The purpose of this text is to provide an overview of curriculum design in the health sciences that is transformative and synergizes the relationship between learner and teacher. This intent is to provide a theoretical, as well as practical, overview of transformative learning, curriculum design and technology and how they can be applied to the health science.

The concept of education began in ancient times with apprenticeship training where there was no official curriculum; training was accomplished on the job by teaching the apprentice to do specific tasks. The curriculum, as it existed, was different for every student who brought his own strengths and weaknesses into the learning relationship. If you look at the history of education and in particular education in the health sciences, it has varied greatly since its inception. In the 17th and 18th century, health sciences education was primarily medical education for physicians which consisted of apprenticeship training. Apprenticeship education existed since ancient times in numerous fields. These physicians and their apprentices cared for the sick as well as compounding the medicines that were available. The quality of the training these apprentices received varied greatly depending on the skill and disposition of the physician who was training them. According to the Flexner Report (1910), informal training in anatomy occurred as early as 1750 in the United States. Often medical training occurred in the home until the early 1800s where training was taken into hospitals where doctors in training would attend lectures in large lecture halls given by an experienced physician. In 1762, John Shippen returned to Philadelphia from training in Europe and helped establish the first formal medical school in the United States. Teaching methods included bedside training for physicians in training who were required to be well versed in mathematics, philosophy and Latin. These candidates received a bachelor’s degree after completing one year of apprenticeship training. After the Revolutionary War with rapid population growth in the United States, this model fell apart and such strict standards for apprenticeship were not enforced. The number of medical schools increased greatly and many did not provide the highest quality of training. Schools sprang up in remote areas and the requirements for clinical training established in Philadelphia deteriorated
in many of these schools. These institutions were developed as money-making ventures that provided only didactic instruction. In some cases training lasted only six months and no applicant was turned down. There were no examinations. With a diploma from these institutions the graduate could practice as a physician even though he might never have actually treated a patient. The medical schools based in universities such as Harvard and Yale were treated as entities separate from the university itself. In 1846 the American Medical Association (AMA) was established and called for physicians to have adequate preliminary education and an adopted set of standards; this also established the Medical Doctor (MD). In the mid to late 1800s educational requirements increased to four years including at least some apprenticeship training. Most of the independent medical schools which had sprung up as money making ventures closed. State boards were created. In the early 1900s medical schools began requiring students to have two or more years of college work before they could be admitted (Flexner, 1910). In doing so, medicine transformed into a scientific discipline.

Within the original apprenticeship model, medical education was one-on-one mentoring that includes components of what today is called experiential learning. The student worked one-on-one with a physician. There was no formal written curriculum. When medical schools were formed, experiential learning was no longer conducted and a lecture-based curriculum was instituted. This changed medical education to an assortment of facts and symptoms students were required to memorize and regurgitate, but these facts were never applied in real life situations until after the students had their diplomas and were practicing on their own. The people entering medical schools at this time were not always the best and brightest since anyone who could pay could enter. This means the curriculum could not possibly be robust. In addition, this curriculum was obviously not adequate and many patients suffered at the hands of physicians who did not really know how to treat them. This is one reason why during the 1800s physicians did not necessarily have good reputations as a whole and many citizens feared going to hospitals for treatment (Flexner, 1910).

While medical schools began to require college work, pedagogy was also undergoing significant changes in the United States. Edward Thorndike and John Dewey were some of the first modern educational theorists who felt curriculum in schools was more than just learning facts in several individual courses; instead, its purpose was to prepare students for dealing with the world. At this time, less than 10% of U.S. students were graduating from high school and even less were going on to college. At this time, high school curriculum was determined by the views of the colleges that would accept graduates who sought a college education (Tyler, 1981).

Ten years later, Flexner (1910) called for sweeping changes that built the basis of the medical curriculum of today and called for students to study anatomy, physiology, biology, microbiology, pathology, chemistry and physics. During the time
of the Flexner report, medical school entrance requirements varied from no education requirements at all (many applicants only had the equivalent of a high school education.) to a two year degree; the most stringent universities required a four year degree prior to entrance. This caused a significant dichotomy in the curriculum that was taught in medical schools. The Flexner Report called for a transformation in medical school entrance requirements, didactic and medical school oversight of clinical instruction that formed the basis of modern medical education.

From 1931 until the start of World War II, extensive curriculum development took place in numerous subject areas. During the war, curriculum development was put on hold. In the 1950s, curriculum development began again in earnest, particularly after fear of the Soviet Union grew when they deployed a satellite in 1957. From that point on, colleges concentrated on strengthening their science and mathematics programs (Tyler, 1981). It was during this time that additional changes in health sciences curriculum were implemented in multiple health fields. After World War II, adult education also became prevalent as returning soldiers used their GI Bill to go to school.

During the 20th century, medical education became focused on pharmaceuticals, interventional procedures and diagnostics; medical education was adjusted accordingly. However, the medical model did not greatly deviate from that outlined by the Flexner Report in 1910. Medical education was somewhat inflexible and not student-centered. In 2010 another Carnegie Foundation Report was released written by Cook, Irby and O’Brien that called for medical education to once again be transformed because it is “inflexible” and “not learner-centered” (p.1). This call towards a relevant, competency-based medical education that will motivate learners and spur critical thinking is the essence of transformative learning. There is still a disconnect between didactic training and experiential learning in clinical training. Residents do not have the opportunity to treat a patient over time and do not always understand the roles of non-clinician health providers. This has caused an increase in interprofessional learning during the last several years in medicine but also in other medical fields. Cook et al. (2010) noted medical education is many times in conflict with what is known about pedagogy, andragogy and the neurological basis of learning.

According to the Bureau of Labor Statistics, as noted by Wyatt and Hecker (2006), the percentage of the U.S. population employed in healthcare increased from just over one percent to seven percent from 1910 to 2000. The percentage of physicians stayed stable at approximately 0.5% of the population during this 90 year period; however, the percentage of nurses increased greatly from 0.2% to over 2% (Wyatt & Hecker, 2006). At an exposition at the World’s Fair in Chicago, a group of nurses met to work towards a formal educational process for nursing. Florence Nightingale did not attend, but her last paper was presented at this meeting. Women had been
performing nursing duties in the home for centuries and as apprentices during the 1800s. When formal educational processes were established, nurses were trained and received diplomas from hospitals. Nursing education did not start to slowly move into the university setting until the 1950s when nursing curriculum transformed from teaching nurses how to be physicians’ helpers to teaching nurses about advances in science and technology. Initially these programs were baccalaureate programs, but since these programs could not produce enough nurses to meet the need, associate degree programs were created in the 1950s. These associate degree nursing (ADN) programs were intended to help alleviate the shortage temporarily. In 1964 the American Nurses’ Association’s position was that there should only be four year degree programs. This pronouncement was met with dismay and nursing education really did not take hold in the university setting until the 1980s (Domrose, 2012).

Pharmacy education also started with apprenticeships in the United States as far back as the Revolutionary War. Training was practical in nature and formal courses were not necessarily required. Pharmaceutical studies first moved into the university environment in 1821 at the Philadelphia College of Pharmacy. In 1862 as land grant universities were created, more schools of pharmacy were opened. The formal curriculum in these schools was focused on chemistry education. Just as with medical schools, independent schools of pharmacy closed down (Fink, 2012). Accreditation standards were put in place and around World War II, pharmacy education moved strictly into the university setting. In 1939 curricular guidelines became mandatory for accreditation (Buerki, 1999). Schools awarded multiple types of degrees with a four year degree becoming the norm. Pharmacy training took on a biology focus in the 1960s and the 1970s. Clinical pharmacy programs were established; however, students had no contact with actual patients in hospitals. In the latter part of the 20th century, pharmacy programs moved to five year bachelor degree programs. By the late 1990s, pharmacy training began to move to a six-year Doctorate of Pharmacy degree (Fink, 2012).

Allied health professions, such as medical technologists (now clinical laboratory scientists) and radiology technicians, also began with apprenticeship and then on-the-job training after diagnostic testing became available in the early to mid-20th century. During the 1880s, advances in medical science led to the creation of the clinical laboratory profession. The first clinical laboratory was opened in 1896 at Johns Hopkins hospital. Testing at this time was primarily done by physicians who took on apprentices, usually young women, to do simpler laboratory procedures leaving pathologists free to do more complex analysis. During World War I, there was a significant shortage of these apprenticed technicians and training programs were created. In 1926 the American College of Surgeon accreditation standards required all clinical laboratories in hospitals to come under the direction of a physician. In 1928 the Board of Registry (BOR) was created to certify technicians and
standardize laboratory training. These laboratory professionals became known as medical technologists, a moniker that remained the same until the name was changed to clinical laboratory scientist in the 2000s. In 1930, technologists were required to be high school graduates who completed one year of didactic work and six months clinical training. In 1940 the didactic training requirement was increased to three years. Since that time clinical laboratory training has been comprised of didactic training in chemistry, microbiology, hematology and immunology. There was significant disagreement in regards to the curricular structure and information over the next several decades and in the 1960s, two paraprofessional categories were created, the laboratory assistant and the medical laboratory technician (Delwiche, 2003).

After the discovery of the X-ray by Conrad Roentgen, physicians saw the medical potential of this discovery which was being used for entertainment purposes. Physicians began using x-ray technology and similar to the history of medical technology, took on more female apprentices that were usually nurses or receptionists. Because of the dangers of radiation, the morbidity and mortality rates of these assistant were very high. Instructional materials were non-existent. In the 1920s, the American Association of Radiological Technicians was established. In the 1950s, formal curricular standards were established. Radiology followed basically the same path as medical technology in a professional sense with varying levels of education and with both didactic and clinical education. In the 1960s, severe shortages led to schools that churned out poorly trained technicians and technologists so more rigorous educational standards were implemented. In 1981 federal certification requirements were developed. In 1995 continuing education was made mandatory (ASRT, n.d.).

Respiratory therapy was not established as a profession until much later in 1943 under the name of inhalation therapy. As with other allied health fields, therapists were training on the job under the apprenticeship model. In 1954 standards were established for respiratory therapy schools and training took on a didactic as well as clinical focus. Formal credentialing was instituted in 1960. In 1974 the curricular requirements were changed to form the basis of didactic and clinical training done today (AARC, n.d.).

These are just a few examples of how curriculum has transformed in health sciences education in the last two to three centuries in the United States. There are many other health science professions that were also created during the 20th century such as perfusionists, public health specialists, health administrators, physical and occupational therapists, speech therapists and mental health providers.

In health education everything that was old is new again. The health sciences field started with apprenticeship training. As the field became more accepted, the pendulum swung in a different direction and training was more didactic. The pendulum then went back towards the apprenticeship model where health sciences students receive significant didactic education and clinical experience. Now the
call for transformative education swings the pendulum back just a bit further as traditional pedagogies in didactic training are questioned. The didactic education of the 20th century was not always meaningful and was often built around theoretical concepts rather than problem-based ones. In addition, traditional lecturing is a passive activity that inspires knowledge but in many cases not true learning where the student can apply what he/she has learned to real life situations. But in the last several years this has been changing with student-centered and problem-based learning. In some types of student-centered learning, the teacher has to transform but the students do not necessarily. In transformative learning, the student and the teacher must both transform to create a synergistic learning experience that has true impact on the learners’ understanding and point of view.

In order for transformational learning (TL) to occur, a student must have gained knowledge as well as additional insight and point of view on a particular topic. In addition, he or she must be able to view that concept and how it applies to the specific environment in a local and more global level. Transformative learning is student-centered and has commonalities with learning theories and frameworks such as problem-based learning and andragogy. However, it differs in the respect that in transformative learning, students are faced with a disorienting dilemma. This makes it applicable to cognitive, psychomotor and cognitive learning experiences. This disorienting dilemma is probably not more evident in any field as it is in health sciences where patients’ health and very lives can be at stake.

This text is divided into six different sections. The first section provides an overview of the basic premises of and theories of transformative education and curriculum design. Chapter One is a discussion of the major transformative learning theorists such as Mezirow, Taylor and Cranton. There is also a discussion of how transformative learning has been used in the health sciences so far. Chapter Two provides an overview of curriculum design including theoretical frameworks and curriculum models and taxonomies, how to write measurable objectives and authentic assessments, curriculum mapping, program evaluation, collaborative course design and an introduction to technology in health sciences curriculum. Section Two provides more specific information on curricular methods and technology and includes chapters on instructional technologies appropriate to the health science classroom of today and flipped, hybrid and online curriculum models and how these can add or subtract from the transformative process.

Section Three begins with Chapter Five which includes a theoretical basis of pedagogy, andragogy and heutagogy and how these theories can be applied to the health sciences. Chapter Six will provide information about how interprofessional education is transforming health sciences education in the 21st century. The last chapter in this section discusses contextually relevant learning experiences. Section
Four includes two chapters about medical education. The first is about transformative learning in osteopathic medical education. The second chapter discusses the transition to online medical training at one of the largest universities in Sweden.

Two chapters about transformative techniques in nursing education are presented in Section Five. These include concept mapping and Socratic and problem-based learning in nursing clinical education. The last section is a miscellaneous section that includes a call for transformation in health administration education and opticianry. The last chapter discusses classroom culture and transformative learning. It is my sincere hope that this book will assist health science educators by providing practical, easy to understand theoretical information and examples of transformative techniques in health education that are evident in the second decade of the 21st century. I also hope that this might spur other educators to take risks beyond traditional education methods to facilitate creativity and innovation in their classroom and most of all, deep, relevant, robust learning experiences.

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REFERENCES


