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This case study investigates the epistemological ideas that inform the development and implementation of medical information literacy education in colleges of osteopathic medicine (COMs). The investigation addresses the ways in which librarians conceive of information literacy and how they foster medical information literacy in osteopathic medical students. A panel of osteopathic medical education experts recommended COMs that are exemplars in teaching information literacy, and semi-structured surveys were conducted with 13 librarians representing seven recommended COMs. Educational materials were collected from 22 COMs representing 18 states from across the U.S. The findings from this investigation have implications for medical information literacy education and suggest osteopathic medical librarians should have a more embedded presence in the curriculum.

Keywords: osteopathic, information literacy, social constructivism, medical education

MORE THAN A LOOK-UP SKILL: MEDICAL INFORMATION LITERACY EDUCATION IN OSTEOPATHIC MEDICAL SCHOOLS

By

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Chapter 1: Introduction

Americans recognize the important role of physicians in preventing illness and maintaining good health. Each year in the United States (U.S.), the community of physicians sees "one billion patients, which equates to an estimated 300 visits per 100 adults" (National Ambulatory Medical Care Survey, 2012, Table 1). According to the National Health Interview Survey, Centers for Disease Control (2012), "82% of all adults in the U. S. have contact with a healthcare professional" (p. 10). These statistics highlight the high frequency of American adult visits to physicians' offices and underscores the importance Americans place on the healthcare system and the availability of physicians. It also points out the high need for licensed physicians. Medical education, including schools and libraries, must keep pace in preparing the physician workforce to meet the expectations to provide quality medical care.

When selecting a physician, people seek physicians with strong credentials and high patient ratings. According to Anderson, Barbara, and Feldman (2007), patients rate physicians high when they are viewed by the patient as having current knowledge, information, and technical skills as well as having a strong ability to connect with patients as individuals, to see patients' values and needs, and to tailor medical treatment to their unique circumstances. This explains why physicians who identify and diagnose diseases without making personal connections with the patient are not rated as highly, or sought as often, as physicians who identify and diagnose patients acknowledging patients' values and needs.

The importance of contextualizing medical information to a patient, and making it individually meaningful, is vital to the success of a physician. Medical expertise,

specifically expertise in the area of biomedical sciences, is a fundamental component of medical education. However, excellent knowledge of biomedical science does not alone ensure that physicians will enjoy a medical practice popular with patients. In addition to knowledge of biomedicine, today's medical students must strive to become quality physicians, physicians who are able to use biomedical science knowledge by applying it in combination with knowledge of patients' backgrounds, needs, and values. According to Kuper and D'Eon (2011), patient-specific contextualization of information is necessary to satisfy the needs of today's patients. Good doctors, according to Conti (2005), get as much information as they can from a variety of sources, maintain and practice the ability to talk with patients, combine information from general medical facts as well as patient-specific history and exam findings, and understand the importance of the patient's specific information from their medical history and current conditions.

Today's medical students, through educational experiences that include engagement with content professors and medical librarians as well as the reading of professional publications, become aware that physicians who are typically sought after and valued by patients successfully develop multiple abilities. They must develop intellectual abilities to comprehend and recall facts, to apply knowledge, attitudes, and skills across diverse situations and experiences, and to engage actively with information and resources to solve problems and create new knowledge. This shift away from medical education based on rote memorization and the repetition of facts, toward active problem-solving and inquiry-based medical education inspires medical educators to develop new approaches to teaching and urges medical students to develop new approaches to learning information literacy skills to answer specific questions.

Information literacy skills are now a fundamental aspect of contemporary education and education policies, particularly relating to medical education accreditation. To establish competencies for medical education, the Association of American Medical Colleges (AAMC) established a list of *Entrustable Professional Activities* (EPAs), 13 skill areas deemed so vital for the practice of medicine that, to be successful medical residents, all medical school graduates must master them by the time they begin their residencies. EPA seven (7) requires a resident be able to "form clinical questions and retrieve evidence to advance patient care" (Association of American Medical Colleges, 2014, p. 26). A function of this EPA is stated as "[a]pply the primary findings of one's information search to an individual patient or panel of patients" (Association of American Medical Colleges, 2014, p. 26). Further, the core competencies from American Association of Colleges of Osteopathic Medicine (AACOM, 2012) includes that the physician must be able to "[d]emonstrate information literacy and the ability to find and apply evidence-based literature as part of the management plan" (p. 9).

Information literacy skills are defined by the Association of Colleges and Research Libraries (ACRL, 2015), a division of the American Library Association, as "a set of abilities requiring individuals to recognize when information is needed and to have the ability to locate, evaluate, and use effectively the needed information" (para. 1). Information literacy skills instruction is central in the education of future physicians who are required and expected to engage in active, inquiry-based problem-solving. Information literacy skills are essential to future healthcare research and practice devoted to preventing illness and sustaining good health.

Research Problem

The problem addressed in this investigation was how to educate future physicians to become knowledgeable in areas of both biomedical science and information literacy. This problem frequently begins with many new osteopathic medical students (OMS) who tend to view their prior learning about information sources and basic resource uses as all that is necessary in the investigation of medicine. Many new students who believe that they already know enough are often closed-minded to new learning about access, evaluation, and use of information in patient care. To complicate this problematic student situation, medical informatics courses and/or library instruction seminars are often not all that they can be to achieve the ultimate goal of information literacy as defined by the ACRL (2015) and articulated in academic standards. Too often students only learn the process of information acquisition rather than learning to contextualize information and make it meaningful. The students who lack contextualization skills are often focused only on information acquisition, or what Shapiro and Hughes (1996) call a "dimension of information literacy" (p. 4), rather than the full scope of information literacy. In information acquisition, medical students learn to locate general, decontextualized information from databases and journals, but they are not always instructed about the processes of contextualizing information so that it is connected to patient-specific problem situations.

There is a growing awareness among medical educators, including content professors and medical librarians, that the problem of lack of information literacy skills instruction exists in today's medical school curriculum and that changes in medical education are necessary to improve future physicians' learning experiences. As Norgaard (2003) says, "information literacy has at its heart evaluative and integrative concerns; no

mere look-up skill, it concerns how we judge and evaluate information" (p. 126). In most cases, medical education is a four-year program of study. The first two years are typically a combination of didactic and simulated instruction followed by two additional years of clinical rotations with actual patients. By the end of four years of medical school, students are expected to be adept in clinical scenarios and knowledgeable about providing care to patients in preparation to enter residency programs involving legitimate and authentic patient-care responsibilities. While the first two years of medical school have relevance to the final two years of medical education, too often they are decontextualized from legitimate patient-centered scenarios.

Medical educators have a need to know how to revise the four-year experience through improved curriculum and instruction that will result in program graduates who are well-known for their abilities to use information and technology in the practice of medicine that results in excellent patient care. This sentiment by medical educators is consistent with the view of Shapiro and Hughes (1996) who point out that "information literacy should in fact be conceived more broadly as a new liberal art that extends from knowing how to use computers and access information to critical reflection on the nature of information itself" (p. 3). There is wide agreement in medical education that today's physicians must know how to translate information from general concepts and Internet-based answers to patient-specific contexts (Association of American Medical Colleges, 2014). Physicians must recognize quality information that is relevant to a specific patient and can be recorded in that patient's record. These specialized abilities to make judgments about information are at the heart of evaluation.

When future physicians are knowledgeable in areas of biomedical science and are information literate, there will be improvement at the intersection of several academic fields. Medical informatics, a new field valued by medical educators who promote effective medical practice, is emerging in response to the growing need to improve human healthcare. The development of the medical informatics field is a direct response to the problems identified in information literacy and biomedical science knowledge and is, therefore, the identified objective of this investigation.

Field of Medical Informatics

Medical informatics is a growing, interdisciplinary field. Its focus is on access and personalized use of medical data and information, and its goal is the resolution of human health problems. According to the American Medical Informatics Association (AMIA), informatics is "the interdisciplinary field that studies and pursues the effective uses of biomedical data, information, and knowledge for scientific inquiry, problem solving and decision making, motivated by efforts to improve human health" (AMIA, 2015, Biomedical Informatics, para. 1). Medical informatics is also defined by the Florida State University College of Medicine (2015) as the "intersection of information science, computer science, and health care. It deals with the resources, devices, and methods required to optimize the acquisition, storage, retrieval, and use of information in health and biomedicine**"** (para. 1). These descriptions underscore the problem identified in this investigation and the need for more medical school curricula and instruction that combine information with clinical skills and patient context to promote effective health-care practice.

As Lungeanu, Trachtenberg, Bersan, and Mihalas (2009) point out; medical informatics intends to further develop the initial description and understanding of information literacy, going beyond resource literacy to provide a new space where medical students can learn to use information to produce best results for their patients. These researchers emphasize that the pursuit of medical information literacy for medical students is an important component of medical education and the life-long learning of practicing physicians. They also assert the understanding that finding information is one step, but not the only step, in the use of information in medical practice.

Medical information literacy requires the ability to know when information is needed to fill an information gap, or deficit. Medical students must accumulate knowledge that makes sense to them in the context of the deficit. In her theory of Sense-making, Dervin (1992) compares information gaps to a person walking along a path, and coming to an impassable hole, necessitating that he builds a bridge in order to continue. The information gap requires information seeking, enabling advancement through a problem or process, until the information necessary to bridge the gap is located and contextualized in order to make sense. Whether that deficit exists because of the physician's lack of information specific to the patient, the disease state, the treatment, the prognosis, or any other facet of the healthcare process, the first step is knowing when there is a lack of information. Once the need is identified, the information required to fill the gap, or resolve the information deficit, must be located before moving on. Upon acquisition of the necessary information, it must be appraised for validity, relevance, and currency. Finally, the information must be used in communication between the physician and patient.

In medical informatics education, the objective is for students to learn all facets of information literacy and to develop and use the knowledge and information literacy skill set. In various medical schools, these skills are taught under various course titles, course descriptions, course learning outcomes, and learning activities. The courses and/or lessons are identified and described using a variety of terminology, including medical informatics, medical information literacy, life-long learning, and/or library instruction. For the purposes of this investigation, programs and/or courses using these, or similar terminology, are referred to as medical informatics. Medical informatics also involves the related process referred to as evidence-based medicine to emphasize the use of information, or research-based evidence, within the unique context of individual patient needs for medical care.

Evidence-based medicine. Evidence-based medicine (EBM) is defined by the Centre for Evidence-Based Medicine (CEBM) as "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients" (Sackett, Rosenberg, Gray, 1996, p. 71). According to Meyer (2006), EBM is the combination of the best evidence from the literature, clinical expertise, and patient values and preferences. EBM is not simply the location and implementation of the best scientific evidence, it is the process of treating patients in the most effective way possible, guided by the physician's clinical expertise, informed by the evidence, and framed within the individual patient context. EBM and medical informatics are related concepts, both emphasizing the use of information within the unique context of individual patients. Wyer and Silva (2009) state that "among the most important

accomplishments of the EBM movement in modern medicine is the emphasis it places on medical information literacy" (p. 896).

Caring for patients in a way that is both aware and respectful of their individuality and specific needs and values is an important component of quality medical care. Access to research-based evidence has become a fundamental element in healthcare that decreases physicians' need to simply guess about the possible outcomes of their choices. Further, the practice of medicine using the basic principles central to the field of medical informatics promotes patient-centered care by emphasizing the importance of information being shared between patient and physician and the benefits of information taking on specific meaning and context as it is passed back and forth between them. In this way, "the patient becomes part of the medical team, empowered to impart their values and preferences, and a co-producer of the healthcare process along with the physician" (Snyder et al., 2011, p. 2). These advancements in medical education are an opportunity for medical educators to think theoretically and practically about effective ways of learning professional skills.

Learning Professional Skills in Medical Informatics

An understanding of biomedical information is fundamental to the effective practice of medicine. The AMIA (2015) states that medical informatics draws on the social and behavioral sciences and recognizes that "people are the ultimate users of biomedical information" (amia.org, *Biomedical Informatics Core Competencies*, para. 4). Informatics is a socially-mediated field, as medical information is both produced and consumed by people. Therefore, utilizing the lens of social science theory for the understanding and application of informatics principles and teaching methodology is

invaluable and results in deeper understandings of the intersection between informatics and human context that is determined by real-life experiences.

The theory of situated cognition (Lave and Wenger, 1991) asserts that the most effective way of learning professional skills is to engage in actual, legitimate experiences in real-world contexts that are fundamentally active and participatory. Working with practicing physicians in clinical rotations during the third and fourth years of medical school is effectively a mentorship where the student learns not only the direct application of knowledge gained in the first two years of medical school but also observes the practice of medicine and ultimately gleans what it means to be a physician within the professional community. Based on situated cognition theory, the clinical experience for medical students should be an effective way to learn professional skills since the clinical experience is a real-work context. It, therefore, follows according to the theory of situated cognition that medical school mentorship is an effective place and way to learn medical information literacy skills.

The Dreyfus (1980) model of skill acquisition provides a framework in which learners pass through five states of performance, from novice to expert, in their professional development that can be applied to medical students' learning experience (Dreyfus & Dreyfus, 1980). The researcher used this model to follow and interpret students' continuum of information literacy skills development. According to Dreyfus and Dreyfus, acquiring and integrating information within a specific context is a fundamental aspect of learning and a hallmark of the transition from the level of novice to the level of advanced beginner. Given the model's unique characteristics, this theory was used to investigate medical school educators' teaching and medical school students'

learning of necessary threshold information literacy performance skills across courses and clinical experiences. I used this model of skill acquisition to understand the goal of medical students' achievement of advanced beginner level information literacy skills as a foundation for further learning in the medical school program and for future professional practice.

One potential problem in osteopathic medical education is the inconsistent application of patient-specific practice scenarios. Eraut (2001) studied this problem and described the importance of teaching theoretical knowledge along with teaching and student development of clinical reasoning skills, including applying patient context in simulated patient-interactive practice scenarios. It is a concern that too often librarian-taught resource literacy education are single-session opportunities focused only on instruction to familiarize students with the library's catalog and databases. They may not be designed to teach students about bodies of knowledge and bodies of literature or how healthcare providers use information and knowledge in their interactions with patients. There are, however, efforts in some COMs being made to revise curricula and to chart a new course for teaching medical information literacy. This investigation was designed to learn more about the COMs that offer librarian-taught literacy education and application of patient context in teaching information literacy skills.

Central Question

This investigation examined the content and objectives of medical informatics courses in osteopathic medical schools as articulated in course syllabi and other course materials and as described in interviews with content and/or library faculty. The investigation applied Lave and Wenger's (1991) principles of situated cognition and the

Dreyfus model of information acquisition (Dreyfus & Dreyfus, 1980) as lenses for examining current teaching of medical informatics, in the teaching of medical informatics. Findings in the investigation can be used to build theory about teaching information-based professional development skills to medical students and to determine and describe instructional practices that utilize patient-specific context anchored in the authentic and legitimate environment in which medical students are likely to practice medicine. The investigation also contributes new theory about learning and information literacy that can help to move library and information studies forward beyond outdated understandings and descriptions of learning and information literacy and incorporating situationally and contextually appropriate content, goals, and outcomes.

Chapter 2: Literature Review

The concept of information literacy is known through authoritative sources found in several academic subject areas, including education, medicine, information science, and information literacy. To focus my investigation on relevant scholarly and professional understandings of information literacy, this literature review includes selected literature (1974 – present) from these fields. The selected literature presents authoritative sources on a brief history of information literacy; the pursuit of best information for patient care; the evolution of information literacy in medical education; and educational philosophy, theories, and models that influence medical education. In this review, the constructivist theory of situated cognition (Lave & Wenger, 1991) and the Dreyfus model of information acquisition (Dreyfus & Dreyfus, 1980) are highlighted as the theoretical framework for this investigation.

Brief History of Information Literacy

In its earliest iteration, the phrase *information literacy* was used to describe information skills related to the performance of jobs or duties as citizens. Information literate people, according to Zurkowski (1974), were unique in their abilities to coalesce various pieces of information into a coherent whole, to locate and access pieces of information germane to their needs, and to use information to accomplish tasks. Scholars writing about information literacy often used the lens of business and economic gain as well as democratic ideals to speculate about roles of librarians. Other scholars conceived information literacy as a larger, universal field, more related to the common good of people viewed to be necessary for a just society. The common good was emphasized by Owens (1976) who related information literacy skills to making rational and intelligent

decisions at election ballot boxes. The view of information literacy as essential for problem solving (Burchinal, 1976; Taylor, 1979) resulted in the evolution of new definitions of information literacy. New definitions demanded the identification of new skills and techniques for locating and acquiring information in the vast and expanding realm of new information resources.

Advancing the Definition of Information Literacy

Three major turning points in advancing the definition of information literacy occurred in the 1980s, each of which impacted the professional and cultural understandings of the concept, its applications, and its meanings. The first turning point was recognition that an information deficit, or information need, was understood as a key part of the information literacy process. The second turning point was the explication of differences between information literacy and resource literacy. The third turning point was the establishment of a link between information literacy and life-long learning.

The importance of identifying and mitigating an information deficit evolved from a definition of information literacy in 1985 at the Auraria Library in Denver, Colorado. Librarians stated that "information literacy requires particular attitudes, such as the awareness of a need for information" (Behrens, 1994, p. 313). The Auraria Library, which still today serves three colleges and universities, conducted a study to determine the most effective way to increase information literacy among approximately 30,000 students enrolled in the library's user education program. The effect of the Auraria study's recasting of the definition was to increase the breadth of user education from that of simply locating information to a more robust understanding of what it means to be information literate. This recasting of information literacy reflects the statement by

Kuhlthau (1987) in which she asserts that information literacy "involves recognizing an information need and seeking information to make informed decisions" (p. 44). This era of research established the recognition of an information deficit as a central component in the search and underscored the importance of context for information literacy. These ideas culminated in the concept that specific information needs exist; that information needs or deficits are linked to specific problem situations, and that for information to be relevant and useful, it should not be decontextualized from the problem situation.

The second turning point in the concept of information literacy in the 1980s was the explication that there exists a difference between information literacy and resource literacy, including computer literacy. Horton's (1983) identification of the difference between information literacy and computer literacy included his belief that computer literacy was but one aspect of information literacy. Further, the Auraria Library list of characteristics stated that information literate people know that "information literacy is not: (only) knowledge of resources, or information finding" (p. 313). This suggested that using resources to find information was not adequate in the pursuit of information literacy. This view moved away from seeing information literacy as simply the awareness of published resources to an expanded idea of information literacy as a means to answer specific questions. This awareness was the beginning of a new phase when resource literacy was seen as the practice of finding specific answers to discrete questions but without an emphasis on presenting or communicating findings. While this phase moved scholarly thinking forward, it stopped short of addressing how information becomes knowledge through human internalization and use of information for problem solving and/or creating new knowledge.

Critics of the 1980's view held that resource literacy was a concept that was inadequate to address critical social needs of people, such as nutrition, health care, and employment. In Breivik's critique of resource literacy (1989), she pointed out that information literacy skills are transferable, not fixed, but fluid and dynamic and not tied to a particular library or set of resources. In other words, if librarians teach resource literacy as a static skill, students will learn to use the resources solely in the environment in which they were taught. In Breivik's (1989) view, static location-specific instruction will lead to students who lack abilities to transfer the lessons learned to other libraries and other resource sets in future circumstances.

The advent and proliferation of the personal computer in the 1980's led to more change in scholars' understandings of the concept of information literacy. Many scholars recognized the importance of skills for operating computer hard and software. Scholars of information literacy, including Horton (1982), were quick to point out that computers should be considered a resource or tool to access electronic publications. About the same time, Kuhlthau (1987) asserted that computer literacy was "an essential component of information literacy" (p. 4), and that information literacy was a bigger concept of which computer literacy was a subset.

The third turning point, or major shift in views of information literacy, was the establishment of the connection between information literacy and life-long learning. This third turning point grew out of the second turning point and its importance for recognition of the transferability of information literacy skills across information use environments. Scholars recognized and asserted that an information literate individual is not tied to one set of resources or fixed in space to one particular library. Rather, the information literate

individual can move away from the known set of resources used to first learn information literacy skills and can continue to find and analyze information. Kuhlthau (1987) emphasized this on-going process of learning and using information literacy skills in terms of leveraging the developed strategies and skills, continuing to learn, make meaning, contextualizing, and constructing knowledge anywhere at any time. When addressing information literacy, Demo (1986) appears to be the first to label the continuous leveraging of strategies and skills "lifelong learning" (p. 22). Breivik (1987) wrote about the importance of developing information literacy skills for life-long learning, stating that the two concepts are mutually reinforcing, symbiotic, and vital for sustained learning and growth, specifically including information acquisition, storage, evaluation, and responsible use of information. At this point, the concept of information literacy became well established as the human ability to know when information is needed and to search, access, evaluate, and use information for continuously developing new knowledge and skills.

Situating Information Literacy within the Library

The publication *Information literacy: Revolution in the library* (Breivik & Gee, 1989) was an important contribution to scholars' understandings of information literacy. This publication advocates that the role of stewardship for information literacy education, including curriculum development and instructional strategies, should reside in the library through the actions of the professional librarian. Libraries, as a repository for disciplinary knowledge, are a natural environment for learning to problem-solve and to apply specialized knowledge to broader social contexts. Libraries and librarians can help students learn and master critical information literacy skills including the development of

successful strategies and approaches to searches and problem solving (Behrens, 1994; Luckenbill, 1989). Breivik and Gee's (1989) work, published by the American Council on Education, further highlighted the importance of the need for an information literacy discussion on a national scale that emphasized the role of the library in the teaching of information literacy skills. The publication of this seminal work and the actions of the American Library Association (ALA) resulted in articulated clarity of the role of librarians in information literacy.

The ALA President's Committee, 1989. The formulation of a definition for information literacy by the American Library Association (ALA) was a pivotal point in advancing understandings of information literacy. In its definition, the ALA (1989) first stated that "To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" (para. 3). This codification had two effects. First, the many definitions and ideas about information literacy converged into a central, well-publicized statement. The second effect was to solidly situate the impetus for information literacy education within the purview of the library and librarians. Along with the influence of the work of Breivik and Gee (1989), the largest organization of librarians in the United States (U. S.) established an accepted definition of information literacy. According to Behrens (1994), the definition and accompanying explanation from the ALA President's Committee (1989) were vital to promoting information literacy education as it both codified and expanded the definition. The new description of information literacy became:

> To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information…Ultimately, information literate people are those who have learned how to learn. They know how to learn because they know how knowledge is organized, how to find information and how to use information in such a way that others can learn from them. They are people prepared for lifelong learning, because they can always find the information needed for any task or decision at hand. (American Library Association, 1989, p.1)

Post ALA Definition. During the early part of the next decade, Behrens (1994) reported that three major trends in the information literacy movement occurred that firmly established the ALA definition resulting in its wide acceptance. The first event was the increasing attention to information literacy education as a course of study. The second event was that information literacy became recognized as part of the larger literacy movement. And, the third event was the debate among librarians regarding their roles in the information literacy movement. Considered independently and collectively, these events translate to a major step forward in conceptualizing information literacy.

The new concept of information literacy as an educational programming goal positioned librarians at the forefront of information literacy education. Librarians, particularly school and academic librarians, began to embrace information literacy and to make it a priority for student learning in the larger educational landscape. For example, academic librarians began to teach instructional sessions and library resource seminars,

primarily to first-year college students. Expanding the earlier practice of one-time instructional sessions about the library's resources and services, some librarians began to teach information literacy skills as a stand-alone course through partnering with faculty in various academic departments. Some scholars (Breivik, 1991; McCrank, 1992) advocated this restructuring and expansion leading to first-year instruction, while others advocated for a more complete and newly-developed curriculum, which emphasized teaching critical thinking skills in the context of content areas and life-long learning.

The second event was the United Nations General Assembly proclamation of 1990 as *International Literacy Year* that brought the concept of general literacy into a global spotlight. Until this time, many in the general public did not make a connection between information literacy and being able to read. This proclamation coincided with the furthering of the information literacy discussion and the issuance of the watershed ALA definition (Behrens, 1994). According to Behrens, placing the concept of information literacy in the larger literacy discussion reiterated the notion that literacy was a developmental sequence rather than a finite set of concepts, a situation which proved to be valuable in the evolution of information literacy. She further indicated that information literacy is a developmental process not only of skills and knowledge but also of accompanying attitudes and behaviors such as persistence, attention to detail, skepticism, and situation-specific contexts. Like general literacy, information literacy relies on the development of attitudes, behaviors, and skills with recognition of the importance of context, and, thus, should be seen as existing on a continuum, not as a discrete, dichotomous framework of *literate* or *illiterate* (Breivik, 1991; Campbell, 1990).

These concepts were articulated during the previous decade, but librarians and researchers began to discuss them with more fervor and intent at this point.

The third and final element at this time was that librarians became more intent on establishing their place as the experts in the areas of information organization, retrieval, and searching skills and formed partnerships with subject-matter teachers to increase the efficacy of education. In a paper written for the White House Conference of Libraries and Information Services (WHCLIS), Breivik (1991) stated, "[w]ith their expertise in information…librarians compliment teachers' subject area strengths. Such partnerships are now necessary for using real-world resources to achieve learning objectives for courses" (p. 87). By working together to coalesce their separate skill sets into cohesive student-focused information literacy lessons, subject-matter teachers and librarians increased the practical and effective teaching of information literacy. With a combination of information literacy skills and subject-matter knowledge, students began to realize the effects of being empowered to agree, or disagree, with published ideas and learn to learn on their own. This new empowerment created motivation for them to continue their learning by teaching them, as Breivik (1991) said, to "experience the excitement of their own successful quests for knowledge" (p. 87).

Contemporary View of Information Literacy. Librarians today continue to teach and contextualize information literacy instruction in pragmatic ways. Librarians intentionally wrestle with their roles as purveyors of information and teachers of information literacy in a post-modern educational world. Changes are

pervasive in the ways in which librarians consider their profession and professional identity. Library and information science professionals have long considered their roles to be as stewards and keepers of information; however, they need to change these ideas in the 21st century.

As information becomes more democratized and is continuously revised and updated, it ceases to be an individual commodity and becomes an evolving, socially-constructed concept. Consequently, information literacy skills should have a high priority in the educational milieu as a core component of the curriculum rather than an appendage to it, as Elmborg (2006) states, "librarians and library educators can better engage the educational climate on campuses by defining academic librarianship through the scholarship of teaching and learning" (p. 193). A growing number of scholars claim that the ALA definition is no longer sufficient as modern and post-modern educational concerns are beyond its scope. As Luke and Kapitzke (1999) state about the ALA definition, it is "at best anachronistic, and at worst counter-productive in their avoidance of the central questions facing students, teachers, and libraries" (p. 486).

Still others share the view that the ALA definition is inadequate. Norgaard (2003) and Pawley (2003) suggest that information literacy is contextual and nuanced, situated in cultural understandings, particular, and heavily derived from the perspective of individual and communal understandings. These contemporary scholars, like their predecessor colleagues, distance information literacy from resource literacy, removing it from being merely a skill, or series of skills, designed to attain discrete pieces of information for specific reasons. Because it is richly contextual and situational, Norgaard (2003) writes that "information literacy is far more than a look-up skill" (p. 126).

The contemporary importance of context to information literacy was perhaps initially recognized by Demo (1986), who wrote that information skills are most effectively inculcated when learned in context and that "information skills are not well learned in isolation from a purpose" (p. 21). Shapiro and Hughes (1996) emphasize the contemporary view, suggesting that information literacy be considered a liberal art within the academy, inherently epistemological and contextual: "information literacy…extends from knowing how to use computers and access information to critical reflection on the nature of information itself and its social, cultural and even philosophical context and impact" (p. 3).

As earlier discussions implied, and my research points out, there continues to be the need for more exploration into the post-modern meaning of information literacy and related practices of librarians. As Elmborg (2006) points out, there is a need for a new theory of librarianship, as he states:

> The real task for libraries in treating information literacy seriously lies not in defining it or describing it, but in developing a critical practice of librarianship—a theoretically informed praxis. With this philosophical evolution, libraries can no longer be seen as value-neutral cultural space, and librarians cannot be defined as value-neutral information providers. Librarians will be involved with the daily struggle of translation between the organized conceptions of knowledge and the efforts of all students to engage that knowledge. This struggling with meaning is crucial to literacy education, and for librarians and libraries to realize the full potential inherent in information literacy, libraries need to engage this struggle,

> thereby aligning the values of critical literacy with the day-to-day work of librarians. This development will likely require ongoing questioning and challenging of cherished library values. If librarians wish to take their place among the progressive educators in the academy, it is vital that this process takes place. (p. 198)

However, while some scholars continue to debate the real meaning of information literacy, for others the debate has supplanted the real question. The codification and widespread acceptance of the ALA definition did not end the discussion to find what information literacy really means. A number of writers continued to hone and refine the definition, adding and subtracting ideas and nuances that affect the cultural understandings. This continued tinkering with the definition has engendered criticism. For example, Owusu-Ansah (2005) suggested that definitional debate results in losing sight of the importance of information literacy as a concept and that spending so much time naming the concept is supplanting time which should be spent pursuing and achieving it.

This brief history of information literacy reveals the evolution of the concept from its beginning in the 1970s to the current view that information literacy is contextual, situated, and fluid. There are many indications in the selected literature that information literacy should be taught as a mechanism by which students can develop life-long learning skills and dispositions so that they know being information literate can allow them to see information as problem-specific, manifesting itself in real-world learning, and socially-constructed to address identified information deficits. Consideration of how

to best teach information literacy in medical education sheds still more new light on the importance of use of quality information to solve human problems.

Pursuit of Best Medical Information for Patient Care

Medical information literacy education is an emerging area of expertise within the realm of information literacy. The application of information literacy to medical practice can be viewed as the pursuit of the best possible information for the care of patients, "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients" (Centre for Evidence-Based Medicine, 2011, p. 1). When considering making decisions about the care of individual patients, evidence-based medicine (EBM) is the healthcare industry's term given to the process of combining the best available scientific information, the specific clinical circumstances, and the patient's preferences and values. When, according to experts (Centre for Evidence-Based Medicine, 2011; Mayer, 2006), those components are integrated to the best of the physician's abilities, filtered through the lens of clinical expertise, and presented to the patient, the result is EBM.

Evidence-based medicine. An unpacking of EBM, its history, development, claims, and dissent, combine as a framework for understanding the association between information literacy and its application to the teaching and practice of medicine. EBM was originally conceptualized by epidemiologists at a Canadian medical school in the 1970s and 80s, who sought to apply the principles of epidemiology to the practice of medicine (Cohen, Stavri & Hersh, 2004; Mykhalovskiy & Weir, 2004).

EBM emerged as a phenomenon in the early 1990s when Guyatt used the phrase in an editorial. "In 1991, and again before a wider audience in 1992, an official

christening took place as the word ‘medicine’ was positioned after an already existing phrase, ‘evidence-based,’ and ‘evidence-based medicine’ was announced to the world” (Wyer & Silva, 2009, p. 892). Guyatt (1991) and the Evidence-Based Medicine Working Group (1992) proposed a hierarchy of evidence including clinical trials, pathophysiological data, case studies, and other forms of information. This resulted in a didactic, value-laden understanding of which evidence was best, thus informing the most effective treatment modality for patients.

After it initially appeared in the literature, EBM quickly became a unique phenomenon in medical literature. The proliferation of EBM from its earliest discussions through this first codification was largely due to the confluence of two factors. “On the one hand came the rise of biomedical informatics, driven by the explosion of published information related to health care. On the other came the advent of the era of clinical trials and the clinical research in general” (Wyer & Silva, 2009, p. 892). This combination led to a new relationship between practice, medical education, and available information. Mayer (2006) reports that hundreds of books and thousands of articles have been published during the debate in which researchers and authors applied EBM principles to various situations and evaluated its efficacy for patients and practitioners.

EBM has stimulated a great deal of criticism and support in the medical community. A significant portion of the criticism focused on large concepts, one of which is germane to this discussion: EBM can be problematic when applied to individual patients. Of the criticisms of EBM, this idea is most central to the patient context. According to Cohen, Stavri and Hersh (2004), patients’ preferences can become deemphasized in EBM. Patients’ preferences tend to become less important to the

physician; patients' values and uniqueness can be easily overlooked; and patients' voices are muted, or silenced, as physicians read papers, study results from large-scale trials, and make the decisions for them. The danger is that physicians can easily become too tied to the literature, lose sight of patients, and inappropriately apply large-number trials to individual patient needs.

Nevertheless, according to Mayer (2006) and Mykhalovskiy and Weir (2004), patient-specific context is an essential part of EBM when it is practiced correctly. Sackett, Rosenberg, and Gray (1996) posited that excellent medical care is dependent on the exercise of clinical experience and reasoning, the use of the best available evidence and information from the literature, and listening to the preferences and values of the patient. These facets must be used in concert. Evidentiary information mitigates the possibility that medical practice does not maintain currency; yet, clinical reasoning and experience must be maintained in order to best serve the patient. As Sackett (1996) says, "[w]ithout clinical expertise, practice risks becoming tyrannized by evidence, for even excellent external evidence may be inapplicable to or inappropriate for an individual patient" (p. 72). Frankford (1994) further emphasized the dangers of becoming bound by the literature and reducing patients to another unit in the constellation of objective pieces of data, stating that "the increased reliance of western medicine on technology tends to reduce patients to technological objects" (p. 776). Frankford added, "[t]he ideal physician is positioned as a listener and counselor who, by recognizing that people have life contexts and are not scientific objects" (p. 785) is able to be an effective practitioner of medicine.

Another danger in EBM is that the individual patient risks becoming homogenized into a large group of study participants. This is because many studies are statistically based randomized trials that report results of groups rather than individuals. Cohen, Stavri and Hersh (2004) observed that, “First, there is often a lack of studies relevant to the specific patient and interventions under consideration. Second, patients are individuals and not groups” (p. 40). Individual patients have unique needs, contexts, circumstances, and preferences. When evidence coming from large-scale trials and research is superimposed on a single patient, it does not take into account the measure of that patient’s uniqueness. Simply because a population study reveals a particular treatment modality as more effective than others, this does not imply that it is the best regimen for an individual patient.

According to the literature, EBM is primarily perceived as being doctor-centered, not patient-centered, and Cohen, Stavri, and Hersh (2004) sum up the argument by saying, “Finally, individual patient values and circumstances must always be considered” (p. 42). EBM must take into account the importance and power of the doctor-patient relationship, and patients need to be the center of the clinical interactions. Yet, EBM is often used as a blunt instrument, lacking the contextualized relevance to a unique patient and his or her values.

A comprehensive practice of EBM requires that clinical understandings and experience, as well as patient-centeredness, be a fundamental part of the process. Criticisms of EBM result from an opinion that physicians are too tied to medical literature and are determined to use published evidence and trial data as the only guides for the care of their patients. EBM risks taking away the expertise and experience

physicians accrue in the course of their education and practice. “Situated in this way, EBM is construed as subverting the integrity of clinical reasoning and doctor-patient communication” (Mykhalovskiy & Weir, 2004, p. 1063). In fact, these criticisms are aimed at physicians who practice one aspect of EBM without considering the comprehensive aspects of the concept. Practiced as Mayer (2006) and others have defined it, EBM should be practiced as a combination of information, clinical circumstances, patient values, and the physician’s expertise. When practiced in this combination, EBM is an aspect of information literacy well within its definitional bounds as discussed above in the history of information literacy section.

EBM and medical informatics. Medical informatics is an emerging field in need of clarification. The literature provides some indications of the roles that informatics plays in information literacy instruction and EBM. According to Alvarez and Zelmer (1998), medical informatics and EBM are closely identified with one another, related and connected in their effect. Other experts (Cohen, Stavri & Hersh, 2004; Georgiou, 2002) suggest that EBM is a model of usage within medical informatics, and informatics and information literacy concepts are requirements for the effective practice of EBM.

Mayer (2006) states that, “EBM is the use of critical thinking, or healthy skepticism in medicine” (p. 3). This is another indication that EBM is an effective practice of medicine, and is dependent on the ability of the physician to locate, assess, and use the latest medical information. It requires, according to Mayer (2006), that the physician be able to think critically about the information in context with the patient. Therefore, medical education must emphasize the physicians’ skills for recognizing an information need; locating the information to fill that need; assessing the validity and

accuracy of the information; and, using that information in the context and within the values of a specific patient is the process of effective evidence-based medicine. Situating information literacy in those actions shows the confluence of EBM and medical information literacy education.

Evolution of Information Literacy in Medical Education

To present a comprehensive picture of medical education as it relates to information literacy, it is important to identify the accrediting bodies and authorities who develop standards, determine competencies, and determine priorities for medical education. The American Association of Colleges of Osteopathic Medicine (AACOM) is the governing body of osteopathic medical education, and oversees the schools that confer the Doctor of Osteopathic Medicine (D.O.) degree. The American Association of Medical Colleges (AAMC) is the governing body of allopathic medical education, and oversees the schools that confer the Doctor of Medicine (M.D.) degree. These two organizations in medical education have published documents in which they articulate the importance and need for medical students to learn information literacy skills in order to graduate and practice medicine.

To establish competencies for medical education, the AAMC established a list of *Entrustable Professional Activities* (EPAs), 13 skill areas deemed so vital for the practice of medicine that, to be successful medical residents, all medical school graduates must master them by the time they begin their residencies. The Interprofessional Education Collaborative (IPEC), which includes representatives of the AACOM and AAMC as well as the governing bodies of education for nursing, pharmacy, dentistry, and public health, also published a list of core competencies for interprofessional collaborative practice

(American Association of Colleges of Osteopathic Medicine, 2012; Association of American Medical Colleges, 2014; Association of American Medical Colleges, 1998; Interprofessional Education Collaborative Expert Panel, 2011). These authoritative publications serve as the baseline for how physicians practice individually and as a member of the healthcare team.

Medical information literacy skills, competencies, and standards are included in a variety of ways and under a series of headings in the documents. The intent is to articulate the outcomes of medical education that are deemed necessary for all medical school graduates. The standards and competencies indicate necessary skills for physicians in the area of general information literacy as well as four specific components of information literacy. These components are information deficit identification; information location; critical appraisal of information; and use of information.

General Information Literacy. The first area is general information literacy. The general statement of competency incorporates several aspects of information literacy, including understanding the gaps in personal knowledge. The AAMC (2014) states that "Underlying the skill set…is the foundational knowledge an individual has and the self-awareness to identify gaps and fill them" (p. 26). This competency indicates that the ability to ask a pertinent question from the first day of residency is crucial. In order to care for patients, residents must be able to identify key clinical questions, find and assess information, and retrieve information and evidence that will be used to address those questions. Additionally, they must link the information found to an individual patient. Entrustable professional activity (EPA) seven (7) requires a resident be able to "form clinical questions and retrieve evidence to advance patient care" (Association of

American Medical Colleges, 2014, p. 26). A function of this EPA is stated as "[a]pply the primary findings of one's information search to an individual patient or panel of patients" (Association of American Medical Colleges, 2014, p. 26).

The core competencies from the American Association of Colleges of Osteopathic Medicine (2012), under the grouping of *Patient Care*, and the heading of *form a patient-centered, interprofessional, evidence-based management plan,* includes that the physician must be able to "[d]emonstrate information literacy and the ability to find and apply evidence-based literature as part of the management plan" (p. 9).

As seen from these statements regarding competencies, both the osteopathic and allopathic medical education establishments recognize the requirement that medical school graduates have information literacy knowledge and skills as essential components of medical education. Each of the competency and standards documents also includes multiple objective statements about information literacy topics and their components.

Deficit identification. One segment of the definition of information literacy is the ability to identify a personal information deficit. The American Association of Colleges of Osteopathic Medicine (2012) lists *Medical Knowledge* as one of 14 general competencies, under which there are several headings. Included under the heading of *Physician Intervention* is the competency to "[r]ecognize the limits of personal medical knowledge" (p. 7). In addition to the EPAs regarding the identification of gaps in personal medical knowledge, the Association of American Medical Colleges (1998) includes the *Educational Premise*, "to utilize biomedical information for: formulating problems; arriving at strategies for solutions" (p. 4). Finally, under the heading of *Roles and Responsibilities*, the new physician needs to "[r]ecognize one's limitations in skills,

knowledge, and abilities" (Interprofessional Education Collaborative Expert Panel, 2011, p. 21). These statements indicate the importance that each governing body places on the need to understand when information is needed to determine the scope and nature of an information problem and the most efficacious way to ameliorate it.

Information location. Locating information to fill a need is a common competency included in the guides and statements of the governing bodies. A section of competencies entitled "Practice-based Learning and Improvement" includes two competencies: "[l]ocate, appraise, and assimilate evidence derived from clinical guidelines" and "[u]tilize web sites, online search engines, PDA-based programs, information services, and journals to locate information related to patients' health needs" (American Association of Colleges of Osteopathic Medicine, 2012, p. 16). These competencies draw a clear connection between effective practice, life-long learning, and information literacy. The Association of American Medical Colleges (1998) includes information retrieval from a variety of sources, including databases, journals, and virtual libraries as part of the competency of becoming a life-long learner (p. 6), and the ability to retrieve patient-specific information from clinical charts and information sources as well as information about a patient's condition or disease from the literature as well as the lab (p. 7). The fact that both organizations include general information and patient-specific information—and delineate between the two—is another indication of their belief that information literacy requires that a physician possess general information literacy as well as the ability to contextualize information to a specific patient.

Critical appraisal. The necessity for a physician to appraise critically the information they find is included frequently in the competencies and guidelines of the

governing bodies of medical education. The Association of American Medical Colleges (1998) states that a competent physician must be able to "[f]ilter, evaluate, and reconcile information" (p. 6), "[m]aintain a healthy skepticism about the quality and validity of all information" (p. 7), and "[a]nalyze, interpret, and report findings" (p. 10). Meanwhile, the American Association of Colleges of Osteopathic Medicine (2012) requires the competent physician be able to "[i]dentify the reliability of medical evidence in medical journal articles and abstracts;" "[a]ssess the value of information and knowledge introduced by the patient during a clinical encounter;" "[i]nterpret features and meaning of different types of data;" "[e]valuate the relevance and validity of clinical research;" and, "[c]ritically evaluate medical information and its sources" (pp. 7-16). This set of information literacy competencies fall under a top-line competency entitled "Evaluation of health sciences literature" (American Association of Colleges of Osteopathic Medicine, 2012, p. 20).

Use of information. After the information is located and appraised, physicians must be able to apply it. This is emphasized by the governing bodies of medical education indicating that the use of information is vital to success as a physician. Whether for patient care, research, or interprofessional communication, physicians must use information to achieve this competency. They need to "apply evidence-based guidelines throughout the scope of practice," "[f]ormulate a management plan based on evaluation of the best evidence from medical literature", and "communicate verbally and in writing with other members of the interprofessional collaborative team" (American Association of Colleges of Osteopathic Medicine, 2012, pp. 7-10). In their *Educational Premise,* the Association of American Medical Colleges (1998) states that physicians

must be adept at “taking action based on findings” (p. 4). They must be capable of “[m]aking decisions based on evidence, when such is available” (p. 7), “[f]ormulate a treatment plan” (p. 8), and “[f]ormulate and make decision for individuals and groups” (p. 11).

The similarity in language and concept from separate medical education and professional entities indicates the commonly-held understandings of the importance of information literacy and its component skills to the education of physicians and the practice of medicine.

Educational Philosophy, Theories, and Models Influencing Medical Education

As is the case in education in general, social constructivism is a foundational philosophy of medical education that supports medical information literacy education (Berger & Luckmann, 1966**)**. It is important to include this philosophy as part of the literature review because it informs the theory and models included in this review.

Social Constructivism. Constructivist theory, referred to as constructivism, is a theory used to explain the way people create meaning of the world through a series of individual and communal constructs. It asserts that individuals seek understanding of the world in which they live and work. Educational constructivism is built on the work of early philosophers, psychologists, such as Dewey (1933, 1944), Kelly (1963), Vygotsky (1978) and others. Social constructivism is an epistemological theory that purports that learning and understanding—in fact reality as a whole—are social in nature, negotiated among people, and lead to a shared understanding of the world. According to McAvoy and Paparozzi (1997), social constructivism exists in contrast to objectivism and fundamentally perceives that reality is not discovered but is literally invented or created

among people, and understanding is achieved directly due to interactions with the environment and the people who are in it.

The necessarily shared construction of knowledge and development of learning makes interactions with others an essential component of the educational process. For example, in explaining the zone of proximal development, Vygotsky (1978) wrote that "[l]earning awakens a variety of internal developmental processes that are able to operate only when the child is interacting with people in his environment and in cooperation with peers" (p. 90). This statement about children can be applied to all learners. The social narrative undertaken between and among individuals leads to a shared creation of knowledge, learning, and meaning. Hein (1999) says that "[c]onstructivist educational theory elevates personal or socially mediated meaning making to a central role in learning" (p. 18). Hein (1991) earlier stated that "[t]here is no knowledge independent of the meaning attributed to experience (constructed) by the learner, or community of learners" (para. 4). Constructing meaning and knowledge is a lynchpin of education. Students' development of their understandings of the world in general and within the praxis of their course of study is the crux of the learning process (Berger & Luckmann, 1966; Vygotsky, 1978).

Constructivism, specifically social constructivism, is a constant negotiation among people and the environment, as Haenen, Schrijnemakers and Stufkins (2003) state: "the creation of a learning environment can be conceived of as a shared problem space" (p. 246) that allows students to be fully-empowered participants in the process of knowledge creation, negotiating its development and meaning. The impetus for learning is puzzlement or question, a gap in a person's knowledge or understanding. There is a

goal, a stimulus for learning, growth, and knowledge acquisition, and it is directly related to some lack of understanding to be mitigated. The knowledge or understanding gained in the constructivist process evolves not only through social negotiation but also through a constant and complex metacognitive process in which people evaluate the viability of their new, shared, constructed understandings (Savery & Duffy, 2001). These ideas based on social constructivism provide a foundational basis for creating and implementing medical information literacy education and makes way for a focus on cognition.

Situated Cognition. Situated cognition is a constructivist theory of learning that provides the theoretical framework for this investigation. It is grounded in the idea that learning, specifically practice learning, most effectively takes place in real-world context (Lave & Wenger, 1991). Not unlike an apprenticeship, a student of a craft can learn the fundamental aspects and skills most effectively by immersion in the field. Through this field-based experience, the aspiring practitioner can become inculcated to the practice modality, the cultural understandings of its professionals, and develop a deep and situated understanding of what it means to be a part of the community of practice.

Social constructivism is perspectival and, as such, needs to be grounded in a pragmatic base that can allow it to be practiced, studied, and applied. One such base is the introduction of a new learner of a craft into the larger professional society in a role not unlike that of an apprentice. According to Honebein (1993), who explains learning is a craft, "[t]he apprenticeship model, with its emphasis on embedding learning in a larger, functional context, is a model which captures the constructivist epistemology of learning and understanding" (p. 88). Apprenticeship is a method of training a new practitioner in which the apprentice learns a craft in real time, with the guidance of a master or

community of masters. The teaching that occurs, much the same as the teaching in osteopathic medical schools, is focused on the apprentice; access to the actual work of the profession is paramount and the apprenticeship is more successful with more access to the actual work. Evaluation is part of the process of participation, and direct feedback is limited, "apprenticeship usually involves no external tests and little praise or blame, progress being visible to the learner and others in the process of the work itself" (Lave, 1991, p. 68). Apprenticeship is situational, set in the course of daily life, and in the common practices of the community. The learning is, therefore, authentic to the task or set of tasks for which the apprentice is being trained.

Wenger (2009) provides a description of learning central to this investigation. He indicates that learning is a social phenomenon that requires authentic participation in an established community. According to Wenger's description, learning is decentralized, not constrained by artificial and fallacious boundaries between human information processing and societal and communal interaction and practice. Lave (1983; 1991) indicated that activity in the community of practice necessarily changes the knowledge base of the practitioner and, through legitimate peripheral participation, professional identity is changed as skills and attitudes are developed. The learning is situated in the community of practice. Through this learning process, new members internalize not only how to perform routine tasks but also what it means to be a member of the community, assuming the professional characteristics and understandings.

Situated cognition and the necessity of context. The necessity to include patient-specific context for effective medical education and future treatment of patients can be addressed through the theory of situated cognition. Lave (1991) asserts that the learning

process as a form of participation in a community of practice is necessarily contextualized for the learner. Didactic classroom learning decontextualizes information, makes it decidedly cognitive, and often removes negotiation and experience from the process. The fundamental understanding of cognitivism is of information as a commodity to be passed along from one person to another and conveyed in one setting and implemented in another. In contrast, Cobb and Bowers (1999) claim that activity is the basis of situated cognition. Participation in a task and the growth and development of knowledge is inherent in that participation. Because situated cognition is a fundamentally interactive and participatory process, the learning that takes place does so because specific activities take place in a particular time and physical location. The situational context is paramount to the learning and inseparable from it. Therefore, context is the learning, and the acquisition of situated cognition is necessarily contextual.

Dreyfus Model of Skill Acquisition. Through a study of professions including airline pilots, chess players, and air traffic controllers, Dreyfus and Dreyfus (1980) developed a model of skill acquisition in which learners go through five stages of performance, from novice to expert, in their professional development. Progressing through the levels of skill requires development through experience in various situations as well as an understanding of the nuances and contexts unique to various instances of the same general work.

Practice in the field over time allows a worker to move along a continuum through the stages of novice, advanced beginner, competence, proficiency, and expertise. Progression through the five stages moves learners from following decontextualized rules to intuitive understanding, from equal relevance placed on all pieces of information to

perception and insight to determine situational relevance and importance; and, from detached observation to involved participation (Dreyfus & Dreyfus, 1980; Dreyfus, 2004). The Dreyfus model explicates assessments for and qualities of learners at each of the levels, as seen in Table 1.

Explanation of each stage of development is necessary for the understanding of the model as a whole. Through an understanding of each stage individually, it is possible for an instructor or educator to determine where students are in their skill acquisition, and to which stage they can next go, as Dreyfus and Dreyfus (1980) claim, "it is essential to identify at each stage what capacities the performer has acquired and which more sophisticated capacity he is then in a position to attain" (p. 6).

Novice. The first stage of the Dreyfus framework is characterized by a reliance on rules, decontextualized sets of instructions which are presented out of the environment in which they will be practiced. Dreyfus and Dreyfus (1980) say "[w]e will call such features, which can be recognized without experience of particular situations in the instructional domain, *non-situational*" (p. 7). Individuals are unable to process changes in situational aspects in order to change the rules or determine which of the rules to follow. All of the rules are equal in importance because the novice does not have the understanding of context or sufficient experience to prioritize or alter them. Novices feel detached from the environment and are utterly dependent on the external rules provided to them.

Advanced beginner. An understanding of the context and nuances of particular situations within the larger environment is the indication of an advanced beginner. When a learner has reached this stage of skill development, the individual can make small

assumptions and decisions about the relevance and application of certain rules. The advanced beginner can process context and ascertain meaning based on aspects of the environment and the situation. The advanced beginner begins to combine the previously-learned rules with situational context and develop a series of *maxims* that are easier to remember and employ than decontextualized rules. As the individual develops more experience, he or she is able to apply the understandings of situation and context and begin to identify similar facets in different iterations. Advanced beginners are not completely independent of the rules; they continue to need reassurance and advice from external sources. Although they are more personally invested, advanced beginners do not yet have complete responsibility for actions.

***Competence*.** Competent individuals can recognize and attach context to a particular iteration of the work. "These situational components, in terms of which a competent student understands his environment, are no longer the context-free features used by the novice" (Dreyfus & Dreyfus, 1980, p. 8). A hallmark of this level is an emotional connection to the work, a sense that they are, in small measure, responsible for the outcomes. As novices and advanced beginners, the individual had a feeling of failure due to an inability to change some external force which controlled the process. However, at the level of competent, the learner has a small stake in the success of the work or learning.

Learners at this level have devised a set of problem-solving tricks and methods to go along with a growing body of experience in order to complete tasks. However, they are still in the process of determining what is important and relevant to a particular situation. Competent practitioners have assimilated many pieces of information,

formulated personal rules, and developed procedures that allow them to attain a desired outcome. The learner must decide the next course of action or process, and the ability to do so is a quality that separates a competent person from earlier stages. A competent practitioner must consciously decide and think, an exhausting and time-consuming process. Competent learners make rule- and maxim-based decisions, but they rely on these rules only when they encounter a situation with which they have no experience.

Proficiency. Proficient performers are emotionally invested in the process and accept the responsibility and pressure derived from making choices. They have a hard time reverting to the detached, emotionless, value-free rule sets of the novice and advanced beginner. Proficient learners attain perspective; they make qualitative decisions about the relative importance of various factors. Proficiency encompasses the ability to intuit importance because individuals at this skill level have collected and internalized a great deal of situational and contextual information. They have moved beyond rule-based theories about a task to act on situated assimilations of experience. This stage marks the beginning development of intuition based on growing experience. Actions or behaviors which were previously successful are triggered by similar circumstances in a different situation. Rules are still in place, and the maxim lists utilized in the competent phase are present at this stage. Decisions are made in a largely detached, objective, self-conscious fashion, and the rules and maxims inform those decisions.

Expert. While a proficient individual can see what needs to be done, he or she must consciously think about how to do it. An expert can rely on a wealth of experience and situational determinations, intuitively seeing how to achieve a desired end. Dreyfus

(2004) says that “thanks to his or her vast repertoire of situational discriminations, . . . sees immediately how to achieve this goal” (p. 180).

Expertise is a continuation of proficiency, a furthering and deepening of the skills and abilities attained earlier. However, the decision-making capacity comes instinctively, organically, and without conscious decision or thought. Expertise is characterized by a situational, contextual response devoid of intentional thought, and is seemingly immediate.

Mastery. Dreyfus and Dreyfus (1980) elucidate *mastery* which, while not a separate level from expertise, is a periodic experience experts can have which goes beyond usual expertise. In an episode of mastery, an expert “can cease to pay conscious attention to his performance and can let all the mental energy previously used in monitoring his performance go into producing almost instantaneously the appropriate perspective and its associated action” (p. 14).

Progression through the five stages, the practitioner’s performance mode, situational perception, and role perception, appear in Table 2.

The Dreyfus Model, Medicine, and Medical Education. Applications of the Dreyfus model in the field of medicine have been tested and described by Benner in her landmark studies *From Novice to Expert* (1982) and *Using the Dreyfus Model of Skill Acquisition to Describe and interpret Skill Acquisition and Clinical Judgment in Nursing Practice and Education* (2004). Following the precepts and components of EBM and describing the development of expertise in nursing, Benner (2004) described a combination of scientific knowledge, technological advances, and clinical reasoning and judgment. She reported that “[g]ood practice requires that the nurse develop skillful

ethical comportment as a practitioner and that the nurse use good clinical judgment informed by scientific evidence and technological development" (p. 189). This research focused on nursing can be used to inform my investigation focused on physician education.

The aspect of clinical reasoning as a lynchpin of good patient care requires the acquisition of skill and experience, hallmarks of an expert nurse who has the ability to view science and technology through the lens of patient-specific context to ascertain the correct diagnosis and treatment. Benner situates the difference between beginner and expert nurses in Aristotle's dichotomy of *techne* and *phronesis.* Techne are quantitative measurements, standards which are decontextualized and applied in a given scenario. Techne measurements in medicine include blood pressure and other vital signs and laboratory test data. On the other hand, phronesis requires acuity to a particular situation, a particular patient, defined by Benner (2004) as "situated actions based on skill, judgment, character, and wisdom" (p. 189).

Schmidt, Norman, and Boshuizen (1990) described the stages of clinical reasoning through which students go as they learn to be physicians. The results of this study indicated that non-expert students rely solely on analytic reasoning, while expert practitioners use non-analytic reasoning, or pattern-based recognition. The model takes learners through four stages which correlate in many ways with the Dreyfus model. The implications of this study for medical education indicate an emphasis on basic science knowledge as a prerequisite for medical practice; the importance of clinical encounters to begin developing experience and creating illness scripts, the creation of which allows student physicians to move from analytical to non-analytical reasoning; and, exposure to

clinical situations and environments which test the learner and encourage the development of higher-order reasoning skills necessary for transition to expertise.

Carraccio et al (2008) apply the Dreyfus model's stages of development from novice to expert specifically in the context of medical education. They incorporate lessons for medical school instructors to support the growth and maturation of students, stating that the purpose of their article is to "establish a framework for the application of the Dreyfus model…to the assessment of students and residents as they learn to practice clinical medicine" (Carraccio et al, 2008, p. 761).

Through the lens of specific application to medical knowledge, practice, and education, the stages of the Dreyfus model of skill acquisition become situated in the practice and education of physicians. Benner's (2004) study summarizes the application of the Dreyfus model to the training of medical personnel by stating that, "recognition of clinical situations moves from abstract textbook accounts of general features to an experience-based response to the situation" (p. 190).

Novice. Novice medical students are rule-based, and they adhere to strict guidelines due to their lack of experience. "The rule-governed behavior of the novice is extremely limited and inflexible (Benner, 2004, p. 191). They lack the ability to contextualize, prioritize, or synthesize multiple pieces of information. Students at this level create causal relationships, such as between the signs and symptoms of a disease with the pathophysiology they have learned in school. Novices are necessarily analytic in their problem-solving. They lack experience, illness scripts to situate patients and diseases, and exposure to clinical situations. Rules learned in decontextualized academic

courses are employed to test those causal networks, and patient interactions are dictated by checklists and sets of didactic guidelines (Schmidt, Norman, & Boshuizen, 1990).

Teaching students in this stage of development requires careful and intentional selection of cases and clinical scenarios based on stability of the patient. Instructors must forecast changes undergone by the patient, as the rules-based understandings of the student are limited and cast, as Benner (2004) says "[t]he student is coached in comparing and matching textbook examples with actual clinical cases" (p. 191). Instructors are most effective at this stage when they teach students to separate the meaningful from the irrelevant and synthesize multiple clinical cases to compare different treatment modalities (Carraccio, Benson, Nixon, & Derstine, 2008).

***Advanced beginner*.** One of the most important qualities that distinguish advanced beginners from novices is the ability to determine the situational relevance of particular rules and information. Their decisions and actions are based on increasing experience and sophistication, the increase of which allows the student "some basis for filtering the relevant aspects of a clinical case from the wealth of information resulting from data-gathering activities" (Carraccio, Benson, Nixon, & Derstine, 2008, p. 764). Nurses at this stage see a multitude of tasks in the clinic, but discern each as equally important (Benner, 2004).

Advanced beginner-level medical students combine analytic and non-analytic reasoning processes because they have begun to accumulate clinical experience and can perform some limited pattern-recognition. As novices, students create concept maps which elucidate causal relationships between signs and symptoms, and pathophysiology. These maps can be organized by advanced beginners and used to explain or express a

specific clinical problem, moving from a concrete concept to a general understanding (Schmidt, Norman, & Boshuizen, 1990). Benner (2004) links the advanced beginner stage to a newly-graduated nurse. In accordance with the Dreyfus model, advanced beginners develop a personal investment in their jobs. As they are graduates and licensed nurses rather than students, they feel a "new level of responsibility and entitlement" (Benner, 2004, p. 191), which carries with it a change in the way they perceive themselves and their roles in the healthcare world. While their evaluation is still detached and largely analytical, they see a larger picture and can apply situativity in some common clinical cases.

Medical educators working with advanced beginners involve clinical cases and scenarios as often as possible to allow the medical students to build their backlogs of illness scripts and increase pattern recognition. Even in hypothetical clinical scenarios, students see patterns emerging, and this phenomenon contributes to their clinical comfort and ability (Carraccio, Benson, Nixon, & Derstine, 2008). Advanced beginners are also willing to take the information provided to them by more experienced colleagues and instructors as solid fact, relying on the experience they lack and equating it with accuracy. They have an intractable belief in those more experienced, and they "have a level of trust in the environment and in the legitimacy of co-worker's knowledge" (Benner, 2004, p. 192). This situation requires educators and mentors to begin imparting on the learners the importance of developing their own knowledge base, building confidence in their limited but growing experience.

Competent. This is the stage of development in which experiential learning is most important. Competent practitioners are no longer students and, thus, are in the world

of medicine, treating patients and operating in the community of practice (Benner, 2004). The more time spent in the community and in the presence of more advanced physicians or nurses, the more of a chance exists to gain experience both in practicing medicine and behaving like a physician. The hallmark of this phase is the beginning of an ability to gauge relevance, contextualize the patient within the scope of practice, and see the big picture through the lens of experience (Carraccio, Benson, Nixon, & Derstine, 2008; Schmidt, Norman, & Boshuizen, 1990). Competent physicians have a larger backlog of clinical experience that allows for a more robust repository of recognizable patterns. Learners in this phase of development vacillate between analytic and non-analytic reasoning structures, as common or simple patient problems allow pattern-recognition to predominate; yet, more complex or uncommon problems cause competent physicians to revert to analytic reasoning.

Educators working with competent-level physicians are in the clinic, treating patients, and it is important to find a balance between supervision and autonomy in order to increase physician buy-in and self-efficacy. Competent physicians must see a myriad of patients with a variety of presentations. Carraccio, Benson, Nixon, and Derstine (2008) state that therefore, "it is critical that the learner see a breadth and depth of patient encounters to be able to construct and store in memory a robust repertoire of illness scripts" (p. 764). Teaching competent physicians as they move along the continuum toward proficiency requires mentoring, and the instructors must work alongside the competent physician-student in the actual community of practice.

Proficient. The crucial differentiating factor between competence and proficiency is the ability to change plans. Carraccio, Benson, Nixon, and Derstine (2008) claim that

proficient physicians have developed a "comfort level in correcting or changing plans in response to an evolving clinical situation" (p. 765). Consequently, proficient physicians can deal effectively with ambiguity. The development of intuition as the chief manifestation of clinical reasoning is another indication of proficiency; the application of illness scripts is both unconscious and rapid, which makes clinical problem-solving seem intuitive. While the proficient physician does not have intuitive response to the variety of clinical problems manifested by an expert, he or she can intuitively grasp nuances of more limited, common cases which they have seen before (Schmidt, Norman, & Boshuizen, 1990). Previous illness scripts are filtered and sorted for relevance to a new situation and contextualized to a specific patient (Benner, 2004).

Teaching proficient physicians requires mentoring by an expert. Proficient physicians have a nascent understanding of the veracity of their intuition, limited as it is, and must "learn to trust his or her intuition for managing a clinical situation, so it is important that the learner not be constantly presented with complex unknowns" (Carraccio, Benson, Nixon, & Derstine, 2008, p. 765). Further, proficient medical practitioners can now synthesize patient information as it evolves over time but must be made to understand that they now possess that skill. Benner (2004) observed that a nurse in this stage often "fails to recognize that her understanding of the patient is now situated" (p. 195).

Expert. Reaching this level of skill and experience requires comfort in the unknown clinical situation, recognition of uncommon patient presentations, and a willingness to apply lessons learned to new and unfamiliar situations. Experts are open to and capable of noticing the unexpected, of working effectively in unknown, uncommon,

or previously unseen patient circumstances. Schmidt, Norman, and Boshuizen (1990) refer to stage four skill acquisition as the implementation of *instance scripts* which are essentially illness scripts intentionally designed to adhere to a specific patient.

Expert physicians employ the wisdom gained from their experiences and translate it to the patient in a unique way, searching not for common threads with previous patients, but with the unique characteristics of a specific patient. Carraccio, Benson, Nixon, and Derstine (2008) write that expertise comes when "thought, feeling, and action align into intuitive problem recognition and intuitive situational responses and management" (p. 763). The emotional connection that underscores expertise requires building relationships with patients, allowing individual, unique context to be applied to patient care. As skill is acquired throughout the developmental continuum, clinicians learn to situate the care to specific needs, not simply through the application of rules-based science. Benner (2004) places learning about the patient as paramount in medicine and the creation of socially-constructed, situationally-relevant relationships at the heart of effective medicine. "Clinician and patient bend and respond to the other so that horizons and world are opened and reconstituted so that new possibilities can emerge" (Benner, 2004, p. 190).

According to Carraccio, Benson, Nixon, and Derstine (2008), teaching an expert must be done by a master who can foster innovation and creativity by setting new goals and guarding against becoming static. "The expert needs ongoing experience and exposure to interesting and complex cases to avoid complacency" (p. 765).

Master. Dreyfus and Dreyfus (1980) describe mastery as a state of practice occasionally entered into by experts. Carraccio, Benson, Nixon, and Derstine (2008)

explicate the importance of self-awareness and self-reflectiveness to a master-level physician. Master physicians are practitioners who engage in metacognition, seeking to learn and improve their skills and patient outcomes. Although she does not include the level of mastery in her studies, Benner (2004) refers to the expert level of skill development as the acquisition and use of "practical wisdom" in which actions and thoughts are innovative, building from past experiences to create new and intuitive processes, and utilizing technical and scientific knowledge along with experience to solve new problems in new ways (p. 196). Carraccio, Benson, Nixon, and Derstine (2008) used the same language to describe mastery, "This stage is characterized by practical wisdom" (p. 765). Masters acquire a larger scope of the nature and effect of medical practice, effortlessly teaching other physicians.

For masters, teaching and learning is an internal mechanism because they are self-regulated and self-motivated for ongoing, life-long learning. They are hyperaware of the cultural and contextual meanings of their practice and situate learning within a larger parameter. Along with their intuitive grasp of the relevance and context of individual patient concerns, masters have developed a deep and abiding sense of right and wrong, a moral compass to their practice of medicine which acts as the intrinsic motivator for their continued learning. Their emotional connection to their practice instills in them a need to continue learning, to continue to enhance their own abilities and skills, and to further employ self-reflection in their learning process (Carraccio, Benson, Nixon, & Derstine, 2008).

Conclusion

Information literacy as a concept has gone through iterations of understanding across disciplines and in the midst of technological advances. Over the last four decades, the basic components have remained the same: identify an information gap; locate and access information to fill that gap; assess the validity of the information found; and, use the information for a purpose. Information literacy began as a name solely for the location of information, but it has grown to go far beyond that initial concept of resource literacy. While some foundational elements have remained stable, recent understandings of information literacy have grown to include contextual and situational nuances. For general information literacy, as well as medical information literacy in particular, teaching the concept and process are goals for educators, both content teacher and librarians. Within the medical and medical education communities, accrediting bodies have placed an emphasis and requirement that students acquire literacy with medical information before they graduate, begin residency, and enter practice.

Viewing information literacy through the lens of situated cognition, a constructivist learning theory grounded in legitimate peripheral participation as a mechanism for learning the skills and culture of the profession, informs the teaching of medical information literacy by medical school library faculty and informatics faculty who are typically professional librarians. Understanding of the Dreyfus model of skill acquisition is also informative for faculty who teach information literacy because it offers insight into characteristics and skill levels of individuals as they progress through the continuum of learning. The development of technical skills and competencies can be applied directly to medical information literacy teaching and learning. Understanding the

importance of these skills and competencies provides necessary background for this research project.

Chapter 3: Methods

The problem that was investigated is that new osteopathic medical students (OMS) tend to view their prior learning about information sources and their uses as all that is necessary in the study and practice of medicine. To complicate this problematic student situation, medical informatics courses and/or library instruction seminars are often inadequate to achieve the goal of information literacy as defined by the ACRL (2015) and articulated in academic standards. This point-of-view by OMS is a misunderstanding that if continued in the program of study will cause students to fail to achieve at a high academic level. OMS first-learned perceptions of access and use of information must be advanced sooner rather than later in the process of learning to provide patient care. In the context of osteopathic medical education, the new OMS must move quickly beyond novice knowledge and skills to an advanced beginner level (Dreyfus & Dreyfus, 1980) of utilization of a new medical information literacy skillset that includes both asking and answering patient-specific questions and using empirical evidence from research to diagnose and treat patient's disease and illness.

The purpose of this investigation was to gather data to expedite and effectively improve universally developing medical information literacy skills instruction. To accomplish this purpose, the investigator considered information literacy instruction taught at colleges of osteopathic medicine (COM) where information literacy instruction is considered by experts in the field of osteopathic medical education to be the best. Through review and analysis of instructional materials and interviews with librarians and non-library faculty members, this investigation reveals how OMS are taught skills to 1) identify when more information is needed; 2) finding information to fill a deficit or gap;

3) critically appraising information situationally and contextually located; and, 4) learning to present, or communicate, evidence-based information in the diagnosis and treatment of patients. These skills are particularly relevant to physicians' roles and responsibilities to gather facts from the patient and published research to determine and treat the root causes of disease and illness. The theory of situated cognition (Lave & Wenger, 1991) and the Dreyfus model of information acquisition (Dreyfus & Dreyfus, 1980) provided the theoretical framework to bind this investigation together and to inform articulation and analysis of interview questions and content analysis. To gain broad understanding of learning and medical information literacy, this investigation was designed to reveal foundational educational philosophies, use of standards to inform creation of courses, publications incorporated in required readings, and learning activities and their assessment of student learning used by librarians and non-library faculty. The investigation also reveals librarian and non-librarian faculty perceptions of students' learning strengths, weaknesses, and needs in achieving outcomes aligned with educational standards of the profession. Findings in this investigation not only have the potential to inform professional understandings of medical information literacy skills relevant to the contemporary information and technology-rich society but are also applicable to all who teach and learn general information literacy skills.

Research Questions

To address the study problem, the central question of the investigation was "In what ways are the principles of situated cognition and the Dreyfus model of information acquisition applied in the teaching of medical information literacy?" Sub-questions included:

1. What is the educational philosophy used by librarians and non-librarian faculty in the creation, development, and implementation of information literacy skills instruction?
2. How do the competencies outlined in standards by the medical profession related to patient-specific context and evidence-based medicine inform desired course learning outcomes in colleges of osteopathic medicine?
3. To what extent is the use of information literacy skills integrated throughout the curriculum of the osteopathic medical school?
4. In what ways are information literacy skills taught beyond use of library resources to include patient-specific context?

Case Study

This investigation of information literacy education in COMs is designed as a qualitative case study that used narrative data from course materials and semi-structured interviews. The case study method was selected for its capacity to investigate, as Fidel (1984) suggests, "phenomena as they occur without any significant intervention from the investigators" (p. 274). Based on Yin's (1993) assertions about case studies, this investigation is appropriately designed to answer questions of why or how; it does not manipulate variables as in a control-variable experiment; and, the OMS context where information literacy instruction takes place is relevant to the phenomenon of information literacy being studied. Further, the case study design is appropriately selected for this study because, as indicated by Feagin, Orum and Sjoberg (1991), case studies are the ideal methodology to use when, as in this investigation, a holistic, in-depth investigation is needed and is the desired outcome.

This case study investigation sought to draw conclusions from findings that can be generalized to the larger osteopathic medical education establishment. Yin's (1984) criteria to achieve generalizability are that a study must adhere to a framework of an established theory. The established theory-base of situated cognition by Lave and Wenger and the Dreyfus model of information acquisition are established theories and serve as the basis for generalization from this study to future studies of information literacy instruction in other medical schools.

This case study investigation focused on medical information literacy as taught in multiple COMs. The schools were selected through the use of an expert panel as a form of purposive sampling (Bryman, 2012; Erlandson et al., 1993). Purposive sampling was an important sampling strategy for this investigation because it maximized opportunities to identify emerging themes that take into account the contextual conditions within osteopathic medical schools that were identified as exemplars in the field. Further, given that OMS can be considered a special population of students, purposive sampling is appropriate according to Wildemuth (2009) who states that "most qualitative research, especially research involving special populations, relies on the use of purposive sampling" (p. 130).

Sampling

Instructional materials including syllabi, assignment instructions, lesson outlines, and other materials, were obtained from as many of the entire population of osteopathic medical schools as possible, excluding Rocky Vista University College of Osteopathic Medicine where I am employed. Participants who were interviewed were identified using an expert panel.

Expert panel. The expert panel was comprised of three individuals who hold academic rank and administrative positions in osteopathic medical schools (Appendix A). These individuals' extensive academic credentials are distinguished by more than 10 years' experience in osteopathic medical education, current leadership or administrative responsibilities, and current responsibility for curriculum development and implementation. Since there were more than three individuals who fit these criteria, I selected three who demonstrated high interest in the topic and had a history at multiple institutions of curricular innovation. In particular, these individuals were experts on this topic given the basis of their education and experiences such as serving as deans, provosts, department chairs, and as practicing professionals in medicine, law, or education. The expert panel had knowledge of education at multiple institutions and provided insight from a large geographic area. After an individual agreed to serve as a member of the expert panel, each was asked, in confidence, to answer the question "What accredited osteopathic medical schools do you consider the best when teaching information literacy skills and library instruction to OMS?"

Each member of this panel had the opportunity to identify all individual COMs he/ she knew to have outstanding efforts in teaching information literacy instruction. A list of recommended individuals and their location was created. Using the list of identified schools, librarians and non-library faculty officially responsible for teaching the information literacy skills, individuals were contacted and invited to participate. This expert panel approach to identification of schools increased the trustworthiness of the investigation and mitigated potential problems associated with researcher bias. This

process continued until a total of seven schools accepted this invitation and were sent an informed consent document (Appendix B).

Data Gathering Procedures

Data for this investigation was gathered in two forms creating a robust picture of the instructional materials and eliciting a thorough discussion of medical information literacy coursework through interviews with librarians and non-library faculty. Invitations to participate (Appendix C) were sent to all COM librarians and non-librarian faculty via email and osteopathic medical librarian listservs.

Instructional materials. A review of instructional materials began with the course syllabus or unit lesson plan, whichever is used at each institution. Course syllabi were first reviewed and summarized based on Bers, Davis, and Taylor's (2000) position that "[w]ell-done syllabi identify learning objectives or expected learning outcomes, enumerate topics or learning activities to be covered, and describe the learning activities in which students will engage. Logical syllabi link these so that they are mutually supportive" (p. 4). The analysis further considered the alignment of course learning outcomes and objectives to the medical school's vision and mission statements as well as to Council on Osteopathic College Accreditation (COCA) standards. In addition to the syllabus or unit lesson plan, any other instructional materials such as supplemental documents with details about learning activities, assignment instructions, and assessments and grading criteria were included in the analysis of instructional materials. Ultimately, any document identified as instructional materials by the librarian or non-librarian faculty who teach information literacy skills was included, with the exception of materials which duplicated or were identical, in which cases one document only was

analyzed. The intent was to collect materials and cross-differentiate them according to faculty size, student contact hours, number of required courses, or other categories to be determined by the available data.

Semi-structured interviews. The second data source was generated through conducting semi-structured interviews (Appendix D) with the librarians and non-library faculty who develop and teach the information literacy content. According to Galletta (2013), the semi-structured interview:

> creates openings for a narrative to unfold, while also including questions informed by theory. It also leaves a space through which you might explore with participants the contextual influences evident in the narratives but not always narrated as such" (pp. 4-5).

The semi-structured interview format frames initial questions and allows for new, or follow-up questions, to be posed by the researcher to further pursue a line of information, clarify a salient point, or delve further into a concept elicited by a previous answer. The semi-structured interview process allowed space for the librarians and non-library faculty to expound, situate, contextualize, and delve into the questions and follow-up questions generated from previous responses that improved the quality of the data set and the ability to extract richer meaning from the interview data. The interview transcriptions were sent to each participant as a member check (Creswell, 1998) to ensure the accuracy of statements.

To further ensure reliability of the data derived from semi-structured interviews, a field journal was created and notes were kept during the interviews. The use of a field journal helped include the researcher's thoughts and impressions of the nuance and non-

verbal communication of the interview subject, allowing further contextualization to take place during data analysis. They are, as Clifford (1990) says, "a turning away from dialogue and observation toward a separate piece of writing, a place for reflection, analysis, and interpretation (p. 52), and they contribute to the overall impression derived by the researcher of the subject (Tuckett, 2005).

Care of data. All materials and/or information provided were stored in a safe and private location, were kept confidential, were destroyed at the conclusion of this investigation, and names of individuals, course titles, and/or institutions were not used.

Data Analysis Procedures

The instructional materials and the interview narrative data were analyzed separately using the same content analysis procedures. Although the instructional materials and the interview data are the only two distinctly different data sources, they provided multiple perceptions of the teaching and learning currently taking place in osteopathic medical schools allowing for triangulation of data, which Stake (2000) defines as "a process using multiple perceptions to clarify meaning, verifying the repeatability of an observation or interpretation" (p. 443). Two elements of triangulation as explained by Denzin (1978), were employed: data triangulation and methodological triangulation. Data triangulation is combining data from multiple sources, which was accomplished in this investigation by collecting data from multiple osteopathic medical schools. Methodological triangulation is combining data gathered via multiple forms, and was achieved by amassing narrative raw data from syllabi and other instructional materials as well as from interviews. The use of these multiple methods to triangulate

data together with the use of an expert panel increased the trustworthiness of the conclusions and served to eliminate research bias.

The content analysis used in this investigation was comparable to the constant comparative method (Glaser & Strauss, 1967; Lincoln & Guba, 1985), the most common method for analyzing qualitative data. Krippendorff (2012) defines content analysis as "a research technique for making replicable and valid inferences from data to their context" (p. 18). In addition, Hsieh and Shannon (2005) define qualitative content analysis as "a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (p. 1278). Altheide (1996) also emphasized in a description of content analysis that the objective of qualitative content analysis is "to capture the meanings, emphasis, and themes of messages" (p. 33). Content analysis has become a widely accepted approach to analytic, inductive reasoning to make sense of data. Recently, content analysis has become a method used with frequency in social sciences in general, and in library and information science in particular (Spurgin & Wildemuth, 2008; Zheng & Wildemuth, 2008).

The content analysis, including instructional materials and recorded and transcribed interview data, began with initial coding and proceeded through a series of 11-steps, an integrated approach to analysis adapted from the work of Krathwohl (1998) as follows. It is important to note that each data source was analyzed separately and then reviewed, determining the presence or absence of common categories and/or themes. This structured process was modified as needed to reflect the data collected.

1. Read (scanned) the raw data to get a sense of what is there. Read and re-read raw data looking for patterns. Looked for repetitions and relationships and

noted them in the margins. This helped to devise codes. A codebook for this investigation was created using Microsoft Excel 2010. The initial categories used the sub-questions, Dreyfus levels and terms of differentiation between levels as well as pertinent vocabulary from the EPAs and accreditation documents.

2. Separated the narrative data by research question number.
3. Read only the raw data. This time, identified significant parts and made margin notes. This separated actual responses from unrelated "talk." At this step, identified emerging and recurring themes and categories of responses while simultaneously establishing categorization rules.
4. Made a tentative list of themes and/or categories that emerged from the raw data. Gave each category a code number.
5. Sorted (and coded) each interview response and instructional material narrative into its appropriate category. Used the actual words. Did not omit any responses. Counted the number of responses.
6. Reviewed the results looking for overlap and redundancy, especially for whether the codes reflected what was important about the data. Still further refined and revised the codes, especially category titles, so that they fit.
7. Organized the codes in a graphic. This enabled researcher to see the relationship of one variable to another.
8. Selected two or three instances of verbatim narrative from the data for each of the codes. Wrote a definition of the code; delineated what fell under the code title. This definition showed its generality and helped to define the boundaries

of what was included. Constructing definitions helped to reveal other relationships among the codes and the necessity for further refinement and revision of the structure.

9. Wrote statements describing what could best be drawn from the data generalities, general perceptions or perspectives, typologies of individuals, actions, situations, central actions or events, processes, strategies, interactions, etc.
10. Selected from the data model examples of each of the generalities, typologies, and so forth.
    a. Looked for data providing counter examples of this generalization.
    b. Determined if the generalization would lead to certain expectations and saw if those expectations were supported by the data.
    c. If they were supported, determined if it could be revised so as to fit both the new implications and the original data from which it was derived.
    d. Repeated steps *b* and *c* to see if support could be found for the revised generalization.
    e. Reviewed the case that can be made for the generalization and assembled the data that bears on it, pro and con.
    f. Proceeded with a similar set of steps for any other generalizations that could be inferred from the data.
11. If seeking to construct descriptive typologies, assembled the best examples and described the common features.

A qualitative content analysis of the raw data derived from the course materials and semi-structured interviews allow for a direct connection between the data and the research questions stated above in this chapter. Making inferences about philosophical underpinnings, the relation to the competency standards, the intentional integration into the larger curriculum of medical education, and the depth of information literacy inherent in the courses, was a product of this type of content analysis and, as such, provided answers relating to the questions asked.

A direct qualitative content analysis provided for the categories and codes in the codebook to be derived from the pre-determined questions and epistemological foundations of the goals of the investigation. Secondary categories and codes were added to the codebook as themes and consistencies that were drawn from the data.

The Researcher

It is important to note that this research was influenced by my education and experience. I am a medical librarian who holds faculty status and serves as the Director of an academic program at an osteopathic medical school. I have taught medical informatics and worked in the medical school library since 2008, interacting with many faculty colleagues, students, and the wider professional community of osteopathic medical educators through the American Association of Colleges of Osteopathic Medicine and the Medical Library Association.

Limitations

Every effort was made to obtain instructional materials from all 32 potential COMs. Limiting the investigation is the fact that the librarians and non-library faculty teachers of medical information literacy vary in their length of experience in teaching

OMS. This investigation was a snapshot rather than a longitudinal study indicating what some COMs are doing currently, rather than a historic or future-looking investigation of information literacy education. The investigation provided the basis for additional data collected in the future from COMs.

CHAPTER 4: FINDINGS

This chapter provides the data gathered from the direct qualitative content analysis, the syllabi and other learning materials submitted by osteopathic medical school librarians, and transcripts from the semi-structured interviews with the librarian participants. All data were supplied by participants representing COMs that the expert panel, described in Chapter Three, reported as being exemplars in information literacy, or informatics programs in osteopathic medical education. Following an overview of participants, analysis of data included themes from the interview and materials data. While maintaining anonymity for participants, demographic information about the participating schools is included in this chapter. Also included is basic quantitative data from the materials and transcripts. The code definitions and codebook used in the data analysis are included as Appendices E-H.

Participants

The participants in the semi-structured interviews were 13 librarians from seven colleges of osteopathic medicine (COMs) identified by the expert panel as educational exemplars in teaching information literacy. The demographic data (Table 3) indicate that three schools (3/7, 43%) are a single campus while four (4/7, 57%) are multi-campus (more than one location) colleges. Interviews at three colleges (3/7, 43%) were by 3-person interview teams, and four (4/7, 57%) were by a single participant. Additional demographic information appears in Table 4, including information about the college, geographical region, and first-year class size that is presented as a range to ensure anonymity.

Themes that Emerged from Interviews

Recorded interviews ranged in length from 35:30 min to 53:48 min, totaling 319:34 min. The transcribed interviews totaled 72 pages and words, phrases, or ideas that constitute 175 units of analysis. Following the steps outlined in the Chapter Three, I conducted a qualitative content analysis of the transcriptions, which revealed seven themes that answer the investigation questions. Within each thematic category (Table 8), there were several responses from multiple institutions that contribute to the theme and its categorization. The themes that emerged from the data are listed below along with the word count of many of the operative terms, phrases, words, or concepts that produced the understanding of the theme.

Evidence-based medicine (in codebook as EBM, Table 11). Throughout the interviews, the participants frequently mentioned evidence-based medicine (EBM). As previously discussed in Chapter Two, EBM is a major focus of medical education. The ubiquity with which it was discussed is evidence of its importance. Table 11 shows the frequency of occurrence for words and phrases referring to EBM in the interviews. No concept was more prevalent than EBM, along with its components and processes. The word *Evidence* was used 117 times, *evidence-based* was used 66, and *EBM* was used 20 times. EBM explicates a five-step process, called the five A's: Ask, Acquire, Appraise, Apply, Assess. Each of these is a step in EBM and, combined, they were mentioned 123 times. A common form of clinical question formation in EBM is a *PICO question*. PICO is an acronym for *Patient, Intervention, Comparison, Outcome*, which are the components of a well-formed clinical question. PICO was mentioned 28 times.

Clinical questions as they were taught to OMS were separated into background and foreground questions depending on the objective of the question and the point at

which the questions are asked. *Background* and *foreground* questions were mentioned in the interviews 16 times. EBM divides types of research into a pyramid based on the reliability and power of the methodology. Double-blinded, randomized controlled trials with control and experimental groups are at the top of the pyramid; single-instance case studies are at the bottom. *Evidence pyramids* were mentioned six times in the interviews.

Resource versus information literacy (in codebook as RIL, Table 12). This theme was discussed by the participants in terms of databases, information literacy as a concept, and library instruction. Another theme that emerged from the interviews was about instruction by the librarians based either in resources or in the larger context of information literacy skills. Instruction based in resource literacy skills and instruction based in information literacy skills, was discussed in Chapter Two, pointing out how these two approaches differ.

Databases. Databases were mentioned in the interviews 30 times. The term *databases* is used interchangeably as a general use of the word *database,* or specifically to note medical databases including *Up-To-Date, Dynamed Plus, Clinical Key, Visual DX, Google and Google Scholar, clinicaltrials.gov,* and other databases. *Pubmed*, mentioned 27 times in the interviews, is the largest collection of medical journal articles and article citations in the world. It is government-supported and freely available. *MeSH*, or *medical subject headings*, mentioned 11 times, is a controlled vocabulary created for Pubmed by the National Library of Medicine (NLM) and is the authoritative list of terms and phrases for keyword searching used for many databases. In the interviews, the participants discussed smart-device-based applications, or apps, 11 times, specifically as

they pertained to clinical apps that combine multiple databases and institutional library databases.

Information literacy as a concept. Information literacy was discussed by the participants as an approach, or process, taught to OMS, often with the implication that becoming information literate is the goal of medical information education. As a base concept, *information literacy* was discussed 13 times, and the word *informatics* was stated 29 times.

Library instruction. Whether as teaching resources available through the library or as specific content used in teaching interventions for OMS, *library instruction*, mentioned 15 times, was discussed in the interviews. Words used in the interviews to describe or componentize library instruction were *library website or webpage* (6), *search* (22), and *resources* in the context of library resources (45).

Life-long learning (in the codebook as LLL, Table 13). This theme was discussed by the participants in terms of pedagogical discussions and on-going skill, knowledge, and attitude development. The third theme that emerged was life-long learning. The data revealed that information literacy is perceived by the participants as a skill that will serve the OMS throughout their careers, and a process that they will continue to hone, refine, and personalize through experience and expertise. Thus, discussions of the importance of information literacy as a life-long learning skill pervaded the interviews, both as a mechanism of pedagogy and as a basis of on-going development.

Pedagogical discussions. Syllabi, learning outcomes, and objectives created by participants for teaching information literacy as a skill progression, or process, were

common in the interviews. Participants mentioned *syllabus* or *syllabi* 13 times and *learning objectives* or *learning outcomes* 28 times, which is an indication that some COM librarians place a high priority making sound decisions about instruction.

On-going skill, knowledge, and attitude development. Because information literacy is a process for OMS that must be built and grown, a discussion of the learning that continues into the clinical years of a student's education (usually third and fourth years) was present in the interviews. Phrases that connote OMS' clinical education such as *third year, fourth year, clinical rotations, clinical years,* and *clinical questions* are stated by participants 32 times in the interviews. Further, *information literacy* or *information literate* were stated 15 times specifically as a concept, or learning mechanism, and not related to accreditation, standards, or competencies.

Dreyfus model and social constructivism (in the codebook as DSC, Table 14). This theme was discussed by participants in terms of progressive development and concepts of the theories. The Dreyfus model, a social constructivist philosophy, which describes how people learn and develop knowledge through socially-constructed experiences, was one of the theoretical foundations selected for this investigation. Through the interviews, it was revealed that many of the participants utilize the precepts of the Dreyfus model and social construction, without naming or using the language of the model. In the interviews I identified phrases and words that implied the Dreyfus concepts.

Dreyfus terms. The levels of the Dreyfus model, including *novice, advanced beginner, competent, proficient, and expert* are not stated at all in the interviews in that context. Participants did use the word *competent* 20 times in the interviews and *expert* 14

times in various contexts particularly while discussing accreditation standards and the benefit of themselves as instructors.

Progressive development. According to Dreyfus (1980), one of the hallmarks of novice students is their need for worksheets and checklists, as they have yet to acquire the expertise or sophistication to break the rules. The participants in the interviews mentioned *worksheet* and *checklist* 9 times in this context. One of the participants, without naming the Dreyfus model, discussed at length the information literacy education provided to the OMS by describing it as *longitudinal*, taking place throughout the four years of medical school. In total, the word *longitudinal* was said three times by different participants in the interviews.

Concepts of the theories. The Dreyfus model places a tremendous amount of importance on context and meaning. Communication between physicians and patients is an example of socially-constructed context for learning. *Context* is mentioned 11 times, *circumstance* is stated two times, and *situation* seven times, all related to physician and patient situations, either real or simulated.

Standards and guidelines (in the codebook as SAG, Table 15). This theme was discussed by the participants in terms of general standards and programmatic or osteopathic standards. Much of what is taught in COMs in general, and in their libraries and information literacy instruction, is dictated by accreditation standards and guidelines, externally-derived competencies, and outcomes. In Chapter Two, the various accrediting bodies, standards, and EPAs were discussed and defined. From the regularity of their mention, accrediting bodies and guidelines are a significant factor in curricular design.

General. In the interviews, the participants discussed institutional accreditation as a general concept, or in the context of larger, institutional accreditation. In the interviews, participants said the words *accredit* or *accreditation* 25 times. Additionally, *competency* or a variant on that word, such as *competent*, or *competencies* used in relation to a set of guidelines derived from an external body such as American Association of Colleges of Osteopathic Medicine (discussed by the participants as *AACOM*), were said 18 times in the interviews.

Programmatic, osteopathic. The participants discussed professional standards and guidelines specific to osteopathic medical education. The Commission on Osteopathic College Accreditation (discussed by the participants as *COCA*) was mentioned 13 times. The Entrustable Professional Activities, a set of competencies required of medical students before entering residency programs (discussed by the participants as *EPAs),* were stated 30 times. This includes uses of the word e*ntrustable*, and *EPA 7*, which relates directly to EBM.

Outreach and collegiality (in codebook as OUT, Table 16). This theme was discussed by the participants in terms of teaching with other faculty and courses in which librarians teach. One of the major themes in the interviews was the way in which information literacy education is currently embedded in the COM curricula. This theme that emerged was named as it is to convey the idea I learned through the interviews that outreach extends both from librarians to faculty and to librarians from faculty. Whether as a stand-alone course or woven into the content of other courses, librarians reported in the interviews that they taught students in a variety of ways. The participants mentioned an on-going discussion in osteopathic medical education regarding whether professional

librarians (with an MLIS) should hold the rank of faculty. The data from the interviews revealed that librarians collaborated with other faculty members on course content, taught sessions in both biomedical and clinical science courses regularly, established partnerships, and participated in team-based teaching cohorts.

Teaching with other faculty. In the interviews, participants described establishing relationships with other teaching faculty in their institutions and some of the ways in which they become partners with their colleagues. *Partner* or *partnership* were used by two participants implying creating teaching relationships, and *colleague* was used four times in the same context. In terms of being faculty and teaching with colleagues (e.g., instructors and professors), participants used the word *faculty* 103 times. Getting more specific as to the roles of the partners and colleagues, in the interviews, *clinician* was stated 11 times and *basic science* or *scientist,* or *Ph.D.* mentioned 24 times to describe the department or expertise of the faculty peer.

Courses in which librarians teach. I learned in the interviews that librarians teach within a wide range of courses. During the interviews, participants mentioned that they teach in other courses 48 times. They specifically mentioned the following as courses in which they have co-taught with other faculty: *anatomy, physiology, pharmacology, microbiology, cell biology, immunology, biochemistry, clinical medicine courses including clinical skills and principles of clinical medicine, osteopathic manipulative medicine, respiratory, cardiac*, and *gastro-intestinal*. The interviews yielded seven mentions of *systems,* or *systems courses,* as a generalized description of courses in which they teach. The words *curriculum* or *curricular* were stated 13 times as relating to teaching in courses with other professors and faculty.

Patient versus population (coded as PVP, Table 17). This theme was discussed by the participants in terms of patient-centeredness, and population-centeredness. In EBM, there is an on-going debate about the efficacy of individual patient context as opposed to population studies or generalized standards of care. This is the final theme that emerged from the interview data. Many of the participants mentioned that their roles were to explicate the general literature and leave the specifics of a given, individual patient to a clinician to teach.

Patient-centered. The word *patient* was mentioned in the interviews 104 times, with meanings relating to evidence of treatment protocols, diagnostic procedures, and prognosis. In contrast to speaking about patients in general, specifically patient-centered concepts such as *patient-centered, patient context, values, preferences, circumstances* were only said five times in the interviews.

Population-centered. In the interviews, the participants discussed generalized methods for using epidemiological or population-based medical or scientific resources and analyses. Interviews included the word *statistic* in some of its forms 49 times. The participants used the word *population* 10 times and *epidemiology* 10 times in the interviews.

Summary of Interview Data

The seven recurring themes that emerged from the interview transcriptions provided indications of the mindset and practices of the participants as librarians in COMs. The sub-categories for each of these themes revealed details uncovered through the interviews that go beyond day-to-day observations. I presented data in tables to make

clear details in the research questions. I used the same content analysis procedure in analyzing interview data used in the analysis of materials data.

The materials data, which included several typologies of material, elicited a different set of themes and provided a different perspective for the construction of this investigation. The materials data presented a wider breadth of data than the interviews, ranging from lectures and handouts as prosaic as descriptions of physical location of the library and where to find the restrooms, to ones as aspirational as the mission of the library education and the desired effect on the larger community in which students will practice. I grouped the materials data in five typologies and additional themes emerged.

Typologies of Materials Data

The collected materials data (Table 6) included a variety of teaching materials contributed by librarians and information literacy faculty from 27 COMs and from all geographic regions of the U.S. (Figure 1). These data were arranged for analysis into five typologies: (1) lecture notes and slideshows, (2) handouts, (3) syllabi, (4) worksheets, and (5) assignments.

Lecture notes and slideshows. These materials included the slides used in a lecture format for students and the outlines and/or scripts created by the participants to use during the lecture. In this context, lecture is meant to include any formal teaching session including interactive sessions that do not conform to traditional lecture formats but are delivered either to a full class of OMS or some subgroup of them, including special interest groups, tracks, sections, or groups.

Handouts. These are materials designed by participants and given to students as a physical or electronic piece of information. Handouts, supplemental to the required

course materials, included lists of resources available through the library; descriptions of resources and appropriate uses of them; reminders and primers for information literacy procedures or processes; processes for accessing resources, websites, and databases; reviews of information seeking experiences; and guidelines for information literacy activities.

Syllabi. This group of materials included both traditional course syllabi meant to describe the procedures, expectations, objectives, and activities that will occur in a course and learning activities outlining an individual instructional intervention within a larger course. The syllabi usually included course and session objectives and student learning outcomes based on either the larger course in which they are situated or the principles of the stand-alone information literacy course.

Worksheets. This set of data included outlines, or forms, given to students and designed to be completed to augment or assist learning. This category differed from assignments in that worksheets were not designed to be turned in, assessed, or to generate feedback from an instructor. The worksheets assisted with EBM topics and included specific components of the EBM process, including critical appraisal of the literature and the application of information to a specific, simulated patient or population situation.

Assignments. These data included activities to be completed by students and submitted to the session instructors for summative or formative assessment, with some rubrics provided. The majority of the assignments in this category included evaluations aligned with learning objectives from the syllabi. The assignments were designed to be clinically relevant and include simulated clinical scenarios, which form the foundation of the assignment.

Categories of Materials Data

There were seven categories (Table 10) of purposes of the materials, each distributed among the typologies: operational overviews; course overviews; EBM topics; in-or-out of class activities; resource literacy; course reviews; and, objectives, mission, and learning documents.

Operational overviews (in codebook as OO). This category included discussions of the physical location of the library, library holdings and resources, library rules and guidelines, and accessing library resources and websites. These materials were designed to orient students to the library and acquaint them with the sorts of resources and assets they can find or access. Operational overviews were present in three lectures, three handouts, and one assignment.

Course overviews (in codebook as CO). This category included materials previewing and giving general and broad-themed expectations and processes of courses of information literacy. Additionally, they provided baseline definitions of terms and ideas including *informatics, medical informatics,* and *information literacy*. Course overviews were present in two lectures and two syllabi.

EBM topics (in codebook as EBM). These materials were designed to augment and develop the EBM skills taught in class. They enhanced student learning by providing activities to display knowledge gained, opportunities to apply lessons learned, or to serve as reminders of EBM processes. Most often, these materials reinforced critical appraisal and information location, the Assess and Acquire steps of EBM. This is the only category included in all five typologies of materials data. EBM topics were present in seven lectures, seven handouts, 10 syllabi, three worksheets, and 18 assignments.

In-or-out of class activities (in codebook as AA). This category included work to be completed either in class or out of class that may include a basis for a formative or summative assessment. They included foundational reading assignments, which were assessed through a secondary means, and clinical scenarios and vignettes to which skills must be applied. In-and-out of class activities were included in four lectures, nine syllabi, three worksheets, and 21 assignments.

Resource literacy (in codebook as RIL). This category included materials that provided students with general overviews of databases, overviews of specific databases available to the students through their library, and assignments for extending learning of MeSH terms. These materials were most often reviews, assignments, and discussions of library holdings that are designed to impart skills to students, not simply provide a list as with the operational overviews. Resource literacy materials were included in 11 lectures, three handouts, seven syllabi, and six assignments.

Course reviews (in codebook as CR). There was only one course review in the materials data. This document reviewed the learning for multiple sessions prior to a course evaluation and focus group to discuss concepts learned by the OMS. The course review was included in one lecture.

Objectives, mission, learning documents (in codebook as OML). Objectives, missions, and learning documents were included in three lectures, 16 syllabi, and four assignments. This category included statements of purpose in various forms that conveyed general reasons for the existence, importance, and value of information literacy education. The OMLs were meant to acquaint the students with motives for including this

subject matter in the curriculum. These materials included statements designed to be aspirational and grounded in specific purposes.

Chapter Summary

Upon collection and analysis of the interview and materials data, themes and categories emerged that shed light on the thought process and ideas utilized in the creation of information literacy instruction. Taken together, these interviews and materials present a picture of various strategies that expedite, develop, and improve medical information literacy instruction in COMs. Participants' interview responses and course materials gave some indication as to their mindset, priorities, values, and mission in the development of their teaching and enabled the construction of narratives and development of discussions that pertained to the central and sub-questions of this investigation and are discussed in Chapter Five.

Chapter 5: Conclusions, Discussion, and Future Directions

The purpose of this investigation was to gather data to expedite and improve universally developing medical information literacy skills instruction. To accomplish this purpose, the investigator researched information literacy instruction taught at colleges of osteopathic medicine (COM) where information literacy instruction was considered by experts in the field of osteopathic medical education to be exemplary. Through a qualitative content analysis (Hsieh & Shannon, 2005) of syllabi and other course materials used in the teaching of students, and semi-structured interviews with librarians who teach the programs noted as exemplars by an expert panel of osteopathic medical educators, data were collected and analyzed, providing insight into the central research question and the sub-questions. This study design made possible initial close analysis of materials and the insights of the librarians that could not have been ascertained from other methodologies. Additionally, the data served to coalesce themes that spanned multiple sub-questions within the larger paradigm of information literacy instruction. These themes are presented in this chapter as responses to the central question of the investigation that is "In what ways are the principles of situated cognition and the Dreyfus model of information acquisition applied in the teaching of medical information literacy?" Sub-questions include:

1. What is the educational philosophy used by librarians and non-librarian faculty in the creation, development, and implementation of information literacy skill instruction?

2. How do competencies outlined in standards by the medical profession related to patient-specific context and evidence-based medicine inform desired course learning outcomes in colleges of osteopathic medicine?
3. To what extent is the use of information literacy skills integrated throughout the curriculum of the osteopathic medical school?
4. In what ways are information literacy skills taught beyond use of library resources to include patient-specific context?

Central Question Answered

In answer to the investigation's central question, I found that the requirement of OMS to shadow clinicians and interactive information seeking between OMS and COM librarians, the principles of situated cognition (Lave and Wenger, 1991) and the Dreyfus model (Dreyfus, 1980) were applied through longitudinal information literacy instruction and iterative development of information literacy skills, knowledge, and attitudes. My answer to this central question is detailed throughout the following discussion of the sub-questions. It should be noted that participants discussed both physician shadowing and clinical rotations, and I analyzed both as iterative applications of legitimate peripheral participation.

Sub-question One: Philosophical Foundation for Teaching Information Literacy

The first sub-question was answered in the analysis of interviews and materials. It is clear from the analysis that the COM librarians, as teachers of information literacy to OMS, have a constructivist philosophy of education. While they did not specifically use this terminology to describe their philosophy, some created and delivered instruction that was focused on the student as a learner and co-creator of knowledge that is anchored in

the authentic way it will be used in medical practice. However, some COM librarians appeared to lack opportunities to engage with students and other faculty to the extent necessary to become fully involved in authentic instruction. An example of lack of opportunity is in the statement by a participant who said:

> I have no permanent teaching role in (name of school removed) but we do teach when we're asked to, you know, like at orientation or sometimes the hospital wants me to come over… and they give me like, 30 minutes to talk to them and telling them about the services we can provide for them.

This situation, while present in several COMs, was not the norm in all COMs, as many COM librarians are deeply embedded in authentic information literacy instruction focused on topics and problems experienced by patients.

Constructivist philosophy of participants' is evidenced in their uses of technology. The investigated materials and interviews revealed that these librarians were teaching information literacy as multi-dimensional skills in a technologically modern information world. An example was one COM that worked with students through a grant-funded project to develop an electronic application (app) for smart devices that aggregated multiple sources of information that can be used by the students in their clinical education at the patient's bedside. Given today's emphasis on direct patient care, missing from the data were specific and obvious discussions of OMS' contributing to the expanding body of medical literature, which is an area for expansion of information literacy education.

According to the data, the philosophical views of COM librarians did not appear to be formed around learning theories such as the Dreyfus model (Dreyfus, 1980) or situated cognition (Lave & Wenger, 1991) but appeared through a lens focused on

medicine and medical education, particularly theory and models related to EBM. Using the interview transcripts and syllabi, I organized responses into six motifs discussed below: educational principles; making better physicians; understanding the literature; evidence-based medicine; patient-centeredness; and critical thinking and thinking like a physician.

1.1 Educational principles. The materials and interview data reflected a longitudinal approach, as well as one that was grounded in gaining experience and expertise, which was described by the participants and present in their materials. I interpreted their approaches as consistent with Dreyfus' (1980) view that development of understandings required long-term exposure to content and skill instruction. Medical education is of a fixed time, usually four years of study before graduation and residency, so a longitudinal experience is of a finite duration, but the goal exists to extend the learning and skill development of information over the entire course of study. One participant said, "We have these different longitudinal threads across the curriculum, the four years…the abbreviation OPC which is osteopathic patient care." According to the Dreyfus model, one of the hallmarks of a students' passage from a *novice* to an *advanced beginner* is the ability and willingness to go away from prescribed checklists and worksheets, to deviate from a script or rote process. Multiple interviews included the stated idea of students learning when to break away from checklists and rules and substitute their own growing expertise.

1.2 Making better doctors. Participants revealed their underlying philosophy through materials and interviews that anchored their lessons in a desire to teach the OMS what they need to know in order to be better physicians. The goal to make better doctors

was a powerful statement of the relevance and role of medical information literacy courses. Far from being auxiliary to the education of the OMS, these courses constitute an important part of it. Librarians' desire to participate in the development of excellent physicians could have personal repercussions. Multiple research participants stated that they themselves are the eventual patients of today's medical students. As one participant said, "And they're going to have some questions that they need answered before they can treat me" Another direct quote from a participant regarding this motif was from a librarian who said, "Making a better physician is what I feel is sort of the one sentence thing that I'm helping with."

1.3 Understanding the literature. The interviews and the syllabi contained many references to the ever-growing body of medical literature in the form of journals, textbooks, databases, and many others, as informing the creation of instructional strategies. Whether the reference was to OMS' developing an appreciation for, knowing the importance of, or understanding the various types of literature, discussions of the body of published medical information were a fundamental component of the development of information literacy teaching for many librarians. One participant stated:

> We're not expecting the end result to be like…in depth researchers, but just, you know, good judges of information sources and good consumers of literature, like have an appreciation for it. And so it really does go back to the information literacy idea, I think, in our philosophy of what we're trying to accomplish.

This quote from a participant captured the ideal of several others who contributed information.

1.4 Evidence-based medicine. All of the syllabi and interviews, as well as many of the lectures, indicated that EBM is a foundational element in participants' lesson planning, course developing, and philosophical approach to teaching information literacy. Throughout the interviews, EBM was named as the basis for teaching, as one participant said, "and the way we teach information literacy is through evidence-based medicine." EBM was also cited as the underlying philosophy through course objectives, as one school included in their course syllabus, "Students will identify levels of evidence in the decision-making process and demonstrate basic clinical reasoning used in evidence based practice." In addition to naming EBM, the components were also employed as the philosophy, "My third lecture is called Finding and Evaluating Medical Information, and that is probably the base for the whole information literacy piece of my course." While EBM is not an educational or epistemological theory per se, according to the data it was clearly a widely-used and commonly-accepted lens, as I described it in Chapter Two as a problem-solving approach to the delivery of healthcare, through which librarians design and implement their information literacy teaching for OMS. This view lead to the premise that EBM, when provided in a context of caring, leads to the best clinical decision-making and patient care.

1.5 Patient-centeredness. Many of the participants considered the most important factor for their teaching to be the patients who will ultimately be treated by the OMS. Some deemed patient care as a grounding for their teaching, including one participant who said:

> if we don't give our students tools and the knowledge to be able to find the most current most accurate evidence-based information to treat their patients, we are not educators.

Another addressed doctor-patient communication as a fundamental piece of information literacy, "to be able to explain it to somebody else, and involve the patient in the decision-making process based on the evidence." Further, another participant said, "I like to think that we help them locate it and recognize if it's applicable…and then translate it to the patient." The data suggested that when librarians and non-librarian faculty assemble information literacy teaching, they often looked to the result of medical education—patient care—as the foundation of the OMS' educational experience.

1.6 Critical thinking, thinking like a physician. Teaching students to be professional physicians requires that the OMS acquire the ability to think like a physician and to be prepared to take their place in the professional community. The principles of situated cognition (Lave & Wenger, 1991) were evident in assigned experience of observing physicians in order to develop an understanding of how to act and how to practice. Teaching the critical thinking skills of information literacy as used by physicians in practice is something that librarians in COMs value as an essential element of OM'S shadowing experiences. Learning to think critically, like a physician, was an area that will translate to OMS' ability to be physicians, as one participant said, "and what we're trying to do is tie this critical reasoning more closely into the decision-making." Developing critical thinking skills was connected with another of the motifs of this sub-question, regarding the Dreyfus level (1980), as critical thinking skills are essential for OMS to move along the continuum. Finally, the connection between critical

thinking and the job of practicing medicine was clearly articulated by one of the participants who said:

> So the, I think, I hope, I'm probably going to say the largest level…is the development of critical thought in the idea of, I want to push them to think about what it means to be a physician.

There was much to indicate in the data that the philosophical foundations of information literacy education at COMs is grounded in constructivist views of teaching and learning.

Sub-question Two: Competencies and Accreditation Standards

The accreditation guidelines and standards, and competencies developed by the profession of osteopathic medicine, were strong components for determining the content and method of delivery of coursework in osteopathic medical education, including information literacy. The second sub-question of this investigation addresses how the competencies outlined in standards by the medical profession related to patient-specific context and evidence-based medicine inform desired course learning outcomes in COMs. With the rise in importance of the Entrustable Professional Activities (EPAs), discussed in Chapters Two and Four, from the American Osteopathic Association (AOA), specifically EPA 7, which prescribes the information literacy skills OMS must possess upon graduation, many of the participants in interviews and in several typologies of course materials discussed the priority of information literacy education to follow the EPAs and other accreditation standards.

2.1 COCA accreditation and EPAs. The Council on Osteopathic College Accreditation (COCA) mandates information literacy be part of the curriculum of the COMs, exemplified by the Entrustable Professional Activities (EPAs). Chapter Two of

this dissertation goes into greater detail about the EPAs, the COCA, and accreditation in general. The participants in interviews and creation of course materials revealed their cognizance of the standards and guidelines that they used in the creation of the courses. The standards were employed less as philosophy underlying the teaching and more as content checks to ensure the skills required were being taught to the OMS, including one participant who said, "Yeah, so I'm pretty conscious of what the EPAs are and trying to put them in there just because of that project." Also, participants from one institution credited the EPAs with their place in the curriculum, saying, "I think the fact that I'm asked to teach, is part of the COCA standards."

2.2 EBM components. As with the previous sub-question, as well as the ones that will follow, EBM was a factor in determining content and philosophy for information literacy education, sometimes an overt discussion of EBM, and in other cases a description of the EBM components. EBM was one of the overarching foundations of osteopathic medical education from the perspective of the participants, and the prominent place it holds in the accreditation standards motivated and guided the creation of lessons and courses. In a discussion of accreditation standards, one of the participants said:

> We took anything that had to do with information at all and pulled it out so we could look at it and see, from our perspective, and our background, what kind of things they were looking for, and that helped us a lot, actually understand what was going on with those. So when we did that, I kind of grouped them together, so like, finding information, evaluating information, and using the information

2.3 Osteopathic core competencies. In osteopathic medical education, the students are responsible for a series of competencies, dictated by the American

Association of Colleges of Osteopathic Medicine (AACOM). These AACOM Core Competencies, described in Chapter Two, also became part of the discussion for some participants in the development of their information literacy courses. A clear example of this from the interview data was, “Oh, well, in our syllabus, we were trying to tie here the course objectives to those core competencies”

2.4 National licensure and board exams. Throughout their education, OMS must take and pass several steps of national, standardized, board exams and, upon graduation, must take and pass national, standardized, licensure exams. These exams, colloquially called *boards*, are another nationally-determined set of knowledge, skills, and attitudes students must possess. As such, they were mentioned by several of the participants as a facet of their philosophy in course and session development, with one stating, “Well, so it’s time, it’s a refresher, it’s your board prep and they’re going to have to find some evidence.” These were all indications that the accreditation standards and guidelines have a significant impact on information literacy education in COMs.

Sub-question Three: Integration of Information Literacy in the Curriculum

The third sub-question in the investigation addressed the extent to which teaching information literacy knowledge, skills, and attitudes was integrated throughout the curriculum of the COMs. The purpose of this question was to unpack how schools either teach information literacy by itself or combine information literacy education into other courses or programs over the span of medical school. In the curricula of most of the participating schools, information literacy education was well-integrated and widely distributed, though in some COMs, information literacy existed as a course in itself. The data revealed five general motifs addressing this sub-question: information literacy as a

stand-alone course; information literacy embedded in other courses; information literacy taught by non-librarians; librarians or information faculty sitting on curriculum committees; and, faculty development sessions.

3.1 Stand-alone course. Of the responses, three COMs that participated in the survey had syllabi and reported in the interviews that they have currently or had in the past, stand-alone information literacy courses, all called Medical Informatics. The primary instructors in these courses are/were librarians. The goals and objectives stated in the syllabi of the Medical Informatics courses included topics of information literacy including EBM in its component parts, use of databases to locate information, critical appraisal of the literature, and developing clinical reasoning skills for use in practice, all rooted in the information needs of physicians. What was not apparent in the objectives stated in the syllabi was learning outcomes related to specific patient information needs. All Medical Informatics courses that exist, or existed, were taught in the first year of medical school. In describing one such course, a participant said, "Well, it is a pass/fail, one credit course for first-year medical students." The librarians who are responsible for teaching Informatics uniformly stated that they are satisfied with the fact that they have a place in the curriculum and felt it is the best way to impact student learning of information literacy. An example of this from a participant who is the primary instructor of a course was, "I expose them to the evidence-based resources, to *Cochrane Reviews*. I think it's essential that they meet those their first year of medical school."

3.2 Within existing courses. This motif describes, overwhelmingly, the majority of information literacy instruction taking place in COMs. Four of the seven schools interviewed (4/7, 57%), five colleges' assignments (5/7, 71%), and 10 colleges' lecture

materials (10/17, 59%) indicate that they had information literacy instruction embedded within other courses in the curriculum. This motif was limited to information literacy education in other courses, which was conducted by librarians. The courses within which the instruction occurred were widespread across the curriculum, spanned all four years, and were embedded in clinical medicine courses, biomedical science courses, and general introductory courses.

The participants who instructed these sessions reported that they copied the objectives and delivery method from the faculty who taught the rest of the course. As one participant stated "I let the department decide if they have specific objectives they think we're a good fit for, then I can adjust the presentation." One syllabus, which was also indicative of this phenomenon, was from a course entitled *Rural Health,* and contained content specific to the practice of rural medicine. Included in the list of requirements for the course was "Information Literacy: advanced literature/database searching, and evidence-based medicine searches and sources."

Multiple sessions of information literacy were taught within clinical rotations during the third year, including one whose syllabus included, as a learning objective, that students will have the ability to, "independently find authoritative information; discern authoritative literature from non-authoritative; and utilize highlighted resources off-campus."

3.3 Information literacy taught by non-librarians. As was revealed in the data, oftentimes, within the scope of the curriculum, librarians are removed from the teaching of information literacy, which will be discussed in more detail later in this chapter. This teaching was exclusively within the realm of EBM and was taught by either physicians or

biostatistics faculty. This situation was evident in the following quotes from two librarians at different colleges, “(name of school removed) is supposed to have access and use of evidence integrated into their curriculum; however, the library is not involved in that.” The other statement was, “There’s an emphasis on medical informatics at (name of school removed), and they do a lot of it in house, not necessarily with us present.” Being excluded from the curriculum and not involved in the teaching of the OMS was a point of dissatisfaction for many librarians in the COMs, and a focus of attempts to change that fact pervaded, as exemplified by a participant who said, “And as you probably picked up, I’m a little frustrated that we’re not more embedded in instruction but keep fighting the good fight.”

3.4 On curriculum committee. Curriculum committees exist in many schools, and are often the places in which the decisions about who teaches and what is taught are made. The data revealed that there are two COMs that participated in this investigation that had librarians as full voting members of the curriculum committee, described by one participant as “we have folks sitting on the different curriculum committees and so when that kind of comes up, it has been a discussion of a kind of series of courses” Another participant commented on the importance of being in the room for those curricular discussions by saying, “For your information, (name of librarian removed) is on the (name of school removed) curriculum committee, so she gets to hear all those good things.”

3.5 Faculty development. Multiple participants in this investigation reported that they were involved in faculty development at their COM. One school used faculty development sessions as a method of integrating themselves into the curriculum through

existing courses by showing the rest of the faculty the benefits and expertise that exists in the library, saying "doing something as a faculty development… so that people in other programs could see that this does, it exists, and it works." Another college had a faculty development program, titled "Developing Informatics Competencies in Faculty Members," designed to ingrain principles of information literacy in non-librarian faculty members. One participant discussed a faculty development session to tie together for the rest of the faculty the intersection between information literacy and EBM:

> So, I'd have to go look and see where people are putting it in, and so we have classes planned for the faculty on evidence-based medicine and different things, so we're starting to do classes for them to show them what we're doing in Foundations, so they can keep rolling with it.

Sub-question four: Beyond Resource Literacy

As described in detail in Chapter Two, one of the pivotal moments in the establishment of information literacy as an important learning component for higher education was the growth of understanding the difference between information literacy and resource literacy, which is, in short, the difference between fluency in the use of resources to locate information and fluency in the ability to socially construct meaning from information that creates new knowledge (Horton, 1982; Kuhlthau, 1987). The fourth sub-question in this investigation sought to find the ways information literacy was taught beyond the use of library resources to include patient-specific context. Teaching the function of resources, rather than the application and use of meaning and context, was a common occurrence in osteopathic medical education. The participants rarely reported moving beyond resource literacy to teach information literacy as a goal for instruction.

As shown by the collected data, it is clear that few information literacy courses or sessions included intentional discussions of patient-specific context. The responses from interviews and from the course materials revealed three motifs: population and patient; teaching specific library resources; and outside faculty-driven resource education.

4.1 Population and patient. One of the most common ideas conveyed in interviews and materials was that patient specifics, details, context, and meaning are often outside the purview of the librarians and information literacy instruction. The instruction from the librarians is predominantly depersonalized and decontextualized, adhering to the component of EBM, which is geared towards the literature, to the exclusion of a patient, and is specifically determined to find statistics and population studies, "I tell them, but we're going to spend most of the time talking about this next part of evidence-based medicine, the best research evidence."

4.2 Teaching specific library resources. According to the data, the majority of the teaching time of COM librarians focuses on resource literacy: databases, websites, and specific library holdings. This was true of all schools that participated in the investigation. However, this motif specifically addresses insight into the schools that solely teach the effective use of library resources, to the exclusion of information literacy topics such as meaning, context, and social construction of knowledge. Schools that feature stand-alone or well-integrated information literacy programs or sessions most often utilized resource literacy as a first step, a foundation from which the students grow into more patient-centered or specific understandings. From the word count in Table 12, concepts such as library webpages, specific databases held in library collections, clinical apps, and library instruction were used 78 times in the interviews. While this quantitative

count of instances did not generate themes or theories, it was informative as to the prevalence of those resource literacy-specific words and phrases.

Further, 14 assignments or lectures collected as course material data included student requirements to use a resource and find an article, answer, fact, or database page, without patient-specific information beyond the patient's age and gender. An example of this type of depersonalized, demographic-only question was contained in an assignment for a medical information literacy session embedded in another course:

> A 38-year-old female arrives at the ER with chest pain. The pain began 2 hours ago and is substernal pressure, non-radiating, and rates a 6/10 in severity. What are the resources you would use to seek management options prior to diagnosis?

4.3 Outside faculty-driven resource instruction. This motif elucidated the instances in which library faculty were relegated to resource instruction, while patient-specific instruction, if any, was taught by other faculty members. One of the most remarkable observations in the interviews was the division of the teaching at one school in EBM instruction:

> I do the Ask, Acquire, and Appraise part, and so the clinicians do the Apply and Assess. I haven't been able to, with addition of the stuff I've had this year, I haven't been as involved in the Apply and Assess piece as I need to be yet. So I don't know that I can really speak to that.

Discussion

The evidence supports the conclusion that, while principles of the Dreyfus model and situated cognition were present in the interviews, the most intense underlying philosophy employed as the basis for creation, development, and implementation of

information literacy courses was EBM. This affirms the need for faculty and librarians to work together in addressing the EPAs and immediately move new students away from their common belief that earlier learned information and technology skills are all that they need in medical school. This conclusion leads to the discussion of the ways in which EBM corresponds with social constructivist theory, and how the principles of situated cognition and the Dreyfus model are used but not named. Also discussed is how librarians take part in the process and what role they should play in information literacy instruction.

EBM as a social constructivist learning theory. While EBM is sometimes considered to be only a call to the research to inform medical practice (Schwartz, Vosko & Michels, 2016), this investigation reveals that it should also be considered a learning theory. EBM aligns with social constructivist theory in that EBM is necessarily social and negotiated. EBM does not subscribe to a set of rules, to an external structure of guidelines that are independent of situation and context. Greenhalgh (2014) cites the Dreyfus model and follows the continuum from novice to expert in a discussion of the principles of EBM, stating, "To equate 'quality' in the clinical care with strict adherence to guidelines or protocols… is to overlook the evidence on the more sophisticated process of advanced expertise." (p. 3). EBM requires the evolution of knowledge, leveraged from decontextualized but fact-laden trials, developing the context of a single and unique patient. It is an evolution from general to specific, which occurs through interpersonal social construction: "Knowledge evolves through social negotiation and through evaluation of individual understandings" (Savery & Duffy, 1995, p. 2).

The connection between EBM and the Dreyfus model is further explicated in the interviews as participants described their educational process for students as being iterative, growing and developing in sophistication and depth as the OMS acquire a more robust understanding of medicine and patient care. Students evolve, just as knowledge does, and as they evolve from novice medical students into competent practitioners of medicine, their information needs change and evolve as well. Background and foreground questions, essential components of EBM, are indicative of the depth to which a topic is understood. Background questions are data gathering, filling in blanks and discovering the information deficits on a topic. Foreground questions are contextualizing, addressing individual questions specific to a situation or circumstance. The following quote from a participant in the interviews exemplifies that idea:

> And we teach them that the more inexperienced you are with a topic, the more background questions you'll have because you don't know a lot about diabetes or whatever. But, the more experienced you become, the more foreground questions you'll have because you're treating more patients and you see how these different treatments affect specific outcomes.

This understanding of background and foreground questions indicates the need for more extensive teaching of the process of social construction of knowledge and applications of the Dreyfus model to the librarians who instruct OMS. The step-wise development of medical students in their understanding and implementation of EBM processes coincides with the rise in foreground and reduction in background questions. Students grow in depth as they gain experience; intuition begins to supersede checklists and worksheets, and rules are subsumed by the insight born of experience.

EBM is an information seeking process. It requires that the participants assess and grasp an information deficit; develop the nature and structure of the question being asked; interact with the information environment to discern the previously derived information and multiple inputs from the corpus of medical, scientific, and humanistic data; and, extrapolate a *de novo* understanding which is situationally and uniquely meaningful to the patient and physician. It is an information seeking process, but does not have information as the end-product. The end-product is constructed meaning and wisdom, less about what we know and more about contextualizing what we do with what we know. This is not a universal truth, but a situational one, not about the evidence, but about what we do with the evidence in this instance with this patient at this moment. EBM is, in its original conception, a practice of medicine that sits at the confluence of three components: the evidence from the literature, the expertise of the clinician, and the patient's values and preferences. Each of these components is, in and of itself, a social construction, whether generated through interaction with the environment, with people retrospectively, or with the patient in the exam room.

The role of librarians. The evidence gained in this investigation shows that medical school librarians can play a pivotal role as unique experts in information and information seeking, a fundamental component of EBM. However, as the highly-trained local experts on information seeking, it would be appropriate, as this evidence indicates, for that role to be expanded and for the librarians in the COMs to be more ingrained, further embedded into the curricula of their schools. As noted in Chapter four, many of the participants expressed frustration with the limited or non-existent role they play in

instruction and the perception that their role is limited to brief interactions with students, or as curriculum-adjacent functionaries, excluded from faculty status and rank.

As stated by a participant who expressed frustration about having faculty rank but not full faculty status:

> I am faculty, but that's because I've – I've been here so long. However, it's just a name mainly because we don't, you know, we don't really get to vote at the senate meetings or any of that. We can attend the meetings but we don't have any power.

This nationwide investigation provides evidence that COM librarians should be recognized as subject matter experts and afforded the faculty status and teaching role in accordance.

Another idea discussed multiple times in the interviews was that librarians in medical education can struggle with the perception of librarians by other members of the faculty and community. In some cases, being called a librarian relegated one to second-class status. According to the data derived from the participants, there were two mechanisms by which this struggle can be mitigated. The first was to expand the role of the librarian into one of curricular importance and prominence and leverage the role as instructor into a more collegial relationship with other faculty members. The experiences of one medical school librarian who benefitted from a change in administration were illustrative of this tactic. A medical informatics course was put into the curriculum through the fiat of a new Dean, and the librarian was enlisted to teach a significant part of that course, greatly expanding her teaching from episodic sessions to a required course. The nature of the course required that the librarian enlist the teaching help of both

clinician and biomedical science faculty. The change in the perception was significant, both due to the good fortune of the Dean's decision to create the class, and the librarian's determination to become a more active part of the faculty. This participant stated:

> I feel isolated from the faculty, just as a librarian. As a course instructor, I think that's opened doors and changed a lot just with the nature of getting out and interacting with the faculty.

A further explanation of the importance and value of teaching with other members of the faculty was stated by one participant:

> So, you know, I'm there, I'm listening, I'm engaged in talking to them, I'm thanking them and supporting them and they're supporting me and it's just become, I've become part of the team, of the faculty, where I wasn't before.

Becoming more involved in the instruction of OMS can improve the perception of the librarian as teacher and the environment for teaching.

The second mechanism for librarians becoming a more involved and accepted part of the teaching faculty of the COM was to abandon much of traditional librarianship, both in name and in content. As the role of librarians in the teaching of medical information literacy and EBM specifically revolves often around the process of information retrieval, relinquishing this assumed function of librarianship can be perceived as turning away from the role many librarians have traditionally been trained to fulfill. But a participant in this investigation—one whose teaching role is significant and expanding within the curriculum—intentionally changed the perception of the role by going against the conventions and functions commonly associated, as this participant said:

> So what we've done is slowly we've been adding pieces and kinda the big picture thing that's interesting is we started to have more success with this as I moved it away from the concept of the library or myself as being a librarian, that I started to adopt more of what physicians themselves use.

Further, it was not just the edifice or the name that was being rejected in order to maintain a place with the faculty, but the established role as well, "Great, because as part of that, I don't teach searching anymore...at this point, I'm honestly sort of resource agnostic." This finding suggests a possible need for renaming the medical librarian position to something such as *informaticist* or *informatics specialist.*

Directions for Further Research

The data collected from this investigation and the themes uncovered lead to understandings and conclusions about the teaching of information literacy in COMS and provided some perspective into the ideas, frustrations, successes, and goals of COM librarians. However, the data and themes also shed light on several questions not yet answered, and future research into those questions specifically could be of benefit to medical information literacy teaching in particular, and physician training in general.

The first is to repeat this investigation among allopathic medical schools. There are currently 144 allopathic medical schools in the United States, not counting those medical schools in the Caribbean that confer the M.D. degree and participate in U.S. residency match programs and board examination processes. Expanding the investigation to those schools would provide an additional layer of richness to the data, and that is a direction for future research.

A second suggestion for a future research project is an investigation of library and information science programs in the U.S. and the methods they employ to prepare library and information science students specifically for health librarianship through coursework, fellowships, internships, or practica. Within library and information science schools there are many new opportunities for specializing in medical informatics. The findings in this investigation can inform development of course content and strategies for preparing future librarians as information specialists in medical education. Future research could use the findings in this investigation to design a new investigation that could lead to improving library and information science students' ability to better utilize pedagogy and educational philosophy to inform and anchor teaching methodologies, syllabi, and objectives to be full participants in the education and creation of future physicians.

Capitalizing on the understandings gained in this investigation, in future research, it may prove valuable to extend the Dreyfus model. Adding a component of self-reflection in various levels will allow the model to be directly applicable to studies of information literacy. The findings in this investigation reveal that as learners become more sophisticated and work towards developing expertise, reflective thinking and practice are important. In the level of *advanced beginner*, when learners begin to take responsibility in familiar situations, and continuing throughout the subsequent levels, self-reflective thinking becomes a valuable component of further learning.

Reflections

The goal of this investigation was to gain new understandings that can be used to improve the future of the field of medical informatics and the practices of future physicians, medical librarians, and potentially other healthcare providers. The courses

and/or lessons were identified and described using a variety of terminology, including medical informatics, medical information literacy, life-long learning, and/or library instruction. For the purposes of this investigation, programs and/or courses using these, or similar terminology, have been referred to as medical informatics. Terminology in the field is evolving and there are likely to be other terms used for medical information literacy. An understanding derived from the investigation was that the principles of EBM ground the way many librarians teach information literacy. I believe this is a concept that should be discussed between and among policy writers and educators. EBM is a social construct, a method of gleaning information from the patient, the body of medical literature, and the experience of the physician. When information, situated in the immediate needs of a specific patient, is negotiated among the three components of EBM, new knowledge is created, new meanings understood, and new context is derived. As many librarians use EBM as the basis for information literacy, and since EBM is a social constructivist process, as this investigation revealed, librarians often employ epistemological theory in their course and session development. A more intentional approach, knowledge of the constructivist elements of EBM, and a full understanding of the elements of EBM, especially the patient-centered elements, could add depth and quality to librarian-taught information literacy education in COMs. This is further emphasized and required by the EPAs and the accrediting bodies of osteopathic medical education.

The data and subsequent analysis through this investigation indicated that medical information literacy education in COMs was rooted in the fundamental premise of EBM. Additionally, while many osteopathic medical schools leverage the unique skill set of

librarians to teach information literacy, some do not. In those cases, OMS sacrifice the learned expertise attained by librarians in the study of information science. Physician and biomedical science faculty achieve a high level of information skill in their education but in a different way than librarians do. Principles of EBM, taught as the concept was intended, require that information be a pursuit in itself, that the information seeking process is essential in the ability to answer questions and, ultimately, treat patients. As one librarian stated:

> I think we were able to convince them that information literacy skills, it's practically, it's absolutely the most important thing that a medical student especially will learn in medical school [be]cause everything else changes. In fact…I would show a quote from the Dean of Harvard Medical School in the 30s and 40s, it's that quote that says like half of what you learn in medical school will be obsolete in ten years; the problem is no one knows which half. And that was always the most base level thing that we're proceeding from with all our instruction, is that in both the philosophical and practical way, it's literally the most important thing they can learn. So that's always been…a big motivational factor or underlying philosophy for all of the instruction. And I assume the half-life of their knowledge is shorter than 10 years now just given the pace of scientific change. That's even more true than it used to be.

Findings in this investigation indicate that to neglect the professional competencies that librarians bring to instruction involving advanced searching and use of information to create new knowledge is to take something away from the education of OMS. Without the presence of professional librarians in the curriculum, OMS' ability to achieve

competence according to the EPAs could be compromised. Findings highlight an urgency to implement librarian-taught information literacy instruction in the COM curricula so that OMS develop the skills needed to meet the requirement of the EPAs, skills deemed by the profession to be vital to the practice of medicine. To delay or resist the importance of librarian-taught instruction can stunt the development of an OMS's information seeking process, and their ability to find and discern information. When present from the beginning of medical education, information literacy skill development can enable OMS to become successful and valued physicians who can meet the expectations to provide quality medical care in the U.S.

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Table 1

Dreyfus model skill levels and the accompanying mental functions

Skill Level / Mental Function	NOVICE	COMPETENT	PROFICIENT	EXPERT	MASTER
Recollection	Non-situational	Situational	Situational	Situational	Situational
Recognition	Decomposed	Decomposed	Holistic	Holistic	Holistic
Decision	Analytical	Analytical	Analytical	Intuitive	Intuitive
Awareness	Monitoring	Monitoring	Monitoring	Monitoring	Absorbed

Source: Dreyfus, S. E., & Dreyfus, H. L. (1980). *A five-stage model of the mental activities involved in directed skill acquisition* (No. ORC-80-2). Berkeley, CA: California University Berkeley, Operations Research Center.

Table 2

The Dreyfus Model Performance Modes, Situational Perception, and Role Perception associated with Dreyfus Level

DREYFUS LEVEL	PERFORMANCE MODE	SITUATIONAL PERCEPTION	ROLE PERCEPTION
Novice	Follows rules; requires instruction from others; uses structure	Requires help to discern salient aspects	Feels detached from outcome; failure is not "my fault"
Advanced Beginner	Comprehends some context; relies on rules and structures, others to bolster performance; learning style is energetic	Recognizes some familiar situations but still requires help in most situations	Beginning to feel some responsibility in familiar situations
Competent	Is analytic, systematic, goal-directed; uses reasoning to cope with overload; develops scripts and tricks to speed performance	Perceives salient aspects after analysis without help in most cases; spurred to organize situational information	Takes more responsibility; involved emotionally in success/failure; engages responsively in some situations
Proficient	Achieves responsive, speedy performance; is immersed and highly situated; decision making is still analytical	Perceives and integrates salient aspects quickly; beginning to understand wider picture	Engages responsively and empathetically; develops deeper moral awareness; beginning to perceive conflict; encourages client autonomy
Expert	Exhibits deep, tacit understanding of salient aspects; extends the ends of practice through	Perceives salient aspects and appropriate solutions intuitively; sees far-reaching	Is highly involved, reflects on practice and encourages client reflection; resolves conflicts and dilemmas

innovation; decision making is intuitive	implications of long-term goals

Source: Dreyfus, H.L. & Dreyfus, S.E. (1986) *Mind over machine: The power of human intuition and expertise in the era of the computer.* New York: Free Press.

Table 3

Interview Participants by Number of Participants and Campuses per COM

School	Number of participants	Number of campuses/COM
A	1	1
B	3	2
C	3	1
D	1	2
E	1	1
F	3	2
G	1	2

Table 4

Interview Participants by School Demographics

School	Single program or university	Type	Region(s)	1st year size
A	single program	private	southeast	medium
B	university	private	midwest/ southwest	medium/ medium
C	university	public	south	large
D	university	private	midwest	large
E	university	public	upper midwest	large
F	university	private	midwest/ southwest	large/ large
G	university	private	west/ Pacific northwest	large both campuses counted in total

Note: first year size is number of students enrolled in first year class: small = <100; medium = 101-200; large = >200

Table 5

Materials Participants by Demographics

School	Single Program or University	Type	Region	1st year size
a1	university	private	northeast	large
a2	university	private	west	medium
a3	university	private	west	medium
b1	university	private	Midwest	large
b2	university	private	southwest	large
c	university	private	northeast	medium
d	university	private	south	large
e1	university	private	Midwest	medium
e2	university	private	southwest	medium
f	university	public	northeast	medium
g1	university	private	west	large
g2	university	private	Pacific northwest	large
h1	university	private	northeast	large

h2	university	private	southeast	medium
I	university	public	Midwest	large
J	university	public	south	medium
k	single program	private	Pac. Northwest	medium
l	university	private	M. Atlantic	medium
m	university	public	south	large
n1	university	private	Midwest	large
n2	university	private	Midwest	large
o	university	private	Midwest	medium
p	single program	private	southeast	medium

Note: first year size is number of students enrolled in first year class: small = <100; medium = 101-200; large = >200

Table 6

Typologies of Materials Data

Document type	Number Documents Analyzed	Number schools or campuses	Region
Lecture notes, outlines	25	17	S, SE, W, MA, SW
Handouts	12	4	MW, SW, NE, W, P.NW
Syllabi, objectives	13	9	MW, W, PNW SW
Worksheets	3	6	MW, NE, W, S, PNW
Assignments	19	7	W, MW, SW, S, PNW

Table 7

Interview Data by Sub-Question

School	Total coded units	SQ1	SQ2	SQ3	SQ4
A	28	1	6	6	14
B	24	0	2	10	12
C	33	6	2	16	9
D	28	4	3	8	13
E	29	14	3	6	6
F	23	10	3	6	4
G	26	9	2	8	7

Table 8

Interview Data by Major Theme

School	EBM	RIL	LLL	DSC	SAG	OUT	PVP
A	14	5	0	3	6	4	2
B	6	9	2	0	2	11	0
C	6	8	7	2	2	12	1
D	6	9	5	2	3	7	2
E	9	3	8	5	3	8	2
F	8	4	5	2	3	5	0
G	10	2	5	3	2	9	3

Table 9

Materials Data by Sub-Question

Typology	Total coded units	SQ1	SQ2	SQ3	SQ4
Lectures	28	0	2	1	25
Handouts	12	0	0	0	12
Syllabi	25	2	3	1	19
Worksheets	3	0	0	0	3
Assignments	21	1	0	0	20

Table 10

Materials Data by Theme

Typology	OO	CO	EBM	AA	RIL	CR	OML
Lectures	5	2	9	4	15	1	3
Handouts	3	0	9	0	4	0	0
Syllabi	0	2	10	9	4	0	16
Worksheets	0	0	3	3	0	0	0
Assignments	1	0	18	21	6	0	4

Table 11

Responses by Theme, Number, Sub-questions Answered, and Illustrative Quotes:

Evidence-Based Medicine (EBM)

Theme: EBM (words indicative of)	**Number**	**Sub-Question Answered**	**Illustrative Quotes**
EBM, evidence-based	86	1,3,4	"we do a lot of evidence based medicine" "so each incoming class is getting more and more stuff in terms of informatics and evidence based medicine" "I've been a firm believer that an evidence-based model, in terms of support of clinical care and clinical setting, cannot be based upon primary literature" "And it's probably my key lecture where we talking about evidence-based medicine," "one of my big projects coming in was building this evidence based curriculum more into it"
Pyramid (as EBM pyramid)	6	1,3,4	"More the um broader appraisal in terms of where did this come from, what type of evidence is it, where does it fall in the chain, the level of the evidence pyramid" "oh systematic review or here's the pyramid, let's do PICO searching"
PICO, ASK, clinical question	38	1,3,4	"a little while on PICO and how to find things" "please tell them how to create a good PICO question that they can then search" "we talk about the pico, we talk you know it's it's my intense lecture"

ACQUIRE, locate	8	1,3,4	"they need to be able to locate … what they can get"
APPRAISE	14	1,3,4	"teaching them how to critically appraise an article and how to find" "the methodology is sound whether or not the conclusions that the author has drawn are sound"
APPLY	12	1,3,4	"I haven't been as involved in the Apply and Assess piece as I need to be yet"
ASSESS	51	1,3,4	"I haven't been as involved in the Apply and Assess piece as I need to be yet"
Background, foreground	16	1,3,4	**"**we would go in for about two hours and show them how to identify background, foreground questions and do a search" "So we try and help students recognize the difference between a background and a foreground question"

Table 12

Responses by Theme, Number, Sub-questions Answered, and Illustrative Quotes:

Resource and Information Literacy (RIL)

Theme: RIL (words indicative of)	**Number**	**Sub-Question Answered**	**Illustrative Quotes**
Databases, general or specific databases	30	3,4	"showing them different important resources they might find useful like up-to-date and dynamed"
Pubmed	27	3,4	"how to use pubmed, and how to use all those point of care tools"
Information literacy (as a concept or theory)	13	3,4	"It is truly still like an information literacy approach though"
Informatics	29	3,4	"so each incoming class is getting more and more stuff in terms of informatics and evidence based medicine" "I call it informatics slash EBM piece"
Library webpage, website, web page, web site	6	3,4	"when they had their orientations you went over and said 'hey, here's the library stuff'" "speak to them and show them the library webpage"
Library instruction	15	3,4	"We have a big standing part on the student satisfaction surveys, which includes questions about library instruction and library services that are offered"
Searching	22	3,4	"I think it's essential for them to be able to construct a clinical question. So you know, so that

			then they can go to the literature, do a search, hopefully come up with some clinical trials”
resource, resources	45	3,4	“my first lecture is the general introduction to library resources” “even their first week or two on campus, it is more of an introduction to library resources. Here’s what we have for you, here’s how you can make use of them”

Table 13

Responses by Theme, Number, Sub-questions Answered, and Illustrative Quotes: Life-long Learning (LLL)

Theme: LLL (words indicative of)	**Number**	**Sub-Question Answered**	**Illustrative Quotes**
Information litera* (not EPA related, skill development)	15	1,3,4	"we were able to convince them that information literacy skills is practically, well, not practically, we're biased, it's absolutely the most important thing that a medical student especially will learn in medical school cause everything else changes"
Learning objectives, outcomes	28	1,3,4	"now looking more at the framework. Such things as lesson plans, learning outcomes, active learning activities, assessment"
Syllabus, syllabi	13	1,3,4	"I'm looking to reevaluate all my lectures and look at the syllabus"
Third year, fourth year, clinical rotations, clinical questions	32	1,3,4	"There's a yearly … lecture for the third and fourth year … students" "There's a first year presentation, a second year, a third year, fourth year, even if it's just a check-in on and just say, okay, you've done some stuff now here's the stuff you need to know Okay, now you've done this, here's some things you need to know I think that'd be good" "To make sure that what you are lecturing on they think, so in their 3rd or 4th year still understand, or that they've been

			able to keep that knowledge, and are using that knowledge."
Clinical reasoning	2	1,3,4	"morphing into critical reasoning or more of a clinical reasoning because that's more of the thrust that it's pushing into now"

Table 14

Responses by Theme, Number, Sub-questions Answered, and Illustrative Quotes: Dreyfus and Social Constructivism (DSC)

Theme: DSC (words indicative of)	**Number**	**Sub-Question Answered**	**Illustrative Quotes**
Critical thinking	2	1,3,4	"one of my purposes is to make them as paranoid and skeptical as possible so they question things" "Then you know it so that's where we tied it into a that's also for this critical reasoning so it everything about is this up-to-date telling me should I actually take the recommendations as strongly as what they're saying"
Longitudinal	3	1,3,4	"and what we've finally been able to do is build it longitudinally into the curriculum" "We have these different longitudinal threads across the curriculum, the four years, and I'm in one"
Context	11	1,3,4	"Kind of put all of this into some kinda context for them to, to understand how far this has all gone in what, 20 years?"
Worksheet	8	1,3,4	"centers for evidence based medicine therapy worksheet" "It's a worksheet that I found in a book for dental evidence based medicine, and it walks students through how to identify"
Dreyfus terms (novice, advanced beginner, etc.)	0 in context	1,3,4	

Patient communication	1	1,3,4	“the EBM and statistics part of it, is really helping them also with patient communication”

Table 15

Responses by Theme, Number, Sub-questions Answered, and Illustrative Quotes:

Standards and Guidelines (SAG)

Theme: SAG (words indicative of)	**Number**	**Sub-Question Answered**	**Illustrative Quotes**
Accreditation, accrediting bodies (not COCA)	25	2	"we've never had any problems in terms of accreditations with libraries resources and services" "because we're getting ready next year for our HLC accreditations"
Competency, competencies	18	2	"That part of the course definitely with those AACOM core competencies"
COCA	13	2	"And, you know, the, the COCA, the accreditation stuff can often be a bit, you know for the EBM stuff, standards, they talk about it a little bit" "I think the fact that I am asked to teach, is part of the COCA standards"
EPA	30	2	"what are the EPAs, what kind of entrustable professional stuff they're gonna to have to have" "so I'm pretty conscious of what the EPAs are and trying to put them in there"

Table 16

Responses by Theme, Number, Sub-questions Answered, and Illustrative Quotes:

Outreach (OUT)

Theme: OUT (words indicative of)	**Number**	**Sub-Question Answered**	**Illustrative Quotes**
Partnership	2	3,4	"I also tailored that vision as far as what they want to do, so they see us as partners, you know, in there" "Yes I do write, I and my faculty partner, write questions for midterms"
Faculty	103	3,4	"The real answer to that is we probably use our emotional intelligence to tailor our approach to individual faculty members" "If the faculty is receptive, is engaged with having the session, they will usually help" "the only way these grand rounds can be successful is only with our faculty input, they help direct and mentor the students"
System (systems courses)	7	3,4	"sit down with them and go through their syllabus and talk about you know, especially in systems courses, let's say they're talking about the circulatory system, then we make sure if we're teaching them how to search for information that it's something geared on this week's topic"
Clinicians (as partners)	11	3,4	"I do the Ask, Acquire, and Appraise part, and so the clinicians do the Apply and Assess"
Basic science, basic scientist, Ph.D. (as	24	3,4	"Well we have assigned a basic scientist and a clinical instructor"

courses or partners)			"Because I think the physicians recognize that we have a different area of expertise and the PhDs are usually not clinicians, so they recognize that just cause you're not a a physician, you do still have expertise"
Other courses (other curricular courses including anatomy, physiology, pharmacology, microbiology, etc.)	48	3,4	"I co-taught with our biostatistician the EBM course" "we would go into a course, say an anatomy course and discuss an anatomy database" "they'll bring in the biochemistry, the anatomy, try to bring in all the different departments if so if there's OMM as a treatment they'll bring that emphasis in on it"
Curriculum (part of or involved in)	13	3,4	**"**As a library we're very well recognized, we work very well at the programs we do, we're just not directly in the curriculum" "there was one class in particular on medical informatics that was part of the … curriculum"

Table 17

Responses by Theme, Number, Sub-questions Answered, and Illustrative Quotes: Patient Versus Population (PVP)

Theme: PVP (words indicative of)	**Number**	**Sub-Question Answered**	**Illustrative Quotes**
Patient	3,4	104	"we talked about patient engagement, e-patients, and patient communities" "got to be able to find information to treat that patient" "and that is starting with credible resources for patient care" "I like to think that we help them locate it and recognize if it's applicable to a specific patient and then translate it to the patient"
Population	3,4	10	"does the population match the population you're serving in the article," "You know, because you give them the vignette, and then they pull out the population, the intervention, and all that"
Statistics, statistical	3,4	49	"Yeah, a little bit of statistical analysis. We talked a little bit about [tie] squares and t-tests and that type of thing"
Epidemiology	3,4	10	"when I do the epidemiology and evidence based medicine stuff, we talk about how these, when you get pulled into a study, how do you get a sample, and is that sample representative of your community" "epidemiology is the population, so being aware, like if you got a flu outbreak in Alabama, then how to track that outbreak and where to report"

			"Epidemiology, you know to me, epidemiology is kind the umbrella over evidence based medicine"
Patient centered, context, values, preferences	3,4	3	"because the patient centeredness and all of that is pretty, pretty serious business here" "for patient values and circumstances I tell them it's really important"

Appendix A

Request for Participation on Expert Panel

Dear

I am writing to invite you to participate as a member of an expert panel in my dissertation research.

I am conducting research to investigate the content and objectives of medical informatics courses in osteopathic medical schools as articulated in course syllabi and other course materials and as described in interviews with content and/or librarian faculty. Findings in the study will be used to build theory about teaching information-based professional development skills to osteopathic medical students and to determine and describe instructional practices that utilize patient-specific context anchored in authentic and legitimate environment in which medical students are likely to practicing medicine. Findings in this study are likely to be useful to librarians, faculty, and administrators who share responsibilities for developing library collections and providing information literacy instruction.

The study is entitled ***More than a Look-up Skill: Medical Information Literacy Education in Osteopathic Medical Schools.*** My goal is to learn more about the process of teaching vital library, resource, and informational skills by investigating the processes, philosophies, and pedagogies of the experts who teach them. Proprietary teaching materials will have the names and institutions removed.

As part of the dissertation research, I am creating an expert panel of members of the osteopathic medical education community. Members of the panel must have experience and responsibility for curriculum development and implementation in an administrative and/or teaching capacity, as well as 10 years or more experience in osteopathic medical education.

Members of this expert panel will be asked to identify individuals and institutions to be invited to participate in the semi-structured interviews in the study. I anticipate that this task is likely to take approximately 30-60 minutes of your time.

I would be honored if you would agree to serve on the expert panel and aid in this study. Should you agree to participate, I will be sending you more information and details.

Thank you very much for your time and consideration.

Sincerely,

Brian D. Schwartz, MLIS

Doctoral student, Emporia State University

Director of Medical Informatics, Rocky Vista University College of Osteopathic Medicine

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Appendix B

Informed Consent Document

I understand that the purpose of this study, ***More than a Look-up Skill: Medical Information Literacy Education in Osteopathic Medical Schools,*** is to investigate the content and objectives of medical informatics courses in osteopathic medical schools as articulated in course syllabi and other course materials and as described in interviews with content and/or librarian faculty. Findings in the study will be used to build theory about teaching information-based professional development skills to osteopathic medical students and to determine and describe instructional practices that utilize patient-specific context anchored in authentic and legitimate environment in which medical students are likely to practicing medicine. Findings in this study are likely to be useful to librarians, faculty, and administrators who share responsibilities for developing library collections and providing information literacy instruction.

I understand that data in the form of interview and/or instruction materials that I provide will be used in the above-reference study. I understand that all materials and/or information that I provide will be stored in a safe and private location; will be kept confidential; will be destroyed at the conclusion of this study; and names of individuals and/or institutions will not be used.

I understand that my participation in the study is voluntary. I understand that if I wish to terminate my participation, I may do so at any time. I am assured that there are no risks involved in completing this study.

I, _____, have read the above information. I agree to participate.
(please print name)

_____ _____
(signature of participant) (date)

If you have any questions or comments about this study, please contact the dissertation researcher, Brian Schwartz, at bschwar1@g.emporia.edu or 720-875-2882.

Brian Schwartz, Ph.D. Candidate
School of Library and Information Management
Emporia State University
http://www.emporia.edu/slim/programs/doctorofphilosophy.html

Appendix C

Request for Faculty Participation

Date

To

From Brian Schwartz, MLIS bschwartz@rvu.edu (720) 875-2882

Doctoral candidate, School of Library and Information Management, Emporia State University, Emporia, Kansas

Director, Medical Informatics, Rocky Vista University College of Osteopathic Medicine, Parker, Colorado

This is an invitation to you to participate in my doctoral dissertation, *More than a Look-up Skill: Medical Information Literacy Education in Osteopathic Medical Schools*. This is a qualitative study that will gather data from instructional materials (syllabi, assignment instructions, session outlines, etc.) and interview sessions and will use content analysis methods to analyze data. I hope you will accept this invitation, a research-based opportunity to positively influence education in osteopathic medicine. Names of faculty, librarians, courses, and/or institutions will not be revealed in my study.

If you accept this invitation, please send to me at the above email address your most current syllabi and any other teaching materials that convey learning outcomes and instructional strategies you use when teaching research and/or library-related skills (information literacy skills). If your syllabus and/or instructional materials are available online, please direct me to the online location by sending the web address. If you are willing to participate in an interview, please tell me in your email message to me.

If you would like more information about my study, please call or email me.

Thank you for your consideration. I hope to hear from you very soon.

Appendix D

Semi-structured Interview Questions

1. Tell me about library education or information literacy education/ instruction as it happens at your school.
2. What informs how you teach library education or information literacy?
3. How do you decide what and how you are going to teach the material?
4. Talk about how accreditation competencies and standards inform how you write your syllabus and course materials.
5. Ideally, information literacy skills instruction continues throughout the program in courses. What are examples of how information literacy skills instruction are taught in other courses in your school and curriculum?
    a. Describe the ways in which you collaborate and teach with other members of the faculty in their courses.
    b. Would you identify certain professors or departments you teach with more often?
6. How do you think you directly impact students' ability to address patient-specific context in patient interactions?

Appendix E

Codebook Definitions – Interview Data Analysis

Unit of analysis: Each substantive answer given in the semi-structured interview, particular answers are, in some cases, divided into multiple units within a single answer.

Coding process: Each substantive answer coded using interview code (A-G) and numerical identifier, or given code (X) if not applicable or general background information. Multiple responses may be given same numerical identifier if they are clarifying, repeating, or answering the same question.

Initial coding categories: Research sub-questions, coded SQ1 – SQ4

SQ1: What is the educational philosophy used by librarians and non-librarian faculty in the creation, development, and implementation of information literacy skills instruction?

SQ2: How do the competencies outlined in the standards by the medical profession related to patient-specific context and evidence-based medicine inform desired course learning outcomes in college of osteopathic medicine?

SQ3: To what extent is the use of information literacy skills integrated throughout the curriculum of the osteopathic medical school?

SQ4: In what ways are information literacy skills taught beyond use of library resources to include patient-specific context?

Secondary coding categories: Emerging themes, coded by unique identifiers:

EBM: discussion of evidence-based medicine as a philosophy, process, or set of behaviors including discussion of the steps, the evidence pyramid, or EBM as the grounding for development of an educational intervention. EBM specifically not used in relation to accreditation standards or guidelines.

RIL: discussion of teaching resource literacy as a set of skills, and information literacy as a knowledge or attitude set. This category includes all mentions of databases, apps, either generally or specific databases, library websites or webpages, library instruction, web searching, and other methods of utilizing library resources.

LLL: discussion of information literacy as a skill to be developed, a learning process, of education in the clinical years, of determining self-assessing skill sets for continued information literacy

DSC: discussion of epistemological theory or paradigm of social construction, or implication of using the concepts without knowing the name such as longitudinal improvement and learning, critical thinking, contextualization and meaning making, communication as creating knowledge, or any component of iterative skill and knowledge development such as worksheets or checklists

SAG: discussion of accreditation standards, guidelines, competencies, EPAs, or any other mandated component of education derived from requirements handed down from accrediting agencies, bodies, or organizations

OUT: discussion of outreach to faculty colleagues for co-teaching, team-teaching, or opportunities to work within the existing course structure and deliver information literacy content within another course or courses.

PVP: discussion of patient-specific or population-based content in information literacy as understood to mean individual, unique perspectives, characteristics, values, preferences of patients in contrast to population or epidemiological understandings and teaching interventions.

Appendix F

Codebook Definitions – materials data

Unit of analysis: each document, regardless of typology, is analyzed as a whole, with potential for dissection based on a switch in process, theme, or idea within the document. Lectures, syllabi and the other typologies build on themselves within the document and have an internal structure not unlike a narrative. Thus, taking the document as one unit allows for emergence of idea or theme throughout. When there is a switch or change in theme, the document may be broken up into multiple, uniquely identified units.

Coding process: Each document read and categorized into one of five typologies. Each unit coded using typology code (a-e) and numerical identifier, or given code (X) if not applicable or general background information. Multiple responses may be given same numerical identifier if they are clarifying, repeating, or answering the same question.

Typology codes:

- a = lecture
- b = handouts
- c = syllabi
- d = worksheets
- e = assignments

Initial coding categories: Research sub-questions, coded SQ1 – SQ4

SQ1: What is the educational philosophy used by librarians and non-librarian faculty in the creation, development, and implementation of information literacy skills instruction?

SQ2: How do the competencies outlined in the standards by the medical profession related to patient-specific context and evidence-based medicine inform desired course learning outcomes in college of osteopathic medicine?

SQ3: To what extent is the use of information literacy skills integrated throughout the curriculum of the osteopathic medical school?

SQ4: In what ways are information literacy skills taught beyond use of library resources to include patient-specific context?

Secondary coding categories: Emerging themes, coded by unique identifiers:

EBM: discussion of evidence-based medicine as a philosophy, process, or set of behaviors including discussion of the steps, the evidence pyramid, or EBM as the grounding for development of an educational intervention. EBM specifically not used in relation to accreditation standards or guidelines.

RIL: discussion of teaching resource literacy as a set of skills, and information literacy as a knowledge or attitude set. This category includes all mentions of databases, apps, either generally or specific databases, library websites or webpages, library instruction, web searching, and other methods of utilizing library resources.

LLL: discussion of information literacy as a skill to be developed, a learning process, of education in the clinical years, of determining self-assessing skill sets for continued information literacy

DSC: discussion of epistemological theory or paradigm of social construction, or implication of using the concepts without knowing the name such as longitudinal improvement and learning, critical thinking, contextualization and meaning making, communication as creating knowledge, or any component of iterative skill and knowledge development such as worksheets or checklists

SAG: discussion of accreditation standards, guidelines, competencies, EPAs, or any other mandated component of education derived from requirements handed down from accrediting agencies, bodies, or organizations

OUT: discussion of outreach to faculty colleagues for co-teaching, team-teaching, or opportunities to work within the existing course structure and deliver information literacy content within another course or courses.

PVP: discussion of patient-specific or population-based content in information literacy as understood to mean individual, unique perspectives, characteristics, values, preferences of patients in contrast to population or epidemiological understandings and teaching interventions.

Thematic coding categories:

OO: Operational overviews which discuss physical location, resource catalogs, holdings, or process of access

CO: discusses broad themes and previews of the content and philosophy of a particular course

AA: assignments and activities, both for in-class or out-of-class completion.

RL: discussion of resources and holdings of the library and how to use them

CR: course reviews and preparation for examination and evaluation

OML: discusses objectives, mission, learning objectives for a course or session, or makes a philosophical, theoretical, or pedagogical statement on the student learning

Appendix G

Interview Codebook

Unit of analysis	initial code(s)	secondary code(s)
A1	SQ3	EBM, OUT
A2	SQ3. SQ4	EBM, RIL
A3	SQ2	SAG
A4	SQ2	SAG
A5	SQ4	EBM, DSC
A6	SQ1	DSC
A7	SQ3	RIL
A8	SQ4	RIL
A9	SQ4	RIL, EBM
A10	SQ4	EBM
A11	SQ4	EBM, OUT
A12	SQ3	OUT
A13	SQ4	PVP
A14	SQ2	SAG
A15	SQ4	PVP, EBM
A16	SQ2	SAG
A17	SQ2	SAG
A18	SQ2	SAG
A19	SQ4	EBM
A20	SQ4	EBM
A21	SQ4	EBM
A22	SQ4	EBM
A23	SQ4	EBM
A24	SQ4	EBM
A25	SQ3	RIL, DSC
A26	SQ3	EBM, OUT
B1	SQ3	RIL
B2	SQ4	RIL
B3	SQ3	EBM
B4	SQ4	OUT
B5	SQ4	RIL
B6	SQ3	EBM, OUT
B7	SQ3	OUT
B8	SQ3	OUT
B9	SQ4	LLL
B10	SQ4	EBM

B11	SQ3	EBM
B12	SQ4	OUT
B13	SQ3	RIL, OUT
B14	SQ2	SAG
B15	SQ2	SAG
B16	SQ4	RIL
B17	SQ4	OUT
B18	SQ4	RIL, EBM
B19	SQ3	OUT
B20	SQ4	RIL
B21	SQ4	OUT
B22	SQ4	RIL
B23	SQ3	EBM, OUT, LLL
B24	SQ3	OUT, RIL
C1	SQ4	RIL
C2	SQ3	RIL
C3	SQ4	RIL
C4	SQ4	RIL
C5	SQ1, SQ3	EBM, OUT
C6	SQ3	OUT, RIL
C7	SQ4	DSC, LLL
C8	SQ1, SQ3	LLL
C9	SQ4	LLL
C10	SQ1	LLL
C11	SQ4	RIL
C12	SQ3	OUT
C13	SQ2	SAG
C14	SQ2	SAG
C15	SQ3	OUT
C16	SQ3	OUT
C17	SQ3	EBM
C18	SQ4	EBM, LLL
C19	SQ3	OUT
C20	SQ3, SQ4	EBM
C21	SQ1	EBM
C22	SQ4	EBM, PVP, OUT
C23	SQ3	OUT
C24	SQ3	OUT
C25	SQ3	OUT, RIL
C26	SQ3	RIL
C27	SQ1, SQ3	DSC, LLL, OUT
C28	SQ1, SQ3	OUT, LLL

D1	SQ3, SQ4	EBM
D2	SQ4	EBM
D3	SQ4	RIL
D4	SQ1, SQ4	RIL, EBM, DSC
D5	SQ1	EBM
D6	SQ4	EBM, RIL, LLL
D7	SQ3, SQ4	LLL
D8	SQ4	LLL
D9	SQ4	RIL, PVP
D10	SQ4	RIL
D11	SQ2	SAG
D12	SQ2	SAG
D13	SQ2	SAG
D14	SQ3	OUT
D15	SQ3	OUT
D16	SQ3	OUT
D17	SQ3	OUT
D18	SQ4	OUT
D19	SQ4	OUT, RIL
D20	SQ4	RIL
D21	SQ4	DSC, EBM
D22	SQ1	LLL, PVP
D23	SQ1	RIL, LLL
D24	SQ3	OUT
D25	SQ3	RIL
E1	SQ4	OUT
E2	SQ1	EBM
E3	SQ1	DSC
E4	SQ4	RIL
E5	SQ1	DSC
E6	SQ1	EBM
E7	SQ3	OUT
E8	SQ3	EBM
E9	SQ1	EBM
E10	SQ1	LLL, EBM
E11	SQ4	RIL
E12	SQ1	LLL
E13	SQ4	OUT, LLL
E14	SQ1	PVP
E15	SQ3	OUT, RIL
E16	SQ1	OUT

E17	SQ3	OUT, DSC
E18	SQ1	DSC
E19	SQ4	LLL, EBM
E20	SQ4	EBM, PVP
E21	SQ1	LLL
E22	SQ2	SAG
E23	SQ2	SAG
E24	SQ2	SAG
E25	SQ1	LLL
E26	SQ3	OUT
E27	SQ3	OUT
E28	SQ1	EBM, LLL
E29	SQ1	LLL, DSC, EBM
F1	SQ4	RIL
F2	SQ1, SQ4	EBM, DSC
F3	SQ3	OUT
F4	SQ1, SQ4	EBM, DSC
F5	SQ1, SQ3	OUT
F6	SQ1	LLL
F7	SQ1	EBM
F8	SQ3	OUT, EBM
F9	SQ1	EBM, LLL
F10	SQ2	SAG
F11	SQ2	SAG
F12	SQ1	EBM, LLL
F13	SQ1	EBM
F14	SQ3	OUT
F15	SQ2	SAG
F16	SQ3	OUT, RIL
F17	SQ3	LLL, RIL
F18	SQ1	EBM, RIL
F19	SQ1, SQ4	LLL
G1	SQ1	OUT, EBM
G2	SQ3	OUT
G3	SQ1	OUT
G4	SQ1	EBM, LLL
G5	SQ3	EBM, PVP
G6	SQ4	PVP
G7	SQ1, SQ4	EBM, LLL, DSC
G8	SQ1, SQ4	EBM,DSC, PVP
G9	SQ1, SQ4	EBM

G10	SQ1	DSC
G11	SQ2	SAG
G12	SQ2	SAG
G13	SQ3	OUT
G14	SQ4	DSC
G15	SQ1	LLL, EBM
G16	SQ4	RIL
G18	SQ3	OUT, RIL
G19	SQ3	OUT
G20	SQ3	EBM, OUT
G21	SQ3	OUT
G22	SQ1	LLL, EBM
G23	SQ4	EBM, LLL
G24	SQ3	OUT

Appendix H

Materials Codebook

Unit of analysis	initial	secondary	category
a1	SQ4	DSC	OML, EBM
a2	SQ4	RIL	CO
a3	SQ4	EBM	EBM
a4	SQ4	EBM, RIL	OML, EBM
a5i	SQ4	EBM, RIL	AA, EBM
a5ii	SQ4	RIL, LLL	CR
a6	SQ4	RIL	RIL, OO
a7	SQ4	RIL	RIL
a8	SQ4	RIL	OO, RIL
a9	SQ4	RIL	RIL
a10	SQ4	RIL	RIL
a11	SQ4	EBM, RIL	EBM
a12	SQ4	EBM	EBM
a13	SQ4	RIL, EBM	RIL, EBM
a14	SQ4	EBM, RIL	EBM, RIL
a15	SQ4	RIL	RIL
a16	SQ4	RIL, EBM	RIL, AA
a17	SQ4	EBM, LLL	OML, EBM, RIL
a18	SQ3, SQ4	OUT	AA
a19	SQ2, SQ4	EBM, RIL, SAG	AA, OML
a20	SQ4	RIL	OO, RIL
a21	SQ4	RIL	OO, RIL
a22	SQ4	RIL	RIL
a23	SQ4	RIL	RIL
a24	SQ4	RIL	RIL
a25	SQ2, SQ4	SAG, EBM	CO, OO
b1	SQ4	OUT	OO
b2	SQ4	EBM, LLL	EBM, AA
b3	SQ4	EBM, LLL	EBM, AA
b4	SQ4	EBM, LLL	EBM, AA
b5	SQ4	EBM, LLL	EBM, AA
b6	SQ4	EBM, LLL	EBM, AA

b7	SQ4	EBM	EBM
b8	SQ4	EBM, RIL	EBM, RIL
b9	SQ4	RIL	RIL, OO
b10	SQ4	EBM, RIL	EBM, RIL
b11	SQ4	LLL, RIL	RIL
b12	SQ4	EBM	EBM
c1i	SQ 4	LLL	OML
c1ii	SQ4	RIL	AA
c2i	SQ1	LLL, DSC	CO, OML
c2ii	SQ4	LLL, EBM	OML
c2iii	SQ4	RIL, EBM	AA, EBM
c3i	SQ1	LLL, DSC	CO, OML
c3iii	SQ4	LLL, EBM	OML
c3iii	SQ4	RIL, EBM	AA, EBM
c4	SQ4	RIL, LLL	OO, AA
c5	SQ4	RIL, LLL	RIL, OML, AA
c6	SQ2	SAG, LLL, EBM	OML, RIL, AA
c7	SQ2	SAG, EBM	OML, EBM
c8	SQ4	DSC, EBM	EBM, RIL, AA
c9i	SQ2	EBM, SAG	OML
c9ii	SQ3, SQ4	EBM, OUT	AA, EBM
c10i	SQ4	PVP	OML
c10ii	SQ4	EBM, PVP	EBM, OML
c10iii	SQ4	EBM, PVP	OML
c10iv	SQ4	EBM	EBM, OML
c10v	SQ4	EBM	EBM, OML
c10vi	SQ4	EBM	EBM
c10vii	SQ4	EBM	EBM, OML
c11	SQ4	RIL	RIL
c12	SQ4	LLL, RIL	OML
d1	SQ4	EBM, LLL	AA, EBM
d2	SQ4	EBM, LLL	AA, EBM
d3	SQ4	EBM, LLL	AA, EBM
e1	SQ4	EBM	AA
e2	SQ4	EBM	AA
e3	SQ4	EBM, LLL	AA, EBM
e4	SQ4	EBM, LLL	EBM, AA

e5	SQ4	EBM, LLL	AA, EBM
e6	SQ4	EBM, RIL	AA, OML
e7	SQ4	EBM, RIL	AA, OML, EBM
e8	SQ4	EBM	OML, AA
e9	SQ4	EBM	OML, AA
e10	SQ4	RIL, LLL, EBM	AA, EBM, OML
e11	SQ4	RIL	AA
e12	SQ4	EBM	AA
e13	SQ4	EBM	AA, EBM
e14	SQ4	EBM	AA, OML
e15i	SQ4	EBM	EBM, AA
e15ii	SQ4	EBM	EBM, AA
e16	SQ4	PVP, EBM	AA, EBM
e17	SQ4	EBM, RIL	AA, EBM
e18	SQ4	EBM	AA
e19	SQ1, SQ4	EBM, LLL, DSC	OML, AA

I, Brian D. Schwartz, hereby submit this dissertation to Emporia State University as partial fulfillment of the requirements for a doctoral degree. I agree that the Library of the University may make it available for use in accordance with its regulations governing materials of this type. I further agree that quoting, photocopying, or other reproduction of this document is allowed for private study, scholarship (including teaching) and research purposes of a nonprofit nature. No copying which involves potential financial gain will be allowed without written permission of the author. I also agree to permit the Graduate School at Emporia State University to digitize and place this dissertation in the ESU institutional repository.

_____

Signature of Author

_____

Date

More Than a Look-up Skill:

Information Literacy Education in

Osteopathic Medical Schools

Title of Dissertation

_____

Signature of Graduate School Staff

_____

Date Received