Evidence Based Library and Information Practice

Research Article

An Evaluation of Methods to Assess Team Research Consultations

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Received: 19 Dec. 2019 **Accepted**: 27 May 2020

DOI: 10.18438/eblip29698

Abstract

Objective – Due to the individualized nature of consultations and institutional constraints, research consultations can be challenging to assess. At Texas A&M University Libraries, subject librarians use research consultations to teach information literacy to upper-division engineering student teams working on a technical paper project. This paper describes an action research project designed to evaluate which assessment method for consultations with student teams would provide the most actionable data about the instruction and the consultation logistics as well as optimize librarian time.

Methods – For three semesters, we simultaneously used up to four consultation assessment methods: one-minute papers, team process interviews, retrospective interviews, and questionnaires. We followed the action research cycle to plan the assessments, implement the

assessments, reflect on the data collected and our experiences implementing the assessments, and revise the assessments for the next semester. Each assessment method was distributed to students enrolled in an engineering course at a different point in the technical paper project. The one-minute paper was given immediately after the consultation. The team process interviews occurred after project deliverables. The questionnaire was distributed in-person on the last day of class. Focus groups were planned for after the assignment was completed, but low participation meant that instead of focus groups we conducted retrospective interviews. We used three criteria to compare the assessments: information provided related to the effectiveness of the instruction, information provided about the logistics of the consultation, and suitability as an assessment method in our context. After comparing the results of the assessment methods and reflecting on our experiences implementing the assessments, we modified the consultation and the assessment methods for the next semester.

Results – Each assessment method had strengths and weaknesses. The one-minute papers provided the best responses about the effectiveness of the instruction when questions were framed positively, but required the most staff buy-in to distribute. The team process interviews were time intensive, but provided an essential understanding of how students think about and prepare for each progress report. Recruiting for and scheduling the focus groups required more time and effort than the data collected about the instruction and logistics warranted. The questionnaire provided student perspectives about their learning after the assignment had been completed, collected feedback about the logistics of the consultations, was easy to modify each semester, and required minimal librarian time.

Conclusion – Utilizing multiple assessment methods at the same time allowed us to determine what would work best in our context. The questionnaire, which allowed us to collect data on the instruction and consultation logistics, was the most suitable assessment method for us. The description of our assessment methods and our findings can assist other libraries with planning and implementing consultation assessment.

Introduction

Research consultations provide personalized instruction that is not available during one-shot instruction sessions, but they can create staffing challenges due to the amount of time librarians spend preparing for and providing the consultations (Faix, MacDonald, & Taxakis, 2014). Assessing research consultations can help librarians to design the service, to justify the time they spend providing consultations, and to determine the value of providing consultations (Fournier & Sikora, 2017). Despite the benefits of assessing research consultations, formal consultation assessment seldom occurs in academic libraries due in part to the personalized nature and diverse learning goals of consultations (Fournier & Sikora, 2017).

At Texas A&M University Libraries, multiple librarians provide research consultations for engineering teams in a writing-intensive course. Multiple librarians devote a significant amount of time each semester meeting with the teams, and the number of teams scheduling consultations has been increasing. We wanted to assess these consultations in order to gather evidence that allowed for continuous improvement of the consultations and that justified the staff time and library space needed to provide the consultations.

Since consultations are under-represented in the assessment literature (Fournier & Sikora, 2015; Miller, 2018; Savage, 2015), guidance was limited about the most effective assessment methods. To address this gap in the literature,

we developed an action research project that evaluated the suitability of four assessment methods for the research consultations provided to the engineering teams.

Context

At Texas A&M University, the Engineering Technology and Industrial Distribution Department requires students to take a junior level, writing-intensive engineering course. One of the course writing components is a technical paper. The technical paper is a 16-page paper that focuses on a mechanical power transmission component (e.g., bearing, lubrication, gear box) in a product (e.g., airplane, car, wind turbine, diesel generator). This is the first time many students need to find technical information outside the manuals provided in their engineering labs. The junior and senior engineering students work in teams of four to complete the assignment over a 12-week period.

Research consultations have been integrated into the course for the last 10 years. In 2016, the course instructor made the research consultation a requirement and recommended that students attend a second consultation. Most students scheduled research consultations between weeks 6 and 10 of the semester. The learning outcomes for the one-hour research consultation were for students to become aware of the breadth of sources available for them to use in their paper and to become efficient in searching these sources. An online research guide and video tutorials were available to students as supplementary resources. A detailed description of the instruction topics covered during the consultation is available in a previously published conference paper (Melgoza, 2017).

Initially, all consultations were provided by the second author – a science and engineering librarian – and another science and engineering librarian. As course enrollment increased to a maximum of 180 students, they could no longer provide all of the consultations and the second author began to recruit additional librarians (see Table 1). By fall 2017, six librarians (four science and engineering librarians and two non-engineering librarians) and a library assistant taught the teams. In addition to the one-hour consultation, librarians spent one to two hours preparing and had the possibility of a one-hour follow-up consultation. During the six weeks the consultations were held, one of the library's consultation rooms was taken offline to accommodate the consultations.

Table 1
Student Enrollment and Consultation Statistics

Semester	**Students Enrolled in Course**[a]	**Total Teams**[a]	**Teams Who Met With a Librarian**
Fall 2017	173	49	27
Spring 2018	171	47	47
Fall 2018	169	44	43

[a]Enrollment numbers and number of teams were provided by the course instructor.

Due to the increasing amount of librarian time devoted to the consultations and the demand for library space, the second author started considering alternate ways of providing the consultations. Before making changes, the second author wanted to assess the consultations. We had robust usage statistics about the numbers of students coming for consultations and use of the course guide (Stephens, Melgoza, Hubbard, Pearson, & Wan, 2018), but this data provided no information about the effectiveness of the instruction or the logistics of the consultations.

To plan the assessment, the second author asked the first author for assistance because she had assessment experience and was a neutral party who did not provide consultations for this course. From the outset, analyzing student papers would not be an option because the course instructor preferred not to share the final student papers with the librarians. After an initial review of the consultation assessment literature, we determined that we did not have a clear path for determining the best assessment method. We wanted a method that would allow us to know more about the information students were remembering and applying from the consultations, as well as how students felt about the consultation experience. Thus, we developed this action research project to evaluate different research consultation assessment methods.

Literature Review

Consultation Assessment

Librarians have used various methods to assess research consultations including surveys (e.g., Butler & Byrd, 2016; Drew & Vaz, 2008), usage statistics (Fournier & Sikora, 2015), citation analysis (e.g., Hanlan & Riley, 2015; Reinsfelder, 2012), pre and post testing (e.g., Sikora, Fournier, & Rebner, 2019), focus groups (e.g., Watts & Mahfood, 2015), interviews (e.g., Rogers & Carrier, 2017), mystery shoppers (e.g., Newton & Feinberg, 2020), and examining students' course grades (e.g., Cox, Gruber, & Neuhaus, 2019; Newton & Feinberg, 2020). While most of these articles discuss the limitations of the particular method, direct comparison of different consultation assessment methods is limited. Even when researchers used multiple consultation assessment methods, the discussions focused on the findings of the method, not the utility of each method (e.g., Hanlan & Riley, 2015; Newton & Feinberg, 2020; Watts & Mahfood, 2015).

Only Fournier and Sikora's (2015) scoping review provided an explicit discussion of the strengths and weaknesses of the three consultation methods they identified: usage statistics, surveys, and objective quantitative methods. Usage statistics are useful for understanding the demand and planning the service (Fournier & Sikora, 2015). Surveys can show user satisfaction and assist in making modifications to the service, but are limited by their subjective nature and positively skewed results (Fournier & Sikora, 2015). Statistics and surveys are not the best methods to use to provide evidence of the outcomes of research consultations. Rather, objective quantitative methods, like pre/post testing, provide a better way to assess the impact of consultations on student learning (Fournier & Sikora, 2015). Since the use of objective quantitative methods would be challenging in our context, we looked for other ways to assess the outcomes and logistics of consultations.

Qualitative methods offer an alternative way to assess the outcomes and logistics of consultations. Both interviews and focus groups have been used to provide evidence of what students believed were the outcomes of research consultations (Watts & Mahfood, 2015; Yee et al., 2018). Interviews can be an initial step in creating a survey and can provide detailed information about outcomes students felt as a result of consultation (Yee et al., 2018). Open-ended survey questions can elicit responses about how students perceive the value of consultations (Magi & Mardeusz, 2013).

Action Research and Assessment

Action research is a method of inquiry that aims to improve practice (Malenfant, Hinchliffe, & Gilchrist, 2016; Reason & Bradbury, 2006; Suskie, 2018). Action research projects focus on an issue derived from a specific context, are led by the librarian involved in the service, incorporate stakeholders in their design, make changes immediately based on the results, and utilize an evolving design (Coghlan & Brydon-Miller, 2014; Malenfant et al., 2016; Woodland, 2018).

Action research aligns well with library assessment projects. The unique contextual factors within an academic library often drive assessment projects. Librarians and other stakeholders involved in the delivery of a service plan, evaluate, and make changes to the service based on the assessment data.

Action research has been used in the library and information science discipline as the basis of assessment projects. Multiple researchers have used action research to assess information literacy instruction (e.g., Insua, Lantz, & Armstrong, 2018; LeMire, Sullivan, & Kotinek, 2019; Margolin, Brown, & Ward, 2018). In addition, researchers have used action research for other types of assessment including the enhancement of services (Kong, Fosmire, & Branch, 2017) and planning library spaces (Brown-Sica, 2012; Brown-Sica, Sobel, & Rogers, 2010). Using action research to determine a way to assess our consultations would allow us to build upon the hallmarks of the assessment cycle, while incorporating the aspects of action research that would keep our research design flexible as we encountered new information. Our study adds to the literature on consultation assessment by directly comparing four assessment methods in terms of the data collected about the instruction and logistics as well as the ability to implement the method.

Aims

The aim of this action research project was to determine which assessment method would be the best way for us to collect actionable feedback in order to continuously improve the team research consultations. The goals of the assessment were to assess the effectiveness of the instruction and the logistical aspects of the consultation service in order to maximize the use of available resources.

Each assessment method was evaluated on three criteria: information provided related to the effectiveness of the instruction, information provided about the logistics of the consultation, and suitability as an assessment method. We defined effectiveness of the instruction by evaluating if what students reported learning from the consultation was related to the consultation learning outcomes. The logistics of the consultation was defined as student opinions about the timing of the consultation in relation to the assignment milestones, the length of the consultation, and the format of the consultation. The suitability of the assessment method was determined by considering the usefulness of the information collected and the amount of staff time needed to implement the assessment.

Methods

We planned to implement one-minute papers, team process interviews, and focus groups as our assessment methods. One-minute papers are frequently used as an assessment technique in library instruction sessions (Bowles-Terry & Kvenild, 2015). Given their popularity in classroom assessment, we found limited discussion of the use of one-minute papers as an assessment technique for consultations. One-minute papers typically consist of two questions: one focused on what students learned and the other focused on what was confusing.

We chose the one-minute paper because it would allow us to assess students' recall of information immediately after instruction. However, our Institutional Review Board (IRB) approval come too late in the fall 2017 semester to use the one-minute papers immediately after the consultation. Instead, we used the IRB-approved one-minute paper questions on the end of semester questionnaire in fall 2017. We did not initially plan to use a questionnaire to assess the consultations, but took advantage of an opportunity provided by the course instructor. Once we starting using the one-minute paper after the consultation, we changed the questions on the questionnaire.

Interviews and focus groups were chosen because we thought they would provide more in-depth responses from students. These methods had been used by other universities examining how consultations impact student learning (Watts & Mahfood, 2015; Yee et al., 2018). Two studies that used citation analysis concluded that qualitative data from the students about their research process would have been helpful to understand the results (Hanlan & Riley, 2015; Sokoloff & Simmons, 2015). Based on these studies, we decided to use team process interviews to explore the process that teams used to find information at different points in the assignment. We planned to use focus groups in order to engage students in conversation about the consultations.

Action Research Cycle

We used action research as a way to evaluate the assessment methods for team research consultations. Action research includes a cycle of *planning*, *acting and observing*, *reflecting*, *re-planning*, *acting and observing*, and *reflecting* (Kemmis, McTaggart, & Nixon, 2014, p. 18). We *planned* how to collect data using one-minute papers, questionnaires, focus groups, and team process interviews. We *acted and observed* our implementation of the assessment methods. Then, we *reflected* on the utility of the methods, compared the results of the assessments, and made changes to the assessments and the consultations. Reflection occurred throughout the semester. We talked at least once a week about how the assessments and the consultations were going. Small changes to the consultations and the assessment methods were made immediately based on the assessment data and personal observations. Larger changes to the consultations were made after each semester.

Stakeholders

We had three groups of stakeholders: the course instructor, librarians, and students. After we informed the course instructor of our assessment project, he offered his support and willingness to assist as needed. The instructor gave us a portion of the last class each semester to distribute the questionnaire. Each semester we shared student responses to illuminate students' confusion with the project and our changes in instruction.

Librarians assisted with the data collection for the one-minute papers and the questionnaires. After collecting the one-minute papers, some librarians reviewed the responses to see what the students retained. Some of the group reviewed the questions on the questionnaire. Librarians received a summary of themes from the assessments as well as representative responses prior to the start of consultations for the next semester. The group discussed changes to make for the consultations based on the findings.

The students were not as involved as one would expect for an action research project. Prior to distributing the questionnaire, we shared our past findings and asked students to share their honest assessment of our instruction and changes.

Data Collection and Data Analysis

Our data collection spanned three semesters; it began in fall 2017 and ended in fall 2018. We

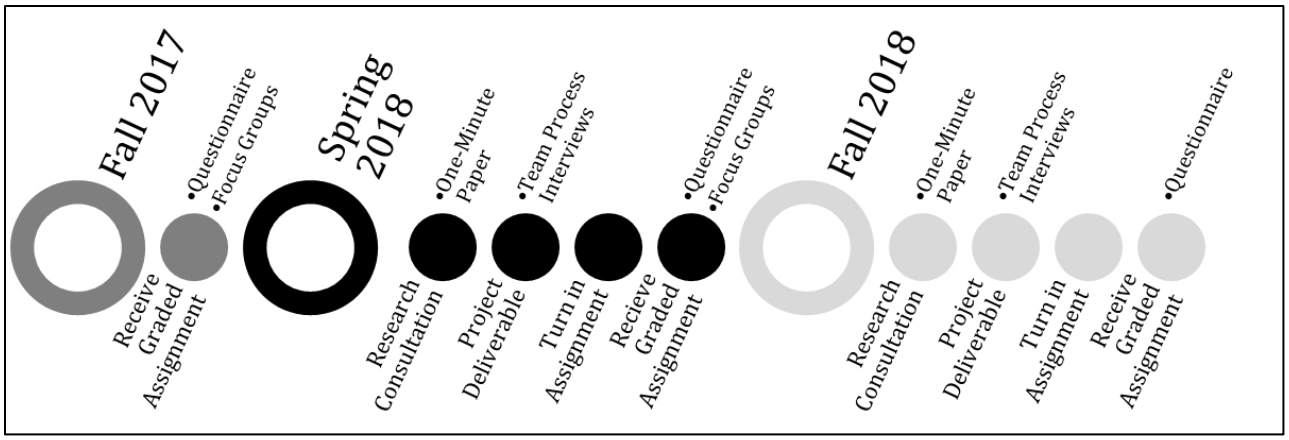

Figure 1
Timeline of planned data collection and assignment milestones.

used each assessment method at a different point in the assignment (see Figure 1). The participants were junior and senior engineering students who were currently enrolled in the engineering course.

One-Minute Papers

The one-minute paper assessed the immediate impact of the instruction. One-minute papers were distributed to individual students after their team's research consultation for two semesters, spring 2018 and fall 2018. The first author met individually with each librarian conducting research consultations to explain the data collection process and answer any questions. The librarian who conducted the consultation distributed the one-minute paper in hardcopy to students immediately after the consultation. The librarian stepped away from the table to give students privacy. Students' participation was voluntary, no incentives were used to increase participation, and student responses were anonymous. The librarian collected the one-minute papers and gave them to the first author for transcription and data analysis. We received 77 completed one-minute papers (see Table 2).

In spring 2018, we piloted four versions of the one-minute paper in order to determine the questions that would provide the most useful information. Librarians gave the different versions to the students randomly. Table 3 presents the questions on the four versions and number of responses per version. After analyzing the spring 2018 data, we found that student responses to question 2 on version 2 were the most useful for highlighting additional topics to cover during the research consultation. The first question on each of the versions elicited similar responses from students. Therefore, we only used version 2 of the one-minute paper in fall 2018.

The first author transcribed and analyzed the data from the one-minute papers. The coding followed the qualitative coding procedures outlined in Creswell and Guetterman (2019): noting words and phrases, assigning a descriptive code to the phrase, defining each code, merging similar codes, and developing themes by aggregating the codes. Codes focused on resources and information that students described learning during the consultation. The codes were both descriptive terms and in vivo codes, which are code labels that use the same language from the student's responses (Creswell & Guetterman, 2019). Each question was coded independently. Then, the codes for the first questions on each version and the codes for the second questions on each version were pooled

Table 2
Participants by Semester

Semester	One-Minute Papers	Team Process Interviews	Questionnaires			Retrospective Interviews
			Total Number	Met with Librarian	Did Not Meet with Librarian	
Fall 2017	n/a	n/a	57	38	19	0
Spring 2018	52	7 (3 teams)	68	57	11	3
Fall 2018	25	3 (1 team)	95	93	2	n/a
Total	77	10 (4 teams)	220	188	32	3

Table 3
One-Minute Paper Questions

Version	Questions	Spring 2018 Responses	Fall 2018 Responses
1	1. What do you think you will do differently after meeting with a librarian? 2. What is still unclear about using library resources for your assignment?	17	
2	1. What did you learn? 2. What would you like to learn more about?	15	25
3	1. What was helpful? 2. What was not helpful?	10	
4	1. What was the most important thing you learned during this consultation? 2. What question remains unanswered?	10	

to develop themes. The first author coded the data in ATLAS.ti each semester. After the initial coding each semester, we met to discuss the themes that emerged from the data.

Team Process Interviews

Team process interviews investigated how teams worked through the assignment. The second author recruited teams during the team's initial research consultation with her. Project reports were due about every two weeks, and the interviews were scheduled for the day after a project report was due, for a total of three interviews. The interviews were held in one of the library's consultation rooms and snacks were provided. The same five questions were asked during each interview. Questions focused

on what type of information the team used to meet the requirements of the previous progress report and what kind of information the team needed to find for the next progress report (see Appendix A). The second author took notes during the interview; interviews were not recorded. After each team process interview, we debriefed to discuss the data. The notes were analyzed for trends that could inform the instruction and the logistics of the consultation.

Four teams (A, B, C, and D) participated in the team process interviews. All members of a team were encouraged to attend each interview. In spring 2018, the second author recruited three teams. Team A had the same, single student attend all sessions. Team B had four members attend the first session, three the second, and two the last session. Team C had the same two students attend all sessions. In fall 2018, only one team (D) was recruited. Three students attended the first session, and the same two students attended the last 2 sessions. The team process interview took 10 minutes and afterwards the second author asked the students if they wanted to stay for an additional consultation. All of the teams did stay for the consultation. They discussed their outline and asked for additional tips for locating the next set of information.

Questionnaires

The questionnaire gathered feedback from the students who had met with a librarian and from the students who had not met with a librarian. We collected data using the questionnaire in fall 2017, spring 2018, and fall 2018. The paper questionnaire was distributed to the students attending the last class session of the semester. Students received their graded project after the questionnaire was completed. A food incentive was provided, but students were not required to participate in order to have the incentive. The questionnaires were printed on different colors of paper to better keep track of those who met with a librarian and those who did not meet with a librarian. All questionnaire responses were anonymous. We collected 220 questionnaires (see Table 2).

Since we were using action research, the questions naturally changed as we instituted modifications based on the questionnaire responses (see Appendix B). We dropped questions and added new ones. The fall 2017 questionnaire questions were based on the one-minute papers questions with added questions about citations. The spring 2018 questionnaire for students who had a consultation had questions that addressed the effectiveness of the instruction and the logistics. The questions included the information students learned from their consultation, what they could apply to future courses, and their feedback on having another team present during the consultation. For the students who did not meet with a librarian, we asked if any member of the team met with a librarian and if they shared any information, how they chose their topic, the search process and where the information was found, and if they were aware of the course guide.

For the fall 2018 questionnaire, we only made changes to the questions about the logistics of the consultation. The new questions were about their experience with a shorter consultation time, how often they met with a librarian, if they had needed to consult with a librarian in another engineering course, and feedback on the online tutorials. For the group that did not meet with a librarian, the new questions were about the tutorials and if they struggled to find information for their project.

After data transcription, the data analysis for the questionnaires followed a similar procedure to the one-minute papers. For open-ended questions, the first author used the qualitative coding procedures outlined in Creswell and Guetterman (2019). All responses for each question were pooled for analysis, but each question was analyzed separately. The first author used ATLAS.ti to apply the code labels to the student responses each semester. The list of

code labels in ATLAS.ti provided a starting point for coding each semester, and additional codes were added when needed. For the questions that had a closed ended component, the first author used a set coding scheme (e.g., yes, no, maybe) to code the closed ended answer and analyzed the data using descriptive statistics.

Focus Groups/Retrospective Interviews

Planning Focus Groups

After the team project was completed, we wanted to use focus groups to solicit feedback on the instruction and the timing of the consultation. Our focus group recruitment was unsuccessful in fall 2017. We attempted to recruit students who had a research consultation via email, but we did not have an email address for every student who met with a librarian. We scheduled multiple time slots during the day and evening in the last full week of classes and offered an incentive of pizza, but no students indicated interest in participating. After the unsuccessful email recruitment, we tried to hold focus groups during the class meeting time on the last class day, but again no students were interested in participating.

For the spring 2018, we changed our recruitment method and added additional incentives. At the consultation sessions, we obtained the emails of all the present team members. The focus groups were scheduled for the days immediately following the questionnaire distribution. We recruited in-person when we went to distribute the questionnaires on the last class day. If a student indicated interest in participating, we handed them a slip of paper with instructions for signing up. We also offered a $10 gift card in addition to lunch. Using the new recruitment technique, we had three students volunteer.

Conducting and Analyzing Retrospective Interviews

Since we did not get enough volunteers to hold focus groups, we held two retrospective interviews. The first interview had two participants. The second interview only had one participant because this student had been a part of the team process interviews. We felt this student's experience would be different from the other students and wanted to keep the participants with similar consultation experiences together. The first author conducted the interviews, and another library staff member, who did not provide consultations, observed. The same protocol was used for both interviews (see Appendix C). The retrospective interviews were audio recorded. Both the first author and the library staff member took notes during the interview. As soon as possible after each interview, the first author transcribed the notes and added additional details and observations. A summary-based approach was used for the data analysis (Morgan, 2019). To do this, the first author compared the responses from each interview in order to summarize the information that could inform the instruction provided and the logistics of the research consultation.

Results

The results are discussed by data collection method. For each method, we highlight how the collected data showed the effectiveness of the instruction, informed the logistical aspects of the consultation, and contributed to our analysis of the suitability of the method.

One-Minute Papers

Relating to the effectiveness of the instruction, the one-minute paper responses to the first question on each version (see Table 3) fell into three primary themes: resources and services, how to use the library or resources, and related to the assignment (see Table 4).

The analysis of one-minute paper responses to the second question on each version showed certain questions would elicit more actionable responses. Students did not answer questions that were negative in nature (e.g., "What is still

Table 4
Example Student Reponses for One-Minute Paper Themes

Theme	**Examples of Student Reponses**
Resources and services	• Databases • Library resources • RefWorks • EndNote
How to use the library or resources	• Using combinations of words to search • Navigating through databases
Related to the assignment	• Topic needs to be narrowed down • How to structure the paper • Best way to organize/approach paper

unclear about using library resources for your assignment?", "What was not helpful?"). Typical responses to these questions were "none," "n/a," or positive responses, like "everything was explained thoroughly." The positively framed "What would you like to learn more about?" question provided the most actionable responses. The responses were primarily about the assignment, but a few were about utilizing library resources. For example, "proper citations" and "maybe more specifics on key search words and which phrases might be the most effective in searching."

The one-minute papers were an effective method for collecting data about the immediate effectiveness of the instruction, but not about the logistics of the consultation. Therefore, this method would not fit both of our needs for effectiveness of the instruction and logistics of the consultation. This assessment method also had implementation challenges. While all librarians providing the consultations were willing to hand out the one-minute papers, not everyone did so consistently. In addition, we had to coordinate a centralized location to collect the responses and plan time to transcribe the data.

Team Process Interviews

All four teams had different topics but still approached the project similarly. Initially, the teams felt that the first consultation was sufficient for them to complete their project. Though they agreed for their team to be interviewed, they really wanted continued access to the librarian in case they needed additional instruction.

In the first session of the team assessment, none of the teams demonstrated a complete understanding of the scope of the project. With each session, the teams gained confidence with understanding the scope of the project and used their newfound searching techniques to find information for the forthcoming project sections. Other times, they struggled to compose searches for previously unexplored aspects of their topic.

As suspected, the teams were not following the course instructor's timetable for writing the paper; they did not understand or embrace how the progress reports schedule was leading them to write their paper at a manageable pace. Sometimes the teams did not submit what the course instructor required because they had

competing assignments from other courses. Teams appreciated having a regularly scheduled, structured appointment to discuss the project and get more focused information for each project submission. There was no consensus as to when a second library consultation should be offered.

This method was better suited to understanding how the teams work on the project, and therefore, should not be used for measuring the effectiveness of the instruction and logistics of the consultation. The team process interviews were an effective method for collecting data about how the teams' research needs changed during the project, but did not need to be continued once we found similar results both semesters. The team process interviews would be good to use again if there were fundamental changes to the assignment. The high time commitment was also a disadvantage. While all teams could schedule up to two consultations, the personalized assistance given to the teams who agreed to be interviewed could give those teams an advantage.

Questionnaires

At the end of the semester, students' responses to the most important things they learned during the consultation focused on three themes: the assignment, awareness of library resources, and utilization of databases and resources. When answering about what they learned that could be used in future courses, student responses fell into two primary themes: awareness of library resources and utilization of databases and resources.

Responses from students who did not personally meet with a librarian, but had team members who met with a librarian, supported the themes. These students responded that their teammates shared which databases to use and advice for choosing a topic.

In regard to the logistics of the consultations, student responses showed that they appreciated the personalized nature of the experience, including the focus on only their topic and the ability to ask specific questions about their topic. Feedback to the idea of a librarian meeting with multiple teams at once was mostly negative. After shortening the consultations to 30 minutes in fall 2018, the majority of the responses indicated that the 30-minute length of the consultation was sufficient. However, a third of the responses expressed that students would like longer consultations or that 30 minutes is only sufficient in certain cases.

Table 5
Example Student Reponses for Questionnaire Themes

Theme	**Examples of Student Responses**
Assignment	• How to layout our paper and what to focus on • Ability to narrow down a research topic using library resources
Awareness of library resources	• How to access the research databases • about the wide variety of sources that were available • I could go there for research paper help. I had no idea that was possible.
Utilization of databases and resources	• Keywords to search with to find sources directly related to my topic • Research more effectively with credible resources

The questionnaire assessment method was suitable for assessing both the effectiveness of the instruction and the logistics of the consultations. This method allowed us to modify the questions each semester to collect data needed at that particular time. The challenges with the questionnaire method were writing questions in a way that elicited useful student responses, recruiting library staff to help with the in-class data collection, and deciphering and transcribing students' handwritten responses. Collecting data required a half-day time commitment of multiple librarians, but we were able to gather evidence from a meaningful portion of the students at one time. The continued use of this method depends on the continued support of the course instructor to allow us to collect data during class time.

Retrospective Interviews

In regard to the effectiveness of the instruction, we learned about what students believed were the outcomes of the consultation and the amount of general library information to be covered. Students saw assistance in helping them decide which topic to choose as the primary outcome of the consultation. Students felt that the consultations helped them have a better understanding of the types of information sources that were appropriate for the course paper. This included sources that are not necessarily scholarly, like patents, websites, and contacting industry people directly. The students disagreed about the amount of general library information that should be provided during the consultation.

The retrospective interview participants' responses about the logistics of the consultations gave us additional insight about student expectations about the consultations and accessing resources. Participants mentioned preparation both in regard to the librarian and the students. Students expected the librarians to already know the good resources for the topic and share their personal experiences with the project. Students also realized they personally needed to prepare beforehand to fully take advantage of the research consultation. The participants strongly preferred that a librarian only meet with one team at a time. Students gave no clear answer about the timing of consultations.

Focus groups were not a suitable method to collect assessment data for our research consultations. While we appreciated the in-depth responses provided by students about the effectiveness of the instruction and the consultation logistics, the challenge of recruiting students outweighed the insights we gained. Due to the low participation, the amount of coordination required, and scheduling conflicts, we never conducted any focus groups and we only conducted retrospective interviews one semester.

Discussion

Comparing Data for Effectiveness of Instruction

We found that the one-minute papers and the questionnaires were the best methods to assess the effectiveness of the instruction. Students' answers to both of these assessments aligned with the learning outcomes for the consultations: learn about the breadth of resources provided by the library and how to search the resources. Mapping student responses to learning outcomes is one way to analyze one-minute papers to determine if the instruction is meeting its objectives (Bowles-Terry & Kvenild, 2015). In the one-minute papers and the questionnaires, the same themes were found in student responses about what was learned, which demonstrated in our case the timing of the assessment did not influence the responses. One strength of the questionnaire was that the timing at the end of the semester allowed for a better understanding of whether students continued to use what they learned in the consultation (Goek, 2019). However, when only using the questionnaire at the end of the

semester, any changes to instruction had to wait until the next semester.

The retrospective and team process interviews provided the most detailed information about student beliefs about what they learned. From the retrospective interviews, we learned how students applied information from the consultation to complete the assignment, and the team process interviews helped us understand how students worked through the project and the challenges they encountered with finding information for the assignment. In order to make better use of the interviews, we could ask questions to clarify and provide context to the questionnaire responses, like other researchers have suggested (Hanlan & Riley, 2015; Sokoloff & Simmons, 2015).

Comparing Data for Logistics of Consultations

In terms of assessing the logistical aspects of the consultation, the questionnaire again provided us with the best assessment method. The questionnaire was easy to modify each semester to solicit student feedback on ways to modify the consultation service. The use of questionnaires to inform consultation logistics supports Newton and Feinberg's (2020) finding that a survey was a good method to assess student satisfaction with the consultations in regard to scheduling and the location of the consultation.

The one-minute paper offered no information about the logistics, but the team process interviews and the retrospective interviews provided some student feedback about the logistics. While the retrospective interviews provided us with preferences about the consultation logistics, self-selection bias might have influenced the results. Students were aware of us seeking information about meeting with multiple teams at once prior to the focus group. Students participating in the team process interviews might have been influenced by the desire to have more personalized assistance. Self-selection bias is a limitation that other researchers using interviews have also noted (e.g., Rogers & Carrier, 2017).

Comparing Utility of Methods

In regard to the utility of each method in our context, we determined that the questionnaire was the best method for our environment due to the data collected and our ability to distribute the assessment (see Table 6). Questionnaires are one of the most frequently used methods to assess research consultations (Fournier & Sikora, 2015). We identified three reasons why questionnaires were the most suitable assessment method in our context, which provide additional insight into why questionnaires are often used. First, the questionnaire allowed us to collect data about the effectiveness of the instruction and the logistics of the consultation. The questions could easily be modified to meet our needs at a particular time. To continue to provide actionable data, the questions should not focus on user satisfaction, which has been shown to receive positive responses (Fournier & Sikora, 2015; Newton & Feinberg, 2020). Positive feedback is flattering, but does not identify areas for service improvement. The questionnaire also allowed us to collect data from students who did not meet with a librarian.

Second, the distribution of the questionnaire was more streamlined than other methods. Since we distributed the questionnaires once each semester, the method avoided the challenges we encountered with the one-minute papers. As the questionnaire was distributed at the beginning of the class, we had a high response rate. Our experience supports Faix, MacDonald, and Taxakis (2014) who found they got a better response rate when distributing the survey in class.

Third, the data analysis of the questionnaires was the easiest to integrate into our workflows. While the questionnaires took a few weeks to completely transcribe and analyze, the different topics of questions allowed us to prioritize the

Table 6
Methods Evaluation Summary

Method	Effectiveness of Instruction	Consultation Logistics	Utility of Method
One-minute papers	Best learning outcomes data	No data provided	Some utility
Team process interviews	Limited learning outcomes data	Limited actionable data	Difficult implementation
Questionnaires	Best learning outcomes data	Best actionable data	Best utility
Focus Groups	N/A	N/A	Difficult implementation
Retrospective interviews	Limited learning outcomes data	Limited actionable data	N/A

analysis of the questions, if required, to gather the information needed to make changes to the consultations. The one-minute papers also required a time commitment to transcribe and code the responses, and this analysis needed to occur immediately to make changes to the ongoing instruction. We only had time to do summaries of the interview data before needing to make changes for the next semester, which meant some of the data we collected was not utilized.

Changes Made to Consultations

The fall 2017 questionnaire led to instructional changes in the spring 2018 semester. The librarians added showing students how to find the formatted citations in databases, and if that was not available, how to find the citation in Google Scholar. For help beyond that, librarians reminded students that the Writing Center was available. Consultations for each team continued to be scheduled for one hour.

For the fall 2018 semester, the consultation was shortened from one hour to 30 minutes. During the first week of the semester, the second author met with each class section and provided an overview of the course guide, the new tutorials, and the assignment. Thus, prior to the consultation, librarians told the teams via email to review the tutorials so that they could be better prepared for the session. Librarians used the team process interview questions to help guide the consultation.

Practical Implications

Our project illuminated multiple considerations for assessing consultations. First, framing questions on the one-minute papers positively elicited more responses than negatively framed questions. Descriptions of how to use one-minute papers advise asking a question about points of confusion, the muddiest point, or what is unclear (Bowles-Terry & Kvenild, 2015; Schilling & Applegate, 2012). While several versions of our one-minute papers had this type of question, we found that framing the question positively provided us with more actionable data. For example, instead of "What question remains unanswered?" we asked, "What would you like to learn more about?" This finding supports Bowles-Terry and Kvenild's (2015)

caution about using a negatively framed assessment technique too often.

Also, librarians should consider the possible role that each assessment method could play in student learning (Oakleaf, 2009). Reflection is part of the learning process (Fosnot & Perry, 1996). Offering a one-minute paper at the end of the consultation provided students time to reflect on the session and could potentially deepen learning. The questions asked during the team process interviews also helped students frame their learning and what was needed next for their assignment. The questionnaire allowed students to reflect on what information sources they used throughout the semester. However, the retrospective interviews, while reflective, were more informative for the librarian than the students.

Limitations

Our study has several limitations. First, the involvement of stakeholders is key to action research. While we involved stakeholders in our project, stakeholder involvement in assessment design, data collection, and data analysis could be expanded. In particular, we could look for ways to include students. Second, only one person coded all of the data. Although we frequently discussed the findings during the coding process, having only one person code the data could have led to bias. Finally, all of the data collected represent individual student perceptions. For our project, we did not feel the student perceptions were a large limitation, as we were able to see that students' reports of learning mapped to the consultation learning outcomes. However, future assessments could use other methods like journaling, pre/post testing, and citation analysis of the project.

Conclusion

We used action research to evaluate four assessment methods for consultations. The action research method allowed us to plan an assessment, implement the assessment, analyze the results, reflect on the effectiveness and utility of the assessment, and make changes to the assessment for the next semester. The cyclical nature of this project allowed us to make changes and continuously reflect on the usefulness of each method. After implementing one-minute papers, team process interviews, questionnaires, and retrospective interviews, we found that questionnaires were the best assessment method for our context. Questionnaires provided the most actionable information about both the effectiveness of the instruction and the logistics of the consultation and were the easiest to administer. The continuous evaluation and modification of an assessment method allows for the development of an assessment that is the best for a particular context.

Acknowledgements

Thank you to T. Derek Halling, David Hubbard, Mike Larson, Bruce Neville, Chad Pearson, Ashley Staff, Jane Stephens, and Gary Wan for assistance with data collection. Thank you to Michael R. Golla for his support of our research project.

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Appendix A
Team Process Interview Protocol

1. What did you turn in for the project?
2. Are you satisfied with your project report submittal? Did you have sufficient information to submit for the update?
3. Is there anything that you wish you had done differently?
4. What do you need to submit for your next project due date?
5. What kind of information do you need for the next due date?

Appendix B
Questionnaire Instruments

Fall 2017

Met with a Librarian

Version	Questions
1	1. What was helpful? 2. What was not helpful?
2	1. What was the most important thing you learned during this consultation? 2. Do you need help with citing resources in your project? Which citation style did you use?

Did Not Meet with a Librarian

Version	Questions
1	1. Were there any barriers to meeting with the librarian for the research consultation? 2. Did you use the Library IDIS Class Guide? Which sections?
2	1. Did you find or use any resources that the Library should add to their IDIS 303 Class Guide or book collection? 2. Do you need help with citing resources in your project? Which citation style did you use?

Spring 2018

Met with Librarian

1. What was the most important thing you learned during the consultation?
2. What did you learn about library resources that you could use in your future courses?
3. Do you intend to schedule an appointment with a librarian in MMET 401 (currently IDIS 403)? Why?
4. Librarians currently meet with one team at a time. For the future MMET 301 (currently IDIS 303) team meetings, we are considering having multiple teams meet with a librarian at the same time and providing information using video tutorials.
a. What aspects of the one-on-one team meeting were most beneficial to you?
b. Based on your research consultation experience, do you have any concerns about multiple teams meeting with a librarian at once?
c. What information from the research consultation would you like see in video tutorial format?

Did Not Meet with Librarian

1. Did anyone on your team meet with a librarian?
2. If someone from your team met with a librarian, what did they share with you about finding information for your team's project?
3. How did your team choose a topic?
4. Where did you find the information needed to write your paper?
5. How did you find the information needed to write your paper?
6. Did you know the library created an IDIS 303 class guide to assist you with finding sources for your paper?

Fall 2018

Met with a Librarian

1. What was the most important thing you learned during the consultation?
2. What did you learn about library resources and services that you could use in your future courses?
3. Librarians currently meet with one team at a time, but have considered meeting with multiple teams at once. What aspects of the one-on-one team meeting were most beneficial to you?
4. What are your impressions about the 30-minute length of the consultation?
5. Did you meet with a librarian multiple times? Why or why not?
6. Do you wish you had met with an engineering librarian before this class? If so, in which course or context?
7. Do you intend to schedule an appointment with a librarian in MMET 401? Why or why not?
8. Did you view any of the library tutorial videos?
9. What information from the research consultation would you like to see in video tutorial format?

Did Not Meet with a Librarian

1. Did anyone on your team meet with a librarian?
2. If someone from your team met with a librarian, what did they share with you about finding information for your team's project?
3. Do you intend to schedule an appointment with a librarian in MMET 401? Why or why not?
4. Did you know the library created an online MMET 301 class guide to assist you with finding sources for your paper?
5. How did your team choose a topic?
6. How did you find the information needed to write your paper?
7. Did you have any difficulty finding the information for your paper? Please describe.
8. Did you view any of the library tutorial videos?
9. What information from the research consultation would you like to see in video tutorial format?

Appendix C
Retrospective Interview Protocol

1. What did you enjoy about the class project?
2. What did you not enjoy about the class project?
3. How did the information that you needed early in the assignment compare to the information that you needed closer to the assignment due date?
4. Think about how the research consultation fit within the flow of your research assignment. How would you describe the timing of your consultation: too early, just right, too late? Why?
5. How did you approach finding resources for your paper after meeting with a librarian?
6. Describe the resources that you used to find information for your project.
7. Did you use any sources that were not mentioned by a librarian?
8. Did you use the library's *Get It for Me* service to obtain any resources?
9. How did you decide which sources to use and which not to use?
10. What could have made the research consultation experience better?
11. Consider you are talking to a student who will be taking the IDIS 303 or IDIS 403 course next semester. What would you say about meeting with a librarian to that student?
12. Is there anything else you would like to add about the research consultations?