Investigating any Bi-directional Influence Between an Educational Intervention and the Subjective Task Value of Digital Literacy

by

Cody Sykes Gilbert

Bachelor of Science, University of Pittsburgh, 2019

Submitted to the Graduate Faculty of

University of Pittsburgh Honor's College in partial fulfillment

of the requirements for the degree of

Bachelor of Philosophy

University of Pittsburgh

2019

University of Pittsburgh

Kenneth P Dietrich School of Arts and Sciences

This thesis was presented

by

Cody Sykes Gilbert

It was defended on

March 25, 2019

and approved by

Byeong-Young Cho, PhD, Department of Instruction and Learning, University of Pittsburgh

Ed Orehek, PhD, Department of Psychology, University of Pittsburgh

Julie Coiro, PhD, School of Education, University of Rhode Island

Thesis Advisor: Scott Fraundorf, PhD, Department of Psychology, University of Pittsburgh

Investigating any Bi-directional Influence Between an Educational Intervention and the Subjective Task Value of Digital Literacy

Cody Sykes Gilbert, BPhil

University of Pittsburgh, 2019

Digital literacy, or the ability to locate, evaluate, and integrate online sources, is an essential skill in the modern world of "fake news," biased reporting, and misinformation. Unfortunately, its development is often found to be lacking in current educational settings. This thesis was part of a larger project in which an educational intervention was designed and administered to 250+ high school students over five classroom sessions to cultivate these abilities. Here, I analyzed any bi-directional influence between a specific facet of student motivation (subjective task value) and the intervention. Subjective task value (STV), a component of Expectancy Value Theory, is a measurement of how much one values a specific task or skill. Given the numerous positive outcomes to which STV has been associated, I hypothesized that higher pre-test STV ratings of digital literacy would result in better post-test outcomes for students. In addition, I hypothesized that this extensive intervention would increase overall STV ratings of digital literacy. As predicted, we found that the intervention did increase STV of digital literacy significantly across all conditions. Furthermore, we showed that higher pre-test STV ratings were correlated with higher post-test assessment scores. However, this relationship was not moderated by the intervention. Thus, this project provided evidence of an additional benefit provided by the intervention (increasing STV ratings of digital literacy), and demonstrated areas where the intervention could be improved to address its insignificant moderating effect (further measurement and condition development).

Table of Contents

1.0 Introduction **1**

1.1 The Intervention **3**

1.2 Goal Orientation and Learning **4**

1.3 Subjective Task Value **4**

1.4 Current Study **5**

2.0 Method **7**

2.1 Participants **7**

2.2 Materials **7**

2.3 Procedure **8**

3.0 Results **11**

3.1 Reliability of Subjective Task Value Measure **11**

3.2 Pre-Post Increase **11**

Figure 1 Subjective Task Value Ratings at Pre and Post Test Sorted by Question. Error bars indicate standard error. **12**

Figure 2 Subjective Task Value ratings at Pre and Post-Test. Error bars indicate standard error. **13**

3.3 Influence of Pre-Test **14**

4.0 Discussion **16**

4.1 Limitations and Future Directions **18**

5.0 Conclusion **20**

List of Figures

Figure 1 Subjective Task Value Ratings at Pre and Post Test Sorted by Question. Error bars indicate standard error. 12

Figure 2 Subjective Task Value ratings at Pre and Post-Test. Error bars indicate standard error. 13

1.0 Introduction

As the use of technology increases in educational and professional settings, the ability to efficiently navigate digital environments also becomes increasingly important for students and prospective employees (Koltay, 2011). Fortunately, most current students are familiar with digital technology and accessing, creating, and sharing digital information (Ting, 2015). However, students must also know how to comprehend and integrate information from various digital sources (Gilster, 1997). Greene, Yu, and Copeland (2014) further argue that effective *digital literacy* requires students to "search, manage, evaluate, and integrate digital information well" (cited in Tang et al., 2016. p. 602). Research on this topic demonstrates that the best digital learners employ metacognitive skills, such as strategy selection and self-monitoring (Cho, Woodward, Li, & Barlow, 2017). Cho, Woodward, and Li (2017) have also shown that more successful online readers tend to engage in higher-order epistemic processes, such as evaluating and comparing internet sources by their URL, when judging information sources and monitoring their knowing processes. In addition, they regulate their alternative knowledge-seeking actions by using varied approaches in order to find information that is different or lacking. For example, strong online readers looking for information about fracking would compare and contrast multiple sources for consistent statistics, read critically to avoid bias, analyze arguments for and against implementation, and so on. The epistemic actions of their less successful counterparts, on the other hand, are more often disconnected and tend to function at a surface level. These students read

fewer sources, are prone to confirmation bias, and struggle to eliminate untrustworthy sources, among other issues.

Further research shows that metacognitive knowledge of effective strategies is a critical prerequisite for regulating cognitive processes in literacy tasks (Harris et al., 2016; Pressley et al., 1995). Unfortunately, students' metacognitive knowledge and regulation of how to manage multiple sources online—an imperative skill for digital literacy— is often poor, even among advanced placement students (Cho et al., 2017; Goldman et al., 2012; Greene et al., 2017). Despite the need for this varied skillset, modern educational settings often lack a focus on the development of these skills (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). Fortunately, there is evidence that explicit instruction can teach metacognitive strategies and enhance learning (Zepeda et al., 2015).

In light of this research, principal investigators Dr. Scott Fraundorf and Dr. Byeong-Young Cho designed an educational intervention for high school students to develop digital literacy. In this project, I examined any bi-directional influence between the *subjective task value* of digital literacy and this intervention. Given the numerous positive outcomes associated with subjective task value that will be detailed below, examining this motivational factor was important for two main reasons: It demonstrated whether the intervention could increase motivation in future digital literacy learning environments, and it identified any areas in which future interventions could be streamlined and improved.

1.1 **The Intervention**

Based on the documented value in the digital literacy and metacognitive monitoring skills mentioned above, the present intervention was designed to cultivate these abilities over the span of five different classroom sessions. Participants were randomly assigned to one of four conditions. Three of the conditions emphasized one of three metacognitive knowledge types: declarative knowledge, procedural knowledge, or conditional knowledge. The fourth condition was a control group where students spent time interacting with and evaluating web sources but did not receive any metacognitive training. Declarative knowledge was taught using the Internet Reading Strategy Checklist that Dr. Cho developed through previous research (Cho, 2015). The procedural knowledge of similar skills was taught using video clips based on Dr. Cho's previous studies of competent high-school readers (Cho, 2014). Lastly, a group of participants watched videos *and* assessed the strategies used in the videos with the aforementioned reading checklist.

Dr. Cho and Dr. Fraundorf hypothesized that the last condition would be particularly effective because it would provide the opportunity to learn *conditional* knowledge about which strategies work under which circumstances. Though literacy educators suggest conditional knowledge as a crucial type of knowledge (Leu et al., 2013; National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010), the benefits for it have been based only on theory or on experiments with artificial stimuli, such as trivia facts (Veenman et al., 2006). Thus, there is a need to examine the influence of conditional knowledge instruction in more authentic educational settings.

1.2 **Goal Orientation and Learning**

Outside of the specific metacognitive studies that influenced the design of the intervention described above, there is a long history of investigating what factors influence achievement and learning. For instance, learners' goals and views of intelligence predict their persistence and seeking out of challenges. Specifically, Dweck et al. (1986) demonstrated that learners who viewed intelligence as fixed often had *performance goals* of gaining positive judgements and avoiding negative ones. Some of these learners, who had relatively high confidence, had a "mastery-oriented" behavior pattern whereby they would seek challenge and persist for longer. But, if confidence in their present ability was low, they exhibited learned helplessness, avoided challenge, and gave up easily.

By contrast, if learners instead viewed intelligence as malleable, they had learning goals about increasing their competence. With this view of intelligence, high *and* low confidence individuals would seek challenges that foster learning and persist for longer. Unlike for learners with a fixed view of intelligence, learners with a malleable view of intelligence showed positive learning behaviors regardless of their level of self-confidence.

1.3 **Subjective Task Value**

While the theory reviewed above focuses on general beliefs about intelligence, there is another related learning theory that emphasizes the learner's beliefs about one's self and the task at hand: expectancy-value theory (Atkinson, 1957; Eccles et al., 1983; Wigfield, 1994; Wigfield & Eccles, 1992). Expectancy-value theorists argue that "individuals' choice, persistence, and

performance can be explained by their beliefs about how well they will do on the activity and the extent to which they value the activity" (Wigfield & Eccles, 2000, p. 68).

How well an individual believes they will do on a given activity, or *self-efficacy*, has been demonstrated to positively influence several outcomes. For example, it has been shown to predict performance, course enrollment, and occupational aspirations (Bandura, 1997). Furthermore, even when previous performance is controlled for, children's beliefs about their ability and expectancies for success predict subsequent grades in math even stronger than either previous grades or achievement values (Wigfield & Eccles, 2000).

The extent to which an individual values a given activity, or *subjective task value* (STV), has also been shown to have significant effects on certain outcomes. Children's subjective task values are the strongest predictors of their intentions to keep taking math and actual decisions to do so (Wigfield & Eccles, 2000). Similar effects have also been demonstrated in other settings. For instance, in one aviator training program, self-efficacy and task value were positively correlated with learner satisfaction with the program (Artino, 2007). In an online computer programming course, task-value of learners and self-efficacy were significantly correlated with achievement scores (Yukselturk & Bulut, 2007). Another study found that task value was a significant predictor of learner satisfaction, achievement, and persistence among 897 learners enrolled in an online university (Ju Joo et al., 2013).

1.4 **Current Study**

Because of the demonstrated influence that subjective task value has on several different important learning and performance outcomes, this project was designed to investigate any bi-

directional influence between STV and the educational intervention being administered. The benefits of STV reviewed above suggest that, if the intervention were to increase STV, then it would positively influence students' intention to keep learning about digital literacy, as well as improve future performance and satisfaction in prospective digital literacy tasks. On the other hand, if the intervention does not increase STV in digital literacy and related skills, then I will have identified a specific area where the intervention can be improved.

Additionally, if subjective task value prior to the intervention is shown to mediate the positive effects of the intervention, then this project will provide evidence that initially establishing STV enhances learning and success from interventions of this nature. Or, if the pre-test measurement of STV does not mediate the intervention's effect, this project will demonstrate that future interventions need not waste time establishing this aspect of the expectancy-value construct.

To summarize, the goals of the study are to identify if the intervention changes levels of STV, test if these levels mediate the effects of the intervention, and discuss the implications these findings have. Specifically, students completed pre and post assessments measuring one specific aspect of STV called *utility task value*—a facet of STV focusing on the usefulness and importance of a given skill. This facet was chosen because increasing utility task value appears to be much easier than increasing other facets of STV, such as intrinsic value. For example, two studies have already shown that it is possible for specific interventions to increase task value and motivation among participants (Harackiewicz et al., 2012; Hulleman, 2010). Based on this and the numerous studies discussed previously, I hypothesized that (a) the intervention would increase utility task value and that (b) higher utility task value scores during the pre-test would positively mediate the intervention's intended effects.

2.0 Method

2.1 **Participants**

Students were recruited from Riverview High School in Oakmont, PA. According to the most recent public data, Riverview is approximately 89% White, 6% Black, 3% Hispanic, and 2% Asian or multiple race. The school is socioeconomically diverse, with approximately 43% of students eligible for free or reduced-price lunch. Participants were from grades 9-12.

Of 269 eligible students, three opted out and several other students could not complete both pre and post-test assessments. Data was analyzed from the 247 students who completed all measures.

2.2 **Materials**

Students completed several self-report measures. In addition to typical demographic information, three digital literacy measures were administered about metacognitive strategy use, epistemic justification, and metacognitive monitoring respectively. For metacognitive strategy use, students completed a pre and post measurement that had 16 Likert-scale questions about locating sources, comprehension, evaluation, and monitoring. Similarly, epistemic justification was measured with the Internet-Specific Justification Inventory (Bråten et al., n.d.). This assessment included 12 Likert scale items that measured how students justify their knowledge from personal experience, authority, and multiple sources. Lastly, students answered content-knowledge

questions about a topic that was later used in a post-test online inquiry task and rated the confidence in their answers. The alignment of their confidence with correct answers formed our metacognitive monitoring measure (Nelson & Dunloski, 1991). The post-test online inquiry task that is outlined in the procedure below was scored with a three-point scale for each of the following three dimensions: relevance, validity, and significance.

For this project, I added an additional measure assessing subjective task value. Using the expectancy-value literature as a guide, these measures were designed by a collaborative team of faculty, graduate, and undergraduate students. Specifically, to measure utility task value, students responded to the following statements using a five-point Likert scale:

1. "I believe that locating and evaluating internet sources is an essential skill."
2. "I believe that it is valuable to be able to integrate multiple internet sources."
3. "I believe that internet skills are not important to career success."

The third question was reverse-scored in order for us to rule out any students who were blindly agreeing to all the statements.

2.3 **Procedure**

Prior to the specific intervention, principal investigators traveled to Riverview High School to introduce themselves and administer the pre-test measures outlined above. Students' GPA was also obtained from school records.

After completing these measures, students received a metacognitive knowledge intervention in five 45-minute sessions. These sessions were delivered by the students' current classroom teachers. Prior to implementation, teachers received professional development from the

investigators over three days of introduction to the unit, review of materials, and collaborative revision. Content was also integrated into existing classroom curriculum as much as possible. English language arts classes were targeted to avoid disrupting students' existing learning opportunities since similar reading, source evaluation, and relevant skills would be taught during these periods anyway.

Students were randomly assigned at the classroom level to one of the four conditions discussed previously. Those in the control group instead learned about plagiarism and spent time interacting with web sources without learning specific digital literacy skills over the same five-day span detailed below. In the three intervention conditions, during the first day of the intervention, teachers promoted interest in the topic by showing the pros and cons of internet sources and giving an overview of what it means to ask a critical question for discussion. On the second day, teachers introduced condition-specific strategies and allowed students to practice them in class. Specifically, in the declarative condition, students evaluated their use of 16 strategies within the following superordinate categories: information location, intertextual comprehension, source evaluation, and self-monitoring. In doing so, they were presented with a list of core strategies for digital literacy tasks. In the procedural condition, four 5-minute video clips were used based on previous studies by Dr. Cho. These videos were of a skilled high-school reader using the same strategies from the other conditions in an Internet reading task that the students later completed (with a different topic). Students watched the videos and summarize the strategies used via verbal discussion. Unlike the declarative condition, students were not offered an explicit representation of strategies. The conditional group watched the videos *and* assessed strategy use with the help of the declarative checklist.

On the third day, teachers reinforced the learned strategies by modeling them on a smart board and using relevant articles. The fourth day then built on this modeling technique by allowing students to practice their condition-specific skills on laptop computers. During the last implementation session, all students not in the control group practiced developing a critical question to mirror the online inquiry task that would take place during the post-test period (see below). Within the next few days, the same pre-test topic knowledge, judgment of learning, and epistemic justification measures were again administered via Qualtrics Survey Software.

Over the following weeks after the completion of these intervention sessions, researchers then met with all participants to complete a 30-minute online inquiry task in sessions of up to five participants at a time. This activity was designed to elicit a variety of digital literacy skills (Cho et al., 2017). Specifically, students were asked to construct a critical question about a topic—in this case, mountaintop coal mining—that could guide classroom discussion. Examples were provided, and students could conduct online searches to gather information in real time. Student's strategies were recorded and evaluated on a 40-point rubric developed by Cho et al. (2017).

3.0 Results

3.1 **Reliability of Subjective Task Value Measure**

The three subjective task value questions had an overall Cronbach's alpha of .61. This alpha is somewhat lower than conventional standards, which may reflect the fact that the third question likely captured a different aspect of student motivation. The first two questions were skill-specific, heavily reliant on the definition of digital literacy, and quite similar. By contrast, the third question asked about a facet of digital literacy we assumed would vary heavily among student's beliefs – its importance for respective future careers. This interpretation is supported by the item-by-scale correlations, which were .81 for the first question about locating sources, .77 for the second question about integrating sources, but -.27 for the question about career importance. The third question received a negative correlation due to its reverse scoring but is still substantially low in magnitude.

Given these findings, future interventions may need to split this scale into two questionnaires that could be bolstered with further questions: one set about the importance of digital literacy skills and another set about its importance in future careers. For this study, we focused mainly on the overall average since the alpha value is still moderately high. But, we also considered separating the questions in complementary analyses.

3.2 **Pre-Post Increase**

Overall STV was calculated by averaging scores of the three STV questionnaire items. The overall average was found to significantly increase from pre to post-test when analyzed

using a paired-sample *t*-test, $t(246) = -3.872$, $p = .0001$. In addition, significant increases were found when looking at an average of the first two questions about digital literacy skills, $t(246) = -4.406$, $p < .0001$, but not when looking at the change in ratings on the STV question about career importance; $t(246) = -0.499$, $p = 0.618$ (see figure 1). This indicates that the intervention significantly increased the perceived importance of key digital literacy skills but did not affect students' perceptions on the importance of digital literacy in future careers. Given that the intervention was designed to focus on improving digital literacy skills but included little to no mention of career importance, this finding is not surprising.

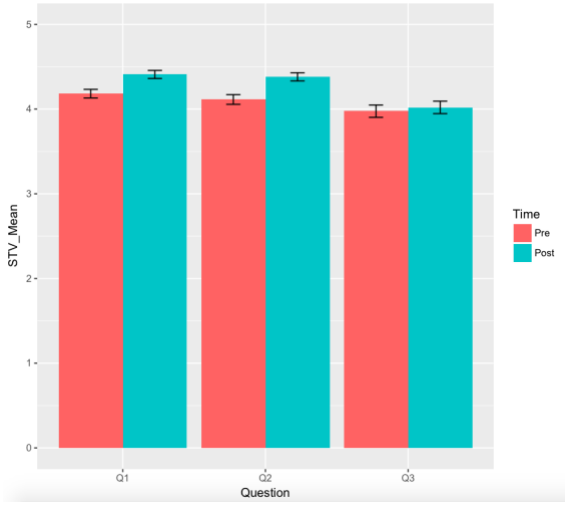

Figure 1 Subjective Task Value Ratings at Pre and Post Test Sorted by Question. Error bars indicate standard error.

Next, we examined the influence of each experimental condition, as depicted in Figure 2. Post-test averages were not found to significantly differ across conditions in a one-way analysis of variance (ANOVA), $F(3,243) = 1.249$, $p = .293$. A second ANOVA was conducted to compare the change in these averages from pre to post-test. This allowed us to examine how much students

increased in STV across condition regardless of how high their STV ratings were initially. Again, the differences across condition were not significant, $F(3,243) = 0.471$, $p = .703$.[1]

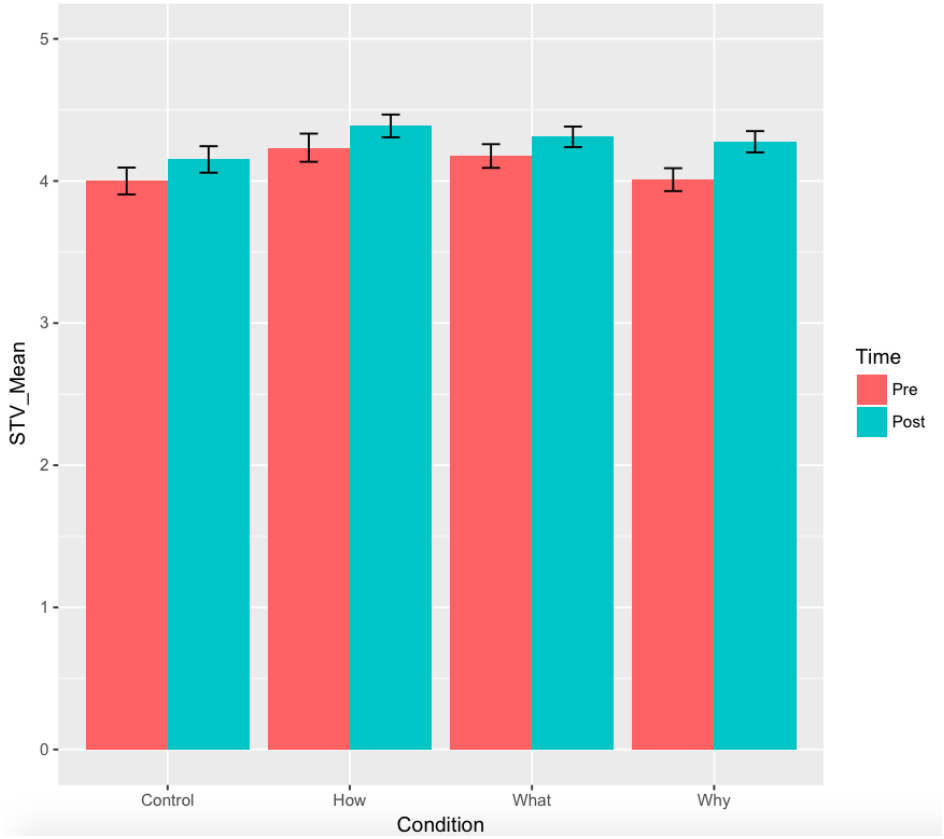

Figure 2 Subjective Task Value ratings at Pre and Post-Test. Error bars indicate standard error.

One concern we needed to address when analyzing these change scores was the possibility that the intervention would only have significant effects on the already high-achieving students (i.e., the Matthew Effect; Merton, 1968). For example, if the intervention was too advanced for some underperforming students, then its benefits would be limited to a smaller subset of the target population and changes would be needed to improve the scope and efficiency of the lessons. In order to confirm that the benefits of the intervention applied more broadly, we also conducted an ANCOVA on the change scores controlling for GPA. Although GPA did marginally predict

[1] We also found no significant effect when focusing on an average of the first two questions or on the third question alone for post-test means and change scores in ANOVA analyses.

change in STV, $p = .054$, we still found no significant effect of the intervention, $F(3,225) = 0.484$, $p = .693$. Further ANCOVA analyses controlling for grade level showed that students' grade level had no significant effect on change scores, $F(1,245) = 2.011$, $p = .158$. It is also unlikely that differences among teachers had a significant influence on outcomes given that the same teachers taught multiple different classes and conditions.

3.3 **Influence of Pre-Test**

Lastly, we considered whether students who viewed digital literacy as important may have paid attention more and learned more from the intervention than those who did not. To determine whether this was the case, we tested the correlation of pre-test STV averages with critical question (CQ) scores on the post-test assessment. Overall STV averages were found to significantly correlate with CQ scores, $r = .164$, $p = .009$. Furthermore, there was as significant correlation between an average of the first two skill focused questions and CQ scores, $r = .172$, $p = .007$, but not between CQ scores and the STV question about career importance, $r = .069$, $p = .282$. In accordance with similar results about the career importance measurement above, it seems that students' beliefs about the importance of digital literacy in their future careers does not have a strong influence on the overall effects of the intervention.

To further examine the significant relationship between overall average STV ratings and CQ scores, we analyzed whether the intervention conditions moderated this effect. Contrary to our initial hypotheses, the intervention did not moderate the effect of pre-test STV ratings on post-test CQ scores, $F(3, 237) = 0.865$, $p = .46$. Although there was a general relationship between pre-test STV and critical question quality, there was no evidence that this relationship was stronger in the

intervention conditions. One possible explanation for this finding is that the students with higher pre-test ratings of STV were more motivated students in general and as a result tried harder on the post-test than their peers. On the other hand, it *is* still possible that students with higher subjective task value at pre-test were more motivated to learn and pay attention like our initial hypothesis suggested. If this were the case, the reason the moderation was not significant could have been because what they were learning was general enough to benefit even the control group.

4.0 Discussion

The current project provided evidence in support of the first hypothesis that a five-day unit on digital literacy would increase students' perceptions about the importance of these skills. Additionally, students' initial beliefs about digital literacy correlated with their post-test critical question score and supported the hypothesis that students who viewed digital literacy as more important were also more likely to get higher scores on the post-test assessment. However, moderation analyses showed that higher pre-test ratings of digital literacy importance did not significantly enhance learning of the intervention curriculum. If they had, the intervention conditions should have moderated the effect of pre-test subjective task value ratings on post-test critical question scores. Instead, we saw that higher ratings of subjective task value at pre-test correlated with likely better learning in all of the conditions, including the control. One possible explanation for this finding is that the relationship between pre-test ratings of importance and post-test assessments is being driven by a confound of general motivation (rather than learning from the classroom unit). Alternatively, it is also possible that students who perceived digital literacy as more important learned more from *all* of the conditions, including the plagiarism lessons in the control group, in a way that may have positively influenced their post-test scores.

In addition, we found that the correlation between pre-test ratings of digital literacy importance and post-test assessment scores was significant for the first two questions, which were about the importance of digital literacy skills, but insignificant when considering just the third question, which was about career importance of digital literacy. One possible explanation for this insignificance is that high school students may not be as aware or interested in the *career* importance of digital literacy skills due to their age. Nevertheless, since higher pre-test subjective value scores of the first two questions did correlate with higher post-test assessment scores, this project provides some evidence that initial perceptions of digital literacy *do* affect outcomes in this

setting. This project did not identify the mediating factor between pre-test STV and achievement scores, but it did substantiate previous findings of the initial relationship (Yukselturk & Bulut, 2007). Therefore, this project provides further evidence that establishing the importance of digital literacy skills among more of the target population may be beneficial even in these shortened interventions.

It is important to note that increases in subjective task value were not found to significantly differ across condition. Since the changes in STV within each condition were not significantly greater than the changes in the control group, we can infer that the intervention groups offered no enhanced education on the importance of digital literacy. This finding is not surprising when considering the conditions differed in the way they sought to increase digital literacy *skills* rather than stress their *importance*. However, it was not expected that the conditions would not significantly increase STV ratings more than the control group. It is likely that the presence of the intervention, researchers, and other related changes made student's view digital literacy as more important than they previously did. But, since the control group showed similar effects, these changes were not necessarily related to the condition-specific lessons. One possible explanation for this finding is that the control group's curriculum was quite similar to that of the intervention conditions. In this group, students learned about plagiarism and citation of web sources—skills that are very closely related to those stressed in the digital literacy conditions. Given their similarity, it would not be surprising if several classes dedicated to plagiarism increased perceived importance in similar digital literacy skills just as effectively as the conditions themselves. In a future study, we could test this hypothesis by having a control group continue with their scheduled high school curriculum while the other classrooms received the intervention lessons.

4.1 **Limitations and Future Directions**

For the intervention, I designed a novel set of questions measuring a specific facet of subjective task value. To test the validity of these measurements, I completed analyses using Cronbach's alpha and found that the alpha was only moderately strong when looking at all three questions. However, this problem was mitigated almost entirely by focusing on an average of the first two questions or the third question alone. In spite of this, the intervention could be improved by further developing these measures. Specifically, given the low magnitude of the third question's item-by-scale correlation, it may be beneficial to split the measurements and focus on the importance of digital literacy skills and career importance separately. To do so, a pool of questions could be created and normed in order to analyze item to scale correlations. From this norming process, questions shown to be measuring the intended construct in multiple forms could be added to the pre-test measurements.

Additional questions could measure specific examples where these skills might be important, such as avoiding bias and opinionated news, gathering information for your career / academic assignments, or evaluating scientific findings. Furthermore, assessing student's perceived importance of other classes could provide context for how they view digital literacy in comparison. The relatively high initial ratings of importance for digital literacy in this study suggest that students also already view digital literacy skills as quite important and thus would not gain that much in perceived importance from the intervention. With comparisons, this idea could be tested and possibly substantiated. Because of the positive outcomes related to subjective task value in this project and previous literature, it may also be beneficial to replicate and possibly improve upon the current findings after improving the intervention.

Finally, it is also possible that confounding variables could have affected the correlational measures. However, by controlling and separating multiple factors such as grade, GPA, and condition in our data analyses, we are confident that this problem has been well addressed.

Nevertheless, there were several additional influences that could be considered. For example, the teachers were noticeably excited to teach about plagiarism and this may have been one of reasons the control group increased similarly to the condition groups in multiple measurements. In addition, lesson overlap may have occurred in some instances given that the same teachers taught multiple conditions.

5.0 Conclusion

Drawing on prior research in education and cognition, an educational intervention was designed and administered to over 200 high school students in order to enhance digital literacy (e.g. the ability to locate, evaluate, and integrate online sources). I conducted this supplementary project to examine the bi-directional relationship between student's perceived importance of digital literacy and the intervention. Higher ratings of perceived importance at pre-test were correlated with higher post-test assessment scores, but this effect was not moderated by the intervention; either students who perceived digital literacy as more important learned more from all the conditions, even the control plagiarism lessons, or this reflects a confound with general motivation. We also found that the intervention increased perceived importance (*subjective task value*) of digital literacy across all conditions. Given the positive benefits of subjective task value in previous studies, this project demonstrated an additional benefit of the intervention (increasing subjective task value among participants) as well as areas where it could be improved (enhanced curriculum on the career importance of digital literacy and further development of the STV measurements).

References

Artino, A. R. (2007). Motivational beliefs and perceptions of instructional quality: predicting satisfaction with online training. *Journal of Computer Assisted Learning*, *24*, 260.

Atkinson, J. W. (1957). Motivational determinants of risk taking behavior. *Psychological Review, 64*, 359–372.

Bandura, A. (1997). Self-efficacy: The exercise of control. New York: W. H. Freeman.

Bråten, I., Brandmo, C., & Kammerer, Y. (n.d.) A validation study of the Internet-Specific Epistemic Justification Inventory with Norwegian pre-service teachers. *Computers & Education*.

Cho, B.-Y. (2014). Competent adolescent readers' use of Internet reading strategies: A think-aloud study. *Cognition and Instruction*, *32*, 253–289. http://doi.org/10.1080/07370008.2014.918133

Cho, B.-Y., & Afflerbach, P. (2015). Reading on the Internet. *Journal of Adolescent & Adult Literacy*, *58*, 504–517. http://doi.org/10.1002/jaal.387

Cho, B.-Y., Woodward, L., Li, D., & Barlow, W. (2017). Examining adolescents' strategic processing during online reading with a question-generating task. *American Educational Research Journal*, *54*, 691–724. http://doi.org/10.3102/0002831217701694

Cho, B.-Y., Woodward, L., & Li, D. (2017). Epistemic processing when adolescents read online: A verbal protocol analysis of more and less successful online readers. *Reading Research Quarterly*. 10.1002/rrq.190.

Chiu, C.-M. & Wang, E. (2008). Understanding Web-based learning continuance intention: The role of subjective task value. *Information & Management*, *45*, 194-201. 10.1016/j.im.2008.02.003.

Dweck, C. S. (1986). Motivational processes affecting learning. *American Psychologist, 41*, 1040-1048. doi:http://dx.doi.org/10.1037/0003-066X.41.10.1040

Eccles J. S., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., & Midgley, C. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), *Achievement and achievement motivation* (pp. 75-146). San Francisco, CA: W. H. Freeman.

Gilster, P. (1997) *Digital literacy*. New York: Wiley.

Goldman, S.R., Braasch, J.L.G., Wiley, J., Graesser, A.C., & Brodowinska, K. (2012). Comprehending and learning from Internet sources: Processing patterns of better and poorer learners. *Reading Research Quarterly*, *47*, 356–381.

Greene, J.A., Yu, S.B., & Copeland, D.Z. (2014). Measuring critical components of digital literacy and their relationships with learning. *Computers & Education*, *76*, 55–69. http://doi.org/10.1016/j.compedu.2014.03.008

Harackiewicz, J. M., Rozek, C. S., Hulleman, C. S., & Hyde, J. S. (2012). Helping parents to motivate adolescents in mathematics and science: An experimental test of a utility-value intervention. *Psychological Science*, 899-906. https://doi.org/10.1177/0956797611435530

Harris, K.R., & Graham, S. (2016). Self-regulated strategy development in writing: Policy insights from the behavioral and brain sciences. *Reading, Writing, and Language*, *3*, 77–84. http://doi.org/10.1177/2372732215624216

Hulleman, C. S., Godes, O., Hendricks, B. L., & Harackiewicz, J. M. (2010). Enhancing interest and performance with a utility value intervention. *Journal of Educational Psychology,* 880-895. http://dx.doi.org/10.1037/a0019506

Fernández-Montalvo, J., Peñalva, A., Irazabal, I., & López-Goñi, J. (2017) Effectiveness of a digital literacy programme for primary education students. *Cultura y Educación*, *29*, 1-30, DOI: 10.1080/11356405.2016.1269501

Ju Joo, Y., Lim, K.-Y., & Kim, J. (2013). Locus of control, self-efficacy, and task value as predictors of learning outcome in an online university context. *Computers & Education*, *62*, 149–158. 10.1016/j.compedu.2012.10.027.

Koltay, T. (2011). The media and the literacies: media literacy, information literacy, digital literacy. *Media, Culture & Society*, *33*, 211–221. https://doi.org/10.1177/0163443710393382

Leu, D.J., Kinzer, C., Coiro, J., Castek, J., & Henry, L.A. (2013). New literacies: A dual-level theory of the changing nature of literacy, instruction, and assessment. In D. E. Alvermann, N. J. Unrau, & R. B. Ruddel (Eds.), *Theoretical models and processes of reading* (6th ed., pp. 1150–1181). Newark, NJ: International Reading Association.

National Governors Association Center for Best Practices & Council of Chief State School Officers (2010). *The Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects*. Washington, DC: The Author.

Nelson, T. O., & Dunlosky, J. (1991). When people's judgments of learning (JOLs) are extremely accurate at predicting subsequent recall: The "Delayed-JOL Effect." *Psychological Science*, *2*, 267–271. https://doi.org/10.1111/j.1467-9280.1991.tb00147.x

Pressley, M., & Afflerbach, P. (1995). *Verbal protocols of reading: The nature of constructively responsive reading*. Routledge.

Tang, C.M. & Chaw, L.Y. (2016). Digital literacy: A prerequisite for effective learning in a blended learning environment? *Electronic Jounral of e-Learning*, *14*. 54-65.

Ting, Y. (2015) Tapping into Students' Digital Literacy and Designing Negotiated Learning to Promote Learner Autonomy. *Internet and Higher Education, Vol. 26,* pp. 25-32.

Veenman, M.V.J., Van Hout-Wolters, B.H.A.M., & Afflerbach, P. (2006). Metacognition and learning: conceptual and methodological considerations. *Metacognition and Learning, 1*, 3–14. http://doi.org/10.1007/s11409-006-6893-0

Wigfield, A. (1994). Expectancy-value theory of achievement motivation: A developmental perspective. *Educational Psychology Review, 6*, 49–78.

Wigfield, A., & Eccles, J. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review, 12*, 265–310

Wigfield, A., & Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. *Contemporary Educational Psychology, 25,* 68-81.

Yukselturk, E. & Bulut, S. (2007). Predictors for student success in an online course. *Journal of Educational Technology & Society, 10*, 71-83. Retrieved from http://www.jstor.org/stable/jeductechsoci.10.2.71

Zepeda, C.D., Richey, J.E., Ronevich, P., & Nokes-Malach, T.J. (2015). Direct instruction of metacognition benefits adolescent science learning, transfer, and motivation: An in vivo study. *Journal of Educational Psychology, 107*, 954–970. http://doi.org/10.1037/edu0000022