

Facilitating Learning and Research Engagement of 4th year Undergraduate Students: the Outcomes of Student Self-Assessment Survey

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Abstract: Teaching faculty and a liaison librarian began exploring ways to facilitate undergraduate student engagement in research, in the context of a 4th year research seminar course. The course was a long established course, "Seminar in Foods and Nutrition," in the Department of Human Nutritional Sciences, University of Manitoba, Canada. The class was small, and eight students completed the course during the 2014 Winter semester. The Research Skills Development Framework (RSD), which was developed at Adelaide University, Australia, was adopted as a conceptual model for collaboratively reorganizing and realigning learning and instructional activities. The RSD framework was very useful in maintaining the shared interest among the collaborators in facilitating student learning. An online survey with 19 Likert-scale questions was administered identically at the beginning and end of the course to measure student self-assessment of research skills. The survey results showed that the efforts in supporting student learning paid off. There were positive learning outcomes in nine research skill areas, and two additional skill areas showed positive trends. They are all corresponding to information literacy.

Keywords: learner-centered teaching, faculty-librarian collaboration, capstone courses, information literacy, higher education

1. Introduction

Many undergraduate programs offer a capstone course in which student engage in disciplinary research and present results in a variety of formats, such as research papers, oral presentations, conference posters, or multimedia productions. A capstone course is usually offered in the last year of an undergraduate program. The course is often designed to give students the opportunity to undertake research that applies what they have thus far learned in a specific disciplinary area in their designated undergraduate programs. Viewing from a life-long learning perspective, a capstone course is designed to

establish the foundational research skills from which students can continue cultivating and developing in their future academic or professional endeavors after the completion of the undergraduate programs. A capstone course provides a favourable context for the teaching faculty to explore better ways of enhancing student learning by putting extra efforts in aligning lectures, class instructions and learning activities (Biggs & Tang, 2011; Hunt & Chalmers, 2013). A traditional, lecture-based course, on the other hand, can create a barrier to facilitating student engagement in research even when there is a research paper assignment is included: the traditional course design prioritizes preparation and delivery of lectures to cover the subject content over the facilitation of student learning. In such an environment, the course instructor has no affordance for conducting or exploring a learner-centered approach to one's teaching (Bar & Tagg, 1995; Huba & Freed, 2000). The tight time lines for content coverage of a traditional course limits creative collaboration between the teaching faculty and academic support professionals—such as subject librarians and writing instructors—to support student learning. In contrast, a capstone course being focused on students' research, has a clear advantage in arranging and exploring such a collaboration to support and enhance student learning.

In this paper, the teaching faculty-librarian collaboration on facilitating student learning in one undergraduate program capstone course at the University of Manitoba, Canada, will be discussed as a case study. An online survey with 19 statements using 10-points Likert scale was administered twice, in the beginning and end of the course, for students to gauge their skills associated with engaging in research. The results from the surveys were compared to measure the impacts of the course on student learning.

2. Background

"Seminar in Foods and Nutrition," a compulsory, 4th-year research seminar course, of the Department of Human Nutritional Sciences, University of Manitoba, Canada, is an example of undergraduate capstone courses. A cohort of 4th-year Human Nutritional Sciences students, between 60 to 70 students, takes the course every year. Three different teaching faculty members are responsible for teaching a total of three sections of the course: two sections offered in the fall semester and another section offered in the winter semester. The Department had been offering the same research-intensive capstone course with the same curriculum design for many years. Upon the teaching faculty's request 6–7 years ago, the librarian began offering a one-hour library session at the beginning of each course section. The sessions given in the past prior to the Winter 2014 teaching faculty-librarian collaboration project were restricted to technical demonstrations of two key research databases, SCOPUS and PubMed, and in some cases, the use of RefWorks, fitting everything in a one-hour class period.

3. The Capstone Course Curriculum

The course has “three credit hours,” and it covers four months of study. Students are asked to conduct two projects in the course: 1) a succinct literature review paper by conducting research in the field of human nutrition using research published in the most recent 5 years; and 2) a group oral presentation targeting a consumer audience on a topic mutually negotiated and agreed upon by the group members. The main thrust of the research paper assignment is for students to develop a research question, and to investigate, to find, and to report evidence from the disciplinary literature. Students are free to select a research topic, and must perform individual research. The students are responsible for selecting 3–4 key research articles and producing a paper between 8–10 pages. In addition, the course syllabus provides the guidelines for a general structure of the paper.

The course starts with the Library Assignment during the first four weeks of the course. Starting with the Library Assignment, the students are directed to locate research articles and start developing their research. At the end of the four weeks, the students are asked to submit the Library Assignment along with draft outlines of their papers.

In addition to the Library Assignment, the course includes many activities. Following the submission of the Library Assignment, the class time is dedicated to covering students’ individual presentations about their research. Because students are asked to do individual presentations as a process of developing their research, as well as group presentations targeting consumer groups, the class time during the first month of the course is used to coordinate and schedule presentations. The course instructor also provides instruction on how to conduct oral presentations during the first month of the course. After students are assigned to a group for the consumer presentations, they also start interacting and coordinating with peers. The students are asked to submit their draft paper for the instructor’s feedback by the time the class completes all individual presentations. The students have the rest of the course time to continue working on the paper, until the due date that is the last day of the course. Following the completion of the individual presentations, the class continues conducting the group presentations. For both individual and group presentations, the students are responsible for evaluating peers. The final grades for the presentations incorporate peer evaluations in addition to the marks given by the instructor.

4. The Research Skill Development Framework and the Faculty-Librarian Collaboration

In the fall of 2013, the instructor of the capstone course for the Winter 2014 session and the liaison librarian exchanged ideas and information regarding the course by arranging numerous meetings in person, supplementing with e-mail communications. The purpose was to discuss instructional and learning activities that can be added or rearranged during the Winter 2014 session to

enhance the facilitation of student learning. The Research Skill Development Framework (RSD)(Willison, 2012; Willison & O'Regan, 2007), developed at the Adelaide University in Australia, was used to guide the teaching faculty-librarian collaboration.

The RSD is a conceptual framework to explore the ways to engage students in a scholarly inquiry by facilitating assessment and planning of research, and interpreting potential and actual student research skill development. The framework integrated two models, the Australian and New Zealand Information Literacy Framework 2004, and Bloom's Taxonomy to develop an underlying principle of research skill development (Willison & O'Regan, 2005). The strength of the RSD as a pedagogical tool for research development skill is attributed to its applicability and adaptability across disciplines through a wide range of skill levels, from undergraduate beginner researchers to graduate and expert researchers. Furthermore, the RSD helps the teaching faculty facilitate assessment, and plan and coordinate learning activities with support professionals in a specific course context (Willison, 2012; Willison & O'Regan, 2005 & 2007).

The RSD uses two key constructs. First, six basic facets of research are vertically represented: 1) embarking on inquiry and determining a need for knowledge or understanding; 2) finding or generating needed information or data using appropriate methodology; 3) critically evaluating information or data and the process to find or generate them; 4) organizing information collected or generated; 5) synthesizing and analyzing new knowledge; and 6) communicating knowledge and understanding the processes used to generate them. Second, student autonomy and inquiry is represented horizontally across as a wide range of skill levels; for example, a closed inquiry with a high degree of structure and guidance is represented on the left extreme while open inquiry with a high degree of self-guidance and direction is represented on the right extreme. The RSD framework attempts to approximate diverse research dynamics using the basic six facets and the level of autonomy and inquiry in order to capture the non-linear, cyclical and recursive nature of research. Students can be ideally guided to become "self-regulated learners" who can monitor and evaluate their learning processes as they undertake research (OECD, 2010).

5. The Faculty-Librarian Collaboration in the Winter 2014 Course

The discussions using the RSD helped both the course instructor and the librarian to identify what they wanted to work on during the Winter 2014 course offering: improving their instructions, facilitation of student learning, and articulation of assessments. The RSD was particularly helpful in generating open conversations between the teaching faculty and the librarian by focusing on shared interests in making the course a better learning environment.

In the faculty-librarian collaboration for the Winter 2014 course, common difficulties that students experience were identified as including understanding the significance of a research question in guiding research; and actually formulating a research question. The course instructor shared her experience of seeing disconnected sources used in papers submitted by the students who took the capstone course in the previous years: disconnected sources in students' papers are often the symptom of students not clearly identifying research questions. The course instructor and the librarian both observed that many undergraduate students find it difficult to understand what exactly it means to conduct research. Further, the RSD helped the librarian clarify the curriculum design of the course, including the duration of the course, the number of students, and the time needed to carry out learning activities; she had to develop appropriate instructional and learning activities while considering the tight administrative framework of the course. In addition, the RSD guided the course instructor in developing the rubrics used for the course and in reassessing her lectures and instructions. With the establishment of the rubric for the research paper project, what was being expected from the paper, and the basis for marking the paper, became visible and explicit to students.

6. Expanding the Library Session in the Winter 2014 Course

As a result of the discussions with the course instructor, the librarian rewrote the Library Assignment and developed group and individual learning activities for her library session. The purpose of her library session was revised to address and facilitate students' understanding of the role of research questions and the value of consciously developing a research question at the beginning of research. The Library Assignment originally emphasized guiding students through a mechanical process of searching databases by identifying keywords and narrowing down results. In the revised Library Assignment, the students were asked to focus on the process of browsing and assessing search results for the purpose of developing and shaping a research question. The librarian demonstrated the mechanical aspects of searching and narrowing down search results as a means of creating a manageable set of sources for further scrutiny. In addition, the librarian asked students first to discuss in small groups how they normally start their research, then to share the results from each group with the entire class. After the group presentations, the librarian began a class discussion asking the students when and how they begin formulating a research question. After the discussion, she provided a lecture on the difference between research topics and research questions. She reiterated the role of a research question in guiding research. In a hands-on session following the discussion, the librarian asked students to individually locate relevant research articles by searching research databases. The students were asked to identify a research topic and to develop a research question. The library session in the Winter 2014 course was consequently extended to three hours to incorporate extra learning activities

together with the demonstrations of SCOPUS and PubMed, and the use of RefWorks in conjunction with respective databases.

In addition to extending the library session at the beginning of the course, the librarian was able to arrange a separate session to demonstrate the use of Practice-based Evidence in Nutrition (PEN), a research database that is useful and relevant in preparing for the group consumer related presentations, close to the time students were focusing on their group presentations. Although PEN had not been introduced during the course in the past, the demonstration benefitted the students, judging from their informal comments. Detailed coordination with the course instructor was crucial for identifying and arranging the right timing for the PEN demonstration. Delaying the PEN demonstration gives the students the opportunity to develop and cultivate research skills in locating evidence among primary sources searching while working on the research paper project.

7. Methodology Used for Evaluating the Effects on Student Learning

Eight students completed the Winter 2014 course. In order to measure the effects of the capstone course on student learning, a link to a self-assessment online survey was made available from the online course management system of the University during the first week and again during the last week of the course. The course instructor explained the purpose of the survey project to the students during the first class and received signed consent forms from those who volunteered to take part in the surveys. The instructor reminded the students of the availability of the survey link during the last week of the course. The survey asked students to self-assess their research related skills by responding to a total of 19 statements using a 1–10 Likert scale ranging from “strongly disagree” to “strongly agree”. The 19 survey items were developed for the Winter 2014 course project by adapting and modifying the student self-assessment questionnaire used in Willison’s large-scale study (2012) [Table 1]. A total of eight students participated in the pre-survey (n=8) and six students participated in the post-survey (n=6). Unpaired, right-tailed t-tests were performed on the two survey results to determine any significant changes between the surveys.

8. Results

When p value is less than 0.05 or between 0.05 and 0.10, the values are bolded or italicized, respectively in Table 2 as shown in the next page. There are nine-survey statements that scored less than $p=0.05$, and they represent positive impacts of the capstone course on student learning. Two additional statements scored a p-value that is less than $p=0.10$ and thus showed positive trends. The results also showed some individual differences in how students perceived their research related skills, and the changes when they completed the course. Three graphs representing the pre- and post-survey results of three randomly selected students highlight the 11 statements showing positive impacts (represented by

statement number 3 to 13) and demonstrate the diversity in how the course impacted individual students.

Table 1 — 19 Statements Used in the Pre- and Post-Surveys

<ol style="list-style-type: none">1. I understand current concepts in the field of human nutrition.2. My general research skills in the topics related to the field of human nutrition are good.3. I can make use of the primary sources in the field of human nutrition.4. I can effectively browse potential sources and evaluate relevancy of the information for my inquiry.5. I can critically evaluate information sources in the field of human nutrition.6. I am confident and able to frame research questions for research papers.7. I can identify the information needed to properly address my research papers.8. I can effectively organize information from multiple sources for the purpose of writing a paper.9. I am able to analyse information effectively for the purpose of writing a paper.10. I can use sources to support an argument/thesis.11. I can clearly communicate in writing what I understand from my research.12. I can effectively communicate an argument/thesis.13. I can clearly communicate in an oral presentation what I understand from my research.14. I can properly cite sources.15. I gain a better understanding of the topic by doing research.16. I can think independently in the field of human nutrition.17. I would like to be more involved in research.18. I believe that research is an activity that influences practices in fields of human nutrition.19. The ability to research will be important in my career.

9. Discussion

A high impact score as shown in Table 2 gives a high-degree of confidence that the course was effective in improving students' self-assessed skill in a respective area. The nine statements that showed significant impacts with a high-degree of confidence are, in decreasing order: 1) effectively organizing information from multiple sources for the purpose of writing a paper; 2) framing research questions for research papers; 3) effectively browsing potential sources and evaluating relevancy of the information for their inquiry; 4) effectively communicating an argument/thesis; 5) effectively analyzing information for the purpose of writing a paper; 6) clearly communicating in writing what I understand from my research; 7) critically evaluating information sources in the field of human nutrition; 8) making use of the primary sources in the field of human nutrition; and 9) using sources to support an argument/thesis.

In addition, two statements that indicated positive trends are: 1) identifying the information needed to properly address my research papers; and 2) clearly communicating in oral presentations what I understand from my research.

All of the above 11 statements discussed roughly characterize the four standard areas identified in the Information Literacy Competency Standards in Higher Education (ACRL, 2000). Further, although the topic of formulating/framing research questions was ranked as the second most significant change with a high degree of impact, the librarian made a note that there is room for improvement in facilitating student formulation of research questions.

Table 2. Statistically Significant Values When the Pre- and Post-Survey Results were Compared (a 10-point Likert Scale)

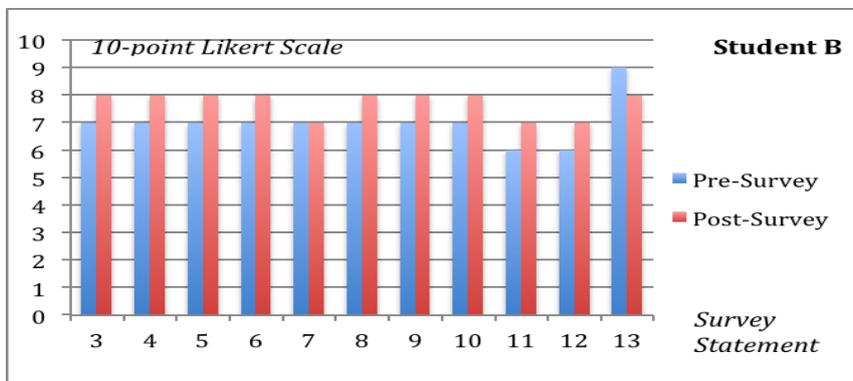
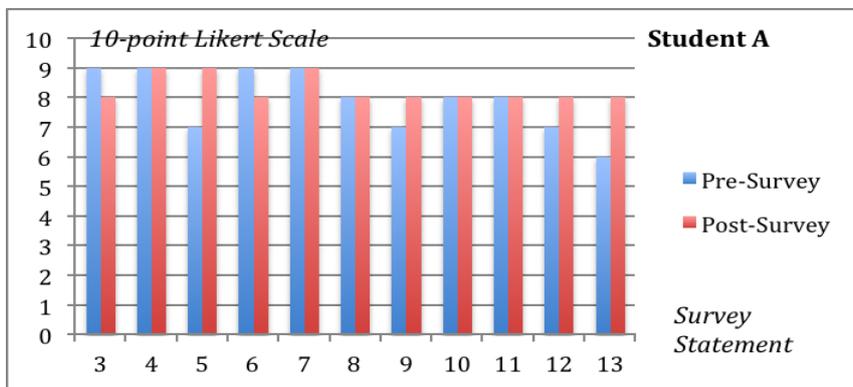
Statement	Pre-Survey n=8 \bar{x}^1	SD ¹	Post-Survey n=6 \bar{x}^2	SD ²	Right-Tailed T-Test p-value
1	7.63	1.51	8.00	0.63	0.270
2	7.13	1.13	7.33	0.82	0.348
3	7.25	1.16	8.17	0.41	0.034¹
4	6.75	1.67	8.50	0.84	0.013¹
5	6.38	1.30	7.83	1.17	0.025¹
6	6.50	1.20	8.00	0.63	0.006¹
7	7.00	1.20	8.00	0.89	<i>0.050²</i>
8	6.88	1.13	8.50	0.84	0.005¹
9	6.63	0.92	8.00	1.10	0.016¹
10	7.63	0.74	8.50	0.84	0.035¹
11	5.88	2.36	8.00	1.10	0.024¹
12	6.50	0.93	7.67	0.82	0.014¹
13	7.00	1.51	7.83	0.41	<i>0.087²</i>
14	8.00	1.85	8.83	0.75	0.138
15	8.50	1.07	9.00	0.63	0.148
16	7.25	1.28	7.67	0.52	0.212
17	7.00	2.88	8.17	1.47	0.173
18	8.25	2.05	9.17	0.98	0.147
19	8.13	1.81	8.50	1.38	0.334

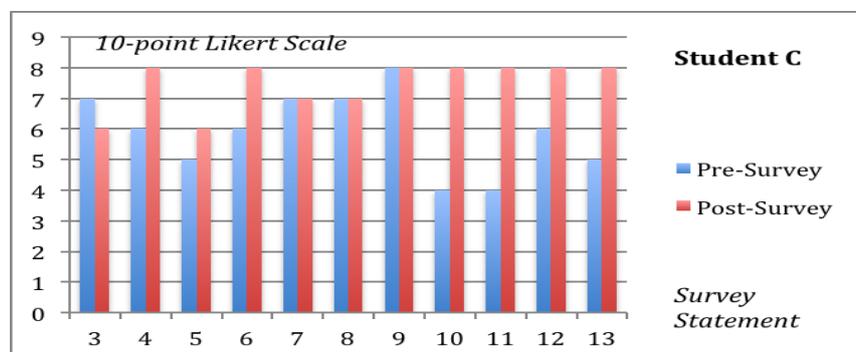
¹The p-value is in bold when $p < 0.05$.

²Positive trend is in italics when $0.10 < p \leq 0.05$.

Three graphs shown in the next page demonstrate the diversity among individual students as to how they perceived their research related skills, and the changes in perception at the end of the course. Although the post-survey results consistently scored higher than the pre-survey results as a group, individual responses varied even in response to the statements showing positive impacts

(statement no 3 to no 13). Students occasionally assessed themselves lower on a scale in the post-survey than the pre-survey. For example, Students A, B, C assessed lower on a scale in response to the statements no. 3 and 6; no. 13; and no. 3, respectively. They might have been overconfident originally and reconsidered their assessments after going through the coursework. Student C seemed to have gained substantial confidence in response to 6 statements, consistently gaining 2 or more points. Student B consistently gained 1 point in response to 7 statements while Student A gained 1 point in response to 2 statements and also gained 2 points in response to 2 other statements.





10. Conclusions

The faculty-librarian collaboration was successful in making the capstone course, “Seminar in Foods and Nutrition,” learner-centered during the Winter 2014 session. The use of the Research Skill Development Framework (RSD) positively facilitated the collaboration, and helped to establish shared focus in the exploration of facilitating student learning during the course. The collaboration gave a productive framework, in which the areas for facilitating student learning were identified, and actual plans were developed and the outcomes were measured. Torres & McCann (2014) also report that librarians at the Monash University adopted the RSD as “a library-faculty collaborative model” following a university-wide strategic plan.

The approach used in the Winter 2014 course was replicated during the Winter 2015 course at the time of writing this paper. The librarian continued working, coordinating, exchanging notes and administrating pre- and post-survey results with a sessional course instructor who taught the course while the regular course instructor was away. Administering the surveys of student self-assessments on research related skills and attitudes, and reviewing of the results, produced tangible results to gauge impacts of the course on student learning and helped generate further insights and new actions. Ideally, the capstone course could be expanded to a 6 credit hours course covering the 8 months of study fully focusing on student learning in engaging in research in the field of human nutrition. The immediate plan, however, is to expand the dialogue and the faculty-librarian collaboration with the teaching faculty who teach two other sections of the course in the fall semester.

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