



ACTIVE OR PASSIVE, IT DEPENDS: Evaluating the Comparative Effect on Student Performance of Online Tutorials

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This study explores student performance differences for students assigned active (Guide on the Side, or GotS) and passive (screencasting) tutorials in an active learning information literacy classroom. Over 400 students took a tutorial and a quiz as part of prework for two sessions of an eight week class. Roughly half the classes received GotS tutorials, whereas the others received screencast tutorials of the same content. Students took the same quizzes in both sections. Screencast students outperformed GotS in both weeks, with no significant differences across gender or ethnicity. The difference was significant for the first quiz but not the second quiz. In qualitative analysis GotS students asserted that GotS contributed to their learning, whereas screencast students did not. This study indicates that while students may prefer novel approaches, screencasts may be more appropriate for one-time instruction.

INTRODUCTION

This contributed paper examines the use of two different types of tutorials in a information literacy course environment comparing their performance on a quiz applying the material. Rather than comparing in-person to online instruction, this study compares two different approaches to an online module embedded inside an in-person class. This study's focus is on student performance mixed with student perception, examining how the students use GotS and screencasting in the larger sense of a classroom experience. This study's aim is to explore potential differences between active and passive online learning for higher education in order to illuminate how students can better utilize complicated web-based platforms for information literacy.

While similar in content, screencasts and GotS represent two different forms of online learning. Screencasting draws from the concept of modeling, where a novice receives potential benefits from observing an expert, then trying to recreate the steps.¹ Interactive resource may promote deeper, more constructivist learning.² Screencasts additionally are much more common in classrooms, where dynamic tutorials are less commonly used.

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Students may be more likely to construct real knowledge when they use library tools to achieve their student-expressed goal, rather than a preset group of worksheets or tutorials.³

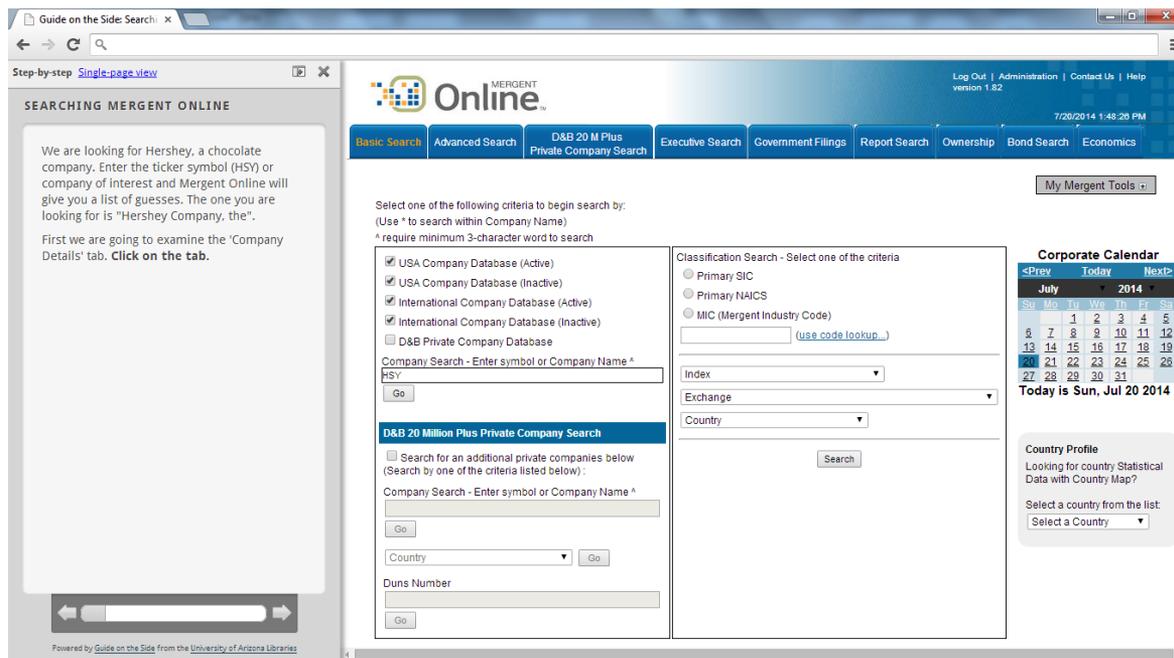


Figure 1. Screenshot of Guide on the Side tutorial

LITERATURE REVIEW

Online Tutorials in Library and Information Science

Yang reviewed 327 online tutorials from 100 academic colleges, finding that screencasting tutorials made with software tools such as Camtasia are the most popular method of teaching databases online today amongst academic, medical, and law libraries.⁴ Arguello (2013) found that business students appreciated these online tutorials, with many reporting that the information was useful for their work in both college and their future career.⁵ Videos have also been found to be helpful in a flipped learning environment. Additionally, students identified following along with videos as the most useful of all strategies for learning materials online currently in use.⁶

Online library tutorials have been described by students and librarians as informative and effective.⁷ Benefits unique to these online resources, such as videos or web-based tutorials, include their ease of use and availability where and when students choose to access them.⁸ Zhang and colleagues conducted a meta-analysis of tutorials and found online and face-to-face instruction to be of generally similar efficacy.⁹ Usability, meaning the ease of use of a product, is also an important factor in the design and evaluation of tutorials.¹⁰ In two studies that were found comparing different types of supplemental online tutorials, the more interactive tutorials provided greater student gains compared the more static tutorials.¹¹

There has been a surge of interest in Guide on the Side tutorials, particularly after the software won the ACRL Instruction Section Innovation Award in 2013.¹² Guide on the Side was developed when library reference desk staff discovered that they were answering the same question from a large group of students in a general education class at the University of Arizona. In-class instruction was not possible, but the librarians investigated ways to accomplish hands-on instruction online¹³. In addition, Sherriff compared two dynamic tutorial interfaces (LibWizard, Guide on the Side) in terms of summative assessment, accessibility, data management, and formative learning.¹⁴ This comparison gave no recommendation between the two dynamic tutorial interfaces, but did suggest that dynamic tutorials gave substantial benefits over static tutorials, including “richer, more dynamic and more authentic experiences.”¹⁵

Figure 2. Screenshot of screencasting tutorial

Guide on the Side differs from non-interactive online tutorials like screencasting in that students actively navigate the database in one side of the split screen while the other screen offers step-by-step directions from the librarian or other expert (See Figure 2). These directions can be combined with simple procedural questions (e.g. “How many results did you find?”). Multiple-choice questions provide students with feedback via a pop-up module as to whether or not a specific answer is correct and why.¹⁶

Following upon Sult et al., Mikkelsen and McMunn-Tetangco compared screencasts to GotS in terms of time to make the tutorial and student preference. Screencasts took less time to create. They implemented both systems in an upper-division undergraduate writing course, where they had the students use both types of tutorials for the same task, screencast first and then GotS, and then surveyed them about their preferences (n=43). The authors reported descriptive statistics versus tests for statistical significance, but reported overall that students were divided on the tutorial versus screencasts.¹⁷ However, the issue is confounded because they did not split the group and have the other set of participants watch the screencasts second. The second tutorial on the same information was necessarily redundant.

The group at University of Arizona followed up their work on the creation of the tutorial with an evaluation of the tutorial in a lab environment.¹⁸ A group of 90 students was divided into three groups and then tested using a 16 item quiz. A control group received no instruction. The first experimental group received instruction from a screencast and the second group used GotS. While there was a statistically significant difference between the control and experiment groups, there was no significant difference in performance between groups receiving instruction. The screencast group did perform better.

Mery et al. (2014) also found better learning gains in screencasts, as was found in this current study, but the study did not test knowledge through a pre-test or gather demographic characteristics. Authors posited that better performance by students using screencasts could have been because student had previous library knowledge, or demographic characteristics which may have affected their performance on the quiz. The topic selected for the tutorial was very broad in nature, covering many aspects of library services such as evaluating search results, citing articles, distinguishing between scholarly and popular articles, and using Boolean operators. Creating two identical tutorials as well as a 16-item quiz was also identified as challenging by the authors.¹⁹

Mery et al (2014) also did not take into account motivation and tutorial familiarity. Students received no incentive if they did better on the test and may not have needed to learn the information in order to accomplish a task. GotS's defining learning design principle was active learning in a constructivist framework, in which motivation of the learner is critical. Many students have experienced video tutorials, but relatively fewer have previously experienced something like GotS in their classroom. Students may need multiple exposures for learning gains to really be measurable.²⁰

In addition to the studies mentioned, the author previously studied this topic, examining the effect of GotS versus screencasting in a single intervention.²¹ This study revealed that GotS students who consistently performed lowest on all measures outperformed screencast students in their second attempt at quizzes on the topic. While the results were promising, the intervention lacked a large enough sample size to be conclusive. In addition, there was no control for instructor, as each instructor taught only one course each semester.

Building upon the literature and the previous study by the author, this current study focused on a comparative approach of learning gains in a classroom environment, in which students were required to use repeated tutorials to accomplish specific tasks. Given the current focus of the literature, this study is focused on three major research questions:

1. What effect do GotS/screencasts have on student performance in a course environment?
2. What effect do GotS/screencasts have on student performance when used multiple times?
3. What effect do GotS/screencasts have on student performance across demographics?

METHODS

Course Context

MGMT 175 (Information Strategies for Management Students) is a required one credit eight-week course in the business school of a large Midwestern American university. All instructors are librarians who are also professors at the institution (hereafter "professors"). The course is an information literacy-focused course which fulfills the information literacy requirement at the institution.

The course is taught in a "flipped" environment. The flipped environment is one in which the instructor provides instructional resources (usually online) for students to gain a basic understanding of the material before class, so that class time is freed up for active learning or team-based activities.²² Before coming to class, students watched a video and took a quiz on the week's topic (see Table 1 for an example of how the course mechanics worked). Students were able to take this quiz up to two times.

TABLE 1

Lesson Plan to illustrate time of intervention over three week period.

	Pre-Class 1	Class 1	Pre Class 2	Class 2	Pre-Class 3	Class 3
Screencasts	Pre-test	Class intro	Videos on IL, business research;	More introduction; Group Work	Screencasts and Videos; Company Databases; Quiz 1	Company Information Group Challenge
GotS	Pre-test	Class intro	Videos on IL, business research;	More introduction; Group Work	GotS and Videos; Company Databases; Quiz 1	Company Information Group Challenge

As part of the course over a spring and fall semester, pre-class online material was a combination of conceptual and procedural videos. The conceptual videos covered subjects such as the difference between a public and a private company. Procedural videos showed students how to find market research reports in a proprietary database. The procedural videos were screencasts of librarians using the resources, with text highlighting important aspects. Later, the professors created the Guide on the Side tutorials. Since there were multiple sections of the course, some courses could use the GotS whereas others could use the original screencast version.

Quantitative Measures: Quiz Scores and Demographic Information

Three professors taught the sections. Classes were each eight weeks long, so two courses happened in one semester. The design controlled for instructor variability, with Professor B teaching the screencasts section and then teaching the GotS section. To further assure fidelity of implementation, Professor A had discussions with Professors B & C about instruction taking place prior to the intervention to assure that the environments were as similar as possible (see Table 2 for design). For every course, the screencasts group was given a series of videos showing how to find company information (see Figure 2) during the second week of the course. The GotS group received the same content from the same script, but instead of watching a video, the students walked through the database using Guide on the Side (see Figure 1). Both sets of students were given the same 6 quiz questions on the content. Questions were pulled from a larger quiz and selected because the question exhibited that the student comprehended and could now successfully use the database. For example, they asked a student to look up a specific stock number in the database or look up the size of a particular market. All interaction with the content was done online; neither group received in-person instruction. See Table 3 for the list of questions used from Quiz 1.

TABLE 2		
Study Design example		
	GotS	Screencasts
Spring- Module 1	Professor A	Professor B
Fall- First Eight Weeks	Professor B	Professor A
Fall- Second Eight Weeks	Professor C	Professor A

Quiz 1 covered company information and Quiz 2 marketing information. Using a Guide on the Side tutorial for more than one unit may yield repeated patterns and show how well students would perform learning new GotS tutorials in a new environment (practice effect). While in spring only Quiz 1 was included, during the fall semester the students received either the GotS or the screencasts for both Quiz 1 and Quiz 2. The purpose of looking at multiple attempts at each quiz was to examine if repeated uses of the interactive tutorial led to a greater effect as the student gained in experience. There was a three-week period between Quiz 1 and 2, covering other aspects of information literacy with associated quizzes not included in the study.

TABLE 3
Quiz 1 questions used
Using Mergent Online, find the ticker symbol of Eli Lilly & Co.
Using Mergent Online, is the Hershey Company public or private?
According to the information in Mergent Online Key Financials, what are the revenue of Sunpower corp symbol SPWR as of 06/29/2014? Please write out the answer (example 4M should be written 4,000,000).
Also according to the data from Mergent Online, in which state is SPWR headquartered?
The database Privco is able to provide financial information on the private companies it covers.(T/F)
The database Mergent Online covers private and public companies. (T/F)

The author ran statistical tests comparing overall means. The author used independent sample t-tests to assess the degree to which the GotS or screencasting group were significantly different ($p=.05$ level). At times, effect sizes were also reported to better describe the statistical effect. Pairwise t-tests were used to assess growth of an individual, for example when looking the same student taking the same quiz more than once. When a professor had taught both methods (Professor A and Professor B) the means were compared directly to control for instructor variability since instructor variability often affects performance (De Vlieger et al., 2017). The authors also used a one way ANOVA on all student' pre-test scores to control for variability across sections.

Qualitative measures: Small Group Instructional Diagnosis

As part of the assessment cycle for the course, midterm focus groups were conducted with all of the sections of the course. Conducted halfway through by staff members in the Center for Instructional Excellence without the professor present, the 15-30 minute session Small Group Instructional Diagnosis (SGID) focused on two main questions: 1) What about the environment, activities, and structure of this course are helping your learning? 2) What specific suggestions do you have for changing the environment, activities, or structure of the course to better help your learning? A spokesperson for each group reports the group's results to the entire class. The facilitator writes each response on the overhead projector and makes sure there is agreement among the entire class. SGID feedback lets the instructor know how the majority of the class is feeling about the course. The method is attractive because it eliminates extremes, such as students who give all the lowest scores on a course evaluation, and allows instructors to respond to issues earlier than end of term course evaluations. Facilitators were aware of the changes between the sections and pressed for feedback on online instruction materials. Giving SGID feedback allowed students to make connections between what they had learned and the methods they used to attain that knowledge. The author of this paper chose this method in order to understand how students view the tutorials/screencasts in the context of their total classroom experience. This study received IRB exempt approval as it took place during routine classroom contexts.

RESULTS

To address the research questions, a year-long study was conducted and pre-test and demographic information were gathered about the students. Demographic information was supplied by the Office of the Registrar and included gender and ethnicity.

Initial Baseline and Demographics.

To control for the possibility that the students had different levels of knowledge before taking the course, the pre-test was taken during the first week of the sections of the course, and examined those in the GotS condition to those in the screencasts condition. This pre-test was required and had a maximum score of 65. Pairwise comparisons on the baseline quiz showed no significant difference. Effect size comparisons that showed low (below .15) effect sizes for all comparisons were in the moderate range (.40-.59). One way ANOVA found no significant difference between GotS ($M=52.4$, $SD=6.49$) and screencasts ($M=49.9$, $SD=7.2$), $F(68)=2.37$, $p=.128$.

General Performance on Quiz 1 and 2

Students who watched the screencasts outperformed those in the GotS treatment. Comparing mean highest scores between GotS and screencasts did lead to statistical significance for Quiz 1 ($F=11.085$, $p=.047$). See Table 4 for mean differences and effect size differences.

Quiz 1 Mean Second Attempt-GotS/Screencasts			
Comparison	n	Mean scores	SD
GotS All Instructors	281	5.54	.80
Screencasts All Instructors	205	5.66	.59

For Quiz 2, comparing mean highest scores between GotS and screencasts did not lead to statistical significance ($F=.069$, $p=.684$) meaning both groups performed similarly. Limiting to the instance where the same professor taught both the GotS and screencasts condition, the same tests were run, though the results were not significant.

Despite instructors not covering the material until after the lesson, there was still a statistically significant difference between instructors ($p=.024$). As Professor A and B each taught both the GotS and screencasts,

those means were compared to examine differences. For Professor A, both first and second attempts at the quiz showed the same as total population. However, Professor B showed no significant difference between the GotS and screencasts in either attempt. See Table 5 for means, standard deviation, and effect size for the instructors.

TABLE 5				
Score Mean, Standard Deviation, for Attempts 1 and 2, Controlling for Instructor				
Instructor	Intervention	n	M	SD
Professor A	Screencasts	136	5.61	.57
	GotS	69	5.24	.84
Professor B	Screencasts	69	5.77	.62
	GotS	142	5.63	.79

TABLE 6			
Quiz 2 Mean GotS / Screencasts across All Instructors			
Comparison	n	M	SD
GotS All Instructors (GotS)	140	5.60	.88
Screencasts All Instructors (Screencasts)	136	5.64	1.02

Multiple Attempts at the Same Quiz

Students had two tries to answer quiz questions. The difference between first and second attempt were compared for Quiz 1 and 2 using a paired samples t-test. The means for GotS were statistically significant ($p=.004$) whereas for the screencasts it was not ($p=.751$), see Table 7. These results suggest a probably practice effect, where students in GotS treatment were learning how to use the tutorial and likely that was affecting their outcomes on the quiz.

TABLE 7		
The Difference between First and Second Attempt Compared for Quiz 1 and 2 Using a Paired Samples T-test		
Comparison	Mean Difference Quiz 1	Mean Difference Quiz 2
GotS	.43	.74
Screencasts	.57	.49

Effects of Screencasts/GotS across Demographics

It is important to look for demographic differences in performance, especially since there are documented concerns in the literature about how student success differs by demographics.²³ Given a probable practice effect of students learning to use the GotS tutorials, the author chose to focus on the second intervention (Quiz 2) for effects across demographics. The results matched the effects in the larger population (see Table 8 and Table 9). International and female GotS students outperformed screencast international and female students, though not at a statistically significant level as tested through independent sample t-tests.

TABLE 8				
Quiz 2 Final Score by Gender				
Gender	Comparison	N	Mean	SD
F	GotS	65	5.79	.52
	Screencast	66	5.53	1.36
	Total	131	5.66	1.07
M	GotS	75	5.44	1.09
	Screencast	70	5.76	.55
	Total	145	5.59	.8858

Qualitative Data

The students were not prompted with any specific questions about the tutorials versus other materials, but the students in the GotS treatment themselves perceived the effect. A majority of students highlighted that they like “the interactive tutorials (but not the non-interactive ones)” and “being able to use technology to learn what is needed for the class”. Likewise, students in the screencasts group wished for more time to review videos, feeling that they did not understand the material. Students suggested in the screencasts group that the videos should be more interactive.

TABLE 9

Quiz 2 Final Score by Ethnicity

Ethnicity	Teaching Style	<i>n</i>	<i>M</i>	<i>SD</i>
Asian	GotS	7	5.71	.48
	Screencast	10	5.70	.48
	Total	17	5.71	.47
Black or African American	GotS	2	6.00	.00
	Screencast	1	6.00	NA
Hispanic	GotS	4	5.25	1.5
	Screencast	10	6.00	.00
	Total	14	5.79	.80
International	GotS	60	5.75	.84
	Screencast	59	5.73	1.13
	Total	119	5.74	.99
White	GotS	64	5.44	.94
	Screencast	54	5.52	1.08
	Total	118	5.48	1.00
2 or more races	GotS	1	6.00	NA
	Screencast	2	4.50	.71
	Total	3	5.00	1.00

DISCUSSION

This study sought to examine the effect of GotS/screencasts on student performance in a course environment, across different interventions, and across student populations. In its first intervention (Quiz 1), screencast students outperformed GotS students at a statistically significant level. When students used the active and passive tutorials, the effect was less pronounced, but screencast students still outperformed. Women and international students appear to do better with GotS tutorials, but not at a significant level. Students appear to prefer the novelty of the GotS tutorial over the screencast tutorials in its ability to aid student learning.

What does this mean for librarians? Perhaps innovative and new technologies are both a hindrance and a benefit for undergraduate learners. The novelty of method (active learning tutorials) seemed to appeal to them, as evidenced by the qualitative responses. Yet as it is still unfamiliar, undergraduate students may not perform as well using the tutorials initially. GotS did not measurably improve performance compared to screencasts, but rather may have led to lower performance. Librarians may consider this bad news. After all, emerging technology like active tutorials hold such promise to personalize the classroom, allowing users to try out new databases

themselves in context. Perhaps in our rush to implement new technologies, we might have missed that our students might be less effective in learning if they are learning both new content and new ways of learning simultaneously. This “new technologies create high learning curve” theory is supported by the difference in attempt score for GotS users.

Based from the results of this study, the authors would advise that librarians continue to use active learning tutorials, but not in spaces where the students will only complete one tutorial, such on in the traditional one-shot environment, if their goal is for the students to perform well in an immediate assignment. In cases where performance is key, such as some of the library’s harder to use resources, a screencast might improve performance. However, librarians often have other goals, like stimulating curiosity in the content, which might be more important to librarians than performance. Projects with repeated interventions, such as embedded instruction, seem to be a better place for active tutorials like GotS.

This study might also give us cause to re-examine how we look at many other types of online learning. For example, one of the greatest criticisms of online learning is the steep learning curve for students new to mode of the learning, and how this might make learning more challenging. This study might suggest that new ways of learning are exciting and engaging to our students, even when the process of learning differently hobbles their performance.

This study benefited from a very large sample size for an information literacy study of its kind. While the large sample size was a benefit, the relatively small size of the indicator variable means further study is needed. Statistically significant results were only the value of half a correct question different from each other. It was not ethical to make the questions challenging to lead to a wider variance in responses, since the study was conducted inside a course environment, where students were required to pass the quiz for credit in the class. However, a small difference can still be an important difference. Since it is so small, an instructor may not be able to gauge it or assess its effect until years of teaching possibility due to novelty bias. Often in a students’ career, small differences in performance can have large cumulative effect. A couple of questions wrong could be difference between a student getting an A or B grade. Small differences in GPA in turn restrict the types of internships or job opportunities to which a student can achieve. It might be the difference between a student getting into a program, or getting a grade that will allow them to stay in a program.

CONCLUSION

Strategies for undergraduate online learning are increasingly taking the center stage on college campuses, especially in light of the COVID-19 pandemic. This contributed paper examines the use of two different types of tutorials in a classroom environment comparing their performance on a quiz applying the material. Rather than comparing in-person to online instruction, this study compared two different approaches to an online module embedded inside an in-person class.

This study has implications for people implementing tutorials in many different environments, especially in the current COVID-19 environment where one-size-fits-all approaches (all in-person, all passive tutorials, all active tutorials) are not sustainable as well as not evidence-based. We consider the strength of the study results that it acknowledges that different environments require different types of tutorials and we feel this study is a good way of moving towards that approach. While students may prefer novel approaches, screencasts may be more appropriate for one-time instruction.

Librarians should consider these results in their online content strategy. Shorter, more focused video tutorials offer benefit for non-repeat users of the library. More in-depth consultations and tutorials would benefit from the novel interactive tutorial method. Rightsizing instruction is important. Active and passive methods should be used in tandem for maximum benefit. As librarians embrace new technologies like interactive tutorials, they should look for opportunities where they will most benefit student education.

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