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Research

Student Research & Intrinsic Motivation

Effects of Formative Assessment and the Two-Session Model of Information Literacy Instruction

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Formative assessment is a well-established practice within education. However, the traditionally brief format of information literacy instruction has not lent itself well to formative assessment efforts conducted during the learning process. At the same time, there is increasing focus within the library literature on affective measures of information literacy instruction such as motivation, and instruction formats that incorporate multiple sessions. This study seeks to examine the relationship between student motivation, delivery of instruction, and formative assessment, by comparing scores from the Intrinsic Motivation Inventory (IMI) across two groups of research writing students: a control group receiving one session of information literacy instruction, and an intervention group receiving written formative assessment and two sessions of information literacy instruction. Statistical significance analyses indicate that the addition of formative assessment and a second instruction session significantly increased motivation for conducting research in the intervention group when compared to students receiving only one session of instruction and no formative assessment. These findings indicate that librarians can significantly increase students' intrinsic motivation to conduct research by incorporating formative assessment strategies into a two-session model of information literacy instruction.

Literature Review

In his 2010 book on motivational design, Keller states that "teachers cannot control student motivation but they certainly do influence it" (p. 38). Librarians have increasingly taken on the role of teachers of information literacy. However, whereas the education literature is rich in the application of motivational techniques and the effective use of formative assessment, the library literature is only in the infancy of exploring these applications within information literacy instruction.

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Internal Motivation

Numerous iterations of motivational theory have examined, categorized, and re-evaluated motivation within the realm of education. Deci and Ryan published their theories on motivation in 1985, and have continued to develop their ideas into what is now known as Self-Determination Theory (Deci & Ryan, 1985; Deci & Ryan, 2008). Their work originally examined the differences between intrinsic and extrinsic motivation, where intrinsic motivation is defined as engaging in a task because one finds it personally rewarding to do so, and extrinsic motivation is defined as engaging in a task because of the desire for some external reward (Ryan & Deci, 2000).

Intrinsic motivation has been the focus of much educational research, because of the proven relationship between intrinsic motivation and student achievement over time (Dennis & Dees, 2015; Taylor et al., 2014). While external motivators, such as grades and scoring, are important for showing student improvement, relying solely on these mechanisms is not enough to motivate students to engage deeply with their research projects. In fact, motivation for some students has been shown to decrease when teachers use frequent, high-stakes evaluations (Hancock, 2001). When information literacy librarians focus their teaching on simply meeting the requirements of an assignment, we play into this external reward system that does not motivate students to understand the wider applications of their research skills. Indeed, research has indicated that motivation is one of the emotional intelligence measures that is strongly correlated with higher student information literacy scores (Matteson, 2014). Additionally, since information literacy instruction often takes place in brief formats but is a necessary skill throughout the curriculum, it is essential that students be intrinsically motivated to continue their research efforts after the individual assignment has ended.

Formative Assessment

When trying to impact student motivation, many authors have focused on formative assessment. One article developed seven principles of good assessment which include: clarifying good performance, facilitating self-assessment, delivering high-quality information, encouraging dialogue, promoting positive self-esteem, providing opportunities to close the knowledge gap, and yielding information for the instructor on student learning (Nicol & Macfarlane-Dick, 2006).

Another article sought to quantify high-quality assessment through the principles of providing transparency of learning goals, information on current task performance, and cues for reaching the desired goal. These concepts can be simplified with the three questions: Where am I going? How am I going? And where to next? (Wollenschlager, Hattie, Machts, & Harms, 2016). However, even when instructors provide high-quality assessment, it is possible that the students never read or internalize the assessment. Multiple authors have found that providing grades along with assessment causes students to pay less attention to the assessment they were given (Butler & Winne, 1995; Draper, 2009). This is an excellent illustration of the externally-motivated student who completes assignments for the grade and not for the learning involved.

Within the library literature, assessment usually takes a summative approach for the purposes of improving library instruction for future classes; there are few examples of using formative assessment to improve student work (Fontichiaro, 2012; Swoger, 2011). The examples that are available have mainly focused on credit-bearing information literacy courses or online assessments (Seely, Fry, & Ruppel, 2011).

The time constraints of the traditional one-shot information literacy session contribute to this focus on simple, end-of-class synthesis tools such as the one-minute paper, muddiest point, one-sentence summary, or quick assessment quizzes. However, some librarians have included the use of clicker or polling technology, as well as pre-tests for formative assessment within the one-session model (Broussard, Hickoff-Cresko, & Urick, 2014; Dunaway & Orblych, 2011). While each of these methods meet some of the seven principles of good assessment, such as encouraging dialogue, delivering high-quality information, facilitating self-assessment, and yielding information for librarians, they

fall short in regard to other characteristics of robust assessment. This is due in part to the lack of individualized assessment being conveyed from the librarian to the student. Without this part of the equation, librarians cannot clarify good performance, or provide opportunities to close the knowledge gap. Librarians are also not able to provide individualized assessment that explains to the student how to get from their current performance levels to the desired learning outcomes (Nicol & Macfarlane-Dick, 2006; Wollenschlager et al., 2016).

The Two-Session Model of Information Literacy Instruction

The time constraints highlighted above contribute to the difficulty of implementing formative assessment in information literacy instruction. Many librarians have recognized this problem and have moved to a model that includes multiple information literacy sessions over the course of the semester (Bean & Thomas, 2010; Rempel & Cossarini, 2013). In one instance, students who received four 12-minute sessions spread throughout the term showed improvement in the information literacy-related abilities of evaluation and choice of appropriate sources (Van Epps & Nelson, 2012). Another model incorporated two information literacy sessions into two separate English courses. Pre- and post-surveys of these two courses showed a positive shift towards confidence with research skills as well as improvement in identifying and evaluating sources (Henry, Glauner, & Lefoe, 2015).

With respect to providing assessment of research skills, the multi-session model is essential to allowing the librarian time to help develop search methods and then to help guide students when they struggle with the implementation of those methods. The literature suggests that an integrated approach with sustained exposure to information literacy instruction may be the best way of incorporating formative assessment into information literacy instruction (Hess, 2015; Small, Zakaria, & El-Figuigui, 2004).

This study combined two back-to-back, 50-minute information literacy sessions that included an in-class activity and individual written assessment from the librarian to determine if individual, formative assessment in combination with practice time has an effect on student motivation for conducting research.

Study Design

This study examines the motivation levels of 73 students across four participating classes of information literacy instruction. Each of the participating classes was a sophomore-level research writing class, which is required as part of the liberal studies curriculum. Classes were placed in one of two groups: the control group received one session of information literacy instruction and no formative assessment, and the intervention group received two sessions of information literacy instruction and written formative assessment.

Originally, a research writing course instructor approached the author about creating a more intensive library session than the traditional one-shot format for delivery to two of her sections. The author then proposed a two-session model with an activity (Appendix A) and written librarian assessment of the search process, individualized for each student. After determining that this model would work well for that instructor's courses, the author suggested studying intrinsic student motivation during the research process. The author approached two additional research writing instructors who had scheduled information literacy instruction that semester about including their courses as a control group as well. All three instructors allowed the author to invite students from their classes to participate in the research survey at the end of the information literacy session. The only stipulation from the three instructors was that the surveys not take more than five minutes of class time.

This study uses quantitative analysis of a Likert scale survey in order to determine whether student motivation levels were improved by adding both individualized, formative assessment and a second session to existing information literacy instruction. These results were compared to the data collected from surveying students in

traditional, one-session information literacy model of instruction. The author obtained IRB approval before collecting data.

Research Question and Hypotheses

The author sought to discover: Does individual formative assessment with additional instruction time have an effect on the level of intrinsic motivation for conducting research that students display at the end of information literacy instruction?

Hypotheses:

1. Students who receive individual formative assessment will self-report a higher level of interest in the task.
2. Students who receive individual formative assessment will self-report a higher level of perceived competence.
3. Students who receive individual formative assessment will self-report equal levels of effort/importance.
4. Students who receive individual formative assessment will self-report a lower level of pressure and tension.

Research Instrument

In order to accurately measure intrinsic motivation, the author chose to use the Intrinsic Motivation Inventory (IMI) that was developed in 1985 and validated in 1989 (McAuley, Duncan, & Tammen, 1989; Plant & Ryan, 1985). The current version of the IMI is made up of six subscales that reflect significant areas that contribute to intrinsic motivation: interest/enjoyment, perceived competence, effort/importance, pressure/tension, perceived choice and value/usefulness. A seventh subscale has also been developed for relatedness but has not yet been validated. The entire scale is available from the Self-Determination Theory website (Self-Determination Theory, 2016).

The IMI was used to evaluate levels of intrinsic motivation across the first four subcategories: interest/enjoyment, effort/importance, perceived competence, and pressure/tension. The subscales of perceived choice, and value/usefulness were eliminated, because all students were required to conduct research as a part of their course. This condition could have skewed the results of those two subscales. Additionally, the entire survey was designed to be completed in less than five minutes at the end of a class period—per the instructors' request—adding these subscales would have extended the time allotted by the instructors.

The four indices were measured using a 23-item survey on a seven-point Likert scale. The original survey items were edited to reflect the task at hand by replacing the words "this activity" with the words "conducting research." See Appendix B for a complete list of survey questions. The scale has been validated for use in education and includes seven control questions that are scored in reverse. Interest/enjoyment, effort/importance, and perceived competence are all positive indicators of intrinsic motivation while pressure/tension is a negative indicator (Self-Determination Theory, 2016).

Sample

The participants for this study included students enrolled in ENGL 202: Research Writing at a teaching university in western Pennsylvania with approximately 12,000 FTE. There were a total of 86 surveys returned across the four participating classes. Students who did not want to participate in the project were instructed to leave their survey blank. Thirteen surveys were removed because of incomplete answers, or because students were not present for the entire instruction activity, leaving the final participation at 73 complete surveys.

The surveys were grouped according to the class format in which they were collected. The control group included 34 participants across two classes that received the traditional library instruction of one 50-minute class session and no individual formative assessment. The intervention group included 39 participants distributed across two classes and received two 50-minute information literacy sessions each in addition to individually-written formative assessment for each student.

Method

The control group completed an activity (Appendix A) as a part or their information literacy instruction, but was not given any formative assessment on it. The intervention group completed the same in-class activity during the first class session and was given individualized, written, formative assessment on that activity at the beginning of the second class session. During the second class session, the participants were able to talk to the librarian about their assessment and conduct research in a variety of databases, while the librarian circulated through the class to offer help. The activity was not graded for either the control or intervention group to avoid the scenario discussed in the literature where students focus on their score and not on the assessment (Butler & Winne, 1995).

Assessment was structured using the three questions: Where am I going? How am I going? And where to next? (Wollenschlager et al., 2016).

Table 1

Example Formative Assessment

Student Research Question	**Librarian Assessment**
What are some common stereotypes teen moms face, and how do they overcome them?	Think about specific examples of stereotypes and how you would expect them to overcome those. Your terms prevention and abstinence don't address stereotypes. Try to think of specific stereotypes and build from there. We can talk more about this in class.
What shifts in societal norms and ideals have resulted in the current pressure to go to college vs. join the workforce?	This question is well focused and your current terms of college, societal norms, and workforce are a great start. You may also consider using pressure or skilled labor as keywords when you search.
Which stereotypes do immigrants face when coming to the United States?	Your keywords of immigrants and stereotypes are a great start to this research question, but you might need to focus on a specific group of immigrants. Consider the different stereotypes that one might encounter as a Hispanic immigrant vs. a Middle Eastern immigrant. When you search try to use terms that are more specific, such as work ethic or Islamophobia.

In each of these examples, the librarian identified the question the student was trying to answer, the problems he or she might encounter with either the question itself or the keywords listed on the activity sheet, and suggested approaches to solving the problem. Each of the students was also given the opportunity to discuss these suggestions with the librarian during the second class session. This time allowed the librarian to explain concepts in greater detail, and to provide more specific instruction to students who were struggling. This format provided the opportunity for high-quality assessment by clarifying good performance and by providing opportunities for the students to practice their performance and close the knowledge gap (Nicol & Macfarlane-Dick, 2006).

The motivation survey (Appendix B) was administered at the end of the 50-minute session to the control group and at the end of the second 50-minute session for the intervention group. Averages for each subcategory were calculated and compared for statistical significance using an independent t-test.

Results

All averages fall within the range of one to seven, where seven indicates a high level of intrinsic motivation and one indicates a low level of intrinsic motivation for the positive subcategories. The opposite is true for pressure/tension, which is a negative indicator of intrinsic motivation (Self-Determination Theory, 2016).

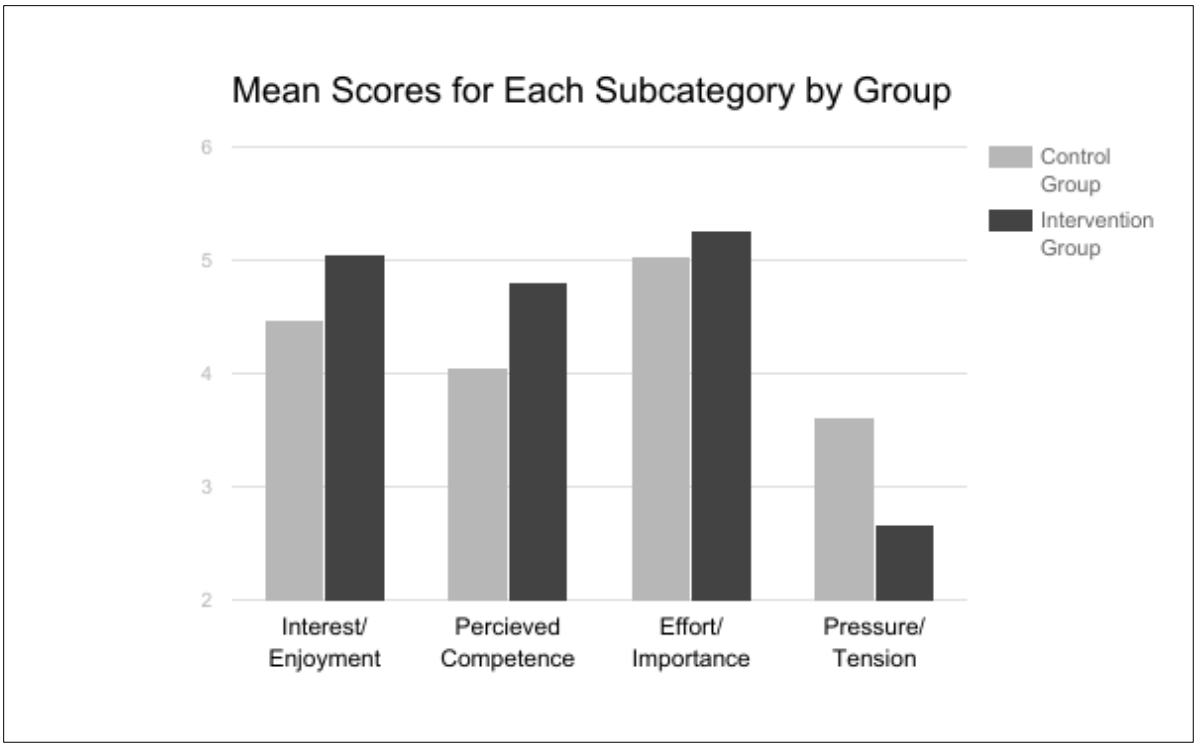

Figure 1

Mean scores for each subcategory by group

Figure 1 illustrates the difference between mean scores for each subcategory by group, while Table 2 shows the mean for each subcategory and group along with the p-values to determine statistical significance. All tests were conducted using an independent t-test with a 95% confidence interval where $p<0.05$.

Table 2

p-Values Comparing Control and Intervention Groups for Each Subscale

IMI Subcategory	Control M (SD)	Intervention M (SD)	t	df	p
Interest/Enjoyment	4.48 (.929)	5.05 (1.106)	-2.359	71	.021
Perceived Competence	4.06 (1.155)	4.81(1.086)	-2.838	71	.006
Effort/Importance	5.04 (1.077)	5.26 (.949)	-.908	71	.367
Pressure/Tension	3.61 (1.509)	2.67 (1.294)	2.865	71	.005

The three subscales of interest/enjoyment (p=.021), perceived competence (p=.006), and pressure/tension (p=.005) did show significant improvement in the intervention group of students. The effort/importance subscale (p=.367) showed no significant difference between the control when compared to the intervention group. This could be because all groups of students were required to conduct research and, therefore, found it important to complete the activity, as it related to the completion of the course.

Discussion

The increase in interest/enjoyment, perceived competence, and decrease in pressure/tension are all indicators of higher levels of intrinsic motivation in the intervention group. Each of these four subcategories have been correlated with higher levels of intrinsic motivation; therefore, one can conclude that the students who received a second class period and individual, formative assessment experienced higher levels of intrinsic motivation during this specific assignment. Additional research is required to determine if these higher levels of intrinsic motivation would be reported in relation to assignments in other courses.

Evaluation of Hypotheses

Hypothesis 1: Students who received individual formative assessment will self-report a higher level interest in the task. The first hypothesis is supported by the data for the control group with a difference of .57 points on the Likert scale and a p-value of .021. This shows that significantly more students in the intervention group were more interested and found more enjoyment in conducting research than in the control group.

Hypothesis 2: Students who received individual formative assessment will self-report a higher level of perceived competence. The difference between the averages for the perceived competence subscale was .075 with a p-value of .006. This shows that, once again, the students in the intervention group had higher levels of perceived confidence than the control group. Therefore, the second hypothesis is also supported. Note that perceived competence makes no judgment about actual competence for the task and that only the perception of competence is necessary for intrinsic motivation to improve student learning (Self-Determination Theory, 2016).

Hypothesis 3: Students who received individual formative assessment will self-report equal levels of effort/importance. While the data show that there was a slight .22 difference in averages between the two groups for the amount of effort/importance placed on conducting research, this difference was not found to be significant. Therefore the third hypothesis is supported.

Hypothesis 4: Students who received individual formative assessment will self-report a lower level of pressure and tension. Pressure and tension is the only negative indicator of intrinsic motivation, and the analysis shows that the intervention group scored significantly lower on the pressure/tension indices with a difference of .94. This is the largest difference of all of the subscales and would indicate that the addition of a formative assessment activity and extra class time did reduce the intervention group of student's level of tension surrounding research. Thus, the fourth hypothesis is supported.

Limitations

This study was conducted during the spring semester. Fewer ENGL 202: Research Writing classes are scheduled in the spring in relation to the number scheduled in the fall semester. This meant that the pool of students was smaller than it would have been during a fall semester, resulting in lower participation. A second limitation is that the combination of formative assessment and additional instruction used in this study means that these results cannot be solely attributed to formative assessment or to additional instruction alone. Any librarian wishing to replicate these

results should be aware of this combination of variables, and plan accordingly. Finally, the author only chose to include 4 of the 6 possible subscales of the IMI; these additional subscales could have provided richer context, specifically related to the dimension of autonomy. Further research may consider using all 6 subscales to gain a clearer picture of the interplay between motivation, formative assessment, and allotted instruction time.

Implications

Motivation is an increasingly important topic in the field of education and is, similarly, important for information literacy instruction. The complexity of student research today and the brief format in which information literacy instruction is often delivered magnify the need to integrate motivational strategies into information literacy instruction. If the ultimate goal is to create students who understand the information landscape and who can use information skills throughout their lives, students must be motivated to internalize the skills they practice as researchers during their time in higher education (Arnone, Reynolds, & Marshall, 2009; Association of College & Research Libraries, 2016).

The two-session model of delivering information literacy instruction has become a recognized compromise between the one-shot and fully embedded models of delivery (Henry et al., 2015). While formative assessment is just beginning to make its way into information literacy instruction in a meaningful way, this study has shown that applying both two-session instruction and formative assessment can have a significant impact on four areas related to intrinsic motivation of students: interest/enjoyment, perceived competence, effort/importance, and pressure/tension (Seely, et al., 2011).

The literature indicates that librarians have focused on the affective factors that make students better researchers, specifically, motivation (Cahoy & Schroeder, 2012; Crow, 2007; Klipfel, 2014; Matteson, 2014). Greater attention to the role of motivation and how to promote it in our students is increasingly important in contemporary information environments, where immediate gratification has become a student expectation. While this study cannot comment on the long-term motivation of the student participants, it does show that the right combination of formative assessment and instruction time can increase intrinsic motivation in the short-term. When combined with the research cited above, librarians may be able to use the techniques described in this article to develop the affective skill of intrinsic motivation in his or her students.

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Appendix A

Student Activity Worksheet

Library Worksheet

General Topic:

Possible focus areas:

Research Question:

Keywords:

Term:			
Broader term:			
Narrower term:			
Synonym:			

Appendix B

The Intrinsic Motivation Inventory (IMI)

For each of the statements please indicate how true this is for you using the following scale:

Statements	Not at all true			Somewhat True			Very True
	1	2	3	4	5	6	7
I enjoyed conducting research very much							
Conducting research was fun to do							
I thought conducting research was a boring activity							
Conducting research did not hold my attention at all							
I would describe conducting research as very interesting							
I think conducting research is quite enjoyable							
While I was working on conducting research, I was thinking about how much I enjoyed it.							
I think I am pretty good at conducting research							
I think I did pretty well at conducting research, compared to other students							
After working on conducting research for a while, I feel pretty competent							
I am satisfied with my performance at conducting research							
I was pretty skilled at conducting research							
Conducting research is an activity that I can't do very well							
I put a lot of effort into conducting research							
I didn't try very hard to do well at conducting research on my topic							
I tried very hard to conduct research on my topic							

It was important to me to do well at conducting research							
I didn't put much energy into conducting research							
I did not feel nervous at all while conducting research on my topic							
I felt very tense while conducting research							
I was very relaxed while conducting research							
I was anxious while conducting research							
I felt pressured while conducting research							

The original scale is available from the Self-Determination Theory website (Self-Determination Theory, 2016).