies in Higher Education*, *40*(3), 393-411. doi:10.1080/03075079.2015.1004241

Appendix A

Possible SLOs in Literature

Possible student learning outcomes referenced in literature about healthcare preparatory programs

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Acceptance of Criticism/Feedback	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Carwile & Murrell, 2002	Yes- Radiologic Technology	No	Clinical Education (Self-evaluation)
	Hayward & Blackmer, 2010	Yes – Physical Therapy	Yes – Physical Therapy	Clinical Education & Didactic (Standardized Patients, Clinical Instructor Evaluation, Inventories, Peer and Self Evaluations)
Adaptability, Resilience	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	Carwile & Murrell, 2002	Yes- Radiologic Technology	No	Clinical Education (Self-evaluation)
	Hayward & Blackmer, 2010	Yes – Physical Therapy	Yes – Physical Therapy	Clinical Education & Didactic (Standardized Patients, Clinical Instructor Evaluation, Inventories, Peer and Self Evaluations)
	Missen et al., 2016	No	Yes - Nursing	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Altruism, Honesty, Integrity	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Harden et al., 1999	Yes – Medical	Yes – Physicians	No
	Hayward & Blackmer, 2010	Yes – Physical Therapy	Yes – Physical Therapy	Clinical Education & Didactic (Standardized Patients, Clinical Instructor Evaluation, Inventories, Peer and Self Evaluations)
	Murray et al., 2000	Yes – Medical	No	No
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Altruism, Honesty, Integrity (continued)	Ulfvarson & Oxelmark, 2012	Yes – Nursing	No	Clinical Education (Assessment of Clinical Education tool)
Career Preparedness/ Employability	Aronson et al., 2015	Yes – Athletic Training	Yes –Athletic Training	Clinical Education (Preceptor Evaluation)
	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	Didactic (Graduation Rates, Job Placement Rates)
	Commission on Accreditation of Athletic Training Education, 2018c	Yes – Athletic Training	No	No
	Hildenbrand & Schultz, 2012	Yes- Athletic Training	Yes – Athletic Training	Didactic (Rubric)
	Knight & Yorke, 2007	Yes – not healthcare specific	Yes – not healthcare specific	No
	Mazerolle & Dodge, 2015	Yes – Athletic Training	No	Clinical Education
	Missen et al., 2016	No	Yes – Nursing	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Career Preparedness/ Employability (continued)	Ostrowski & Marshall, 2015	Yes – Athletic Training	No	Didactic (Certification Exam)
	Principles for Effective Assessment of Student Achievement, 2013	Yes – not healthcare specific	No	Didactic (Completion Rates, Job Placement Rates, Surveys of Alumni, Civic Engagement Rates)
Certification/ Licensure Exam Preparedness	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	No
	Commission on Accreditation of Athletic Training Education, 2018c	Yes – Athletic Training	No	No
	Little, Badway, & Hargis, 2008	Yes – Allied Health Professions	No	Didactic (Licensure Exam Results)
	Ostrowski & Marshall, 2015	Yes – Athletic Training	No	Didactic (Certification Exam)
Clinical Skills Development	American Academy of Physician Assistants, 2014	Yes – Physician Assistant	No	Didactic & Clinical Education (Competency Assessment Tool)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Clinical Skills Development (continued)	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Armstrong & Jarriel, 2016	Yes – Athletic Training	No	Clinical Education (Standardized Patients)
	Aronson et al., 2015	Yes – Athletic Training	No	Clinical Education (Preceptor Evaluation)
	Carwile & Murrell, 2002	Yes- Radiologic Technology	No	Clinical Education (Self-evaluation)
	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Clinical Skills Development (continued)	Commission on Accreditation of Athletic Training Education, 2018c	Yes – Athletic Training	No	No
	Fater, 2013	Yes - Nursing	Yes - Nursing	Didactic & Clinical Education
	Greiner & Knebel, 2003	Yes – All Healthcare Professionals	Yes – All Healthcare Professionals	No
	Harden et al., 1999	Yes – Medical	Yes - Physicians	No
	Hay et al., 2013	Yes – Medical	No	Clinical Education (eCAPS [online clinical assessment of practical skills] Video-based vignettes, Objective Structures Clinical Examination [OSCEs])
	Hayward & Blackmer, 2010	Yes – Physical Therapy	Yes – Physical Therapy	Clinical Education & Didactic (Standardized Patients, Clinical Instructor Evaluation, Inventories, Peer and Self Evaluations)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Clinical Skills Development (continued)	Hildenbrand & Schultz, 2012	Yes- Athletic Training	Yes – Athletic Training	Didactic (Rubric)
	Ho et al., 2014	Yes – Speech Language Pathology	No	Clinical Education (Problem-Based Learning; Locally-developed Preceptor Evaluation Form)
	Jardine et al., 2017	Yes – Graduate Medical Residency	No	Clinical Education (ACGME Milestones Rubrics)
	Keating et al., 2018	Yes – Health Sciences	No	Clinical Education
	Khan et al., 2013	Yes - Medical	No	Clinical Education (OSCE, Standardized Patients)
	Löfmark & Thorell-Ekstrand, 2000	Yes - Nursing	No	Clinical Education
	Marty et al., 2010	Yes – Athletic Training	No	Clinical Education (Peer Evaluation)
	Mazerolle et al., 2015	Yes – Athletic Training	No	Clinical Education

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Clinical Skills Development (continued)	Mazerolle & Dodge, 2015	Yes – Athletic Training	No	Clinical Education
	McCarthy & Murphy, 2007	Yes - Nursing	No	Clinical Education
	Middlemas & Hensal, 2009	Yes –Athletic Training	No	Clinical Education (Written, Objective Tests, Checklists, Oral Examinations, Patient Management Problems, Simulated Patients, Observed Clinical Situations, OSCE, Observation of students)
	Physician Assistant Education Association, 2018b	Yes – Physician Assistant	No	Didactic (Examinations)
	Roberts et al., 2009	Yes - Healthcare	No	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Clinical Skills Development (continued)	Scott et al., 2012	Yes – Physician Assistant	No	Didactic & Clinical Education (exams, simulations, patient- or case-based learning, preceptor evaluation, OSCEs)
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Sexton, 2003	Yes – Athletic Training	No	Clinical Education (Checklists, Preceptor Evaluations)
	Thompson et al., 2014	Yes – Athletic Training	No	Clinical Education (Performance Assessments, Checklists)
	Ulfvarson & Oxelmark, 2012	Yes – Nursing	No	Clinical Education (Assessment of Clinical Education tool)
	Walker et al., 2008	Yes – Athletic Training	No	Clinical Education (Simulations, Standardized Patients, Real-time Evaluations)
	Weber, 2005	Yes – Nursing	No	Clinical Education

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Clinical Skills Development (continued)	Wu et al., 2015	Yes- Nursing	No	Didactic & Clinical Education (variety of assessment tools, most in rubric form)
Confidence	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	Armstrong & Jarriel, 2016	Yes – Athletic Training	No	Clinical Education (Standardized Patients)
	Carwile & Murrell, 2002	Yes- Radiologic Technology	No	Clinical Education (Self-evaluation)
	Cunningham et al., 2015	Yes – Medical Radiation Science	No	Clinical Education
	Hildenbrand & Schultz, 2012	Yes- Athletic Training	Yes – Athletic Training	Didactic (Rubric)
	Jones & Sheppard, 2012	Yes - Physiotherapy	No	Clinical Education (Inventory)
	Löfmark & Thorell-Ekstrand, 2000	Yes - Nursing	No	Clinical Education

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Confidence (continued)	Mazerolle & Dodge, 2015	Yes – Athletic Training	No	Clinical Education
	Marty et al., 2010	Yes – Athletic Training	No	Clinical Education (Peer Evaluation)
	Murray et al., 2000	Yes – Medical	No	No
	Turkel et al., 2016	No	Yes – Medical Surgical Nursing	Clinical Education (Self-Assessment)
Confidentiality, Privacy	American Academy of Physician Assistants, 2014	Yes – Physician Assistant	No	Clinical Education (Competency Assessment Tool – from Physician or Peer)
	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Confidentiality, Privacy (continued)	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	No
	Harden et al., 1999	Yes – Medical	Yes - Physicians	No
	Hayward & Blackmer, 2010	Yes – Physical Therapy	Yes – Physical Therapy	Clinical Education & Didactic (Standardized Patients, Clinical Instructor Evaluation, Inventories, Peer and Self Evaluations)
	Marty et al., 2010	Yes – Athletic Training	No	Clinical Education (Peer Evaluation)
	Missen et al., 2016	No	Yes - Nursing	No
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Thompson et al., 2014	Yes – Athletic Training	No	Clinical Education (Performance Assessments)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Critical Thinking, Problem Solving, Decision-making, Clinical Reasoning/ Judgement	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	Aronson et al., 2015	Yes – Athletic Training	No	Clinical Education (Preceptor Evaluation)
	Banta & Palomba, 2015	Yes – not healthcare specific	No	Didactic & Clinical Education (Inventories, Locally Developed Rubrics, Case Studies, Simulations, Writing Assignments, Reflection Journals, VALUE Rubric on Critical Thinking)
	Beer & Mårtensson, 2015	Yes – Occupational Therapy	No	Clinical Education (Practical Exam)
	Biggs & Tang, 2007	Yes – not healthcare specific	No	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Critical Thinking, Problem Solving, Decision-making, Clinical Reasoning/ Judgement (continued)	Carwile & Murrell, 2002	Yes- Radiologic Technology	No	Clinical Education (Self-evaluation)
	Chamberland et al., 2015	Yes - Medical	Yes – Physicians	Clinical Education (Written Case Studies with Self-explanations)
	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	No
	Commission on Accreditation of Athletic Training Education, 2018c	Yes – Athletic Training	No	No
	Cone et al., 2013	Yes - Pharmacy	Yes - Pharmacy	Didactic & Clinical Education (Case Studies, Inventories)
	Cox, 2014	Yes - Pharmacy	Yes- Pharmacy	Didactic (Inventories)
	Del Bueno, 2005	No	Yes - Nursing	Clinical Education (Performance Based Development System – video-taped vignettes)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Critical Thinking, Problem Solving, Decision-making, Clinical Reasoning/ Judgement (continued)	Fero et al., 2010	No	Yes – Nursing	Clinical Education (Simulations)
	Gadbury-Aymot, 2014	Yes – Dental Hygiene	No	Didactic (Portfolios)
	Golemboski et al., 2013	Yes – Medical Laboratory Science	Yes – Medical Laboratory Science	Didactic (Inventories, Performance Tasks)
	Harden et al., 1999	Yes – Medical	Yes – Physicians	No
	Heidari & Ebrahimi, 2016	Yes – Emergency Medical Students	No	Didactic (Inventories)
	Hildenbrand & Schultz, 2012	Yes- Athletic Training	Yes – Athletic Training	Didactic (Rubric)
	Ho et al., 2014	Yes – Speech Language Pathology	No	Clinical Education (Problem-Based Learning; Locally-developed Preceptor Evaluation Form)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Critical Thinking, Problem Solving, Decision-making, Clinical Reasoning/ Judgement (continued)	Kabay, 2013	Yes – Athletic Training	No	Didactic & Clinical Education (Inventories)
	Kicklighter et al., 2016	Yes – Athletic Training	Yes – Athletic Training	Didactic (Inventories)
	Légaré et al., 2007	No	Yes - Physicians	Clinical Education (Inventories)
	Löfmark & Thorell-Ekstrand, 2000	Yes - Nursing	No	Clinical Education
	Marchigiano et al., 2011	Yes - Nursing	No	Clinical Education (Journals, Case Studies)
	McCarthy & Murphy, 2007	Yes - Nursing	No	Clinical Education

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Critical Thinking, Problem Solving, Decision-making, Clinical Reasoning/ Judgement (continued)	Middlemas & Hensal, 2009	Yes –Athletic Training	No	Clinical Education (Written, Objective Tests, Checklists, Oral Examinations, Patient Management Problems, Simulated Patients, Observed Clinical Situations, OSCE, Observation of students)
	Missen et al., 2016	No	Yes - Nursing	No
	Patel et al., 2015	Yes - Medical	No	Didactic (Case Study)
	Physician Assistant Education Association, 2018a	Yes – Physician Assistant	No	Didactic & Clinical Education (Multiple Choice Exams, Practical Exams, OSCEs, Writing Assignments, Oral Presentations, Portfolios)
	Ramaekers et al., 2010	Yes – Veterinary Medicine	No	Didactic (Script Concordance Test – Case Study)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Critical Thinking, Problem Solving, Decision-making, Clinical Reasoning/ Judgement (continued)	Raup et al., 2010	Yes - Nursing	No	Didactic (Rubrics)
	Roberts et al., 2009	Yes - Healthcare	No	No
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Shahjahan & Torres, 2013	Yes – not healthcare specific	Yes – not healthcare specific	Didactic
	Shelestak et al., 2015	Yes - Nursing	No	Clinical Education (Simulations)
	Thompson et al., 2014	Yes – Athletic Training	No	Clinical Education (Performance Assessments)
	Turkel et al., 2016	No	Yes – Medical Surgical Nursing	Clinical Education (Self-Assessment)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Critical Thinking, Problem Solving, Decision-making, Clinical Reasoning/ Judgement (continued)	Walker et al., 2008	Yes – Athletic Training	No	Clinical Education (Simulations, Standardized Patients, Real-time Evaluations)
	Weber, 2005	Yes - Nursing	No	Clinical Education (Self-Assessment)
	Wu et al., 2015	Yes- Nursing	No	Didactic & Clinical Education (variety of assessment tools, most in rubric form)
Cultural Sensitivity/ Competence	American Academy of Physician Assistants, 2014	Yes – Physician Assistant	No	Clinical Education (Competency Assessment Tool – from Physician or Peer)
	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Cultural Sensitivity/ Competence (continued)	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Banta & Palomba, 2015	Yes – not healthcare specific	No	Didactic & Clinical Education (Observation of Student Behavior, Self-reporting, VALUE Rubric on Intercultural knowledge and competence)
	Harden et al., 1999	Yes – Medical	Yes - Physicians	No
	Murray et al., 2000	Yes – Medical	No	No
	Physician Assistant Education Association, 2018a	Yes – Physician Assistant	No	Didactic & Clinical Education (Multiple Choice Exams, Practical Exams, OSCEs, Writing Assignments, Oral Presentations, Portfolios)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Cultural Sensitivity/ Competence (continued)	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Scott et al., 2012	Yes – Physician Assistant	No	Didactic & Clinical Education (exams, simulations, patient- or case-based learning, preceptor evaluation, OSCEs)
	Ulfvarson & Oxelmark, 2012	Yes - Nursing	No	Clinical Education (Assessment of Clinical Education tool)
	Weber, 2005	Yes - Nursing	No	Clinical Education (Self-Assessment)
Discipline-Specific Knowledge, Medical Knowledge	American Academy of Physician Assistants, 2014	Yes – Physician Assistant	No	Clinical Education (Competency Assessment Tool – from Physician or Peer)
	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Discipline-Specific Knowledge, Medical Knowledge (continued)	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	No
	Commission on Accreditation of Athletic Training Education, 2018c	Yes – Athletic Training	No	No
	Fater, 2013	Yes - Nursing	Yes - Nursing	Didactic & Clinical Education
	Greiner & Knebel, 2003	Yes – All Healthcare Professionals	Yes – All Healthcare Professionals	No
	Harden et al., 1999	Yes – Medical	Yes - Physicians	No
	Hildenbrand & Schultz, 2012	Yes- Athletic Training	Yes – Athletic Training	Didactic (Rubric)
	Jardine et al., 2017	Yes – Graduate Medical Residency	No	Clinical Education (ACGME Milestones Rubrics)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Discipline-Specific Knowledge, Medical Knowledge (continued)	Keating et al., 2018	Yes – Health Sciences	No	Clinical Education
	Löfmark & Thorell-Ekstrand, 2000	Yes – Nursing	No	Clinical Education
	McCarthy & Murphy, 2007	Yes – Nursing	No	Clinical Education
	Physician Assistant Education Association, 2011	Yes – Physician Assistant	No	No
	Physician Assistant Education Association, 2018a	Yes – Physician Assistant	No	Didactic & Clinical Education (Multiple Choice Exams, Practical Exams, OSCEs, Writing Assignments, Oral Presentations, Portfolios)
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Trede et al., 2015	Yes – Physiotherapy	No	Clinical Education

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Discipline-Specific Knowledge, Medical Knowledge (continued)	Ulfvarson & Oxelmark, 2012	Yes - Nursing	No	Clinical Education (Assessment of Clinical Education tool)
Education of others	American Academy of Physician Assistants, 2014	Yes – Physician Assistant	No	Clinical Education (Competency Assessment Tool – from Physician or Peer)
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	No
	Greiner & Knebel, 2003	Yes – All Healthcare Professionals	Yes – All Healthcare Professionals	No
	Löfmark & Thorell-Ekstrand, 2000	Yes - Nursing	No	Clinical Education

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Education of others (continued)	Missen et al., 2016	No	Yes - Nursing	No
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Stupans et al., 2013	Yes- Pharmacy	Yes – Pharmacy	Clinical Education (Reflection)
Empathy, Compassion, Caring	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Banta & Palomba, 2015	Yes – not healthcare specific	No	Didactic & Clinical Education (Observation of Student Behavior, Self-reporting)
	Hayward & Blackmer, 2010	Yes – Physical Therapy	Yes – Physical Therapy	Clinical Education & Didactic (Standardized Patients, Clinical Instructor Evaluation, Inventories, Peer and Self Evaluations)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Empathy, Compassion, Caring (continued)	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
End of Life Care	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
Evidence-Based Practice, Information Literacy	American Academy of Physician Assistants, 2014	Yes – Physician Assistant	No	Clinical Education (Competency Assessment Tool – from Physician or Peer)
	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Banta & Palomba, 2015	Yes – not healthcare specific	No	Didactic (Inventories, Rubrics)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Evidence-Based Practice, Information Literacy (continued)	Cavallario et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Clinical Education (Patient Encounter Student Report)
	Commission on Accreditation of Athletic Training Education, 2020	Yes – Athletic Training	No	Clinical Experience and Didactic
	Commission on Accreditation of Athletic Training Education, 2018a	Yes –Athletic Training	No	No
	Commission on Accreditation of Athletic Training Education, 2018c	Yes – Athletic Training	No	No
	Fater, 2013	Yes - Nursing	Yes - Nursing	Didactic & Clinical Education
	Golemboski et al., 2013	Yes – Medical Laboratory Science	Yes – Medical Laboratory Science	Didactic (Inventories, Performance Tasks)
	Greiner & Knebel, 2003	Yes – All Healthcare Professionals	Yes – All Healthcare Professionals	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Evidence-Based Practice, Information Literacy (continued)	Hayward & Blackmer, 2010	Yes – Physical Therapy	Yes – Physical Therapy	Clinical Education
	Hildenbrand & Schultz, 2012	Yes- Athletic Training	Yes – Athletic Training	Didactic (Rubric)
	Keating et al., 2018	Yes – Health Sciences	No	Clinical Education
	Löfmark & Thorell-Ekstrand, 2000	Yes - Nursing	No	Clinical Education
	Missen et al., 2016	No	Yes - Nursing	No
	Morris & Hancok, 2013	Yes - Nursing	Yes – All Healthcare Professions	Didactic & Clinical Education (Program Rubric)
	Murray et al., 2000	Yes – Medical	No	No
	Parsons et al., 2008	Yes – Athletic Training	Yes –Athletic Training	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Evidence-Based Practice, Information Literacy (continued)	Physician Assistant Education Association, 2018a	Yes – Physician Assistant	No	Didactic & Clinical Education (Multiple Choice Exams, Practical Exams, OSCEs, Writing Assignments, Oral Presentations, Portfolios)
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Scott et al., 2012	Yes – Physician Assistant	No	Didactic & Clinical Education (exams, simulations, patient- or case-based learning, preceptor evaluation, OSCEs)
	Trede et al., 2015	Yes – Physiotherapy	No	Clinical Education
	Turbow & Evener, 2016	Yes –Medical and Healthcare Science, Physical Therapy, Orthopaedic Assistant	Yes – Healthcare Professionals	Didactic (Peer Review, Rubrics for Written Work, VALUE Rubric)
	Turkel et al., 2016	No	Yes – Medical Surgical Nursing	Clinical Education (Self-Assessment)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Evidence-Based Practice, Information Literacy (continued)	Zeind et al., 2012	Yes - Pharmacy	Yes – All Healthcare Professions	Didactic & Clinical Education
Genetic and Genomics	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
Healthcare Informatics	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
Healthcare Informatics (continued)	American Academy of Physician Assistant, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Cavallario et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Clinical Education (Patient Encounter Student Report)
	Commission on Accreditation of Athletic Training Education, 2020	Yes – Athletic Training	No	Clinical Experience and Didactic

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Healthcare Informatics (continued)	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	No
	Fater, 2013	Yes - Nursing	Yes - Nursing	Didactic & Clinical Education
	Gielen et al., 2003	Yes – not healthcare specific	No	Didactic
	Golemboski et al., 2013	Yes – Medical Laboratory Science	Yes – Medical Laboratory Science	Didactic (Inventories, Performance Tasks)
	Greiner & Knebel, 2003	Yes – All Healthcare Professionals	Yes – All Healthcare Professionals	No
	Löfmark & Thorell-Ekstrand, 2000	Yes - Nursing	Yes - nursing	Clinical Education
	Morris & Hancok, 2013	Yes – Nursing	Yes – All Healthcare Professions	Didactic & Clinical Education (Program Rubric)
	Parsons et al., 2008	Yes – Athletic Training	Yes –Athletic Training	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Healthcare Informatics (continued)	Turkel et al., 2016	No	Yes – Medical Surgical Nursing	Clinical Education (Self-Assessment)
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Zeind et al., 2012	Yes – Pharmacy	Yes – All Healthcare Professions	Didactic & Clinical Education
Initiative	American Academy of Physician Assistant, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	Carwile & Murrell, 2002	Yes- Radiologic Technology	No	Clinical Education (Self-evaluation)
	Hayward & Blackmer, 2010	Yes – Physical Therapy	Yes – Physical Therapy	Clinical Education & Didactic (Standardized Patients, Clinical Instructor Evaluation, Inventories, Peer and Self Evaluations)
	Missen et al., 2016	No	Yes - Nursing	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Interpersonal and Communication Skills (written, oral, nonverbal)	American Academy of Physician Assistants, 2014	Yes – Physician Assistant	No	Clinical Education (Competency Assessment Tool – from Physician or Peer)
	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Armstrong & Jarriel, 2016	Yes – Athletic Training	No	Clinical Education (Standardized Patients)
	Banta & Palomba, 2105	Yes – not healthcare specific	No	Didactic (VALUE Rubric for Written Communication, VALUE Rubric for Oral Communication, Inventories)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Interpersonal and Communication Skills (written, oral, nonverbal) (continued)	Carwile & Murrell, 2002	Yes- Radiologic Technology	No	Clinical Education (Self-evaluation)
	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	No
	Commission on Accreditation of Athletic Training Education, 2018c	Yes – Athletic Training	No	No
	Cunningham et al., 2015	Yes – Medical Radiation Science	No	Clinical Education
	Fater, 2013	Yes - Nursing	Yes - Nursing	Didactic & Clinical Education
	Fero et al., 2010	No	Yes - Nursing	No
	Gauthier, 2019	Yes – Medical Education	Yes - Medicine	Clinical Education (direct observation, discharge notes, case presentations)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Interpersonal and Communication Skills (written, oral, nonverbal) (continued)	Greiner & Knebel, 2003	Yes – All Healthcare Professionals	Yes – All Healthcare Professionals	No
	Harden et al., 1999	Yes – Medical	Yes - Physicians	No
	Hayward & Blackmer, 2010	Yes – Physical Therapy	Yes – Physical Therapy	Clinical Education & Didactic (Standardized Patients, Clinical Instructor Evaluation, Inventories, Peer and Self Evaluations)
	Hildenbrand & Schultz, 2012	Yes- Athletic Training	Yes – Athletic Training	Didactic (Rubric)
	Ho et al., 2014	Yes – Speech Language Pathology	No	Clinical Education (Problem-Based Learning; Locally-developed Preceptor Evaluation Form)
	Jardine et al., 2017	Yes – Graduate Medical Residency	No	Clinical Education (ACGME Milestones Rubrics)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Interpersonal and Communication Skills (written, oral, nonverbal) (continued)	Keating et al., 2018	Yes – Health Sciences	No	Clinical Education
	Khan et al., 2013	Yes - Medical	No	Clinical Education (OSCE, Standardized Patients)
	Knight & Yorke, 2007	Yes – not healthcare specific	Yes – not healthcare specific	No
	Löfmark & Thorell-Ekstrand, 2000	Yes - Nursing	No	Clinical Education
	McCathy & Murphy, 2007	Yes - Nursing	No	Clinical Education
	Missen et al., 2016	No	Yes - Nursing	No
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Thompson et al., 2014	Yes – Athletic Training	No	Clinical Education (Performance Assessments)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Interpersonal and Communication Skills (written, oral, nonverbal) (continued)	Trede et al., 2015	Yes – Physiotherapy	No	Clinical Education
	Ulfvarson & Oxelmark, 2012	Yes - Nursing	No	Clinical Education (Assessment of Clinical Education tool)
	Wu et al., 2015	Yes- Nursing	No	Didactic & Clinical Education (variety of assessment tools, most in rubric form)
Interprofessional Practice/Education, Working in Interdisciplinary Teams, Teamwork	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Cavallario et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Clinical Education (Patient Encounter Student Report)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Interprofessional Practice/Education, Working in Interdisciplinary Teams, Teamwork (continued)	Commission on Accreditation of Athletic Training Education, 2020	Yes – Athletic Training	No	Clinical Experience and Didactic
	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	No
	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	No
	Fater, 2013	Yes - Nursing	Yes - Nursing	Didactic & Clinical Education
	Gielen et al., 2003	Yes – not healthcare specific	No	Didactic
	Golemboski et al., 2013	Yes – Medical Laboratory Science	Yes – Medical Laboratory Science	Didactic (Inventories, Performance Tasks)
	Greiner & Knebel, 2003	Yes – All Healthcare Professionals	Yes – All Healthcare Professionals	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Interprofessional Practice/Education, Working in Interdisciplinary Teams, Teamwork (continued)	Hinyard et al., 2019	Yes – All Healthcare Professionals	Yes – All Healthcare Professionals	Didactic/Nonclinal Settings (Self-Assessed Collaboration Skills measure)
	Löfmark & Thorell-Ekstrand, 2000	Yes - Nursing	No	Clinical Education
	Marty et al., 2010	Yes – Athletic Training	No	Clinical Education (Peer Evaluation)
	Missen et al., 2016	No	Yes - Nursing	No
	Morris & Hancok, 2013	Yes - Nursing	Yes – All Healthcare Professions	Didactic & Clinical Education (Program Rubric)
	Murray et al., 2000	Yes – Medical	No	No
	Parsons et al., 2008	Yes – Athletic Training	Yes –Athletic Training	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Interprofessional Practice/Education, Working in Interdisciplinary Teams, Teamwork (continued)	Physician Assistant Education Association, 2018a	Yes – Physician Assistant	No	Didactic (Multiple Choice, Practical Exams, Writing Assignments, Oral Presentations, Portfolios)
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Turkel et al., 2016	No	Yes – Medical Surgical Nursing	Clinical Education (Self-Assessment)
	Weber, 2005	Yes - Nursing	No	Clinical Education (Self-Assessment)
	Zeind et al., 2012	Yes - Pharmacy	Yes – All Healthcare Professions	Didactic & Clinical Education
Leadership	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Leadership (continued)	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Fater, 2013	Yes - Nursing	Yes - Nursing	Didactic & Clinical Education
	Löfmark & Thorell-Ekstrand, 2000	Yes - Nursing	No	Clinical Education
	Missen et al., 2016	No	Yes - Nursing	No
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Trede et al., 2015	Yes – Physiotherapy	No	Clinical Education
Legal/Ethical Practice	American Academy of Physician Assistants, 2014	Yes – Physician Assistant	No	Clinical Education (Competency Assessment Tool – from Physician or Peer)
	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Legal/Ethical Practice (continued)	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Banta & Palomba, 2015	Yes – not healthcare specific	No	Clinical Education & Didactic (VALUE Rubrics, Problem Sets, Case Study Analysis, Simulation, Reflection, Inventories)
	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	No
	Fater, 2013	Yes – Nursing	No	No
	Gadbury-Aymot, 2014	Yes – Dental Hygiene	No	Didactic (Portfolios)
	Harden et al., 1999	Yes – Medical	Yes – Physicians	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Legal/Ethical Practice (continued)	Hayward & Blackmer, 2010	Yes – Physical Therapy	Yes – Physical Therapy	Clinical Education
	Hildenbrand & Schultz, 2012			
	Löfmark & Thorell-Ekstrand, 2000	Yes – Nursing	Yes – nursing	Clinical Education
	McCathy & Murphy, 2007	Yes – Nursing	No	Clinical Education
	Murray et al., 2000	Yes – Medical	No	No
	Physician Assistant Education Association, 2018a	Yes – Physician Assistant	No	Didactic (Multiple Choice, Practical Exams, Writing Assignments, Oral Presentations, Portfolios)
	Raup et al., 2010	Yes – Doctoral Nursing	No	Didactic & Clinical Education (Rubric)
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Legal/Ethical Practice (continued)	Scott et al., 2012	Yes – Physician Assistant	No	Didactic & Clinical Education (exams, simulations, patient- or case-based learning, preceptor evaluation, OSCEs)
	Wu et al., 2015	Yes- Nursing	No	Didactic & Clinical Education (variety of assessment tools, most in rubric form)
Life-long Learning, Personal Development	American Academy of Physician Assistants, 2014	Yes – Physician Assistant	No	Clinical Education (Competency Assessment Tool – from Physician or Peer)
	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Life-long Learning, Personal Development (continued)	Banta & Palomba, 2015	Yes - not healthcare specific	No	Didactic (Assessing information, Participation in Professional Organizations rates, Post-graduation plans/placement rates, Surveys, Reflections, Self-Assessment, VALUE Rubric on Life Long Learning)
	Biggs & Tang, 2007	Yes – not healthcare specific	No	No
	Boud & Falchikov, 2006	Yes – not healthcare specific	Yes – not healthcare specific	Didactic
	Gadbury-Aymot, 2014	Yes – Dental Hygiene	No	Didactic (Portfolios)
	Harden et al., 1999	Yes – Medical	Yes - Physicians	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Life-long Learning, Personal Development (continued)	Ho et al., 2014	Yes – Speech Language Pathology	No	Clinical Education (Problem-Based Learning; Locally-developed Preceptor Evaluation Form)
	Keating et al., 2018	Yes – Health Sciences	No	Clinical Education
	Knight & Yorke, 2007	Yes – not healthcare specific	Yes – not healthcare specific	No
	Marty et al., 2010	Yes – Athletic Training	No	Clinical Education (Peer Evaluation)
	Murray et al., 2000	Yes – Medical	No	No
	Roberts et al., 2009	Yes - Healthcare	No	No
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Stupans et al., 2013	Yes- Pharmacy	Yes – Pharmacy	Clinical Education (Reflection)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Life-long Learning, Personal Development (continued)	Trede et al., 2015	Yes – Physiotherapy	No	Clinical Education
Patient-Centered Care	American Academy of Physician Assistants, 2014	Yes – Physician Assistant	No	Clinical Education (Competency Assessment Tool – from Physician or Peer)
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Cavallario et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Clinical Education (Patient Encounter Student Report)
	Commission on Accreditation of Athletic Training Education, 2020	Yes – Athletic Training	No	Clinical Experience and Didactic

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Patient-Centered Care (continued)	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	No
	Fater, 2013	Yes - Nursing	Yes - Nursing	Didactic & Clinical Education
	Greiner & Knebel, 2003	Yes – All Healthcare Professionals	Yes – All Healthcare Professionals	No
	Hayward & Blackmer, 2010	Yes – Physical Therapy	Yes – Physical Therapy	Clinical Education
	Löfmark & Thorell-Ekstrand, 2000	Yes - Nursing	No	Clinical Education
	Morris & Hancok, 2013	Yes - Nursing	Yes – All Healthcare Professions	Didactic & Clinical Education (Program Rubric)
	Murray et al., 2000	Yes – Medical	No	No
	Parsons et al., 2008	Yes – Athletic Training	Yes –Athletic Training	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Patient-Centered Care (continued)	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Turkel et al., 2016	No	Yes – Medical Surgical Nursing	Clinical Education (Self-Assessment)
	Ulfvarson & Oxelmark, 2012	Yes - Nursing	No	Clinical Education (Assessment of Clinical Education tool)
	Zeind et al., 2012	Yes - Pharmacy	Yes – All Healthcare Professions	Didactic & Clinical Education
Patient Safety	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Carwile & Murrell, 2002	Yes- Radiologic Technology	No	Clinical Education (Self-evaluation)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Patient Safety (continued)	Fater, 2013	Yes - Nursing	Yes - Nursing	Didactic & Clinical Education
	Golemboski et al., 2013	Yes – Medical Laboratory Science	Yes – Medical Laboratory Science	Didactic (Inventories, Performance Tasks)
	Missen et al., 2016	No	Yes - Nursing	No
	Morris & Hancok, 2013	Yes - Nursing	Yes – All Healthcare Professions	Didactic & Clinical Education (Program Rubric)
	Physician Assistant Education Association, 2018a	Yes – Physician Assistant	No	Didactic & Clinical Education (Multiple Choice Exams, Practical Exams, OSCEs, Writing Assignments, Oral Presentations, Portfolios)
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Turkel et al., 2016	No	Yes – Medical Surgical Nursing	Clinical Education (Self-Assessment)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Patient Safety (continued)	Zeind et al., 2012	Yes - Pharmacy	Yes – All Healthcare Professions	Didactic & Clinical Education
Practice Across the Lifespan	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
Prevention of Injury/Illness, Health Promotion	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	No
	Greiner & Knebel, 2003	Yes – All Healthcare Professionals	Yes – All Healthcare Professionals	No
	Harden et al., 1999	Yes – Medical	Yes - Physicians	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Prevention of Injury/Illness, Health Promotion (continued)	Physician Assistant Education Association, 2018a	Yes – Physician Assistant	No	Didactic & Clinical Education (Multiple Choice Exams, Practical Exams, OSCEs, Writing Assignments, Oral Presentations, Portfolios)
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
Professionalism	American Academy of Physician Assistants, 2014	Yes – Physician Assistant	No	Clinical Education (Competency Assessment Tool – from Physician or Peer)
	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Professionalism (continued)	Carwile & Murrell, 2002	Yes- Radiologic Technology	No	Clinical Education (Self-evaluation)
	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	No
	Fater, 2013	Yes - Nursing	Yes - Nursing	Didactic & Clinical Education
	Harden et al., 1999	Yes – Medical	Yes - Physicians	No
	Hayward & Blackmer, 2010	Yes – Physical Therapy	Yes – Physical Therapy	Clinical Education
	Ho et al., 2014	Yes – Speech Language Pathology	No	Clinical Education (Problem-Based Learning; Locally-developed Preceptor Evaluation Form)
	Jardine et al., 2017	Yes – Graduate Medical Residency	No	Clinical Education (ACGME Milestones Rubrics)
	Keating et al., 2018	Yes – Health Sciences	No	Clinical Education

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Professionalism (continued)	McCarthy & Murphy, 2007	Yes - Nursing	No	Clinical Education
	Missen et al., 2016	No	Yes - Nursing	No
	Murray et al., 2000	Yes – Medical	No	No
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Stupans et al., 2013	Yes- Pharmacy	Yes – Pharmacy	Clinical Education (Reflection)
	Trede et al., 2015	Yes – Physiotherapy	No	Clinical Education
	Ulfvarson & Oxelmark, 2012	Yes - Nursing	No	Clinical Education (Assessment of Clinical Education tool)
	Wu et al., 2015	Yes- Nursing	No	Didactic & Clinical Education (variety of assessment tools, most in rubric form)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Quality Improvement	American Academy of Physician Assistants, 2014	Yes – Physician Assistant	No	Clinical Education (Competency Assessment Tool – from Physician or Peer)
	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Carwile & Murrell, 2002	Yes- Radiologic Technology	No	Clinical Education (Self-evaluation)
	Cavallario et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Clinical Education (Patient Encounter Student Report)
	Commission on Accreditation of Athletic Training Education, 2020	Yes – Athletic Training	No	Clinical Experience and Didactic

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Quality Improvement (continued)	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	No
	Fater, 2013	Yes - Nursing	Yes - Nursing	Didactic & Clinical Education
	Gielen et al., 2003	Yes – not healthcare specific	No	Didactic
	Golemboski et al., 2013	Yes – Medical Laboratory Science	Yes – Medical Laboratory Science	Didactic (Inventories, Performance Tasks)
	Greiner & Knebel, 2003	Yes – All Healthcare Professionals	Yes – All Healthcare Professionals	No
	Jardine et al., 2017	Yes – Graduate Medical Residency	No	Clinical Education (ACGME Milestones Rubrics)
	Morris & Hancok, 2013	Yes – Nursing	Yes – All Healthcare Professions	Didactic & Clinical Education (Program Rubric)
	Murray et al., 2000	Yes – Medical	No	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Quality Improvement (continued)	Parsons et al., 2008	Yes – Athletic Training	Yes –Athletic Training	No
	Physician Assistant Education Association, 2018a	Yes – Physician Assistant	No	Didactic & Clinical Education (Multiple Choice Exams, Practical Exams, OSCEs, Writing Assignments, Oral Presentations, Portfolios)
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Scott et al., 2012	Yes – Physician Assistant	No	Didactic & Clinical Education (exams, simulations, patient- or case-based learning, preceptor evaluation, OSCEs)
	Weber, 2005	Yes - Nursing	No	Clinical Education (Self-Assessment)
	Zeind et al., 2012	Yes - Pharmacy	Yes – All Healthcare Professions	Didactic & Clinical Education

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Self-Efficacy, Self-Reflection	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Banta & Palomba, 2015	Yes - not healthcare specific	No	Didactic (Portfolios, Self-Assessments, Reflection)
	Gadbury-Aymot, 2014	Yes – Dental Hygiene	No	Didactic (Portfolios)
	Harden et al., 1999	Yes – Medical	Yes - Physicians	No
	Hayward & Blackmer, 2010	Yes – Physical Therapy	Yes – Physical Therapy	Clinical Education
	Jones & Sheppard, 2012	Yes - Physiotherapy	No	Clinical Education (Inventory)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Self-Efficacy, Self-Reflection (continued)	Keating et al., 2018	Yes – Health Sciences	No	Clinical Education
	Löfmark & Thorell-Ekstrand, 2000	Yes - Nursing	No	Clinical Education
	Marty et al., 2010	Yes – Athletic Training	No	Clinical Education (Peer Evaluation)
	Patel et al., 2015	Yes - Medical	No	Didactic (Case Study)
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Trede et al., 2015	Yes – Physiotherapy	No	Clinical Education
	Turkel et al., 2016	No	Yes – Medical Surgical Nursing	Clinical Education (Self-Assessment)
	Weber, 2005	Yes - Nursing	No	Clinical Education (Self-Assessment)

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Systems-based Practice, Healthcare System Knowledge	American Academy of Physician Assistants, 2014	Yes – Physician Assistant	No	Clinical Education (Competency Assessment Tool – from Physician or Peer)
	American Association of Colleges of Nursing, 2008	Yes – Baccalaureate Nursing	No	Clinical Education
	American Academy of Physician Assistants, 2012	Yes – Physician Assistant	Yes – Physician Assistant	No
	American Council on Graduate Medical Education, 2016	Yes – Graduate Medical Residency	No	Didactic & Clinical Education (ACGME Milestones Rubrics)
	Commission on Accreditation of Athletic Training Education, 2018a	Yes – Athletic Training	No	No
	Fater, 2013	Yes - Nursing	Yes - Nursing	Didactic & Clinical Education
	Harden et al., 1999	Yes – Medical	Yes - Physicians	No

Possible student learning outcomes referenced in literature about healthcare preparatory programs (continued)

Student learning outcome (SLO)	Reference	According to this reference, is it an outcome of a program? What type of healthcare?	According to this reference, is it an expectation of a professional? What type of healthcare?	Does this reference refer to where the SLO is or could be assessed? If so, where and what mechanism?
Systems-based Practice, Healthcare System Knowledge (continued)	Jardine et al., 2017	Yes – Graduate Medical Residency	No	Clinical Education (ACGME Milestones Rubrics)
	Löfmark & Thorell-Ekstrand, 2000	Yes - Nursing	No	Clinical Education
	Murray et al., 2000	Yes – Medical	No	No
	Sauers et al., 2019	Yes – Athletic Training	Yes – Athletic Training	Not specific to where but utilizing the Milestones
	Weber, 2005	Yes - Nursing	No	Clinical Education (Self-Assessment)

Appendix B

Survey Instrument

Demographic Information

Thank you for your participation in this study. Please complete the following demographic information about your Athletic Training Program and institution.

Which of the following best classifies your institution?

You can look up your institution's basic classification here: http://carnegieclassifications.iu.edu/lookup/lookup.php

- ◯ Research 1: Doctoral Universities – Very high research activity
- ◯ Research 2: Doctoral Universities – High research activity
- ◯ Doctoral/Professional Universities
- ◯ Masters 1: Master's Colleges and Universities – Larger programs
- ◯ Masters 2: Master's Colleges and Universities – Medium programs
- ◯ Masters 3: Master's Colleges and Universities – Smaller programs
- ◯ Bachelors: Arts & Sciences Focus
- ◯ Bachelors: Diverse Fields
- ◯ ________ Other

How many cohorts has your Professional Athletic Training Program graduated at the graduate-level?

- ◯ 0-2
- ◯ 3 or more

Did your Graudate Professional Athletic Training program transition from an undergraduate professional program?

- ◯ Yes
- ◯ No

Is your Graduate Professional Athletic Training Program housed in a department or college with other healthcare programs?

- ◯ Yes
- ◯ No

Have you received any training on assessment of student learning prior to or during your time as program director?

- ◯ Yes
- ◯ No

Please share what training you have had on assessment of student learning (select all that apply).

- ☐ During your education program (Masters, Doctorate, Certificate)
- ☐ Programming provided by your institution or prior instituion
- ☐ Programming provided by an Athletic Training organization (i.e. ATEC, CAATE, NATA, District Association or State Association, etc.)
- ☐ Programming provided by an educational organization (AAC&U, Accreditation body, etc.)
- ☐ ______ Other

Does your institution provide assessment support to you and your Athletic Training program?

◯ Yes
◯ No

Please explain the support you have received from your instituion in the development and/or administration of your Athletic Training program's assessment plan.

SLO Questions

The following question is to gather information about your program's student learning outcomes along with how and where they are assessed. **It would be helpful for you to have a copy of your program's assessment plan accessible.**

For the following question, the following definitions apply:

Student learning outcome (SLO): an objective to be achieved that is expected of every student enrolled or completing the Athletic Training program. This outcome must be measurable (qualitative and quantitative) and must be included in the Athletic Training program's comprehensive assessment plan and framework.

Clinical Experiences: if the students would be assessed on the SLO during real patient interaction in real time

Controlled Environments: if the students would be assessed on the SLO during an educational experience, not on real patients in real time

Both Environments: if the students would be assessed on that SLO in both clinical experiences and controlled environments at various times during the students' time in the program

Direct measures: assessment tools and strategies that directly measure student achievement of the SLO (examples include a paper, exam, preceptor evaluations, standardize patients, simulations, inventories, rubrics, etc.)

Indirect measures: assessment tools and strategies that rely on perception (self or other) to determine if student is competent in the SLO (examples include self-evaluations, peer-evaluations, satisfaction surveys, employer surveys, exit interviews, exit surveys, etc.)

Both measures: both direct and indirect measures are utilized to assess the SLO

How many program-level student learning outcomes (SLOs) does your Athletic Training program assess?

- ○ 0
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6

- 7
- 8
- 9
- 10
- 11+

The program measure the SLO during in the classroom and with the BOC exam, so the program director would select "Controlled Environment" in column 2.

The program utilizes the BOC exam, employment placement status, and a senior exit survey that asks about how prepared students feel to practice and continue to grow in the profession. The program director would select "Both" in column 3. The program director would then write in "BOC exam, employment placement status, and a senior exit survey" in column 4.

	1.Please check if the SLO category is included in your program's assessment plan.	2. In what environment is this SLO assessed?			3. Using what measures is this SLO assessed?			4. Please provide an additional description of the type of measure utilized to assess the SLO (i.e. exam, Athletic Training Milestones, preceptor evaluation, standardized patient, simulation, written assignment, standardized inventory, etc.)
	Included in Assessment Plan	Clinical Experiences	Controlled Environments	Both	Direct Measures	Indirect Measures	Both	
Acceptance of Criticism/Feedback	○	○	○	○	○	○	○	
Adaptability or Resilience	○	○	○	○	○	○	○	
Altruism, Honesty, or Integrity	○	○	○	○	○	○	○	
Apply Quality Improvement	○	○	○	○	○	○	○	
BOC Preparedness	○	○	○	○	○	○	○	
Career Preparedness	○	○	○	○	○	○	○	
Confidence	○	○	○	○	○	○	○	
Creative Thinking	○	○	○	○	○	○	○	
Confidentiality or Privacy	○	○	○	○	○	○	○	

Critical Thinking, Problem Solving, Decision-Making, Clinical Reasoning, or Clinical Judgement	○	○	○	○	○	○	○	
Cultural Sensitivity/Competence	○	○	○	○	○	○	○	
Education of Others	○	○	○	○	○	○	○	
Empathy, Compassion, or Caring	○	○	○	○	○	○	○	
Evidence-Based Practice, Research, Information Literacy	○	○	○	○	○	○	○	
Initiative	○	○	○	○	○	○	○	
Interpersonal and Communication Skills (including Written, Oral, or Nonverbal)	○	○	○	○	○	○	○	
Knowledge/Skills	○	○	○	○	○	○	○	
Leadership	○	○	○	○	○	○	○	
Legal or Ethical Practice	○	○	○	○	○	○	○	
Life-long Learning or Personal Development	○	○	○	○	○	○	○	
Patient-Centered Care	○	○	○	○	○	○	○	
Patient Safety	○	○	○	○	○	○	○	
Prevention of Injury/Illness or Health Promotion	○	○	○	○	○	○	○	
Professionalism	○	○	○	○	○	○	○	
Retention/Graduation	○	○	○	○	○	○	○	
Self-Efficacy or Reflection	○	○	○	○	○	○	○	
Systems-based Practice or Healthcare Systems Knowledge	○	○	○	○	○	○	○	
Utilize Informatics	○	○	○	○	○	○	○	

Work in Interdisciplinary Teams, Interprofessional Education/Practice, Teamwork								
Other								
Other								
Other								

Please write in or copy and paste your student learning outcomes into the box below.

BOC Pass Rate

Please log into your eAccred account on the CAATE website. Once logged in, please proceed to the "student" menu and then your BOC Pass Rate table. You will utilize this table to answer the following question.

Please report your program's 3-year aggregate BOC first-time pass rate as a percentage (whole numbers only, no percentage symbol).

Powered by Qualtrics

Appendix C

CAATE Permission Letter

GUSTAVUS

Mary Westby <mjoos@gustavus.edu>

Request for soliciting research participation from program directors

CAATE Support <support@caate.net>
To: Mary Westby <mwestby@gustavus.edu>

Wed, Apr 10, 2019 at 11:06 AM

Hi Mary,

The search accredited programs tool is available on the CAATE website (www.caate.net) and is publicly accessible to search all CAATE accredited programs (professional, post professional degree, and post professional residency). The database allows the public easy access to each program's accreditation status and accreditation history. This email serves as your permission to use this tool.

Thank you,

CAATE Office

CAATE

Commission on Accreditation of Athletic Training Education

CAATE Office

6850 Austin Center Blvd., Suite 100, Austin, TX 78731-3184

Office: 512-733-9700

support@caate.net

www.caate.net

How'd we do? Please take a few minutes for our short survey.

Appendix D

IRB Approval

Institutional Review Board
3900 Bethel Drive
PO2322
St. Paul, MN 55112

July 24, 2019

Mary Westby
Bethel University
St. Paul, MN 55112

Re: Project SP-44-19 Assessment of Student Learning Outcomes in Professional Athletic Training Programs

Dear Mary,

On July 24, 2019, the Bethel University Institutional Review Board completed the review of your proposed study and approved the above referenced study.

Please note that this approval is limited to the project as described on the most recent Human Subjects Review Form documentation, including email correspondence. Also, please be reminded that it is the responsibility of the investigator(s) to bring to the attention of the IRB any proposed changes in the project or activity plans, and to report to the IRB any unanticipated problems that may affect the welfare of human subjects. Last, the approval is valid until July 23, 2020.

Sincerely,

Peter Jankowski, Ph.D.
Chair, Bethel University IRB

Appendix E

Email Contact Letters

Teaser Email

Dear Program Directors,

I am writing to you today, as a program director and doctoral student, to ask for your help in the coming weeks. I am completing my dissertation research on assessment of student learning outcomes in athletic training programs. I hope that this study will help guide all of us in what and how we assess student learning outcomes in our programs. The study will be asking about what student learning outcomes our programs cite and how we are assessing them. I intend to share this information with all of you that participate, so that we can learn from each other and help each other develop and maintain strong assessment plans. I also hope this study will help guide our organizations and research groups in developing assessment tools for all of us to use to ensure our students are meeting our outcomes. In addition, you will be invited to enter a raffle for a $250 VISA gift card for your participation.

If this interests you, please keep an eye out for an invitation to participate in my study on the **Assessment of Student Learning Outcomes in Professional Athletic Training programs** within the next two weeks.

If you have any questions leading up to the survey invitation, feel free to contact me and I look forward to your participation.

Sincerely,
Mary Westby, MSEd, ATC, LAT

Introduction Email

Dear Program Director,

Two weeks ago, I wrote to you asking for you to keep an eye out for an opportunity to participate in my dissertation study: **Assessment of Student Learning Outcomes in Professional Athletic Training programs.** I hope you have had time to consider participation and will take the time to complete the survey linked below.

The purpose of this study is to determine what student learning outcomes master's level professional athletic training programs are utilizing for their assessment plans and how those outcomes are currently being assessed by programs. In addition, once the student learning outcomes are identified, this study will investigate if there is any correlation between these student learning outcomes and Board of Certification exam 3-year aggregate first-time aggregate pass rate. A secondary goal of this work is to lay a foundation to assist our programs and profession in developing reliable, valid, and standardized measurement tools for assessment of the most common student learning outcomes for our programs.

Information gathered from this study will be shared with programs following analysis, if desired. In addition, your participation, on behalf of your program, will enter your program into a drawing for a VISA gift card for the amount of a single NATA certified member registration for the 2020 NATA Clinical Symposium & AT Expo ($250.00). The program can utilize this at their own discretion.

Your time commitment should be limited to 15 minutes to complete the survey. Please have your program's assessment plan available to ease in answering questions.

The study has been approved by the Bethel University Institutional Review Board. This information will only be used for data analysis and will not be shared in any manner that identifies the program or in disaggregated form. This study does not aim to evaluate individual program's assessment plans for quality. Please feel free to ask questions regarding this study. You may contact me if you have additional questions at maj42358@bethel.edu.

I would greatly appreciate if you would take a few minutes of your time to provide some information regarding your program. The survey can be found here: Assessment of SLO in ATPs Survey

You can also copy and paste the link into your browser window: https://bethel.qualtrics.com/jfe/form/SV_1zRUdGWHoXpfB7T

Thank you for your time.

Sincerely,

Mary Westby, MSEd, ATC, LAT

Follow-up Email

Dear Program Director,

This email is to serve as an additional request to please consider participating in my dissertation research on **Assessment of Student Learning Outcomes in Professional Athletic Training programs** and be entered for a chance to win a $250 Visa Gift Card. In addition, you will be given the opportunity to see the aggregated data in order to learn from each other on our assessment strategies.

If you have already completed this survey, please disregard this email and THANK YOU!

If you have not participated already, please take a moment to read over the invitation again (see below).
The survey can be found here: Assessment of SLO in ATPs Survey

You can also copy and paste the link into your browser window:
https://bethel.qualtrics.com/jfe/form/SV_1zRUdGWHoXpfB7T

If I can provide any additional information that would help you in your decision to participate, please contact me at maj42358@bethel.edu.

Original Invitation:

Dear Program Director,

A few weeks ago, I wrote to you asking for you to keep an eye out for an opportunity to participate in my dissertation study: **Assessment of Student Learning Outcomes in Professional Athletic Training programs.** I hope you have had time to consider participation and will take the time to complete the survey linked below.

The purpose of this study is to determine what student learning outcomes master's level professional athletic training programs are utilizing for their assessment plans and how those outcomes are currently being assessed by programs. In addition, once the student learning outcomes are identified, this study will investigate if there is any correlation between these student learning outcomes and Board of Certification exam 3-year aggregate first-time aggregate pass rate. A secondary goal of this work is to lay a foundation to assist our programs and profession in developing reliable, valid, and standardized measurement tools for assessment of the most common student learning outcomes for our programs.

Information gathered from this study will be shared with programs following analysis, if desired. In addition, your participation, on behalf of your program, will enter your program into a drawing for a VISA gift card for the amount of a single NATA certified member registration for the 2020 NATA Clinical Symposium & AT Expo ($250.00). The program can utilize this at their own discretion.

Your time commitment should be limited to 15 minutes to complete the survey. Please have your program's assessment plan available to ease in answering questions.

The study has been approved by the Bethel University Institutional Review Board. This information will only be used for data analysis and will not be shared in any manner that identifies the program or in disaggregated form. This study does not aim to evaluate individual program's assessment plans for quality. Please feel free to ask questions regarding this study. You may contact me if you have additional questions at maj42358@bethel.edu.

I would greatly appreciate if you would take a few minutes of your time to provide some information regarding your program. The survey can be found here: Assessment of SLO in ATPs Survey

You can also copy and paste the link into your browser window:
https://bethel.qualtrics.com/jfe/form/SV_1zRUdGWHoXpfB7T

Thank you for your time.

Sincerely,

Mary Westby, MSEd, ATC, LAT

Appendix F

Informed Consent

Potential participant,

You are invited to participate in a study related to identifying student learning outcomes and assessment environment and measures utilized in professional athletic training programs. The researcher hopes to learn what student learning outcomes are prevalent across athletic training programs and the environment these student learning outcomes are assessed and how these student learning outcomes are measured.

You are selected as a possible participant because you are a program director of a professional athletic training program at the master's level. Your participation is completely voluntary. If you decide to participate, this survey will consist of four questions and will take approximately 10 minutes to answer. The questions are focused on the program with which you are currently affiliated. There are no known risks for participation in this study. Your participation will help with providing information for athletic training and other higher education leaders about what student learning outcomes athletic training programs are citing and how they are assessing these student learning outcomes. If you decide during or after the completion of the survey that you would like to withdraw your responses or have any questions about the research study, you can contact the researcher at the means below.

Any information obtained in this study will be utilized strictly to answer the research questions of this study. In the written reports or publications, no individual or program will be identified or identifiable and only aggregate data will be presented. Your responses are completely confidential. Your decision to participate or to not participate will not affect your current or future relationship with your institution, the CAATE, the profession of athletic training, or any other organization. If you decide to participate, you are free to discontinue participation at any time without affecting these relationships.

This research project has been approved by the researcher's dissertation advisor in accordance with Bethel University's Level of Review of Research with Humans, and this college's Level of Review of Research with Humans committee. If you have any questions about the research and/or research participant's rights or wish to report a research related injury, please contact Mary Westby at (952) 913-0087 or maj42358@bethel.edu. By signing this form, you are granting consent to participate in this research.

Thanks,

Mary Westby, M.S. Ed., ATC, A.T.L

Date of signature (mm/dd/yyyy)

Please use your mouse to sign below.