Evidence Based Library and Information Practice

Exploring the Impact of Individualized Research Consultations Using Pre and Posttesting in an Academic Library: A Mixed Methods Study

Lindsey Sikora, Karine Fournier et Jamie Rebner

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Résumé de l'article

Objective – Academic librarians consistently offer individualized help to students and researchers. Few studies have empirically examined the impact of individualized research consultations (IRCs). For many librarians, IRCs are an integral part of their teaching repertoire. However, without any evidence of an IRC's effectiveness or value, one might ask if it's worth investing so much time and effort. Our study explored the impact of IRCs on students' search techniques and self-perceived confidence levels. We attempted to answer the following questions: 1) Do IRCs improve students' information searching techniques, including the proper use of keywords and/or subject headings, the accurate use of Boolean operators, and the appropriate selection of specialized resources/databases? 2) Do IRCs influence students' confidence level in performing effective search strategies?

Methods – Our study used a mixed-methods approach. Our participants were students from the Faculties of Health Sciences and Medicine at the University of Ottawa, completing an undergraduate or graduate degree, and undertaking a research or thesis project. Participants were invited to complete two questionnaires, one before and one after meeting with a librarian. The questionnaires consisted of open-ended and multiple choice questions, which assessed students' search techniques, their self-perceived search techniques proficiency and their confidence level. A rubric was used to score students' open-ended questions, and self-reflective questions were coded and analyzed for content using the software QSR NVivo.

Results – Twenty-nine completed pre and posttests were gathered from February to September 2016. After coding the answers using the rubric, two paired-samples t-tests were conducted. The first t-test shows that students' ability to use appropriate keywords was approaching statistical significance. The second t-test showed a statistically significant increase in students' ability to use appropriate search strings from the pretest to the posttest. We performed a last paired-samples t-test to measure students' confidence level before and after the appointment, and a statistically significant increase in confidence level was found.

Conclusion – Out of three paired t-tests performed, two showed a statistically significant difference from the pretest to the posttest, with one t-test approaching statistical significance. The analysis of our qualitative results also supports the statement that IRCs have a positive real impact on students' search techniques and their confidence levels. Future research may explore specific techniques to improve search strategies across various disciplines, tips to improve confidence levels, and exploring the viewpoint of librarians.

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Abstract

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consultations (IRCs). For many librarians, IRCs are an integral part of their teaching repertoire. However, without any evidence of an IRC's effectiveness or value, one might ask if it's worth investing so much time and effort. Our study explored the impact of IRCs on students' search techniques and self-perceived confidence levels. We attempted to answer the following questions: 1) Do IRCs improve students' information searching techniques, including the proper use of keywords and/or subject headings, the accurate use of Boolean operators, and the appropriate selection of specialized resources/databases? 2) Do IRCs influence students' confidence level in performing effective search strategies?

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Introduction

In the current digital age, a university student's challenge is not finding information, but rather locating the appropriate, validated, and trustworthy information required. Librarians support students in this challenge in various ways, including in-class instructions, specialized workshops, and reference desk assistance. More specifically, individualized research consultations (IRCs) between librarians and students have been increasing, with librarians spending less time at the reference desk. This shift in service appears to be a trend in many academic libraries. For the purpose of this study, IRCs were defined as scheduled appointments that aim to help students with their research projects, including, but not limited to, the literature review process.

In a scoping review, Fournier and Sikora (2015) found that though IRCs have been taking place for decades, the impact of these meetings on a student's information literacy (IL) skills is challenging to measure. The authors reviewed 20 articles for assessment methods, with the

following techniques identified: 1) usage statistics; 2) surveys; 3) objective quantitative methods. While many libraries use statistics and surveys for assessment purposes, only three articles examined using objective quantitative methods as a measure of the impact of IRCs on IL skills (Fournier & Sikora, 2015). It is extremely difficult to evaluate an IRC service objectively (Schobert, 1982). However, this does not mean it should not be attempted. The three studies trying to measure this impact used different approaches. Donegan, Domas, and Deosdade (1989) wanted to demonstrate impact between group instruction and term paper counselling, while Erickson and Warner (1998) examined whether getting individual tutorials vs. no tutorials would change the assessment. The authors were unable to demonstrate a statistically significant difference in the impact of IRCs on students' IL skills. Reinsfelder (2012) found a statistically significant difference in his study, which investigated IL skills using citation analysis to compare students' draft and final papers in a course. Reinsfelder concluded that "some quantitative evidence demonstrating the positive impact of individual research consultation" (p. 263) had been proven.

As there is a paucity in the literature surrounding objective quantitative methods evaluating the impact of IRCs on students' IL skills after meeting with a librarian, we sought to present a new method using pre and posttests to examine students' database searching skills by using a rubric to analyze their search strategies.

Literature Review

It is well known that interactions occurring at the traditional library reference desk are declining (Association of Research Libraries, 2015). However, the demand for librarians to offer more personalized, in-depth services to students and faculty has remained stable, or even risen (Covert-Vail & Collard, 2012). These services often involve a librarian's comprehensive knowledge of resources and strategies tailored to locate the appropriate information. IRCs can serve as one way to connect students to librarians with such expertise.

User surveys and feedback forms have provided librarians with comments from students, illustrating the usefulness of IRCs (Butler & Byrd, 2016). Researchers have discussed the benefits IRCs can provide for students, such as the "overwhelming usefulness" students often reported following a one-on-one meeting with a librarian (Butler & Byrd, 2016), the opportunity to aid in developing students' problem-solving skills (Fields, 2006), the overall positive patron experience with academic library research consultations (Rogers & Carrier, 2017), or the increase in goodwill between libraries and faculty members that extends beyond the library environment (Handler, Lackey, & Vaughn, 2009). While these interactions have positive connotations to encourage ongoing relationships between librarians and students, they are subjective in nature, and do not provide an objective method to analyze a student's success in developing future research skills.

Over the last several decades, few researchers have attempted to assess IRCs quantitatively, as it is challenging to quantitatively prove their effectiveness. Reasons for these challenges vary, including not having the appropriate instrument to evaluate IRCs, the topics of the IRCs can be difficult to compare, and librarians have various ways in which they conduct their IRCs. Nevertheless, researchers have tried to surmount this challenge by utilizing different quantitative approaches. Bergen and MacAdam (1985) analyzed the number and type of students (male vs. female, freshman to seniors, in various departments) who used a voluntary one-on-one instruction service. In 1989, Donegan et al. used objective quantitative methosds such as post-instruction testing by creating a multiple choice test that was given to students immediately following an instruction session. Reinsfelder (2012) and Sokoloff and Simmons (2015) examined IRCs using citation analysis within the

management and business fields. Reinsfelder evaluated the quality of citations used in undergraduate papers, before and after meeting with students individually, whereas Sokoloff and Simmons created an IL rubric, adapted from the Association of American Colleges and Universities rubric, to analyze the performance standards of their group of students. However, no researchers have specifically assessed the impact of IRCs in the health sciences and medicine fields.

ACRL Framework for Information Literacy for Higher Education

The design for our pre/posttest questionnaire, as well as our rubric for assessing the students' search strategies, was informed by the new *ACRL Framework for Information Literacy for Higher Education* sixth concept: Searching as strategic exploration (Association of College and Research Libraries, 2016). This framework states that searching for information is often nonlinear and iterative, requiring the evaluation of a range of information sources and the mental flexibility to pursue alternate avenues as new understanding develops. It goes on to state that as the searching process is complex and often daunting for students, meeting with a librarian permits them to become a more advanced searcher by allowing them to "search more broadly and deeply to determine the most appropriate information with the project scope" (p.9). We hypothesize that by matching students' information needs and search strategies to the appropriate search tools, such as specialized bibliographic databases, we are able to help them design and refine their search strategies as necessary, based on their search results.

Pre and Posttesting Methodology

As previously stated, studies dedicated to the quantitative assessment of IRCs are scarce, and even fewer using a pre and posttest methodology have been found in the literature. In light of this gap, we reviewed the literature evaluating group instructions using a pre and posttest method, focusing on their methodology and test design, in order to prepare our questionnaires.

Many studies use multiple choice questions as their pretest and posttest design to assess IL skills. Multiple choice questions have been used to assess one-shot sessions (Bryan & Karshmer, 2015), IL credited courses (Goebel, Neff, & Mandeville, 2007) and library instructions classes (Chiarella, Khadem, Brown, & Wrobel, 2014; Ivanitskaya, DuFord, Craig, & Casey, 2008). They have also been used to compare online vs. face-to-face library instructions, whether with one-shot face-to-face instructions (Mery, Newby, & Peng, 2012), or with face-to-face workshops (Shaffer, 2011). Understandably, multiple choice questions provide quantifiable data to assess students' IL skills, making multiple choice the evaluation method of choice in many studies. However, other types of assessment techniques have appeared in the literature. Open-ended questions have been used for pre and posttesting to capture students' understanding of IL concepts (Cook & Walsh, 2012; Gross & Latham, 2013; Wakimoto, 2010).

Further, pre and posttesting methodologies have been found to be successful outside of the library literature. Shivaraju, Manu, Vinaya, and Savkar (2017) evaluated knowledge of didactic lecturing among medical students through a pre and posttest questionnaire based evaluation technique. They analyzed how much students were aware of pharmacology concepts before the lecture, and evaluated the students' learning of key concepts following the lecture. Their results found that students' understanding improved following the lecture, as they were able to improve their focus towards the lecture, which improved their overall performance in pharmacology. These findings are also corroborated in other medical schools using this methodology in medical education (Cramer & Mahoney, 2001; Muthukumar, D'cruz, & Anandarajan, 2013).

Self-Efficacy Theory

Bandura's (1977, 1997) self-efficacy theory was used as an inspiration to help design our questionnaires. More specifically, research taking place in a library setting using self-efficacy theory was sought out. The term self-efficacy "refers to a person's belief in his or her own capability to perform specific activities or tasks" (Ren, 2000, p.323). Ren (2000) tested students before and after library instruction on the following qualities: their self-perceived search performance, their attitude about acquiring search skills, and their emotions while completing an assignment. The author concluded that in order "for self-efficacy to increase, students must have adequate searching practice, experience learning accomplishments and not be overwhelmed with negative emotions such as confusion and frustration" (Ren, 2000, p. 327). Serap Kurbanoglu (2003) explored the relationship between university students' IL and their self-efficacy beliefs. The author concluded that more research needs to be conducted to better understand how self-efficacy beliefs affect individuals' information problem solving behaviours and lifelong learning activities.

Aims

For our project, we issued a pre and posttest questionnaire, evaluating students' searching techniques in medical databases such as Medline (via Ovid), before and after meeting with a librarian. We also wanted to gain insight into their self-perceived ability to search the databases by measuring their self-efficacy. We then assessed their search strategies with a rubric we designed (Table 1).

Research Questions

a) Do IRCs improve students' searching techniques, including the proper use of keywords and/or subject headings, the accurate use of Boolean operators, and

the appropriate selection of specialized resources/databases?
b) Do IRCs influence students' confidence levels in performing effective search strategies?

Objectives

Our study's primary goal was to evaluate the impact that IRCs have on students' search techniques and their confidence levels, with the following objectives:

a) Assessing students' search techniques before and after they meet individually with a librarian.
b) Discovering what factors influenced students' self-perceived search techniques proficiency and their self-perceived confidence level of such search techniques.
c) Determining if an IRC influences students' confidence levels in performing effective search strategies.
d) Exploring students' expectations and their satisfaction levels with IRCs.

Methods

Population

The University of Ottawa has over 40,000 students in attendance (University of Ottawa, n.d.). There are 4,500 students within the departments of the Faculty of Health Sciences, which include nursing, rehabilitation, nutrition, human kinetics, and interdisciplinary health sciences. The Faculty of Medicine includes the School of Medicine, postgraduate students, epidemiology and public health, population health and bench science programs, totaling 2,250 students. Participants included a convenience sample of University of Ottawa students who were completing an undergraduate or graduate degree in the Faculties of Health Sciences or Medicine, and also undertaking a research or thesis project.

Data Collection

In order to assess the impact of IRCs on students' searching techniques, a mixed-methods approach was used. Pre and posttesting were used, and ethics approval was received from the University of Ottawa, Office of Research Ethics and Integrity, file number was H12-14-03.

The first round of data collection took place in 2015, but without a monetary incentive, very few participants completed the posttest (n = 9). Additional academic disciplines were also involved in this round of data collection including management, social sciences, arts, and humanities. We found that the topics and resources covered in IRCs can fluctuate greatly between disciplines. For that reason, we decided that the second round of data collection would be concentrated on a more homogenous group: health sciences and medicine. This method would allow a better comparison group between students. The first round of data collection acted as a pilot, allowing a review of the questionnaires, with several questions being adjusted to increase clarity. Data from the first round of data collection is not included in the results listed below.

The second round of data collection took place from February to September 2016. Even with a monetary incentive, it was challenging to recruit participants (n = 29). The pre and posttest questionnaires can be found in Appendix B.

In addition to the authors, two other librarians employed by the University of Ottawa were included in the second round of data collection. When a student contacted a librarian for assistance, a recruitment email was sent to the student, which contained a brief description of the study, and the links to the consent form and the pretest questionnaire. At the end of the first questionnaire, participants were asked if they wished to complete the second questionnaire (posttest). If their answer was affirmative, the online survey system (FluidSurveys) would send them an invitation one week after the first questionnaire was filled up. Using this method of recruitment allowed complete anonymity for the participants, that is, none of the librarians, including the present study's authors, providing IRCs knew if the students they were helping had participated in the study or not. This anonymity helped to reduce bias, in the sense that librarians wouldn't change their approach or their attitudes toward students depending on whether they participated in the study or not. Librarians were asked to use a Search Strategy Worksheet (see Appendix A) with every student they met during an IRC for the duration of the study, whether they were participating in the study or not. This worksheet is frequently used during regular IRCs at this library, outside the scope of this study, therefore, no training of the librarians was required.

The questionnaires consisted of open-ended and self-reflective questions (see Appendix B for the pre and posttest full questionnaires). The open-ended questions assessed students' search techniques, specifically their choice of keywords, synonyms, subject headings, and the creation of a search string with the appropriate use of Boolean operators. The self-reflective questions assessed students' self-perceived proficiency with search techniques, their confidence level in their search techniques, and their expectations of (before) or their satisfaction with (after) the IRC. To preserve anonymity, once data collection was complete, students' personal information was removed and replaced with an anonymous identifying number (e.g., "student 1") in both questionnaires.

Rubrics were created as a multi-purpose scoring tool to assess student performance. While rubric development can stop after the performance criteria have been identified and performance levels established (Wolf & Stevens, 2007), more comprehensive rubrics include another step in which each of the cells in the matrix contains a description of the performance at that level. We created a rubric to code open-ended questions on search techniques (Table 1), capturing details

Table 1

Rubric Used to Assess the Pre and Posttest Results for the Appropriate Use of Keywords and the Search Strategy

Requirement	Insufficient (0)	Acceptable (1)	Superior (2)
Uses appropriate keywords	No keywords provided, or if keywords provided, very little connection to the research question or topic and are too broad. No use of synonyms.	Keywords provided are connected to the research question or topic, but not all subjects are covered. Keywords are somewhat focused and not too broad. Synonyms used, if applicable. Very little, or no use of subject headings (optional).	Keywords provided are connected to the research question or topic and all subjects are covered. Keywords are well focused. Appropriate use of synonyms, if applicable. Appropriate use of subject headings (optional).
Builds appropriate search string	No search string provided.	Search string provided with some errors or missing elements (e.g.: not all keywords are present; mistakes in the use of Boolean operators)	Search string provided with no errors and all elements are present (all keywords are present, no errors with the use of Boolean operators)

to assess the appropriate use of keywords and the search strategy. The rubric scoring was completed by one of the study's authors (JR).

Results

Our sample size was small, with only 29 completed pre and posttests. Pre and posttest self-reflective, open-ended answers were coded and analyzed with the use of the software QSR NVivo. Multiple choice and Likert scale questions were analyzed using SPSS. Results are presented following the study's outlined objectives.

The first objective was to assess students' search techniques before and after they met individually with a librarian. To do so, we asked participants to provide their list of keywords and search strings before meeting with a

librarian, if they already had done some searching by themselves (e.g., (marine OR ocean) AND (biology OR science)). To assess if their keyword and search string selection were accurate and appropriate, we asked participants to state their research topic or question. We were then able to use our rubric (Table 1) to code their answers. Two paired-sample t-tests were conducted to evaluate the impact that a consultation with a librarian had on students' ability to appropriately use keywords and build search strategies. The first t-test showed that students' ability to use appropriate keywords from the pretest ($M = 1.00$, $SD = .66$) to the posttest ($M = 1.34$, $SD = .72$, $t (28) = -1.98$, p > .05, two-tailed) was approaching statistical significance. The mean increase in score was .345 with a 95% confidence interval ranging from -.70 to .01. The eta squared statistic (.12) indicated a large effect size. The second t-test showed a

statistically significant increase in the students' ability to use appropriate search strategies from the pretest (M = .21, SD = .41) to the posttest (M = .76, SD = .79), t (28) = -3.59, p = .001 (two-tailed). The mean increase in score was .55 with a 95% confidence interval ranging from -.87 to -.24. The eta squared statistic (.32) indicated a large effect size.

The second objective was to discover factors that influenced students' self-perceived search techniques proficiency and confidence level. We asked participants which factors influenced their confidence level before and after the IRC. Before the appointment, both positive and negative factors were stated in almost equal measure, with positive factors rated slightly higher. Negative factors were grouped by the following themes:

1) lack of available research
2) research topic difficulty
3) lack of prior knowledge
4) difficulty using databases

Positive factors were categorized under the themes:

1) prior knowledge
2) help from other people (colleagues, supervisors)

After the appointment, the factors that influenced students' confidence level were almost all positive, and were grouped under the following themes:

1) new or prior knowledge
2) support from others
3) strength of research question or search string

There were no statistically significant differences found between any of the themes presented.

Our third objective was to determine if the IRC influenced students' confidence levels in performing effective search strategies. To answer that objective, we measured student confidence level before and after the appointment. We asked participants how confident they were in finding relevant sources of information, using a scale from 1 ("not confident at all") to 10, ("very confident"). In the pretest, the mean was 5.85 (Table 2), and in the posttest, the mean was 7.24 (Table 3).

We performed a paired-samples t-test to evaluate the impact that meeting with a librarian had on students' confidence with regard to finding relevant sources of information. There was a statistically significant increase in confidence level from the pretest (M = 5.93, SD = 1.46) to the posttest (M = 7.24, SD = 1.46), t (28) = -4.34, p < .001 (two-tailed). The mean increase in confidence was 1.31 with a 95% confidence interval ranging from -1.93 to -.69. The eta squared statistic (.40) indicated a large effect size.

We also asked participants in the posttest if the appointment with a librarian influenced their confidence level, and 96.6% of respondents said "yes" (Table 4). When asked to describe how the appointment with a librarian changed their confidence level, participants provided positive comments, which we compiled under three main themes:

1) finding useful resources
2) learning how to properly search databases
3) learning how to execute a search strategy

Furthermore, students were asked how the appointment with a librarian might have influenced various elements of their research project. A response rate of 63% of participants mentioned that the appointment with a librarian influenced their keyword selection (Table 5).

Table 6 illustrates that 45% of students mentioned that the IRC influenced their search strategy, while 10% mentioned that it did not. However, it should be noted that 45% of

Table 2
Pretest Confidence Level on a Scale from 1 to 10

	Minimum	Maximum	Mean
On a scale from 1 to 10, where 1 represents "not confident at all" and 10 represents "very confident"; how confident are you with finding relevant sources of information?	3	9	5.85

Table 3
Posttest Confidence Level on a Scale from 1 to 10

	Minimum	Maximum	Mean
On a scale from 1 to 10, where 1 represents "not confident at all" and 10 represents "very confident"; how confident are you with finding relevant sources of information?	4	10	7.24

Table 4
Appointment with Librarian Influenced Students' Confidence in their Search Techniques

	Frequency	Percentage (%)
Yes	28	96.6
No	1	3.4
Total	**29**	**100**

Table 5
Students' Keyword Selection had Changed after Meeting with a Librarian

	Frequency	Percentage (%)
Yes	17	63
No	10	37
Total	**27**	**100**

Table 6
Students' Search Strategy had Changed after the Appointment with a Librarian

	Frequency	Percentage
Yes	13	44.8
No	3	10.4
Does not apply	13	44.8
Total	**29**	**100**

respondents didn't have a search strategy before meeting with a librarian, which is why they answered "does not apply" to that question (Table 6).

The last objective explored students' expectations and their satisfaction levels with the IRC. Students were asked if their expectations were met after meeting with a librarian using a Likert scale from 1 to 10, where 1 represented "expectations not met at all" and 10 represented "exceeded expectations", and 86.1% of respondents answered 7 or higher. We also asked participants to describe how their expectations were or were not met. Participants' answers were grouped into three themes:

1) My expectations were met since I learned the appropriate resources and information-seeking knowledge.
2) My expectations were met because I learned how to search properly.
3) My expectations were not met because the appointment time was used to teach me how to use the resources rather than to find all available information.

Discussion

Our study demonstrated that students who met with a librarian for an IRC improved their search strategies. Although there wasn't a significant statistical difference indicated on the pre/posttest questionnaire with regard to the students' ability to use appropriate keywords, there was a statistically significant increase in the students' ability to use appropriate search strategies overall. These strategies may include the choice of keywords, synonyms, subject headings, and the creation of a search string with the appropriate use of Boolean operators. This indicates that while individual keywords still pose a challenge for students, their overall strategies for searching have holistically improved.

Additionally, there was a statistically significant increase in the students' confidence with regard

to retrieving relevant sources of information, after having met with a librarian. The analysis of our qualitative results also supported the positive impact that IRCs have on students' search techniques, as participants indicated that their expectations were met as they learned how to search properly, and how to use the appropriate resources.

Although participants' confidence levels significantly increased after meeting with a librarian, we noted that 12 out of 29 respondents indicated a confidence level of 7 or higher prior to the appointment with a librarian, and mainly stated "prior knowledge" as a factor influencing their confidence level. Prior knowledge may include previous searching experience for another research paper or with a particular database, or familiarity when searching for their specific research topic. It could then be inferred that many participants had a high self-perceived confidence in their own search techniques prior to meeting with a librarian. As Maddux and Volkmann (2010) stated: "people who maintain strong self-efficacy beliefs during self-regulatory efforts are […] more likely to persevere" (p. 317). In other words, to help oneself to self-regulate (the process by which people control their thoughts, feelings and behaviours), one has to believe in one's own capabilities to perform the task at hand in order to do it. The students had likely completed previous searches and felt confident leading up to their meeting with the librarian.

Another possible reason for this high confidence level could be the information-seeking behaviours exhibited by the digital generation. Keshavarz, Esmaeili Givi, and Vafaeian (2016) studied IL self-efficacy in graduate students and found that a high degree of their self-efficacy stemmed from their confidence levels, as well as their motivation and proficiency. Their results are consistent with what we discovered. However, once they meet with a librarian, they learned how to use new resources they hadn't previously considered, with new search techniques that they did not possess previously

(Keshavarz et al, 2016). With the plethora of scientific literature easily retrievable from the Internet, many students might think they are self-sufficient, or do not require professional help, but once they learn what specialized databases and strong search strategies can provide, they appreciate the new knowledge they have acquired after meeting with a librarian.

Our study is unique, as it is one of the first to quantitatively examine student improvement with search strategies in the health sciences. While our methods were not without validation (i.e., the use of a rubric), it does allow future research to build on it in order to create methods that can become validated and reliable. It may also demonstrate a quantitative return on investment (ROI) for libraries, showing the impact that librarians play in the role of student learning, however, this would require further research. Librarians often must defend their impact in a research environment quantitatively, and this may be one manner in which it could be measured.

Limitations

Our study is not without limitations. Firstly, there were only 29 completed questionnaires for the pre and posttesting period. A higher response rate would increase the significance of the results. Also, the sample of students was a convenience sample, and therefore, not representative of the student population.

Secondly, assessing individualized consultations is challenging, as the field of study involved or the type of sources needed are dependent on the research question. As such, individualized consultations are not identical. Therefore, attempting to compare them is challenging due to the different variables each consultation brings to the table. We tried to limit the variability as much as possible by limiting the fields of study (only health sciences and medicine), and requesting participants be involved with a research project.

Thirdly, our rubric was not validated. It is true that rubrics can positively contribute to student learning and program improvement by ensuring that the learning target is more clear, guiding the instructional design and delivery, and making the assessment process more accurate and fair (Wolf & Stevens, 2007). However, without piloting and assessing the rubric properly, in order to adapt it as needed, the validity of the process can be questioned. Although we did pilot our rubric during our first round of data collection with all disciplines, performing a second pilot with our more targeted audience of only health sciences and medicine students would have been beneficial.

Future studies on this topic should include qualitative data from interviews conducted with librarians to examine their perceptions of an effective IRC. As well, specific focus groups with students may also alert librarians to challenges and barriers that were not originally anticipated. Additional research involving IRCs is certainly needed, and future studies could examine the similarities and differences between disciplines in order to adequately meet the unique needs of students in those fields.

Conclusion

With the study's limitations in mind, we can affirm that, overall, IRCs have a positive impact on students' search techniques and their confidence levels. Library services are rapidly changing, and assistance to students takes many forms. In-person, one-on-one tailored help is tremendously appreciated by students and should be kept as an additional service offered to students. Anecdotally, the Health Sciences Library at the University of Ottawa has seen an increase in IRCs provided at a distance via Skype. This could be an additional method to continue offering this dedicated individualized assistance to students going forward.

Conflict of Interest

Two grants aided in the execution of our research project. We received $600 from the University of Ottawa Library Research Grant, which was used to provide a $10 incentive for completing the pretest, and another $10 incentive for the posttest. The full amount received was used for incentives. We believe that the incentive helped gather enough completed posttests, as many students often completed the first questionnaire but didn't usually bother to complete the second one. We received a second grant of the amount of $1,500 from the CARL Research in Librarianship Grant. Funds from that grant were used to pay for a research assistant (JR), who was instrumental by helping with our data analysis.

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Appendix A
Search Strategy Worksheet

Search Statement / Topic		
1.	**Search Question or Topic:**	
List as many as you need		
2.	**Major Concepts:**	1. 2. 3. 4.
3.	**Search Terms:**	

	Concept 1	**AND**	Concept 2	**AND**	Concept 3	**AND**	Concept 4
OR							
OR							
OR							
OR							
OR							
OR							

Resources / databases to use:

_____

_____

Source: Rielding, Ann Marlow. 2002. *Learning to learn*. New York: Neil Shuman Publisher.

Appendix B
Pre and Posttest Questionnaires

Assessing Individualized Research Consultations – Pretest Questionnaire

1. Briefly state your research topic or question.

2. Have you identified keywords for your research project?
   ○ Yes
   ○ No

3. What are your keywords?

4. Have you created a search strategy (search string)? For example: (marine OR ocean) AND (biology OR science).
   ○ Yes
   ○ No

5. What is the search strategy (search string) you would use for your research project? For example: (marine OR ocean) AND (biology OR science).

6. Have you already located relevant sources of information (articles, books, reports, websites, etc.) for your research project?
   ○ None
   ○ Some sources
   ○ Many sources

7. What resources or tools have you used to find these relevant sources of information (e.g. web site, library, database, etc.)?

8. On a scale 1 to 10, where 1 represents "not confident at all" and 10 represents "very confident"; how confident are you with finding relevant sources of information?

[ ]

9. What factors influence your confidence level (e.g. prior knowledge, degree of difficulty, etc.)?

[ ]

10. What are you hoping to achieve/get out of your appointment with a librarian?

[ ]

11. Any additional comments?

[ ]

12. What is your gender?
○ Male
○ Female
○ There isn't an option that applies to me

13. To which age group do you belong?
○ 19 years old or less
○ 20 to 25 years old
○ 26 to 30 years old
○ 31 years old and over

14. Are you doing an:
○ Undergraduate degree
○ Graduate degree
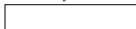
15. In which year are you?
○ 1st year
○ 2nd year
○ 3rd year
○ 4th year
○ Other: _____

16. If you are doing a graduate degree, is it:
- ○ Post graduate certificate
- ○ Master degree
- ○ Doctoral degree
- ○ Other:

17. In what Faculty are you registered in?
- ○ Faculty of Health Sciences
- ○ Faculty of Medicine

18. In the last three months, have you had a formal library presentation in class, or have you attended a library workshop?
- ○ Yes
- ○ No

19. Describe in a few words what was covered in the library presentation, or in the library workshop you attended:

[   ]

20. In the last three months, have you met individually with a librarian?
- ○ Yes
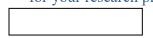- ○ No

21. Briefly state what you discussed.

[   ]

1. After meeting with a librarian, has your research topic or question been modified?
    - ○ Not at all
    - ○ Slightly modified
    - ○ Modified completely

2. Briefly state your research topic or question whether it has been modified or not.

    [   ]

3. If you had provided keywords for your research project before your appointment with a librarian, have they changed now?
    - ○ Yes
    - ○ No

4. Please provide your keywords whether they have changed or not.

    [   ]

5. If you had provided a search strategy (search string) in the previous questionnaire, have it changed now?
    - ○ Yes
    - ○ No
    - ○ Does not apply

6. Please provide your search strategy (search string), whether it has changed or not. For example: (marine OR ocean) AND (biology OR science).

    [   ]

7. What resources/tools are you using, or will you use to find relevant sources of information for your research project (e.g. web site, library, database, etc.)?

    [   ]

8. On a scale 1 to 10, where 1 represents "not confident at all" and 10 represents "very confident"; how confident are you with finding relevant sources of information?

    [   ]

9. What factors influence your confidence level (e.g. prior knowledge, easy or degree of difficulty, etc.)?

┌──────────────┐
│   │
└──────────────┘

10. Has the appointment with a librarian influenced in any way your confidence in your search techniques?
○ Yes
○ No

11. Please describe how the appointment with a librarian has changed or has not changed your confidence level.

┌──────────────┐
│   │
└──────────────┘

12. On a scale 1 to 10, where 1 represent "expectations not met at all" and 10 represent "exceeded expectations"; how the appointment with a librarian met your expectations?

┌──────────────┐
│   │
└──────────────┘

13. Please describe how they were or weren't met.

┌──────────────┐
│   │
└──────────────┘

14. Any additional comments?

┌──────────────┐
│   │
└──────────────┘