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April Schweikhard
Kennesaw State University, aschwei2@kennesaw.edu

Toni Hoberecht
University of Oklahoma-Tulsa

Alyssa Peterson
University of Oklahoma-Tulsa

Ken Randall
University of Oklahoma-Tulsa

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ABSTRACT. This study measures how online library instructional tutorials implemented into an evidence-based practice course have impacted the information literacy skills of occupational and physical therapy graduate students. Through a rubric assessment of final course papers, this study compares differences in students' search strategies and cited sources pre- and post-implementation of the tutorials. The population includes 180 randomly selected graduate students from before and after the library tutorials were introduced into the course curriculum. Results indicate a statistically significant increase in components of students' searching skills and ability to find higher levels of evidence after completing the library tutorials.

KEYWORDS. Allied health students, e-learning, evidence-based practice, information literacy, library tutorials, rubric assessment

AUTHOR INFORMATION. April J. Schweikhard, MLIS, AHIP (aschwei2@kennesaw.edu) is Associate Professor, Scholarly Communications Librarian, Horace W. Sturgis Library, Kennesaw State University, 385 Cobb Avenue, Kennesaw, GA 30144. At the time this manuscript was written, Ms. Schweikhard was Assistant Professor, Reference and Instructional Services Librarian, Schusterman Library, University of Oklahoma-Tulsa.

Toni Hoberecht, MA, MLIS, AHIP (toni-hoberecht@ouhsc.edu) is Assistant Professor, Technical Services Librarian, Schusterman Library, University of Oklahoma-Tulsa, 4502 East 41st Street, Tulsa, OK 74135.

Alyssa Peterson, MLIS (alyssa-k-peterson@ouhsc.edu) is Medical Librarian, Schusterman Library, University of Oklahoma-Tulsa, 4502 East 41st Street, Tulsa, OK 74135.

Ken Randall, PT, PhD, MHR (ken-randall@ouhsc.edu) is Associate Dean for Academic Affairs and Community Engagement for the College of Allied Health and Associate Professor in the Department of Rehabilitation Sciences, University of Oklahoma-Tulsa, 4502 East 41st Street, Tulsa, OK 74135.

INTRODUCTION

Librarians actively collaborate with health sciences faculty members to teach students information literacy (IL) and evidence-based practice (EBP) skills; however, the impact of these instructional efforts are not always evaluated beyond immediate student feedback and response. In 2014, faculty members in the College of Allied Health and Schusterman Library at the University of Oklahoma-Tulsa (OU-Tulsa) campus developed and implemented a series of online library instructional tutorials for occupational and physical therapy students enrolled in the graduate level course, PHTH8152/OCTH7162 Evidence-Based Practice. These tutorials were embedded into the online course platform and supplemented learning by guiding students through search processes for different types of sources and levels of evidence as they were presented in the course. The collaborative nature of creating these tutorials was described in a previous paper.[1]

Three student cohorts have since completed this Allied Health EBP course with the implemented tutorials. Though well-received by students, the course instructor and librarians desired to better understand how the tutorials contributed to overall learning outcomes. To measure the impact of the tutorials on IL and EBP skills, the researchers evaluated the search strategies and sources of evidence within the students' final written course papers in which they applied the five steps of EBP to a hypothetical clinical case. After developing a grading rubric to assess characteristics of their search strategies and sources, the researchers compared these components within randomly selected student papers written before and after the implementation of the tutorials. This paper describes the methods and results of this study and its significance in the field of IL instruction and EPB.

BACKGROUND

Institutional Context

OU-Tulsa is one of three main campuses in the University of Oklahoma system; the other two are located in Norman and Oklahoma City. OU-Tulsa offers over 30 professional, graduate, and undergraduate programs within ten different colleges: Allied Health, Architecture, Arts and Sciences, Education, Engineering, Fine Arts, Liberal Studies, Medicine, Nursing, and Public Health.

The OU College of Allied Health is based on the Oklahoma City campus and consists of departments in Allied Health Sciences, Communication Sciences and Disorders, Medical Imaging and Radiation Sciences, Nutritional Sciences, and Rehabilitation Sciences. The latter department houses the Master of Occupational Therapy and the Doctor of Physical Therapy programs, which merged into one department just over 25 years ago. It extended its programs to the OU-Tulsa campus seven years later. As part of its interprofessional course work, the department developed the curriculum tenet of EBP and created a course of the same name.

The Schusterman Library serves the needs of all OU-Tulsa students, faculty, and staff, in addition to the broader Tulsa community. The 22,000-square-foot, two-story building houses the library collections, a learning commons, group study rooms, a quiet reading room, and a digital exhibit space. The library's employees include faculty, professional staff, and graduate assistants.

Evidence-Based Practice Course

PHTH/OCTH Evidence-Based Practice is a three credit-hour course that occurs in an eight-week/half-semester block of time during the first full-time semester of courses in the Department of Rehabilitation Sciences. The course uses distance education technology to link the campuses and is coordinated by a faculty member based at OU-Tulsa. It has an annual enrollment of approximately 90 occupational therapy and physical therapy students between the Tulsa and Oklahoma City campuses and serves as the department's foundational course in clinical decision-making and IL. A central element of the course is practical application of the five steps of EBP: 1) Ask a focused clinical question, 2) Search for the best research evidence, 3) Appraise the quality of the research evidence, 4) Integrate the evidence with information about the patient and one's clinical expertise to make a decision, and 5) Reflect on the process to improve future practice.[2]

Students move through each of the five steps of EBP as they progress through the course. A substantial portion of the course focuses on steps two and three, in which students learn about the various types and levels of research evidence using the Oxford Centre for Evidence-Based Medicine framework.[3] Course lectures move from the higher levels of evidence of clinical practice guidelines, systematic reviews of the literature, and randomized controlled trials to incrementally lower levels including cohort and case-control studies, case series, case reports, narrative reviews, and expert opinion. As they learn about each type of study, the students also learn how to construct searches and critically appraise the articles that they find. As a culminating and integrating assignment, students write a "Step 5 Paper" near the end of the class,

which, as its name implies, serves to synthesize each of the steps and reflect on the entire process.

The Step 5 Paper is limited to two and a half typed double-spaced pages, and students have great latitude in determining their clinical question, which is based on a patient of their choice. They are tasked with "casting a broad net" of the available literature and databases to locate the three best studies that inform their clinical question. They determine the articles they select based on their critical appraisal of each study and its relevance/external validity to the patient. The students then synthesize the information from the selected studies to inform their clinical question. Finally, they reflect on the process, identify areas of strength and areas in which they can improve upon in the future.

Library EBP Tutorial Implementation

The Schusterman Library has always been active in promoting IL and in looking for ways to assist faculty in developing student IL skills. While many of the library's instruction sessions are limited to one-time class presentations, the librarians know how important it is to initiate and develop relationships with the faculty. The idea for expanding the library's role in the occupational therapy and physical therapy EPB course developed from an informal conversation between a librarian and the course coordinator, a College of Allied Health faculty member, who was unfamiliar with the ACRL *Information Literacy Competency Standards for Higher Education*.[4] He was intrigued by the possibility that these standards could bolster current instruction in the College's EBP course. Over a series of conversations that took place during the following year, librarians and the course coordinator discussed ways in which the librarians

could go beyond the traditional two-hour search instruction session that had previously been the extent of library involvement in the course. These discussions led to the librarians attending sessions of the EBP course in the fall of 2013, in order to understand how the library could fit into an already robust EBP syllabus.

As the EBP course was structured to introduce students to a new type of evidence in each class, the librarians developed online tutorials that would supplement each class and guide students through search processes for finding that type of evidence (see Table 1). For example, during the class period about viewing randomized controlled trials, a tutorial that guided students through the steps of finding this type of evidence was likewise created.

TABLE 1. List of Library EBP Tutorials

Class One	Overview of OU Libraries
Class Two	Using Appropriate Databases
Class Three	Using Medical Subject Headings to Search
Class Four	Searching for Randomized Controlled Trials
Class Five	Searching for Systematic Reviews and Meta-Analyses
Class Six	Searching for Cohort & Case-Control Studies
Class Seven	Searching for Diagnostic Tests
Class Eight	Searching for Qualitative Research
Class Nine	Searching for Clinical Practice Guidelines

The open source tutorial software *Guide on the Side* was chosen for developing most of the tutorials.[5] This software gave librarians the opportunity to create detailed instructions on developing PICO components, searching for MeSH terms, using Boolean operators, and applying applicable limits while also providing students the opportunity to practice these skills in a real-time search. The tutorials were embedded into the EBP online course management system in the fall of 2014, with each module linked to its associated class module. Tutorials were not mandatory; however, the faculty course coordinator strongly encouraged his students to complete each module and demonstrated their utility in class. Based upon positive feedback from students and the instructor, the tutorials have continued to be implemented into the EBP course since their introduction in 2014.

LITERATURE SEARCH

Information Literacy and Evidence-Based Practice

Instruction librarians are concerned with teaching IL to students as a matter of course: the ACRL *Information Literacy Competency Standards for Higher Education*, which has since given way to the *Framework for Information Literacy for Higher Education*, has been familiar to academic instruction librarians for years.[4, 6, 7] Compared to other disciplines, IL instruction took longer to become widespread in the health sciences disciplines; in fact, "information literacy" did not become a MeSH term until 2011, 11 years after ACRL first released their IL standards.[7, 8] However, instruction librarians in the health sciences as well as faculty in various health sciences disciplines understand that without the ability to recognize a need for information, be familiar

with authoritative and appropriate information sources, search effectively within those sources, and then evaluate the results, evidence-based practice becomes difficult, if not impossible.[9-13] If health professionals cannot locate evidence, then their practice cannot be supported by it.

The benefits of IL alone seem clear to librarians and other academics who believe intuitively that if nothing else, knowledge is power. Unfortunately, rigorous quantitative studies on the topic are difficult to conduct, given many academic libraries' funding and time constraints and the complex nature of the knowledge and skill domains that must be assessed.[14, 15] Furthermore, it is difficult to measure learning gains when many library instruction programs are limited to isolated one-shot instruction sessions.[15-17] The news is not all bad, however. ACRL's report on its wide-ranging and multi-year Assessment in Action project found that "information literacy instruction strengthens general education outcomes."[18] Also, the library literature is full of case studies of IL courses using various instruction methods for various student populations that are well-received by students and faculty and show benefits at least in the short term.[19-25]

The connection between IL and EBP has also been examined in the literature. Numerous articles assert the importance of IL as a basic building block of EPB.[9, 26, 27] A large number of studies measure self-reported perceptions of confidence in searching for evidence or attitudes of students in regards to the library.[28-30] Most notable is a 2012 systematic review whose findings suggest "there is a body of literature addressing EBM instructional initiatives" involving librarians, and that the evidence is "mostly positive," though admittedly modest, in terms of increasing EBP competencies in the health sciences.[31] This emerging literature includes quantitative studies as well as randomized controlled trials that measure the effect of instructional intervention on the students' search skills in addition to the ability to conduct critical appraisals.[32-36]

In the field of allied health specifically, librarians and faculty have worked together to improve EBP instruction by teaching students IL skills. Accounts in the literature on these collaborations, while reporting some success in improving students' IL skills, have focused mainly on small-scale case studies and short-term results.[9, 37, 38]

Assessment of Information Literacy

Assessment has become the name of the game in libraries, with librarians tracking inputs and outputs ranging from patron visits per year to minutes of IL instruction provided. Assessment made waves in the IL realm in 2000, after ACRL released the *Information Literacy Competency Standards for Higher Education*. In a review of IL assessment, Walsh discovered that multiple choice questionnaires were by far the most popular evaluation method, followed by bibliography analysis, quizzes, self-assessment, portfolio/essay review, observation, and simulation.[39] However, assessment trends in IL shifted again in 2010 after ACRL released the *Value of Academic Libraries*, which urged librarians to demonstrate value through measurement of their impact on student success instead of reports of inputs and outputs.[14] In order to more accurately measure student success, librarians need to move beyond assessing attainment of IL skills with multiple choice questionnaires, which gauge momentary acquisition of facts, to measurement through authentic assessment, which delves deeper into student learning to examine the performance of IL skills.[40-43]

Rubrics, a form of authentic assessment defined as "descriptive scoring schemes," have long been viewed as an essential tool for systematically and objectively assessing student learning in the education field. Traditionally, rubrics describe levels of performance for a given

task and can evaluate a product as a whole or break it down into specific components.[43] Within the library realm, rubrics offer two specific benefits. First, the rubric creation and documentation process allows all involved to agree upon and understand student learning objectives and outcomes. Second, rubric assessment generates rich and detailed data that can be used to describe stages of student learning and indicate areas where instruction can be improved.[40, 43, 44] These benefits are clearly attractive to librarians, as rubric assessment of IL skills has been documented in a number of research articles, and even inspired an Institute of Museum and Library Services funded project, RAILS (Rubric Assessment of Information Literacy Skills).[45]

As noted above, many research articles have been written about rubric assessment of IL, focusing on issues including interrater reliability and norming, faculty and library collaboration, comparison between instructional methods, and assessment of specific IL courses or skills. For the purposes of this literature review, those in the final category that use rubrics to evaluate annotated bibliographies or essays will be highlighted so as to review rubrics used for a similar purpose to this study. This sample is by no means exhaustive and excludes several studies looking solely at specific IL skills (e.g., attribution, literature searching, and credibility, respectively).[46-48] After reviewing selected rubrics, six broad criteria emerged: statement of a research question, search strategy details, inclusion of a variety of sources, critical evaluation of sources, integration of sources into the student's argument, and attribution. The full breakdown of rubrics can be found in Table 2.

Table 2. Rubric Criteria Breakdown

	Research Question	Search Strategy	Variety of Sources	Critical Evaluation	Argument	Attribution
Carbery & Leahy (2015)	Yes	No	Yes	No	No	Yes
Gariepy et al. (2016)	Yes	Yes	No	No	No	Yes
Gola et al. (2014)	No	No	Yes	Yes	Yes	Yes
Hoffman & LeBonte (2012)	No	Yes	Yes	No	No	Yes
Holliday et al. (2015)	Yes	No	No	Yes	Yes	Yes
Junisbai et al. (2016)	No	No	No	Yes	Yes	Yes
Lowe et al. (2015)	No	No	No	Yes	Yes	Yes

The focus of each rubric reviewed varied slightly, except for Junisbai, Lowe, and Tagge and Lowe, Booth, Stone, and Tagge, which both used the same rubric, Claremont Colleges Library Information Literacy in Student Work Rubric.[49, 50] Some rubrics focused broadly on the entire information searching, gathering, and interpreting process, while others focused more on communicating findings or on the search process.[40, 49, 50] The only rubric criterion all seven studies shared in common was attribution. Additionally, a few studies included criteria not found elsewhere, such as "holistic impression," allowing for appropriate time to implement a search strategy, and using advanced searching techniques like Boolean terms and truncation.[40, 44, 51] Overall, the rubrics tended to integrate IL standards or frames into their criteria and scaled students' performance on a three- or four-factor range.

METHODS

Within this context of IL, EBP, and rubric assessment, the objective was to evaluate the impact of the library tutorials on the IL skills of the occupational therapy and physical therapy students in the EBP course. As students were required to construct and describe an EBP search and locate evidence to support their clinical questions in their Step 5 Papers, this final student assignment was assessed for elements of IL using a rubric design. Students' works were assessed pre- and post-tutorial. It was hypothesized that IL and EBP skills would be higher in the post-tutorial cohort.

The population for this assessment included occupational therapy and physical therapy graduate students enrolled in the EBP course from 2012 to 2016. Students from 2012 and 2013 comprised the pre-tutorial cohorts ($N = 177$); students from 2014, 2015, and 2016 comprised the post-tutorial cohorts ($N = 272$). Investigators randomly selected 45 students from the two pre-tutorial classes ($n_{pre} = 90$) and 30 students from the three post-tutorial classes ($n_{post} = 90$) to serve as the assessment sample.

Rubric Design and Implementation

As previously established, rubrics are an authentic assessment tool that can be used to describe various levels of performance on a given task. Thus, a rubric was created to measure the IL skills demonstrated in the students' Step 5 Papers. The rubric scored components of strategies used in the students' searches and the three studies cited as the best evidence available for answering their clinical questions. The Step 5 Paper Rubric is shown in Table 3.

TABLE 3. Step 5 Paper Rubric

Component	1 point	2 points	3 points	4 points
Use of databases	Student uses 1 database in search	Student uses 2 databases in search	Student uses 3 databases in search	Student uses 4 or more databases in search
Use of search terms & MeSH/subject headings	Student uses 1 search term	Student uses 2 or more search terms; does not use MeSH/Subject Headings	Student uses 2 or more search terms; at least 1 is a MeSH/Subject Headings	Student uses 3 or more search terms; at least 1 is a MeSH/Subject Headings
Use of limits	Student does not use limits	Student indicates using limits, but does not specify which ones or how many	Student uses 1 limit	Student uses 2 or more limits
Level of evidence for each cited study	• Narrative Review • Expert Opinion • Textbook • All other studies/articles	• Case Control Study • Case Study • Case Series	• Cohort Study	• Practice Guideline • Systematic Review • Meta-Analysis • Randomized Controlled Trial

Though previous rubric assessments of IL included criteria such as research question, critical evaluation, and attribution, the Step 5 Paper Rubric was more focused in its design. Since the library tutorials primarily focused on selecting appropriate databases, determining applicable MeSH and subject headings, and applying relevant limits, the rubric was structured to measure these components of students' search strategies and the resulting levels of evidence that they cited in their papers. The rubric components included a range of qualifiers in the following four categories: use of databases, use of search terms and MeSH/subject headings, use of limits, and

the level of evidence for the three studies cited in the assignment. For each of the components, students received one to four points for demonstrating the defined activities and skills. The investigators anticipated that students from the post-tutorial cohorts would display more advanced IL skills in their searches and would thus receive higher rubric scores in all four components.

The selected Step 5 Papers were scored by three reviewers. Each paper was assigned two reviewers to increase validity. Reviewers met to discuss the rubric values and practiced scoring papers not selected for the assessment sample to support inter-rater reliability. Reviewers then proceeded to score their assigned sample papers. Once completed, the principal investigator compiled all paper scores and checked for discrepancies amongst reviewers. Reviewers met for a final session in which they settled disputed scores.

Ethical Considerations

The investigators received approval from the University of Oklahoma Institutional Review Board to conduct the assessment under IRB No: 7348. All personal identifiers were removed from Step 5 Papers to ensure student privacy.

RESULTS

Data was analyzed using the Microsoft Excel Data Analysis plug-in. The rubric assessment of student Step 5 Papers reveals a statistically significant increase of student scores in their use of

search terms and MeSH/subject headings, their use of limits, and their citation of higher level
studies (see Table 4).

TABLE 4. Descriptive Statistics

Rubric Components	Pre-Tutorial Cohort ($n = 90$)	Post-Tutorial Cohort ($n = 90$)	t	p	d
Use of databases	$\tilde{x} = 3.62$, SD $= 0.71$	$\tilde{x} = 3.48$, SD $= 0.74$	1.34	0.09	0.2
Use of search terms & MeSH/subject headings	$\tilde{x} = 2.19$, SD $= 0.65$	$\tilde{x} = 2.67$, SD $= 0.92$	-4.01	0.00005	0.6
Use of limits	$\tilde{x} = 2.27$, SD $= 01.4$	$\tilde{x} = 2.67$, SD $= 1.4$	-1.91	0.03	0.29
Level of evidence for cited studies (combined)	$\tilde{x} = 10.43$, SD $= 2.06$	$\tilde{x} = 10.94$, SD $= 1.57$	-1.92	0.03	0.29

t = t-statistic p = p-value d = effect size

Use of Databases

When looking at student scores for use of databases, the mean score in the post-tutorial cohort ($\tilde{x}$ = 3.48) decreased from the mean score in the pre-tutorial cohort ($\tilde{x} = 3.62$). The full spread of student scores for their use of databases is displayed in Figure 1. Although more students in the pre-tutorial cohort searched four or more databases ($n_{pre} = 66$; $n_{post} = 53$), more students in the post-tutorial cohort searched three databases ($n_{pre} = 16$; $n_{post} = 30$); however, the results were not statistically significant ($p = 0.09$).
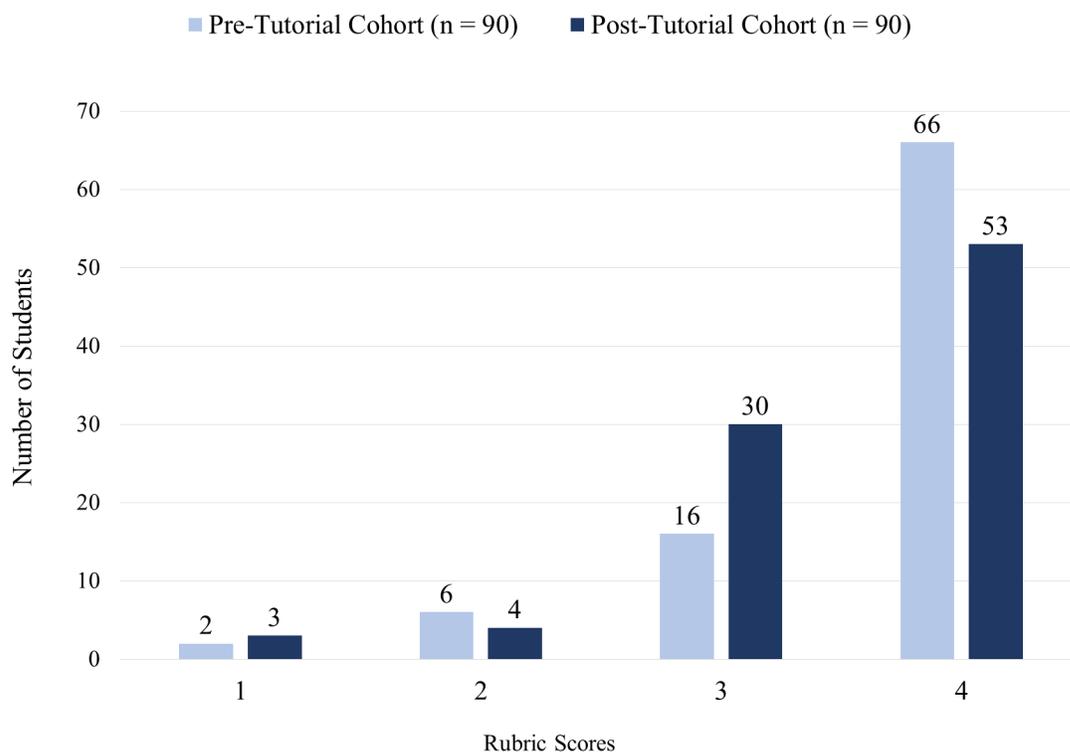
Pre-Tutorial Cohort (n = 90)   Post-Tutorial Cohort (n = 90)

FIGURE 1. Student Scores – Use of Databases

Use of Search Terms and MeSH/Subject Headings

The full spread of student scores for their use of search terms and MeSH/subject headings are displayed in Figure 2. This component's mean score for the post-tutorial cohort ($\tilde{x} = 2.67$) increased from the mean score in the pre-tutorial cohort ($\tilde{x} = 2.19$). Furthermore, the results for this searching component were the most statistically significant and revealed the largest effect size when compared to the other results. When looking at the number of students who received the highest points, more students in the post-tutorial cohort used three or more search terms and at least one MeSH or subject heading in their searches ($n_{pre} = 8$; $n_{post} = 28$).
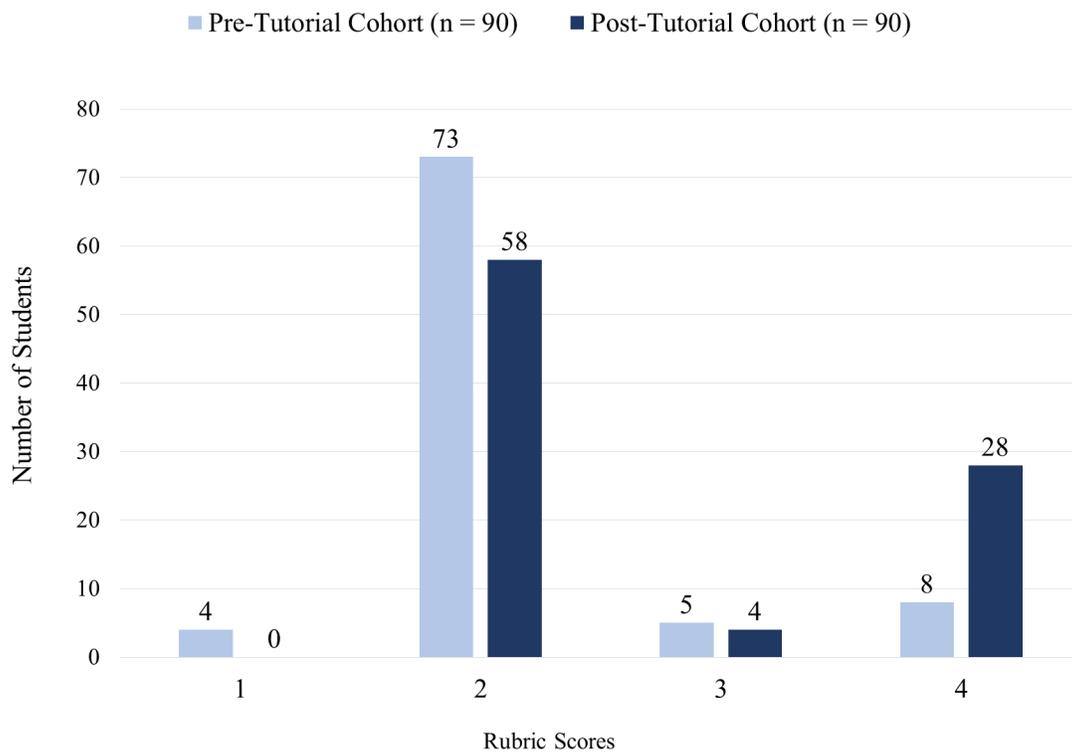
FIGURE 2. Student Scores – Use of Search Terms and MeSH/Subject Headings

Use of Limits

Likewise, the mean score for students' use of limits was higher in the post-tutorial cohort ($\tilde{x} = 2.67$) compared to the pre-tutorial cohort ($\tilde{x} = 2.27$). The full spread of student scores for their use of limits are displayed in Figure 3.
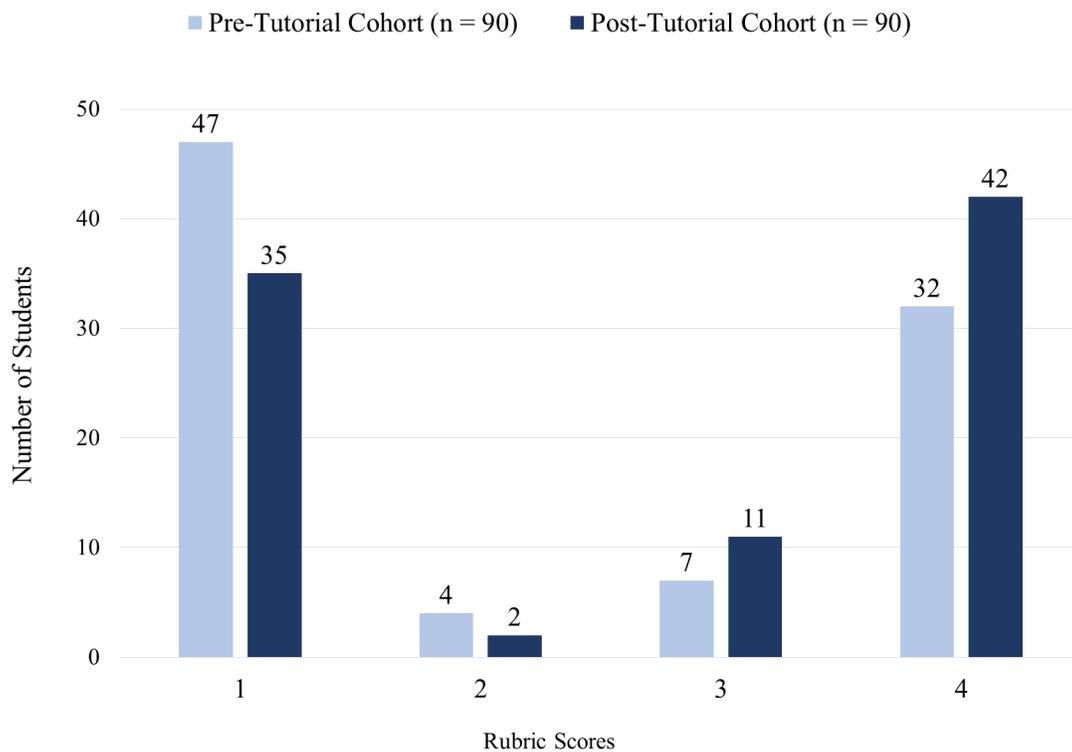
FIGURE 3. Student Scores – Use of Limits

Level of Evidence for Cited Studies

Finally, students were given a score for each of the three studies cited in their Step 5 Papers based upon their levels of evidence. The three scores were combined into one overall score for this component. The spread of student scores for their cited studies are displayed in Figure 4. On average, students in the post-tutorial cohort cited studies with higher levels of evidence than students in the pre-tutorial cohort ($\tilde{x}_{pre}$ = 10.43; $\tilde{x}_{post}$ = 10.94).
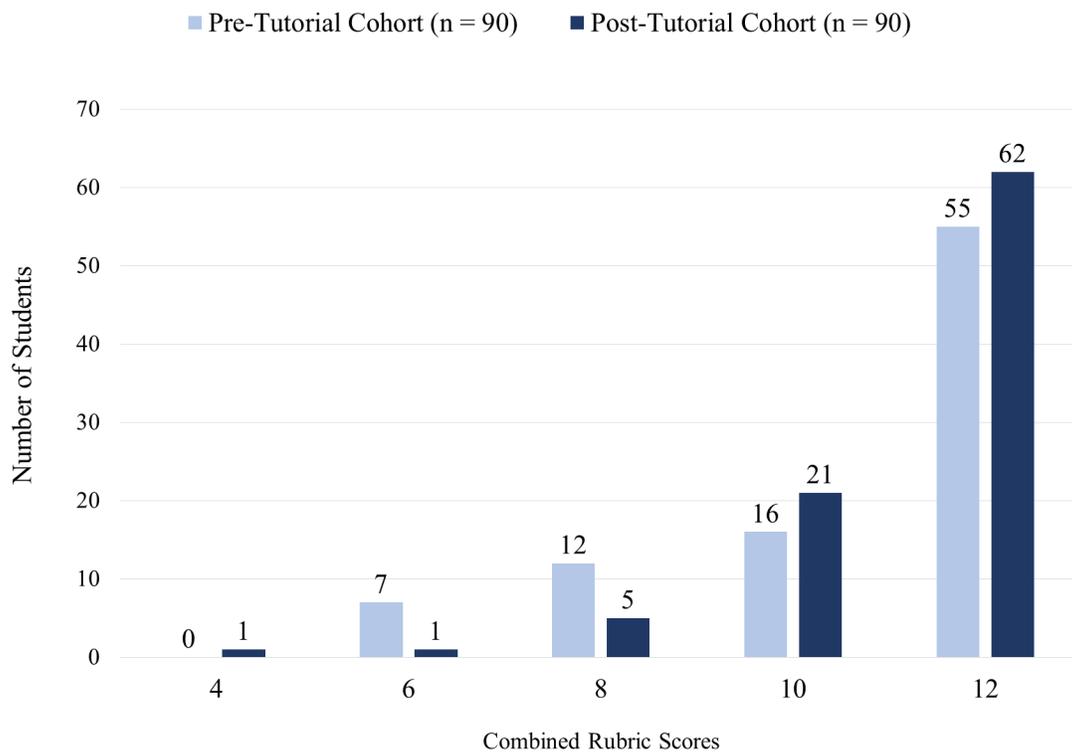
FIGURE 4. Student Scores – Level of Evidence for Cited Studies (Combined Scores)

DISCUSSION

Impact of Tutorials

These results show that the Schusterman Library tutorials embedded into the OCTH/PHTH EBP course displayed a positive effect on the IL skills of occupational therapy and physical therapy graduate students. Specifically, more students in the post-tutorial cohorts employed the advanced searching skills of using MeSH/subject terms and limits to locate evidence for their clinical questions.

Likewise, students in the post-tutorial cohorts cited more Level 1 and Level 2 studies in their Step 5 Papers, including systematic reviews, meta-analyses, clinical practice guidelines, and randomized controlled trials. When looking at the total number of studies cited in the post-tutorial cohort papers, 81% were Level 1 or 2 compared to 73% in the pre-tutorial cohort. This led to the conclusion that students' use of more focused and advanced search strategies increased the citation of higher levels of evidence.

The only component of student scores that decreased in the post-tutorial cohort was the number of databases used in their searches; this also was the only component that did not produce statistically significant results. This decrease could reflect that students in the post-tutorial cohorts began to employ more focused search strategies, which resulted in them using fewer databases. In addition, the mere number of databases used in a search may not be an accurate measure of IL skills. A more helpful measure would be to observe if students increased their use of databases relevant to their clinical questions. An area for further study would be to observe the exact databases used in the Step 5 Paper searches to determine if students increased their use of more relevant databases, such as CINAHL, Ovid Medline, National Guideline Clearinghouse, and PubMed, after completing the Schusterman Library tutorials.

Significance of Results

This study is significant to the field of IL and EBP instruction in that it illustrates how a specific type of embedded tutorial series can impact the IL and EBP skills of occupational therapy and physical therapy graduate students in an EBP course. Furthermore, it illustrates how a collaborative relationship between teaching faculty and librarians can benefit the learning

objectives of students. Though the tutorials were targeted to a university course environment, the model could be used to guide other types of instruction within different situations and then assessed to compare outcomes.

Study Limitations

The main limitation of this study was its reliance on students' self-reported search strategies in their Step 5 Papers. Though students were required to indicate the specific databases searched and the key terms used, their descriptions might not have accurately reflected the actual searches conducted. Furthermore, as students were not required to report use of MeSH terms or limits in their papers, students who used these features but did not specify this activity would not have been scored accordingly. The rubric used in this study combined the use of keyword search terms and MeSH searching in one set of criteria. This was partly due to the fact that not all clinical questions lend themselves to concepts that have corresponding MeSH terms. However, a case could be made that keyword searching and MeSH searching are in fact two separate dimensions that should be measured separately. As noted above, students were not required to indicate use of MeSH terms, but using MeSH could be a marker for IL learning gains.

Finally, though the results indicate that students achieve learning gains in an eight-week course, results are not generalizable over longer periods of time. A follow-up assessment of students in the EBP course later in the program could measure any sustainable learning gains ensuing from IL instruction.

CONCLUSION

The results of this rubric assessment, indicate that the embedded library tutorials increased the IL skills of occupational therapy and physical therapy graduate students enrolled in the EBP course. Specifically, this study reveals that students in the post-tutorials cohorts made modest gains in their use of MeSH/subject terms and limits and cited higher levels of studies in support of their clinical questions when compared to students in the pre-tutorial cohorts. These findings substantiated the general observations of the EBP course instructor and the positive feedback he has received from students regarding these tutorials. The Schusterman Library and College of Allied Health will continue to embed these tutorials into this EBP course and seek out new opportunities to modify their content and assess their impact.

REFERENCES

1. Hoberecht, Toni, Ken Randall, and April J. Schweikhard. "Library Tutorials in an Allied Health Evidence-Based Practice Class." *Medical Reference Services Quarterly* 34, no. 2 (April-June 2015): 240-248.

2. Sackett, David L., Sharon E. Straus, W. Scott Richardson, William Rosenberg, and R. Brian Haynes. *Evidence-Based Medicine: How to Practice and Teach EBM*. 2nd ed. New York: Churchill Livingstone, 2000.

3. Centre for Evidence-Based Medicine. "Oxford Centre for Evidence-Based Medicine – Levels of Evidence." Accessed June 28, 2017. http://www.cebm.net/oxford-centre-evidence-based-medicine-levels-evidence-march-2009/.

4. American Library Association. "Information Literacy Competency Standards for Higher Education." Accessed June 21, 2017. http://www.ala.org/acrl/standards/informationliteracycompetency.

5. University of Arizona Libraries. "About Guide on the Side." Accessed August 8, 2017. http://code.library.arizona.edu/.

6. American Library Association. *Framework for Information Literacy for Higher Education*. Accessed June 21, 2017. http://www.ala.org/acrl/standards/ilframework.

7. Brower, Stewart, and Maureen Knapp. "The ACRL Framework for Information Literacy in Higher Education: Implications for Health Sciences Librarianship." *Medical Reference Services Quarterly* 33, no. 4 (October-December 2014): 4604-68.

8. U.S. National Library of Medicine. "Information Literacy Mesh Descriptor Data 2017." Accessed June 21, 2017. https://meshb.nlm.nih.gov/record/ui?ui=D058980.

9. Boruff, Jill T., and Aliki Thomas. "Integrating Evidence-Based Practice and Information Literacy Skills in Teaching Physical and Occupational Therapy Students." *Health Information & Libraries Journal* 28, no. 4 (December 2011): 264-272.

10. Cheeseman, Susan. "Information Literacy: Foundation for Evidence-Based Practice." *Neonatal Network* 32, no. 2 (March-April 2013): 127-131.

11. Forster, Marc. "A Phenomenographic Investigation into Information Literacy in Nursing Practice - Preliminary Findings and Methodological Issues." *Nurse Education Today* 33, no. 10 (October 2013): 1237-1241.

12. Jacobs, Susan Kaplan, Peri Rosenfeld, and Judith Haber. "Information Literacy as the Foundation for Evidence-Based Practice in Graduate Nursing Education: A Curriculum-Integrated Approach." *Journal of Professional Nursing* 19, no. 5 (September-October 2003): 320-328.

13. Powell, Carol A., and Jane Case-Smith. "Information Literacy Skills of Occupational Therapy Graduates: Promoting Evidence-Based Practice in the Mot Curriculum." *Medical Reference Services Quarterly* 29, no. 4 (October-December 2010): 363-380.

14. Association of College and Research Libraries. *Value of Academic Libraries: A Comprehensive Research Review and Report*. Researched by Megan Oakleaf. Chicago: Association of College and Research Libraries, 2010. Accessed June 21, 2017. http://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/value/val_report.pdf.

15. Spievak, Elizabeth R., and Pamela Hayes-Bohanan. "Just Enough of a Good Thing: Indications of Long-Term Efficacy in One-Shot Library Instruction." *Journal of Academic Librarianship* 39, no. 6 (November 2013): 488-499.

16. Mery, Yvonne, Jill Newby, and Ke Peng. "Why One-Shot Information Literacy Sessions Are Not the Future of Instruction: A Case for Online Credit Courses." *College & Research Libraries* 73, no. 4 (July 2012): 366-377.

17. Rui, Wang. "Assessment for One-Shot Library Instruction: A Conceptual Approach." *portal: Libraries & the Academy* 16, no. 3 (July 2016): 619-648.

18. Association of College and Research Libraries. *Academic Library Impact on Student Learning and Success: Findings from Assessment in Action Team Projects*. Edited by Karen Brown and Kara J. Malenfant. Chicago: Association of College & Research Libraries, 2017. http://www.ala.org/acrl/sites/ala.org.acrl/files/content/publications/whitepapers/academiclib.pdf

19. Carroll, Alexander J., Nedelina Tchangalova, and Eileen G. Harrington. "Flipping One-Shot Library Instruction: Using Canvas and Pecha Kucha for Peer Teaching." *Journal of the Medical Library Association* 104, no. 2 (April 2016): 125-130.

20. Ivanitskaya, Lana, Susan DuFord, Monica Craig, and Anne Marie Casey. "How Does a Pre-Assessment of Off-Campus Students' Information Literacy Affect the Effectiveness of Library Instruction?" *Journal of Library Administration* 48, no. 3-4 (December 2008): 509-525.

21. Janke, Robert, Barbara Pesut, and Lynnelle Erbacker. "Promoting Information Literacy through Collaborative Service Learning in an Undergraduate Research Course." *Nurse Education Today* 32, no. 8 (November 2012): 920-923.

22. Kim, Sung Un, and David Shumaker. "Student, Librarian, and Instructor Perceptions of Information Literacy Instruction and Skills in a First Year Experience Program: A Case Study." *The Journal of Academic Librarianship* 41, no. 4 (July 2015): 449-456.

23. Morley, Sarah Knox, and Ingrid Claire Hendrix. "'Information Survival Skills': A Medical School Elective." *Journal of the Medical Library Association* 100, no. 4 (October 2012): 297-302.

24. O'Dwyer, Linda, and Stephanie C. Kerns. "Evolution of an Information Literacy Curriculum for Third-Year Medical Students." *Medical Reference Services Quarterly* 30, no. 3 (2011): 221-232.

25. O'Malley, Donna, and Frances A. Delwiche. "Aligning Library Instruction with the Needs of Basic Sciences Graduate Students: A Case Study." *Journal of the Medical Library Association* 100, no. 4 (October 2012): 284-290.

26. Shorten, Allison, M. C. Wallace, and Patrick A. Crookes. "Developing Information Literacy: A Key to Evidence-Based Nursing." *International Nursing Review* 48, no. 2 (June 2001): 86-92.

27. Stombaugh, Angie, Rita Sperstad, Arin Vanwormer, Eric Jennings, Hans Kishel, and Bryan Vogh. "Using Lesson Study to Integrate Information Literacy Throughout the Curriculum." *Nurse Educator* 38, no. 4 (July-August 2013): 173-177.

28. Courey, Tamra, Johnett Benson-Soros, Kevin Deemer, and Richard A. Zeller. "The Missing Link: Information Literacy and Evidence-Based Practice as a New Challenge for Nurse Educators." *Nursing Education Perspectives* 27, no. 6 (November-December 2006): 320-323.

29. Dorsch, Josephine L., Meenakshy K. Aiyer, and Lynne E. Meyer. "Impact of an Evidence-Based Medicine Curriculum on Medical Students' Attitudes and Skills." *Journal of the Medical Library Association* 92, no. 4 (October 2004): 397-406.

30. McClurg, Caitlin, Susan Powelson, Eddy Lang, Fariba Aghajafari, and Steven Edworthy. "Evaluating Effectiveness of Small Group Information Literacy Instruction for Undergraduate Medical Education Students Using a Pre- and Post-Survey Study Design." *Health Information & Libraries Journal* 32, no. 2 (June 2015): 120-130.

31. Dorsch, Josephine L., and Gerald (Jerry) Perry. "Evidence-Based Medicine at the Intersection of Research Interests between Academic Health Sciences Librarians and Medical Educators: A Review of the Literature." *Journal of the Medical Library Association* 100, no. 4 (October 2012): 251-257.

32. Bradley, Doreen R., Gurpeet Kaur Rana, Patricia W. Martin, and Roberth E. Schumacher. "Real-Time, Evidence-Based Medicine Instruction: A Randomized Controlled Trial in a Neonatal Intensive Care Unit." *Journal of the Medical Library Association* 90, no. 2 (April 2002): 194-201.

33. Gardois, Paolo, Roberto Calabrese, Nicoletta Colombi, et al. "Effectiveness of Bibliographic Searches Performed by Paediatric Residents and Interns Assisted by Librarians. A Randomised Controlled Trial." *Health Information & Libraries Journal* 28, no. 4 (December 2011): 273-284.

34. Gruppen, Larry D., Gurpeet K. Rana, and Theresa S. Arndt. "A Controlled Comparison Study of the Efficacy of Training Medical Students in Evidence-Based Medicine Literature Searching Skills." *Academic Medicine* 80, no. 10 (October 2005): 940-944.

35. Horsley, Tanya, Chris Hyde, Nancy Santesso, Julie Parkes, Ruairidh Milne, and Ruth Stewart. "Teaching Critical Appraisal Skills in Healthcare Settings." *Cochrane Database of Systematic Reviews*, no. 11 (November 2011). Accessed July 7, 2017. https://dx.doi.org/10.1002/14651858.CD001270.pub2.

36. Schilling, Katherine, John Wiecha, Deepika Polineni, and Souad Khalil. "An Interactive Web-Based Curriculum on Evidence-Based Medicine: Design and Effectiveness." *Family Medicine* 38, no. 2 (February 2006): 126-132.

37. Brooks, Salome V., and Susan Bigelow. "Preparing Students for Research: Faculty/Librarian Collaboration in a Pre-Doctoral Physical Therapy Research Course." *Health Information & Libraries Journal* 32, no. 4 (December 2015): 332-338.

38. Vogel, Kimberly A. "Librarians and Occupational Therapy Faculty: A Collaboration for Teaching Evidence-Based Practice." *Journal of Allied Health* 41, no. 1 (Spring 2012): 15E-20E.

39. Walsh, Andrew. "Information Literacy Assessment: Where Do We Start?" *Journal of Librarianship & Information Science* 41, no. 1 (March 2009): 19-28.

40. Gariepy, Laura W., Jennifer A. Stout, and Megan L. Hodge. "Using Rubrics to Assess Learning in Course-Integrated Library Instruction." *portal: Libraries & the Academy* 16, no. 3 (July 2016): 491-509.

41. Gola, Christina H., Irene Ke, Kerry M. Creelman, and Shawn P. Vaillancourt. "Developing an Information Literacy Assessment Rubric: A Case Study of Collaboration, Process, and Outcomes." *Communications in Information Literacy* 8, no. 1 (2014): 131-144.

42. Holliday, Wendy, Betty Dance, Erin Davis, et al. "An Information Literacy Snapshot: Authentic Assessment across the Curriculum." *College & Research Libraries* 76, no. 2 (March 2015): 170-187.

43. Oakleaf, Megan. "Using Rubrics to Assess Information Literacy: An Examination of Methodology and Interrater Reliability." *Journal of the American Society for Information Science & Technology* 60, no. 5 (May 2009): 969-983.

44. Carbery, Alan, and Sean Leahy. "Evidence-Based Instruction: Assessing Student Work Using Rubrics and Citation Analysis to Inform Instructional Design." *Journal of Information Literacy* 9, no. 1 (June 2015): 74-90.

45. Institute of Museum and Library Services. "Rails: Rubric Assessment of Information Literacy Skills." Accessed July 21, 2017. http://railsontrack.info/.

46. Angell, Katelyn. "The Application of Reliability and Validity Measures to Assess the Effectiveness of an Undergraduate Citation Rubric." *Behavioral & Social Sciences Librarian* 34, no. 1 (2015): 2-15.

47. Blank, Jason M., Karen J. McGaughey, Elena L. Keeling, Kristen L. Thorp, Conor C. Shannon, and Jeanine M. Scaramozzino. "A Novel Assessment Tool for Quantitative Evaluation of Science Literature Search Performance: Application to First-Year and Senior Undergraduate Biology Majors." *College & Research Libraries* 77, no. 6 (November 2016): 682-702.

48. Daniels, Erin. "Using a Targeted Rubric to Deepen Direct Assessment of College Students' Abilities to Evaluate the Credibility of Sources." *College & Undergraduate Libraries* 17, no. 1 (March 2010): 31-43.

49. Junisbai, Barbara, M. Sara Lowe, and Natalie Tagge. "A Pragmatic and Flexible Approach to

Information Literacy: Findings from a Three-Year Study of Faculty-Librarian

Collaboration." *Journal of Academic Librarianship* 42, no. 5 (September 2016): 604-611.

50. Lowe, M. Sara, Char Booth, Sean Stone, and Natalie Tagge. "Impacting Information Literacy

Learning in First-Year Seminars: A Rubric-Based Evaluation." *portal: Libraries & the

Academy* 15, no. 3 (July 2015): 489-512.

51. Hoffmann, Debra, and Kristen LaBonte. "Meeting Information Literacy Outcomes:

Partnering with Faculty to Create Effective Information Literacy Assessment." *Journal of

Information Literacy* 6, no. 2 (December 2012): 70-85.