



Recasting the “One-Shot” for Student Success: Causal Research Findings for More Effective Library Instruction

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Introduction

In this paper we present the results of a causal study on the effectiveness of frequent, short instruction sessions compared to the more traditional 60-minute one-shot sessions in learning basic information literacy concepts. The study was conducted on high school seniors just months away from becoming college freshmen and is relevant to academic librarians preparing to welcome new learners, and learning styles, to campus.

Research demonstrates that increased frequency of instruction is a malleable factor that can improve student achievement in the classroom.¹⁻⁵ However, there is a dearth of this type of research as it relates to library instruction specifically, so the researchers designed a study to see if these findings could be replicated in a school library setting. The study was motivated by the lack of information literacy skills shown by students as they transition from high school to college, which begs the question: how can we best teach students information literacy skills to a new generation of learners? The results provide considerations on how to restructure one-shot instruction sessions to maximize student learning.

Formal student assessments as part of an information literacy course at Southern Utah University (SUU) over three recent years of instruction indicate that incoming freshmen are unprepared to take on the demands of college-level research. A required seven-week, one-credit information literacy course helps to remediate this problem. On average students only score 68% on the pre-course competency exam. After completing the course, the average student score rises to 85% on the final exam.

A preliminary study of our university feeder high schools pointed to several important factors that contribute to a lack of college preparedness in information literacy.⁶ The qualitative portion of the research revealed that lack of collaborative teaching time is the major barrier to providing local students with the necessary information literacy skills. The findings were confirmed in a second statewide information literacy study, where 60 out of 80 school librarians in Utah also listed time as the biggest barrier to collaboratively teaching information literacy skills to students.⁷ After sharing these results with library colleagues at national and statewide conferences, school librarians from various districts in the state approached the project investigators requesting help with preparing their students for college-level library research. These school librarians asked for guidance from academic librarians on instruction topics and lessons. With these experiences in mind, we proposed an intervention in the form of an academic and school library collaboration that mirrors the causal classroom literature that frequency of instruction can improve student achievement. By providing shorter, more frequent instruction of the information

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literacy skills students will need in college, the project addressed the need for collaborative teaching opportunities by increasing the flexibility of instruction. In this way, classroom teachers only give up 15-minutes of their instructional period at a time, rather than the entire class period. This provides the librarian with more opportunities to collaborate with the classroom instructor with a low threshold commitment, while giving the students more exposure to the librarian.

This study is part of the Causality: School Libraries and Student Success (CLASS) II Research co-funded by the American Association of School Librarians (AASL) and the Institute of Museum and Library Services (IMLS).⁸ The research systematically investigates student learning in school libraries; specifically whether students who participated in four 15-minute information literacy instruction sessions with a narrow topical focus performed better on an information literacy skill assessment as compared to students who were exposed to one 60-minute instruction session that encompassed multiple information literacy topics. The effect of short, frequent instruction was tested through the statistical analysis of pre- and post-test scores using randomized classroom selection of on-level students and blind grading of the tests. The research was conducted in 2018 as a collaborative effort between academic librarians, and rural high school librarians and English teachers. The instruction sessions were taught by the school librarians using instructional materials created by the researchers and after coaching sessions on timing and content.

The project team addressed the following research question: *To what extent do students who are exposed to shorter, more frequent information literacy instruction perform better compared to students who are exposed to longer single session information literacy instruction and to students who are not exposed to any information literacy instruction?* Today’s instruction librarians are working with a hyper-connected generation of students. This study is an initial step towards looking to recast the narrative on what effective instruction looks like in an increasingly digital age of shortened attention spans and point-of-need information gathering.

Literature Review

Although literature regarding Generation Z, or digital natives, is still developing, theories have emerged that this particular group of learners is not information literate, despite their hyper-connected upbringing.^{9–11} Gen Z students display mastery of technology, which should not be mistaken for the information literacy and critical thinking skills needed to navigate higher education.¹² Scholars have posited that the disconnect between digital native students and their older generation teachers can be bridged but that “hands-on and minds-on activities” should be used strategically to engage these learners.^{13,14}

High school students often have inadequate information literacy skills to succeed in higher education.^{15–17} One reason may be that high school teachers do not include enough curriculum time for in-depth research projects that studies have indicated improve information literacy skills.¹⁸ Furthermore, a disconnect often exists between academic librarians and high school librarians who, even though they serve overlapping populations, each have their own set of content standards.^{19,20} However, even if the content standards largely converge, students may still be lacking preparation. Varlejs and Stec examined 19 high schools to determine what factors impacted the college transition from an information literacy perspective.²¹ One important finding was that school librarians have little control over the delivery of information literacy instruction since they are dependent on their teacher colleagues for class time. With increased emphasis on test results, teachers are extremely reluctant to give up the much-needed time for school library collaboration,^{22,23} further exacerbating the problem. One way for school librarians to make inroads into the classroom is by providing shorter lessons more frequently, thus taking up less class time in one single setting.

At the university level, one-shot instruction sessions are a popular mode of delivery as academic libraries with limited resources try to reach as many students as possible. There is no definitive answer in the literature as

to which frequency of instruction yields the best results. While some studies confirm that the traditional one-shot increases student learning,^{24,25} others have found that little is retained.²⁶ Multiple, short sessions were found to be effective in one study comprised of five 25–30 minute sessions,²⁷ but more recently, a study comparing a 30 minute one-shot with a 60-minute session to have no statistical difference in student learning.²⁸

Increased frequency of instruction has been demonstrated in the literature as a method for providing “sufficient intensity to help students reach threshold levels of skill and understanding.”²⁹ Mayhall et al. asserted that improvements in academic achievement are demonstrated when instructional frequency is increased, even when total instructional time is equal.³⁰ Several research studies also demonstrate that frequency of instruction has the most effective impact on student achievement and generates better results regardless of instructional methodology.^{31–33} A more recent integrative literature review on in-service training of health care workers by Bluestone et al. showed that repetitive, time-spaced education led to improved learning and retention. In this study we examined whether these findings also hold true in a school library setting.³⁴

Methodology

To answer the research question on the effectiveness of duration and frequency of information literacy instruction on student learning we designed a quasi-experimental study, with Institutional Review Board approval, at two local rural high schools. School librarian and English teacher pairings from each high school were recruited to participate. The English teachers provided important feedback on the research assignments for their classes as well as input on the topics that would be taught during the interventions. They also gave of their class time to allow the librarians instructional time and were provided with a stipend of one hundred dollars each. The school librarians had the additional tasks of learning and delivering the instructional materials as well as administering the assessments to all groups and were provided a stipend of four hundred dollars each.

The study’s dependent variable is student learning and is operationalized by test scores on multiple-choice tests. The independent variables in the study are a) the type of instruction: no instruction (control), long instruction (LI), and multiple short instruction (MSI) groups, and b) high school. For the study, three on-level, grade 12 English classes were invited to participate. Since random assignment of students to different treatment groups was not a possibility, classes representing logical test groups were randomly assigned to either control (no instruction), long instruction (LI), or multiple short instruction (MSI) groups. The LI group took three tests: a pre-test, a post-test following the single long instruction session, and a second post-test administered approximately two weeks later. The control group was subject to the same test schedule without the benefit of any instruction. Students in the MSI group took the pre-test, then received four short instruction sessions, each followed by a brief test. The multiple, short instruction sessions took place over the course of two weeks. The four brief tests were the equivalent of the post-test that the LI and control groups received. Finally, the MSI group also took a cumulative post-test approximately two weeks after the last instruction session to measure long-term retention.

TABLE 1
Intervention by Group

	pre-test	brief instruction 1	test 1	brief instruction 2	test 2	brief instruction 3	test 3	brief instruction 4	test 4	long instruction	post-test	delayed post-test
Control	x										x	x
MSI	x	x	x	x	x	x	x	x	x			x
LI	x									x	x	x

The researchers created the testing and instructional materials (available upon request) with input from the school librarians. The instructional topics covered in this study were: 1) resource types; 2) locating information; 3) Boolean search strategies; and 4) evaluating information. The MSI groups received one lesson per instruction session, whereas the LI group received instruction on all four topics in one single session. The research team created the lesson plans, presentation slides to guide the instruction, and the corresponding test questions used for the different tests. The school librarians were trained in presenting the lessons by first observing and then teaching a mock lesson. The researchers scored the school librarians according to a rubric so as to standardize instruction and to minimize teacher impact on test scores. The study held no weight on the class grade but was timed to coincide with student research projects. The entire instruction schedule can be viewed in Appendix A.

Results

The testing data was input into a spreadsheet, then imported into SPSS for analysis. A repeated measures, mixed-design ANOVA was used to analyze the data to determine the effectiveness of the intervention. The initial test was a repeated measures ANOVA which indicated differences between treatments groups and also between high schools. Additionally, paired sample *t* tests were applied to each test group and high school individually to further interpret the results. The results of these tests showed that in each case, student learning changed significantly over repeated testing.

TABLE 2
Multivariate Tests

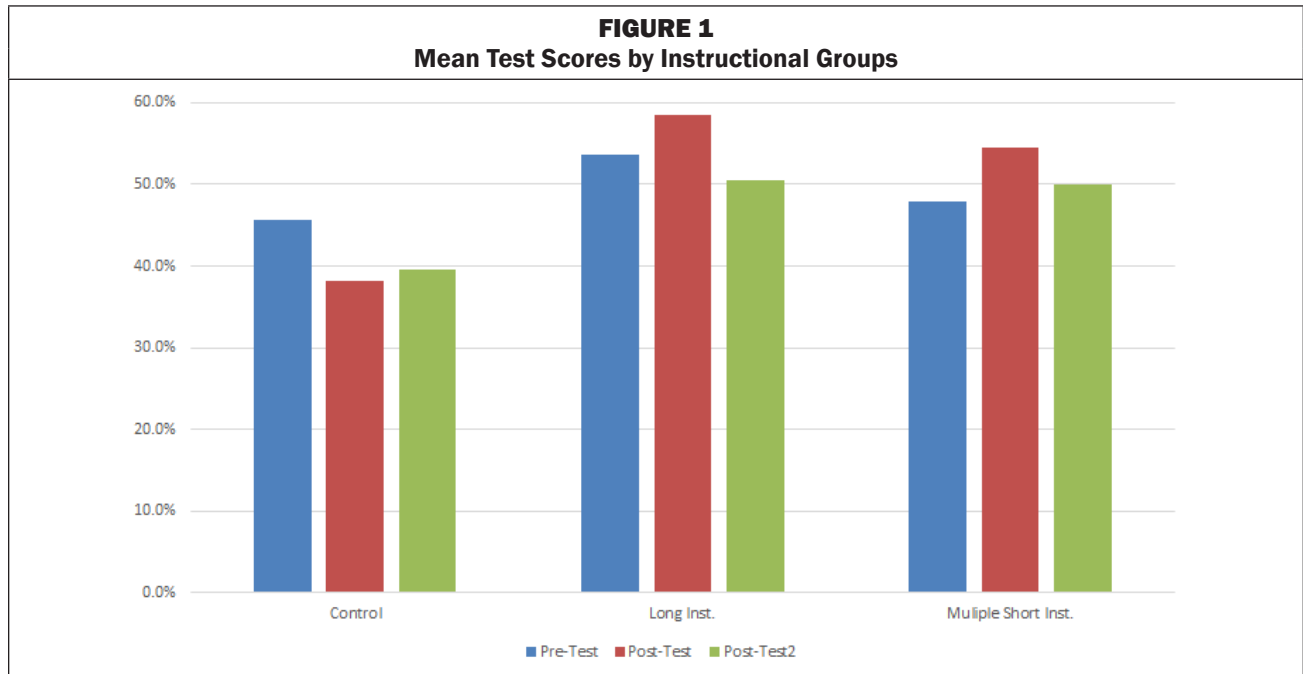
Effect		Value	F	Hypothesis df	Error df	Sig.
Testing	Wilks' Lambda	0.909	4.597	2.000	92.000	0.013
Testing by Group	Wilks' Lambda	0.848	3.967	4.000	184.000	0.004
Testing by High School	Wilks' Lambda	0.905	4.846	2.000	92.000	0.010
Testing by Group by High School	Wilks' Lambda	0.845	4.053	4.000	184.000	0.004

TABLE 3
Paired T Tests Comparing Pre- To Post-Test Scores

Group	Std. Deviation	t	df	Sig. (2-tailed)
Combined Treatment Group	3.831	-2.501	67	.015
Combined LI Group	3.902	-1.858	41	.070
Combined MSI Group	3.720	-2.497	45	.016
Combined Treatment Group at High School A	3.703	-.441	23	.663
LI Group High School A	3.632	1.835	8	.104
MSI Group High School A	2.875	-2.514	14	.025
Combined Treatment Group at High School B	3.865	-2.769	43	.008
LI Group High School B	3.852	-2.755	23	.011
MSI Group High School B	3.873	-1.097	19	.286

By Treatment Group

Another repeated measures ANOVA was run to compare the control group which received no instruction to the two treatment groups: MSI and LI. Looking at the treatment groups across high schools in combined treatment groups, LI and MSI, outperformed the control group, showing that instruction had a significant effect on learning, ($F(2,96)=5.711, p<.01$). An examination of Figure 1 illustrates that this impact was positive. A paired sample t test showed the pre-test to post-test mean scores, 10.13 (sd=3.105) and 11.29 (sd=3.324) respectively, to be significantly different, an indication that the information literacy instruction was successful to some extent. The gains the students made on the post-test were, however, lost by the time of the delayed post-test.



When examining the treatment groups individually using a paired sample t test, only the combined MSI group showed a significant improvement from pre-test to post-test with mean scores of 9.30 (sd=3.306) and 10.67 (sd=3.273) respectively ($t(45)=-2.497, p=.016$). The LI group showed no significant improvement from pre- to post-test.

By High School

The group performance across both high schools obscured the opposing strengths and weaknesses of the two distinct high schools. Further analysis looked more closely at each high school individually.

The paired t test by high school showed that the MSI and LI combined treatment groups at high school A did not show a significant improvement from pre- to post-test with means of 10.13 (sd=3.579) and 10.46 (sd=3.635) respectively ($t(23)=-.441, p>.05$). Looking more closely, the LI group at high school A failed to show any significant improvement, however, the MSI group did show improvement. The MSI group had a pre-test mean score of 9 (sd=3.117) and a post-test score of 10.87 (sd=3.925). This is a significant improvement ($t(14)=-2.514, p=.025$).

High school B's combined treatment groups also showed a significant improvement from pre-test, 10.14 (sd=2.858) to post-test, 11.75 (sd=3.089) with a significance level less than .01 ($t(43)=-2.769, p=.008$). Unlike high school A, high school B's MSI group failed to show any significant increase in test scores. However, their LI

group did show improvement. The LI group had a pre-test mean score of 10.25 (sd=2.472) and a post-test score of 12.42 (sd=3.189)—see Table 3. This is a significant improvement ($t(23)=-2.755, p=.011$). These tests, which considered each school individually, revealed the vast differences in performance between the two high schools. This explains why our initial results showed to be significant.

Discussion

We found, counter to our expectations, that short instruction and long instruction were equally effective. However, the limitations of the study temper our findings. Although our interventions overall demonstrated a positive trend in student achievement, the post-test averages still fell below the 70% percentile. Alarming as it may seem, this finding corroborates our University data on incoming freshmen, where the average pre-test score for information literacy skills is a 68% or “D+.” Both scenarios provide an impetus to continue research on effective delivery of information literacy instruction. Given some of the study limitations such as socioeconomic differences, school policies, and experience level of the librarians, the authors caution that this study should be replicated to assure that the results are reliable and valid. Study limitations arose from the loss of control over some extraneous variables inherent to conducting quasi-experimental research in a natural setting like a school environment.

Limitations

Many limiting factors were observed by the research team throughout the study. Perhaps most significant, the librarian-led instruction did not bear any weight on the students’ grades, providing little incentive for students to take the instruction seriously. Patterns were used to fill out some of the Scantrons indicating a lack of interest by some students. Integrating the instruction into the course with low stakes grading would have changed this situation, even if it was just for the post-instruction exams. The librarians themselves also represented different experience levels at their respective high schools: one in the first year of employment and one in their final year before retirement.

The randomly assigned classes occurred at varying times of the day, impacting student attendance. The class in the morning had much higher attendance than the class immediately after lunch, where students were repeatedly late enough to miss the short instruction entirely. The study was also conducted too close to student graduation which severely reduced enrollment numbers when compared to fall semester. The project investigators setup the research to have 30 students in each of the six participating classes. As the time approached to deliver the instruction, the enrollment at high school A dropped in all three classes to the mid-twenties. At the time of instruction, there were less than 20 in each class. The researchers were informed that by spring, students either had enough credits to graduate and stopped attending, or knew that they would not graduate and had left for GED programs. When working with the senior class, conducting a study in the fall rather than the spring would be more effective. There were also slight socioeconomic differences between the two high schools that could have caused problems with the research, with one high school having 8% more economically disadvantaged students.³⁵ Another important variable to consider is cell phone use, rules, and enforcement. In both schools, students are allowed to carry and access their cell phones throughout the day. Despite teachers and librarians asking the students to put them away, they remained a clear distraction during instruction time. Finally, in this study, students were not given time to apply the teaching through hands-on practice. Adding this practice element may increase learning as well as solidify the gains to avoid the downward trend in retention demonstrated in our delayed post-test results.

Conclusion

In spite of these limitations, our study revealed that shorter instruction times did not hurt student learning when compared to longer instruction sessions. As the study was conducted using high school seniors, just months away from becoming college freshmen, this finding can be applied to college-level one-shot instruction. The authors suggest that, if it is more accessible to students and instructors, breaking up the traditional long one-shot into multiple shorter instruction sessions will not negatively impact student learning. Librarians and subject-area teachers alike may find 15 minutes of instruction easier to schedule and deliver, while students benefit from receiving the same total amount of instruction in smaller “chunks.”

Some extraneous benefits of conducting this study manifested in several new collaborative relationships for the school librarians and teachers at each high school. Both school librarians reported being invited into the other grade 12 English courses after the study concluded. Not only did they gain useful entry points to classrooms in the schools, they also gained vetted instructional materials upon which to build with these new instructional partnerships. The experience the school librarians gained in teaching these critical information skills have also extended to future school librarians conducting their field work in the local schools. Under the directions of these librarians, a new generation of school librarians are using the materials developed in this grant as a springboard for their information literacy instruction.

Future Research

There is a dearth of causal research in the field of school librarianship. This study, funded by a grant by the American Association of School Librarians (AASL) and Institute of Museum of Library Services (IMLS), was an initial step toward applying classroom research to a school library environment, but much remains to be studied in this arena. This study was designed to explore the impact of frequency of instruction using baseline pedagogy such as lecture and multiple-choice assessments. It would behoove future research to include high-impact practices to ensure the engagement of students. The authors recommend that this study be replicated, keeping in mind the limitations shared in this paper. First, causal research using high school seniors should be conducted in the first half of the school year, rather than the second. The instruction should be given weight in the collaborating class' grade, and a hands-on element should be added, giving students the opportunity to apply and retain the new skills being taught. If true random assignment cannot be accomplished, attention should be paid to both the socioeconomic differences of the schools and experience-levels of the respective librarians. Finally, the school's cell phone policy should be carefully considered when designing the intervention. Most importantly, academic researchers should continue to invest their time in school library research, keeping in mind that our K-12 counterparts pass their students along to us as the next step in a continuum of learning.

Appendix A. Instruction Intervention Schedule

High School:	Type:	Class	Time	Date
B	Pre-test	B2	9:23-10:51	Tuesday, Jan 23
B	Pre-test	B3	11:39-1:07	Tuesday, Jan 23
B	Pre-test	B4	1:12-2:40	Tuesday, Jan 23
B	1 long session	B4	1:12-2:40	Mon, Jan 29
B	1st short	B2	9:23-10:51	Mon, Jan 29
B	2nd short	B2	11:08-12:02	Wed, Jan 31
B	3rd short	B2	9:23-10:51	Fri, Feb 2
B	4th short	B2	9:06-10:17	Tues, Feb 6
B	Control Post-test	B3	10:22-11:33	Thurs, Feb 8
B	Delayed post-test	B2	9:23-10:51	Fri, Feb 23
B	Delayed post-test	B3	11:39-1:07	Fri, Feb 23
B	Delayed post-test	B4	1:12-2:40	Fri, Feb 23
A	Pre-test	3A	10:20-11:30	Monday, Jan 22
A	Pre-test	4A	12:15-1:25	Monday, Jan 22
A	Pre-test	5B	1:30-2:40	Tuesday, Jan 23
A	1 long session	3A	10:20-11:30	Tuesday, Jan 30
A	1st short	4A	12:15-1:25	Tuesday, Jan 30
A	2nd short	4A	12:15-1:25	Thursday, Feb 1
A	3rd short	4A	11:33-12:29	Monday, Feb 5
A	4th short	4A	11:33-12:29	Wednesday, Feb 7
A	Control Post-test	5B	12:29-1:31	Thursday, Feb 8
A	Delayed post-test	3A	10:20-11:30	Thursday, Feb 22
A	Delayed post-test	4A	12:15-1:25	Thursday, Feb 22
A	Delayed post-test	5B	1:30-2:40	Friday, Feb 23

Endnotes

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