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An Empirical Evaluation of Reading Comprehension Tablet Software Utilizing the Question Generation Strategy

Dr. Kevin Browne
Mohawk College
kevinbrowne@gmail.com

Dr. Christopher Anand
McMaster University
anandc@mcmaster.ca

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Abstract

Motivated by the substantial socioeconomic issues associated with low literacy skills, we developed a tablet application to help adults improve their reading comprehension skills. Though reading comprehension is a complex and multifaceted skill, studies have shown that teaching students metacognitive strategies can help them improve their reading comprehension skills. We created an iPad application which attempts to teach users the question generation strategy. We built another iPad application as a control that only allowed users to practice their reading comprehension skills; this application did not attempt to teach a metacognitive skill. We tested the applications with 48 undergraduate and graduate student participants from McMaster University. The application which aimed to teach the question generation strategy resulted in a statistically significant improvement in reading comprehension performance relative to the control application. We conclude that tablet software can be used to teach the question generation strategy, and propose directions for future work.

Keywords: literacy, reading comprehension, metacognitive strategies, adult literacy, gamification, dynamic difficulty adjustment

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Introduction

The high prevalence of low literacy skills in adults and associated employment, economic and health impacts has been extensively documented by international and national organizations (Long, 2001; Vernon, 2007; Yin et al., 2006; Barr-Telford, Nault & Pignal, 2005; Kutner, Greenberg, & Baer, 2005). Programs to address low literacy show disappointing enrollment and drop-out rates. The drop-out rate for those participating in literacy organization programming is 30%, and under 10% of Canadians who could benefit from a literacy program enroll (Long, 2001), with those who do not enroll citing employment, financial, childcare and transportation constraints.

Tablet computers have a touch screen interface that may be simpler relative to a keyboard and mouse, could lower costs relative to a human instructor, and allow a user to access interactive educational content remotely (without feeling embarrassment by revealing their low literacy skills to an instructor). As such, these devices appear to provide an opportunity for novel and disruptive approaches to the problem of low adult literacy. Indeed, an Apple Vision video from 1988 envisaged many tablet features and suggested they would be helpful for adult literacy education (McGuinnessPublishing, 2011).

This opportunity led the authors to conduct an exploratory study into the effectiveness of tablet software incorporating gamification and serious game design approaches. Three iPad applications for teaching punctuation and homophone literacy concepts were designed, developed and tested with adult-literacy program clients of the Brant Skills Centre. Groups of participants received instruction of the relevant concepts both with the iPad applications and through more traditional lecture-style instruction. This study was able to show that game design elements could increase learner engagement, and that these tablet software applications are likely best suited for the drill and practice phases of learning.

That the applications were most suited for drill and practice, while not a goal of the previous research, is a natural result of seeking aspects of literacy acquisition which would most likely

demonstrate the effectiveness of gamification and serious game design. It was easiest to design experiments around easily defined subproblems (punctuation, homophones). Although the previous applications were designed in consultation with Brant Skills Centre instructions, and incorporated Brian Cambourne's and Kayne Toukonen's thoughts on learning (Rushton, Eitelgeorge & Zickafoose, 2003; Toukonen, 2011), they were not designed to address the most challenging issues identified by literacy researchers, nor were they designed to teach literacy independently of the instructor.

In this study, we sought to demonstrate that independent learning of a core reading strategy can also be facilitated by tablet software, which really opens up the possibility of remote learning, increasing flexibility and reducing costs of adult education.

During the previous study we noted that traditional lecture-style instruction had a distinct advantage in teaching the concepts due to the dynamism of the instructor. In-the-moment adjustments based on participant reactions, learning tailored to individual needs, and emotional sensitivity combined to make instructors effective. Our applications came closest to this effectiveness when they exhibited dynamic characteristics, for example, a gradually increasing difficulty level, or corrective feedback after an incorrect response to a question.

This work builds on our previous efforts and insights, going deeper by combining learning with practice, teaching more abstract concepts, and exploring the use of dynamic difficulty adjustment in adult-literacy software. Of all the subproblems of literacy teaching, we decided that teaching strategies for reading comprehension best covered these goals.

Given the overlap in terms, and to help better situate our work and goals, we will define reading, literacy, digital literacy and reading comprehension. Reading is a cognitive process of recognizing symbols and constructing meaning and/or understanding (reading comprehension). Traditionally literacy is defined as the ability to read and write (specifically, to read and write text). However, the

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concept is sometimes expanded to include the ability to understand information, and to use multimedia, numbers, mathematics, and technology. Digital literacy is the ability of a person to produce, evaluate, find and communicate on digital platforms (for example, the Internet). Sometimes digital literacy is included in the broader definitions of literacy, in recognition of the importance of digital platforms to modern life. Closely associated with the idea of digital literacy is a concern about a digital divide, that is the inequity in access to digital platforms and communication technologies.

Reading comprehension is the ability to read, decode and comprehend text. Reading comprehension is a complex, multifaceted and creative process, about which much is known. Reviewing this knowledge is beyond the scope of this paper, but it is important to take individual differences into account. To give a short list, reading comprehension is dependent upon individual differences in: working memory (Daneman & Carpenter, 1980), vocabulary knowledge (Cain, Oakhill, & Lemmon, 2004), background knowledge (Pearson, Hansen & Gordon, 1979), phonology (Bishop & Adams, 1990), interest level (Sousa & Oakhill, 1996), inference-making ability (Cain & Oakhill, 1998), text-anomaly resolution ability (Yuill, Oakhill & Parkin, 1989) and cultural background (Johnson, 1981). In addition to the individual, texts also vary widely in subject and style, from more narrative texts such as novels, to technical texts, such as scientific journal papers, and there is a rich literature to mine for approaches to tablet learning, but for our first tablet application in this area, we need a tight focus.

The majority of reading past the primary grades and the majority of reading required by adults to succeed in life and at work involves expository text (Stanovich & Siegel, 1994). Expository text is intended to explain or describe something. The ability to comprehend expository text will only become more important with society's increasing dependence on technology (Lapp, Flood & Ranck-Buhr, 1995). For these reasons, we focus our work towards the comprehension of expository text. Further, we focus

on the recall of information presented directly in the text itself, i.e., on answering who, what, when, where, why, and how, without requiring inference or interpretation by the reader.

Metacognitive reading strategies are considered key to improving reading comprehension within the literature on the subject (Shang & Chang-Chien, 2010; McNamara, 2012; Jetton & Dole, 2004). One way that proficient readers are different from struggling readers is in their application of metacognitive reading strategies (Baker & Brown, 1984). Such strategies involve the reader reflecting on and consciously thinking about what they have read in various different ways, for example, by attempting to visualize (Bell & Lindamood, 1981) or summarize (Bean & Steenwyk, 1984) a passage of text. Proficient readers will employ these strategies before, after, and during the reading of a passage of text (Paris, Wasik & Turner, 1991). Numerous experimental results have shown that struggling readers can improve their performance if they are taught to apply these metacognitive strategies during learning sessions conducted over a period of time (Shang & Chang-Chien, 2010; Wong & Jones, 1982; Bereiter & Bird, 1985). Some experimental results have shown that struggling readers can improve their reading comprehension in a single learning session (Gambrell & Bales, 1986; Bereiter & Bird, 1985). While reading comprehension strategies have previously been taught using software successfully, for example iSTART (McNamara, Levinstein & Boonthum, 2004), we are unaware of any study documenting using tablet software to teach a reading comprehension strategy.

Though our work is inspired by metacognitive strategies which have been in-use for decades, there is more recent research and curriculum approaches that we should also note to help position our work. Teaching multiple reading comprehension strategies designed to improve inference ability to middle school students has shown to be effective (Barth & Elleman, 2017). Elementary schools have used educational literacy software to improve student engagement and test scores, and to promote growth in

metacognitive abilities of students (Smith, 2016). Using spaced repetition software has been shown to be effective at helping ESL students improve performance on Test of English for International Communication (TOEIC) scores (Bower, 2016). First grade students who were briefly taught a rehearsal strategy aimed at improving verbal working memory performed better than a control group that was not (Peng & Fuchs, 2015). Though our work does not directly build on any of these works specifically, it utilizes similar ideas and approaches in a different way, and we hope in this sense that it fills a gap in the current literature.

The *question generation* reading comprehension strategy involves having the learner generate and answer questions in the process of reading the text (Cohen, 1983; Rosenshine, 1997). Our focus on reading comprehension of who, what, where, when, why and how information in a text lends itself naturally to the question generation strategy.

Dynamic difficulty adjustment is a game design concept that involves modifying the difficulty of a game while it is being played (Hunicke, 2005), in contrast to for example selecting a level of difficulty for the game before play begins. *Gamification* can be defined as the “usage of game design elements to motivate user behavior in non-game contexts" (Deterding, 2011). Dynamic difficulty adjustment fits this definition and can be used to make an experience engaging to a wide spectrum of different users (Missura, 2015).

With these motivations and after having consulted the cited literature, we arrived at the following primary research questions:

- Can reading comprehension performance be improved by teaching the question generation strategy using tablet software?

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- Can incorporating dynamic difficulty adjustment and gamification design elements in reading comprehension tablet software result in high user engagement?

In this paper, we present the design and experiment results for two iPad applications we developed. One of the iPad applications attempts to teach the user the question generation strategy, and incorporates several gamification design elements, in particular dynamic difficulty adjustment. The other iPad application was created for use by a control group, and allows users to practice their reading comprehension skills without teaching them the question generation strategy and without incorporating dynamical difficult adjustment and most of the gamification elements. The experiment participants were McMaster University students, selected according to a Research Ethics Board approved plan.

We did find a *statistically significant improvement in reading comprehension* over the control group when using the application incorporating metacognitive strategies and dynamic difficulty adjustment. We did not find evidence for an improvement in user engagement in the experiment group over the control group; this may have been due to issues with the design of our application which caused some participant frustration.

This experiment design does not allow independent quantitative effectiveness evaluation of the reading strategy versus gamification, because our conception of responsively "teaching" the reading strategy required additional software elements and we could not see a practical way of implementing responsiveness without some level of gamification, and the most natural approach was dynamic difficulty adjustment. As we will explain, however, the user survey and qualitative comments allows us to make judgements about the merits of the two features.

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In Section 2, we present the design of the iPad applications. In Section 3, we discuss the design of the usability experiment that took place. In Section 4, we analyze the results of this study, and in Section 5, we discuss our conclusions and provide directions for future work.

Application Design

Two applications were designed and built for the iPad. The *experiment application* was built to improve reading comprehension skills using the question generation strategy, and improve engagement using dynamic difficulty adjustment and gamification. The *control application* was built to be used by a control group, and as a result is only meant to provide a chance for practicing reading comprehension via a series of passages and questions. The control application does not teach the question generation strategy, and does not feature dynamic difficulty adjustment or more sophisticated gamification included in the experiment application.

Experiment Application

The experiment application was designed to teach the question generation strategy to the user, and to facilitate high user engagement, primarily by using dynamic difficulty adjustment.

Design Overview

The first screen that the user accesses is the topic selection screen shown in Figure 1. The topic selection screen allows the user to select a topic to read about. The topic selection screen initially allows the user to select from one of two topics, but the user has the ability to unlock more options as a reward based on their performance in the application.

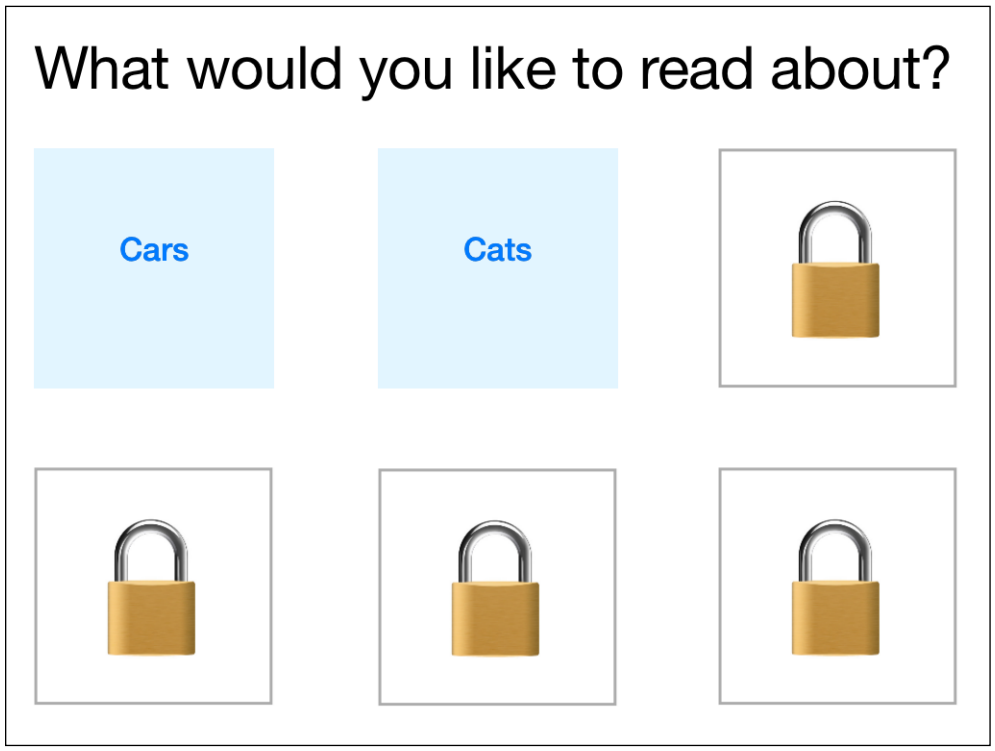

Figure 1: Topic selection screen

After the user selects a topic, they are presented with the text screen shown in Figure 2. The text screen allows the user to read the passage of text, before selecting “Done" to move onto the next screen or “Quit" to exit the application. If the text length exceeds the length of the screen, the user is able to swipe up or down to scroll further into the text. There is no time limit for the user to read the text.

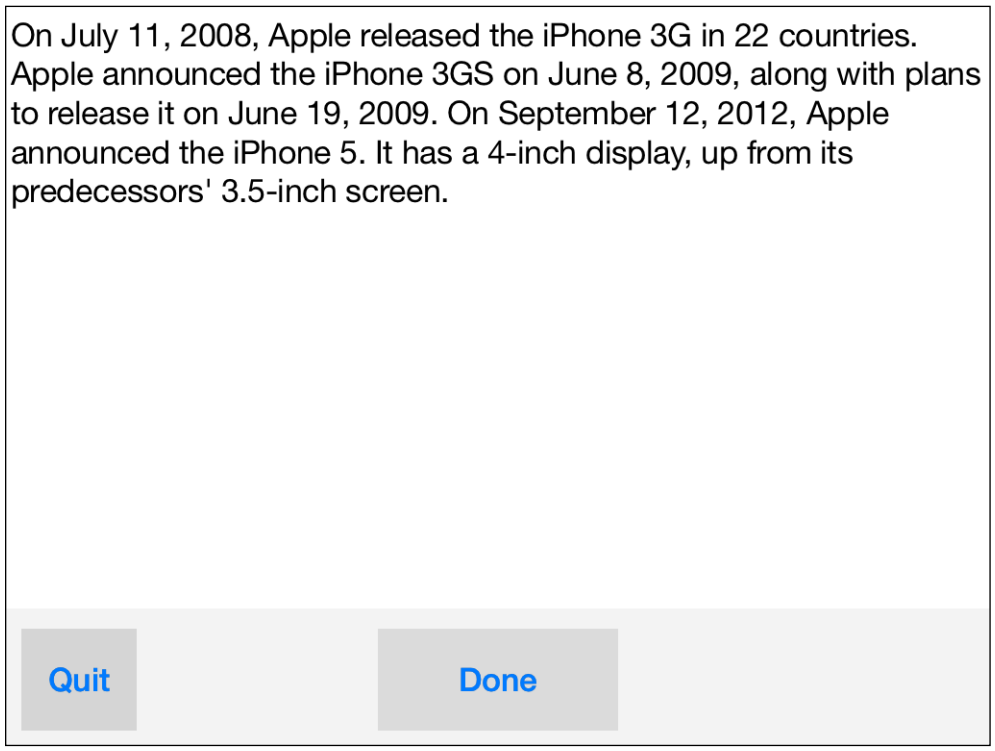

Figure 2: Text screen

After the user clicks “Done" on the text screen they are presented with the question screen found in Figures 3 and 4. The question screen presents a series of questions related to the previous passage. Each question has four potential answers. Only one answer is correct, and the remaining three answers are incorrect. When a user answering a question correctly by taping on the correct response, that response will be highlighted in green as shown in Figure 3. When a user answers a question incorrectly, the incorrect response will be highlighted in red, and the correct response will be highlighted in green, as shown in Figure 4. The top of the question screen allows the user to see how many questions they have remaining, as well as keep track of which questions they have answered correctly by the list of check marks (with correctly answered questions switching from a grey to green check mark).

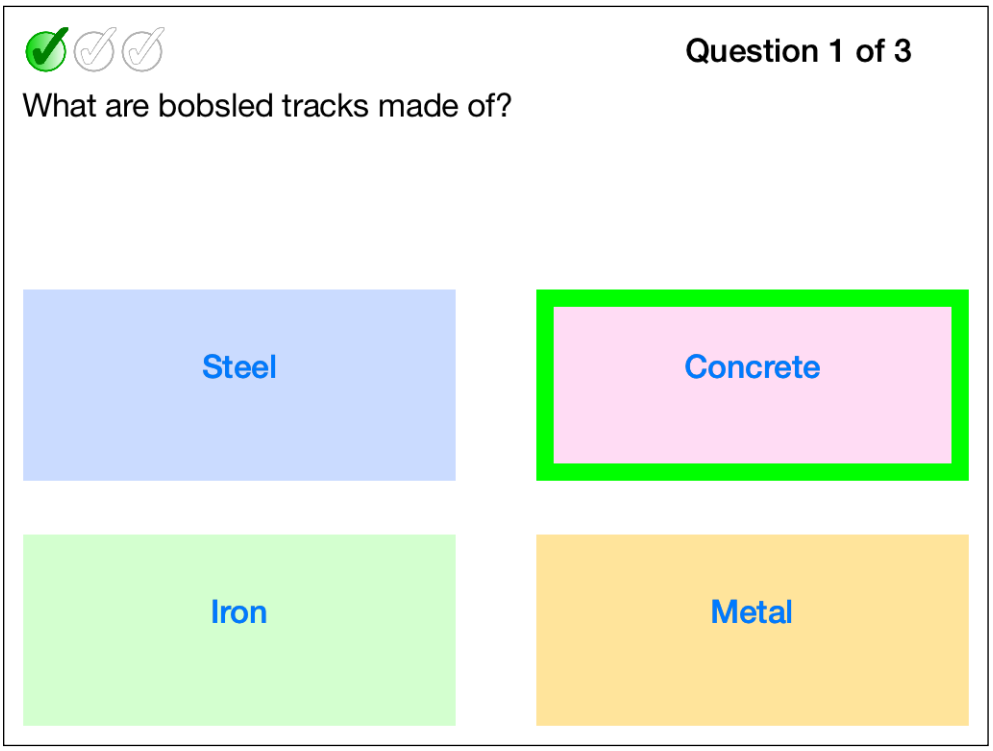

Figure 3: Correct answer

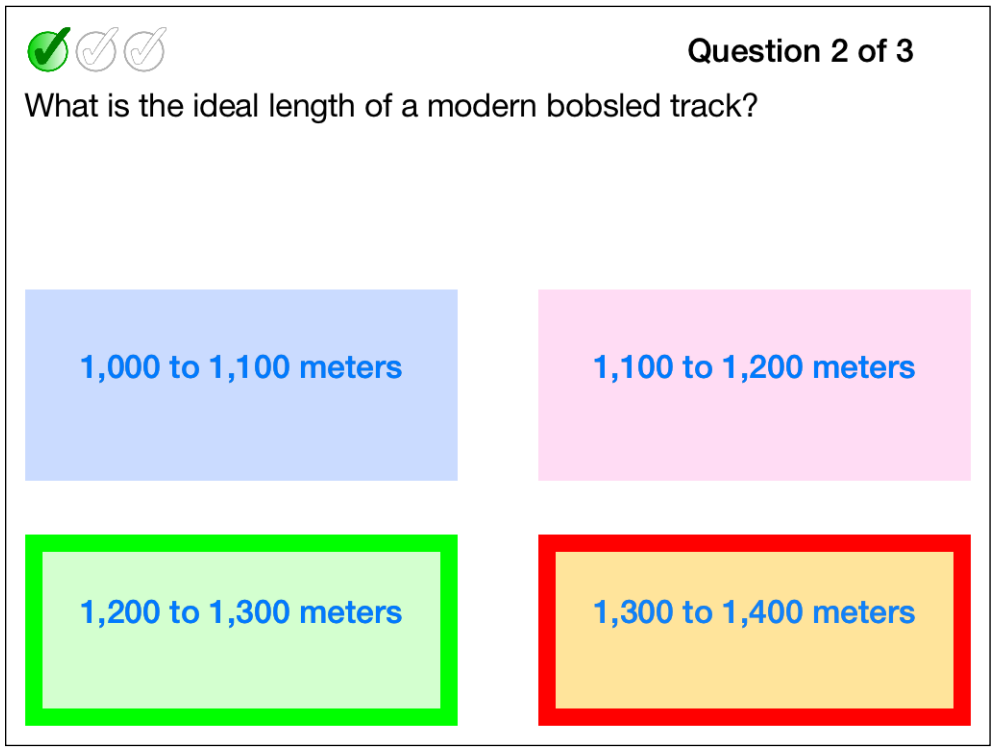

Figure 4: Incorrect answer

Once the user has completed the set of questions associated with the passage, they are forwarded to the reward screen shown in Figure 5. The reward screen keeps track of how many perfect scores the user has accumulated. A perfect score is achieved when a user answers every question associated with a passage of text correctly. The reward screen also keeps track of how many perfect scores are needed to "unlock" another passage topic option in the topic selection screen. Three, four, five and six options are made available to the user on the topic selection screen after achieving two, five, ten and eighteen perfect scores respectively.

When a user has achieved a perfect score in the question screen, before the reward screen is displayed a large gold check mark and "perfect score" text is briefly flashed on the screen. Similarly, when a perfect score results in a topic unlock, before the reward screen is displayed a large unlock icon and "option unlocked" is briefly flashed on the screen.

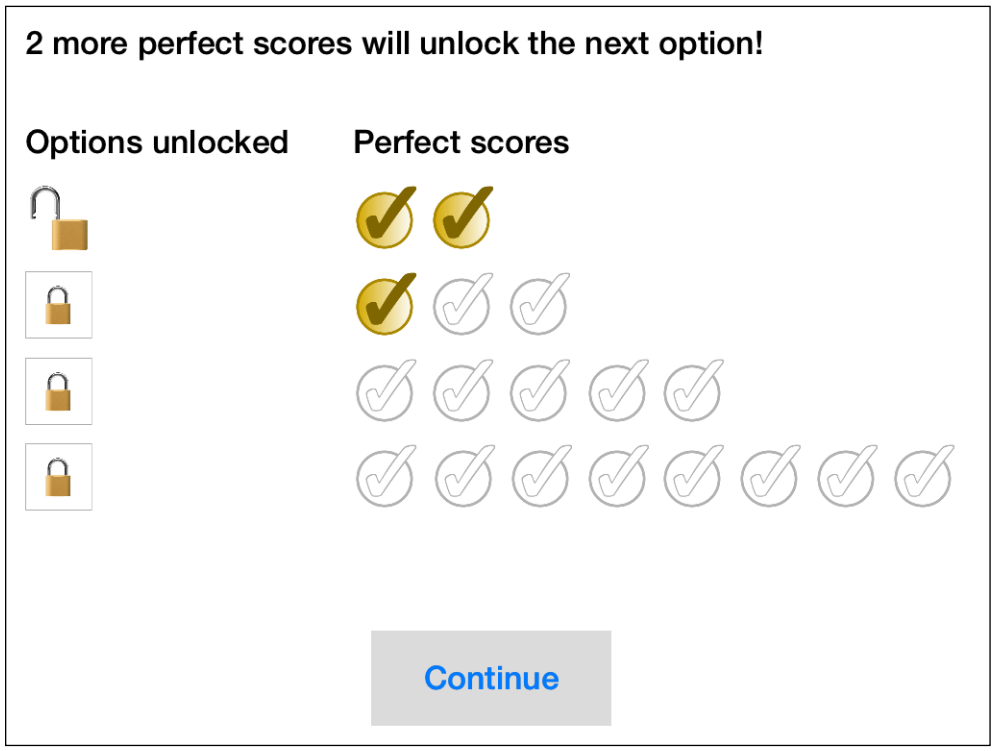

Figure 5: Reward screen

If the user did not receive a perfect score during the question screen, the question generation strategy is presented to the user via a set of consecutive screens shown in Figures 6, 7 and 8.

The motivation screen shown in Figure 6 is meant to show the user that the question generation strategy is effective. This screen randomly cycles through ten research results showing the question generation strategy to be effective.

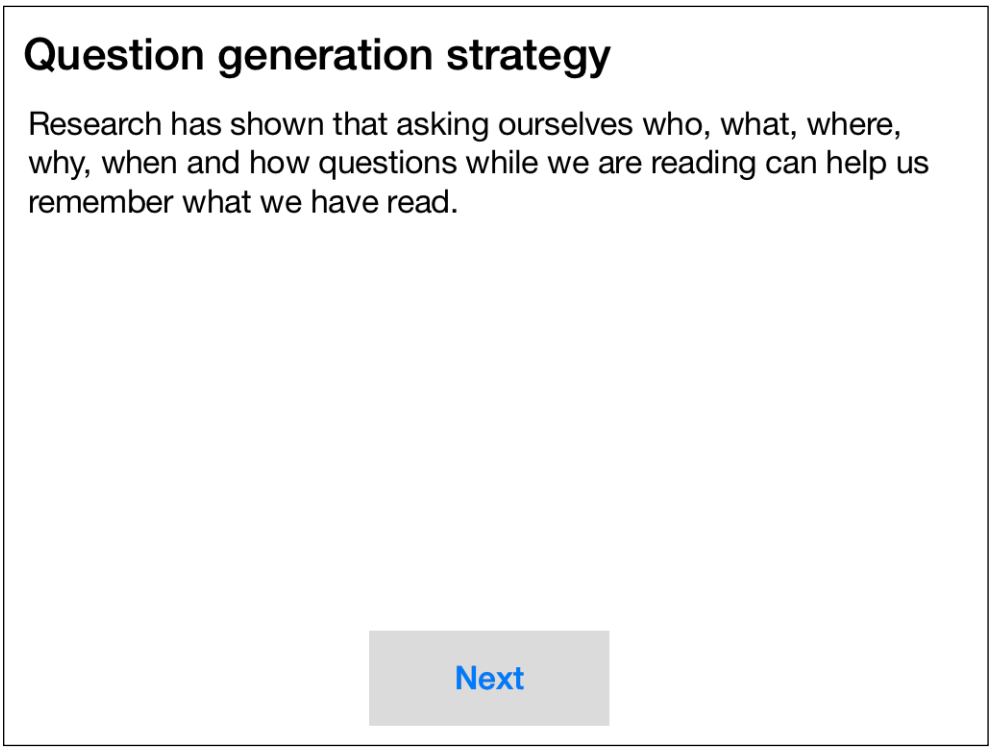

Figure 6: Motivation screen

After clicking “Next" on the motivation screen, the user is presented with an example screen as in Figure 7, demonstrating the question generation strategy, by presenting a passage of text and associated questions that could be derived from the passage of text. The questions are all either who, what, when, where, why or how questions, based on the type of question the user *most recently* answered incorrectly. The example is randomly selected from a set of five possible examples associated with each type of question.

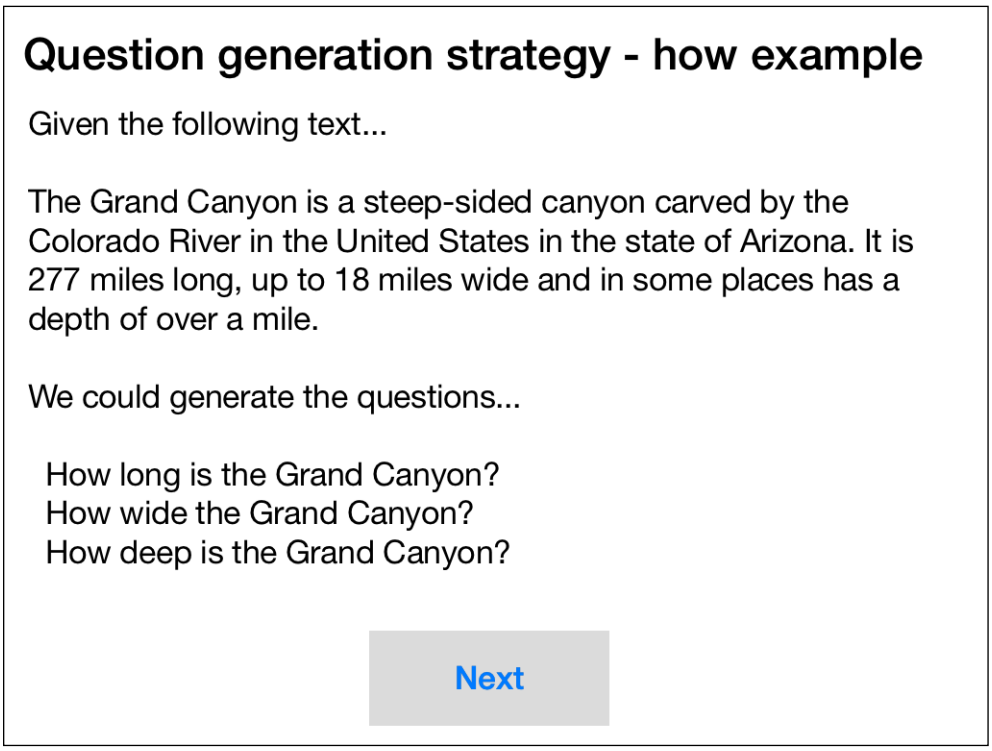

Figure 7: Example screen

After the user clicks “Next" in the example screen, the user is presented with the tactics screen shown in Figure 8. The tactics screen presents a tactic to help the user apply the question generation strategy, i.e. a method of carrying out the question generation strategy. The tactics screen randomly presents one of four possible tactics for carrying out the question generation strategy.

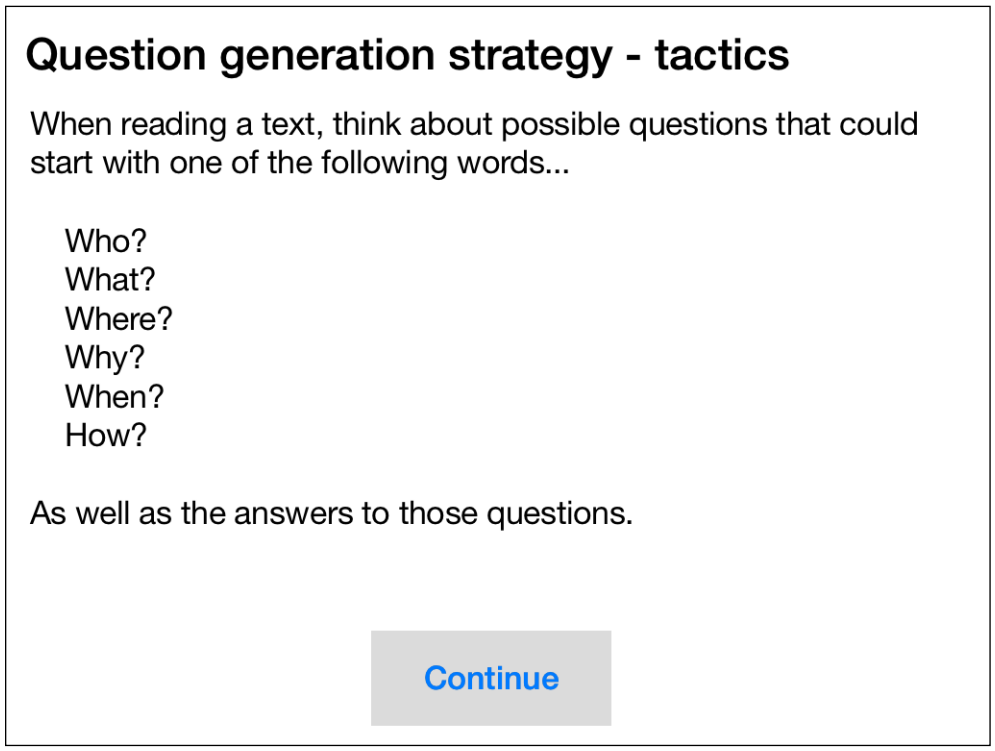

Figure 8: Tactic screen

After the user clicks “Next" in the tactics screen, the user is presented with the topic selection screen again. The application cycles continuously in this way until the user quits the application.

While the user is not made explicitly aware of this process, the application adjusts the difficulty of the passages and associated questions as the user proceeds, based on the user’s performance. The user is able to advance through 7 levels of passages and associated questions. The user begins by receiving level 1 passages and questions. If the user achieves two perfect scores in a row at their current level, then the user advances a level. If the user answers less than 50% of questions correctly three times, then the user returns to the lower level. However, the user will stay in level 1 or level 7, even if they meet the criteria for reversion or advancement, respectively.

The user’s current level determines which passages of text are made available for them to select at the topic selection screen. Each level is made up of 40 different possible texts and topics. The topics

presented to the user at the topic selection screen are random. However, the user will not be presented with the same text options at a given level again until it is no longer possible to present text options that the user has not already read.

Each level has an increasing number of questions associated with each passage in that level. The passages in each level are given an increasing word count range, and a decreasing Flesch-Kincaid score range. The Flesch-Kincaid score ranks the difficulty of a passage of text using metrics such as the total number of sentences, total number of syllables, and total number of words (Kincaid, Aagard, O'Hara & Cottrell, 1981). The levels and associated question count, word count range, and Flesch-Kincaid score range are shown in Table 1.

Level	Questions	Word count range	Flesch-Kincaid score range
1	1	0-20	90-100
2	2	20-40	80-90
3	3	40-60	70-80
4	4	60-80	60-70
5	5	80-100	50-60
6	6	100-140	30-50
7	7	140-180	0-30

Table 1: Passage levels

Creating the 280 passages and questions was a substantial undertaking performed by the first author and freelancers. The passages themselves were, with a few exceptions, taken from Wikipedia articles. If the text from the Wikipedia article did not conform to the required Flesch-Kincaid score, but was relatively close to the required score, words and sentences were altered to ensure that it fit to the desired

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score. In the case of levels 1-2, it was very difficult to find text on Wikipedia with the required Flesch-Kincaid score. As a result, many passages at these levels were created from scratch.

None of the questions require the user to make an inference based on the text to answer them correctly. Every correct answer is directly presented in the text itself (e.g. a date, a person's name).

We made an effort to select diverse topics (including cultural and gender diversity), although no measure of this diversity was taken. Passage topics included areas such as pop culture (e.g. television, movies, celebrities, musicians), history (e.g. war, the history of nations), science (e.g. biology, chemistry) and others. As an example of cultural and gender diversity, music and musician-related topics spanned several genres with male and female musicians represented.

An effort was also made to ensure an equal balance of who, what, when, where, why and how question types. In the case of levels 1-3, the question types occurred across all passages in equal number. In the case of levels 4-7, it became unwieldy to ensure an equal portion of question types, but no question type was represented over 25% more than the other question types.

Design Approach

Four key elements were woven together in the design:

- Question generation strategy
- Dynamic difficulty adjustment
- Gamification
- Experiential learning

The question generation strategy taught by the application is meant to give the user a metacognitive strategy to improve their reading comprehension (Cohen, 1983; Rosenshine, 1997). Metacognitive

strategies include three components: declarative (“knowing what"), procedural (“knowing how"), and conditional (“knowing why") (Paris, Lipson & Wixson, 1983). Teaching a metacognitive strategy can be done by providing explicit answers for these what, how and why questions (Carrell, 1998). In analogy with this decomposition, we *declare* the name of the strategy (“question generation") in the application. The screens which motivate the strategy provide the *conditional* component, and the concrete examples and tactics for applying the strategy provide the *procedural* component.

Dynamic difficulty adjustment is incorporated into the level system. That two perfect scores in a row are required to move up a level is meant to make it relatively difficult to move into the upper levels by random chance, and that three less than 50% scores in a row are required to move down a level is meant to make moving down a level rare.

Though dynamic difficulty adjustment was intended primarily to increase engagement, the related concept of *flow* may also be encouraged. Nakamura and Csíkszentmihályi (2009) describe flow as a subjective experience that seamlessly unfolds from moment to moment. Csíkszentmihályi (1997) models flow as a balance between perceived opportunities and skills, with the current model of flow shown in Figure 9 having apathy experienced when the perceived challenges and skills are below the user’s average levels, and flow experienced when the challenges and skills are above the user’s average levels (i.e. the stretching of existing skills). By balancing the challenge level to the user’s performance, we may also expect that the user experiences a sensation of flow while using the application. However, we also note by this model that if the balance isn’t achieved we may expect anxiety, apathy, worry or boredom on the part of the users.

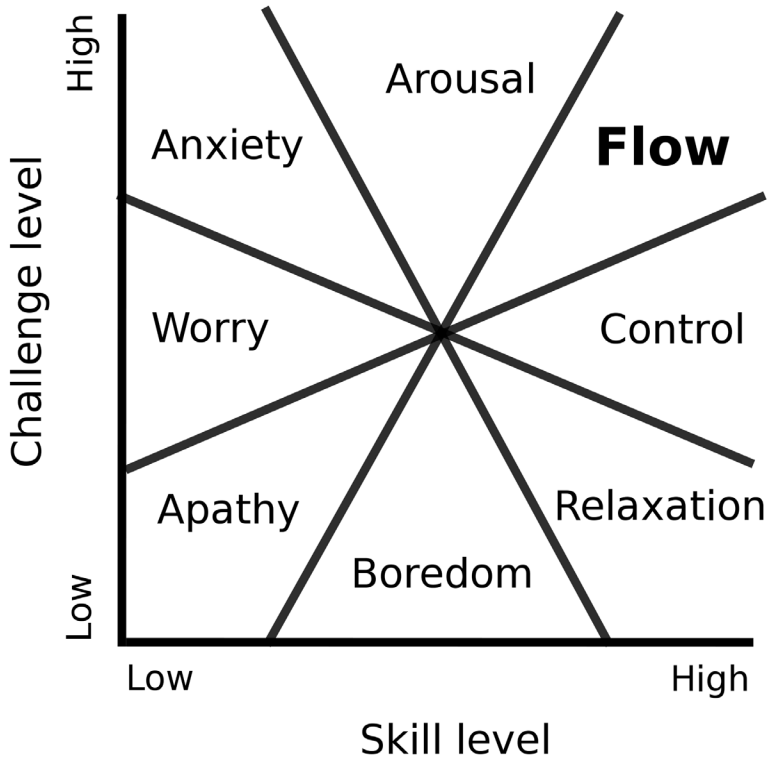

Figure 9: Csíkszentmihályi model of flow

Gamification to increase engagement is facilitated by the following design elements:

- **Badges** - green and gold check marks are given as rewards for successfully answering questions.
- **Levels** - the user has the ability to implicitly proceed through different levels of difficulty depending on their performance.
- **Short, medium, and long term goals** - earning an individual green check mark is a short-term goal, earning a gold check mark is a medium-term goal, and earning enough gold check marks to unlock the next option is a long-term goal.

Distinguishing between short-term goals with green check marks, medium term goals with gold check marks, and long-term goals with an unlocked lock graphic creates a visual layering of goals that

take increasing amounts of time to complete but that come with increasing rewards, a key feature of many games (Dorling & McCaffery, 2012).

Experiential learning is the process of learning through reflection on experience, and can be characterized by a cycle of active experimentation, concrete experience, reflective observation, and abstract conceptualization (Kolb, 1985). The cyclical nature of the application from experimentation and concrete experience (passage and question screens), to reflective observation (results, rewards) to abstract conceptualization (question generation strategy screens) is modeled as such in an attempt to facilitate experiential learning.

Control Application

The control application works by cycling only between the text screen in Figure 2, and the question screen in Figure 3 and Figure 4. No opportunity is given to select a text topic; instead a text is randomly selected from one of the level 7 texts. Level 7 texts were chosen because level 7 texts should be appropriate for university-level readers. The application ensures they will not receive the same text again until all other texts have been used. No reward presentation screens or reward collection screens are displayed. The only gamification that is included is a green check mark upon receiving an individual correct answer. No screens related to the question generation strategy are displayed. The application therefore simply cycles between a randomly selected level 7 text and related questions to allow the user to practice reading comprehension.

Metrics

Both applications recorded metrics such as the level of each passage the user read (all level 7 in the case of the control application), and the total number of passages read.

Experiment Design

McMaster University students were invited to participate in a study measuring improvements in reading comprehension using iPad applications. Participants were recruited using department-wide e-mails to multiple departments in diverse areas of study, and posts to a diverse collection of subject-, activity-, and club-specific Facebook groups.

Participants received a $10 Tim Hortons gift card as compensation for their time and motivation for their participation in the study. The study was approved by the McMaster University Research Ethics Board.

Experiment session protocol

The following protocol was followed with each experiment participant. The protocol refers to the pre-experiment questionnaire in Section 3.4, the usability survey in Section 3.5, and the post-experiment questionnaire in Section 3.6.

The sessions took place in a classroom and a meeting room at McMaster University and were conducted by Browne. The classroom contained desks and chairs facing each other in a circle. The meeting room contained a large table surrounded by chairs.

The sessions took place over a period of 2 weeks. Participants were able to select a convenient time slot. Sessions took place with anywhere from 1 to 7 participants at a time. Sessions took approximately 1 hour to complete.

Half of the participants were given the experiment application, and half of the participants were given the control application. All participants in any single session were given the same application, allowing participants to discuss their experience with that application with their peers. All participants used an iPad Mini tablet device during the sessions. All participants used their version of the application for approximately 30 minutes, as participants were told at the 30-minute mark that they could “now move

on to the post-study practice sheet, but could finish completing the current passage and questions if desired", rather than abruptly cutting them off from the application. Note that 30 minutes of instruction in other reading comprehension strategies has produced significant improvements (Gambrell & Bales, 1986).

The following procedure was used during each session:

1. The participants were told the goal of the experiment.
2. The rest of the experiment procedure was outlined for the participants.
3. The participants completed a paper copy of the pre-experiment questionnaire.
4. The participants completed a reading comprehension practice sheet.
5. The participants used the iPad application for approximately 30 minutes.
6. The participants completed a reading comprehension practice sheet.
7. The participants completed the usability survey.
8. The participants completed the post-experiment questionnaire.
9. The participants were encouraged to discuss their thoughts on the application.

A total of 24 participants used the experiment application (the experiment group), and a total of 24 participants used the control application (the control group).

Two different reading comprehension practice sheets were developed, with a best effort to make them approximately the same level of difficulty. In order to control for a differing level of difficulty between the practice sheets, the practice sheets were alternated within each group of participants (experiment and control). Within each group, half the participants did one practice sheet at the start of

the session and the other at the end of the session, and the other half completed them in the reverse order.

It's reasonable to suspect that if someone simply practiced reading a passage and answering related questions for a period of time, that their score on a reading comprehension practice sheet could go up simply due to practice. The control application was developed for the control group to ensure that any improvement noticed in the experiment group wasn't simply caused by additional practice with reading comprehension passages and questions.

Quantitative observations

Quantitative observations were recorded using the reading comprehension practice sheets to test the participants throughout the experiment session. Each reading comprehension practice sheet contained three passages and associated questions: a level 3 passage and 3 associated questions, a level 5 passage and 5 associated questions, and a level 7 passage and 7 associated questions. Each question had 4 possible answers, and only one answer was correct in each case. Each practice sheet had a maximum score of 15. The passages and questions used for the practice sheets were not included in the iPad applications.

Qualitative observations

After each session, a casual verbal discussion with the participants was used to elicit further insights into the effectiveness of the applications. Observations from these discussions were recorded in writing. Verbal expressions, reactions, and comments made by the participants during the sessions were also recorded in writing as study data. Qualitative observations of user perception of each application were also recorded with the usability survey in Section 3.5.

Pre-experiment questionnaire

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The following information was gathered with the pre-experiment questionnaire:

- Gender (Male/Female)
- Age
- Handedness (Right/Left)
- Years of study completed at the University level
- Year of study in current program
- Current program of study The participants were also asked to rate their reading ability from 1 to 5: 1 is “not well at all" and 5 is “I can read perfectly well", and asked to rate their ability to use the iPad from 1 to 5, where 1 is “not well at all" and 5 is “I can use the iPad perfectly well".

Usability survey

The participants were asked to rate how much they agree (Likert scale) with the following statements:

- **S1** The app was easy to use.
- **S2** It was easy to learn how to use this app.
- **S3** I enjoyed using this app.
- **S4** The iPad was comfortable to hold while using the app.
- **S5** The app helped me to improve my reading comprehension.
- **S6** I found the app to be useful.
- **S7** I would tell other people to use this app.
- **S8** The touchscreen finger gestures required to use the app felt natural.

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- **S9** I liked the app's graphics.
- **S10** I liked the app's voices / sound.
- **S11** The app kept me totally absorbed.
- **S12** The app held my attention.
- **S13** The app excited my curiosity.
- **S14** The app aroused my imagination.
- **S15** The app was fun.
- **S16** The app was intrinsically interesting.
- **S17** The app was engaging.
- **S18** Using the app was interesting in itself.
- **S19** Using the app was fun.
- **S20** I thought of other things while using the app.
- **S21** I felt curious while using the app.
- **S22** I was in control of the app that I was using.
- **S23** I was entirely absorbed in using the app.

The participants could choose from: strongly disagree, disagree, somewhat disagree, neutral, somewhat agree, agree, and strongly agree. For analysis purposes, these descriptions were assigned numeric values 1-7 from strongly disagree to strongly agree.

For brevity's sake we will refer to this survey as the usability survey, but we note that a group of questions are intended to measure aspects of usability, the next group is intended to measure

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engagement, and a final group is intended to measure flow. Statements S1-S10 are intended to measure usability and are identical to those used in our prior study of the effectiveness of tablet software to teach adult literacy skills. Statements S11-S17 are modeled closely after those used in a survey to measure engagement in a prior study by Webster and Ho (1997). Statements S18-S23 are modeled closely after those used in a survey to measure flow in a prior study Choi and Kim (2004). As a result of combining multiple different survey instruments, some survey questions are very similar (e.g. S15 and S19).

Post-experiment questionnaire

The following questions were asked on the post-experiment questionnaire.

1. Would you prefer to be taught reading comprehension using the iPad app or by some other method? (check one)
2. In the future should people be taught reading comprehension only using the iPad app, only using some other methods, or both? (check one)
3. What did you like about the iPad app? (write below)
4. What didn't you like about the iPad app? (write below)

Results and Discussion

A total of 48 participants took part in the experiment, 24 participants in the experiment group used the experiment application and 24 participants in the control group used the control application. The programs of study reported by the participants in the pre-study questionnaire were wide ranging in both the experiment and control group, to such a degree that each group only contained a few instances of participants from the same area of study. The remaining participant data collected during the pre-

experiment questionnaire is presented in Table 2. We note that reading ability and iPad ability as reported by the participants were closely matched between the groups.

	Experiment group	Control group
Gender		
Women	15	13
Men	9	11
Handedness		
Left	2	2
Right	22	22
Age		
Average	22.9	22
SD	5.8	2.9
Reading ability		
Average	4.5	4.5
SD	0.7	0.8
iPad ability		
Average	4.1	4.2
SD	0.9	0.9
Years of University		
Average	4.3	3.9

SD	3.1	2
Years in current program		
Average	2.8	3
SD	1.1	1.2

Table 2: Participant data

With a sample group of exclusively McMaster University students, the results of this study cannot be extended to the general population. However, given the reasonably random participant selection process, we believe our results are statistically significant for the sampled population of those who came in contact with the recruitment materials. When we talk about results being statistically significant for the population, it is this population we refer to and not the general population.

The practice-sheet results are shown in Figure 10, where no improvement in score was found in the control group but the experiment group did improve their average score. The average performance of the control group went from 11.0 (s=2.359) to 10.875 (s=3.353), and the average performance of the experiment group went from 10.958 (s=2.368) to 12.708 (s=2.579).

We conduct the following analysis of variance hypothesis test at significance level α=0.05. We used the ANOVA caluclator (two-factor ANOVA with repeated measure on one factor) available at www.vassarstats.net.

Null and alternative hypotheses:

1. $H_0;\mu_{exp}=\mu_{con}$

   $H_A;\mu_{exp}\neq\mu_{con}$

2. H_0;$\mu_{pre}=\mu_{post}$

   H_A;$\mu_{pre}\neq\mu_{post}$

3. H_0; an interaction is present

   H_A; an interaction is absent

Test statistic:

We compute F_{BS}, F_{WS}, and $F_{BS\times WS}$ in a 2×2 mixed-design analysis of variance model where the between-subjects variable is the iPad application (either experiment or control) and the within-subjects variable is the practice sheet (either pre-application usage or post-application usage).

Decision rules:

1. If F_{BS} is greater than 4.05, we reject the null hypothesis.

2. If F_{WS} is greater than 4.05, we reject the null hypothesis.

3. If $F_{BS\times WS}$ is greater than 4.05, we reject the null hypothesis.

Note: the chosen significance level implies these critical values.

Computing the test statistic:

We present the results of the ANOVA in summary Table 3, where SS is the sum of squares, df is the degrees of freedom, MS is the mean square, and F is the test statistic.

Source	SS	df	MS	F
Between Subjects	453.24	47		

Factor	19.26	1	19.26	2.04
Error	433.98	46	9.43	
Within Subjects	261.5	48		
Factor	15.84	1	15.84	3.25
Factor	21.09	1	21.09	4.32
Error	224.57	46	4.88	
Total	714.74	95		

Table 3: ANOVA Summary Table

Applying the decision rules:

1. F_{BS}=2.04<4.05, therefore we fail to reject the null hypothesis.

2. F_{WS}=3.25<4.05, therefore we fail to reject the null hypothesis.

3. $F_{BS \times WS}$=4.32>4.05, therefore we **reject the null hypothesis**.

The statistically significant interaction suggests that the experiment application successfully taught the experiment group participants the question generation strategy, and that participants improved their reading comprehension skill as a result (at least temporarily).

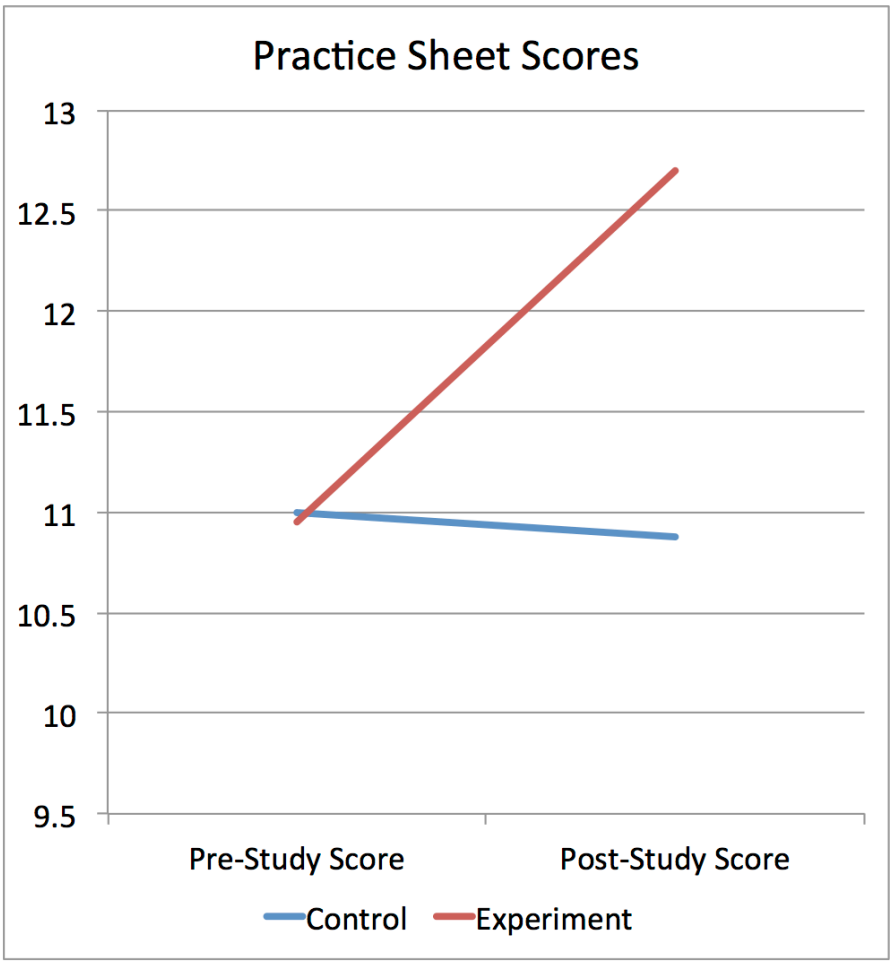

Figure 10: Practice sheet scores

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The result of the usability survey are presented in Figure 11. The results do not show any substantial difference between the applications, though we note that in all but two statements (S9 and S22) the experiment application received higher results. We noted in Section 3.5 that the usability survey was comprised of three sections, S1-S10 focusing on usability, S11-S17 focusing on engagement, and S18-S23 focusing on flow. Within each group of questions, we sum the average result of each question (e.g. summing the average of S1-S10), divide it by the total highest average possible (e.g. divide by 70 in the case of S1-S10), and multiply the result by 100 to give a rough score. We present these results in Figure 12, where again we note that the experiment application has received higher results, but not significantly higher results as was thought possible.

Figure 11: Usability survey results

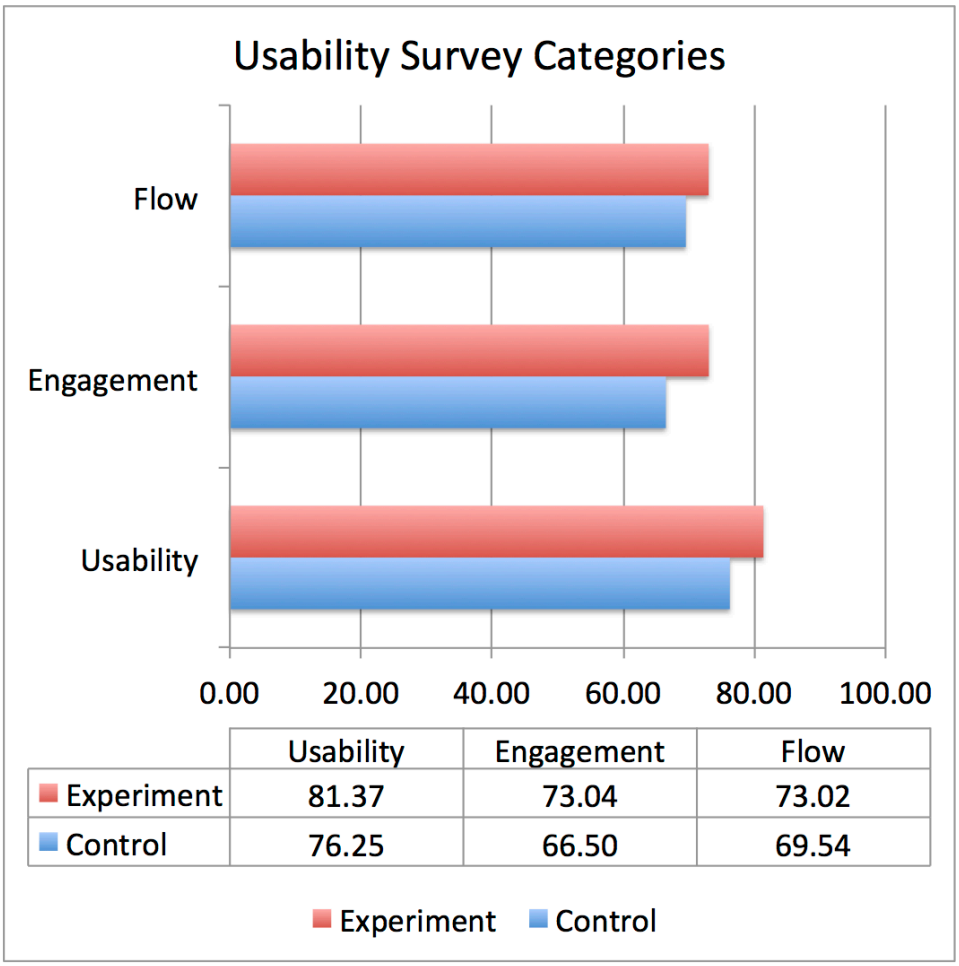

Figure 12: Usability survey categories

In Table 4 we present the results of the post-experiment question asking participants to choose their preference between the iPad application or some other method for learning reading comprehension.

	iPad	**Some other method**
Control	15	9
Experiment	18	6

Table 4: Preferred learning method

In Table 5 we present the results of the post-experiment question asking participants to recommend how reading comprehension should be taught in the future (iPad application, some other

other method, or both). The participants in both groups showed a very strong preference for using both the iPad application and some other method going forward. Again, these results do not provide evidence that the experiment application is preferable to the control application as was thought possible.

	iPad app only	**Some other method**	**Both**
Control	0	1	23
Experiment	0	0	24

Table 5: Preferred future learning method

The free form written post-experiment questionnaire questions and informal discussions with participants offer a reasonable explanation for why the experiment application did not result in a significantly more engaging and preferred experience.

In the case of positive feedback for both applications, participants noted that they were “easy to use".

In the case of positive feedback for the experiment application, participants noted the layered rewards and would even use the word engaging to describe what they were feeling, “It was engaging since you had to improve in order to get to the next level." The ability to select a topic to read was also singled out for praise in the experiment application. Some participants also noted that they were aware of the question generation strategy that the application had taught them, and expressed a feeling that it could help them.

The negative feedback for the control application included having to read passages for which the participant was not interested, that the application was “boring", and a belief that it wasn’t effective at improving reading comprehension. All of these reactions are things that we anticipated.

The negative feedback for the experiment application was roughly divided into two groups. One group of participants would either give little to no negative feedback, where the negative feedback could

be described as “wanting more". These participants were generally happy with the application, but they desired things such as more topics, images to go along with the passages, and more complexity.

The other group of participants found the application to be frustrating. While advancing through levels 1-4 was generally pretty easy for most participants, advancing to levels 5,6 and 7 was more difficult. If a single question in the set of questions associated with a passage was answered incorrectly, a perfect score would not be achieved and the participant could not advance. This requirement for a perfect score to advance, and a general feeling that they needed to advance, was noted by several participants as a cause of frustration. For example, one participant gave the feedback, “If you got one question wrong, you could not unlock the next round." Another cause of frustration was that once participants reached level 7, they were not able to advance further. Participants described this as a lack of finality. For example, one participant gave the feedback, “Use of perfect scores to unlock progression diminished sense of attainability of a final goal."

As a result of this feedback, we believe that the application’s implementation of dynamic difficulty adjustment was mismatched with the expectations of these users, resulting in frustration in some cases. Though participants were not explicitly or purposely made aware of the different levels of difficulty, participants quickly figured out that these different levels of difficulty existed based on the number of questions they were presented. Once participants were aware of these levels, they naturally used them as a yardstick to measure their progress, and became frustrated as a result at the lack of advancement.

In this sense the design of the application was not in keeping with the purpose of dynamic difficulty adjustment. If a game adjusts its difficulty dynamically, strictly speaking it has implemented dynamic difficulty adjustment. But if the goals are not also adjusted to reflect the new level of difficulty, or if the goals are associated with adjustment towards higher levels of difficulty, the user may see the increase or decrease in difficulty as an advancement or setback in their progress.

A further literature review revealed work by Andrew Rollings and Ernest Adams (2003) which emphasized the importance of hiding the existence of dynamic difficulty adjustment from the player for the technique to work as intended. The failure of our application to hide dynamic difficulty adjustment may have been the reason the dynamic difficulty adjustment implementation was poorly received by some participants.

It should be noted that some of the frustration that participants expressed appeared to be motivational. A few participants would talk about how they were frustrated while using the application, but then pump their fists after achieving a perfect score and advancing to another level. However for some participants this frustration appeared to cross over from an enjoyable level into upset, disappointment, and a deeper frustration that was no longer motivating.

In Table 6 we present data on the total number of passages read for each group. All but one participant in the experiment group was able to reach level 7. The minimum number of passages it took to reach level 7 was 6, the maximum was 16, with an average of 8.9 (s=2.9).

	Min	**Max**	**Avg**	**Stdev**
Control	7	34	16.4	6.7
Experiment	9	24	17.2	3.7

Table 6: Total passages read

Conclusion

Our main question was: “Can reading comprehension performance and user engagement be improved by teaching the question generation strategy via tablet software incorporating dynamic difficulty adjustment and gamification strategies.” We can answer with high confidence that reading

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comprehension can be improved, at least for the population sampled over the short interval of the experiment.

While the results cannot be generalized to other populations, they do provide valuable insights into reading comprehension educational software design. Due to the design, the question generation strategy was inherently linked to difficulty adjustment and gamification, but we interpret the lack of significant difference in preference, usability, engagement, and flow between the applications, and the fact that all but one participant in the experiment group reached level 7, to mean that it was the instruction of the question generation strategy that resulted in improved practice sheet scores within the experiment group, rather than the dynamic difficulty adjustment or gamification features of the experiment application. In fact, the feedback suggests that our application design frustrated some participants.

The participants' feedback could be incorporated by shortening the length of time participants spent with the application, so participants would not reach level 7, or, alternatively, providing a reward for reaching level 7, to signify that the user had "completed" the application (akin to "beating" a game). Some users may also prefer a level promotion system not based on perfect scores, but another metric such as average scores at the current level.

Participants' feedback also suggests that the implemented gamification techniques (e.g., layered rewards (Hamari & Eranti, 2011) and gradually increasing difficultly levels (Keller, Bless, Blomann & Kleinböhl, 2011) are effective in the domain of reading comprehension tablet software. However, in our experience, dynamic difficulty adjustment is a difficult system to implement well, requiring the maintenance of a balance between the level of challenge and each user's ability, with rewards to maintain engagement. We recommend an iterative design and test approach.

Our work and results can be beneficial to literacy educational technology creators and literacy researchers. The results of this work should give designers of educational literacy software increased

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confidence that they can teach reading comprehension strategies in their applications effectively. An abundance of literature exists covering various reading comprehension strategies and how to teach them to an individual or a class of a students, but very few studies exist in which the strategy is taught via software. Given the encouraging results of this work, and the economic benefits of delivering education via software, we believe there is an opportunity for researchers to develop new applications which teach different metacognitive strategies, perhaps using different design features (e.g. videos). The effectiveness and viability of metacognitive strategies taught using digital platforms can likely be explored extensively given the abundance of research on the original strategies themselves.

In future work, we hope to:

- Improve the dynamic difficulty adjustment implementation of the experiment application to increase user engagement.
- Test the experiment application (or an improved version of it) with adult-literacy-centre clients to investigate whether it can improve their reading comprehension skills.
- Compare the experiment application to non-tablet software with adult-literacy-centre clients, measuring improvements in reading comprehension.
- Test whether other reading comprehension strategies can be delivered via tablet software, beyond the question generation strategy, and measuring their relative effectiveness.
- Design an application using dynamic difficulty adjustment to assess reading skill level, and comparing it to current methods used to triage students and tailor reading programs.
- Measure the effectiveness of an expanded application over an extended period of time.

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The highest priority is to incorporate the insights gained from this study and to test this new application with adult-literacy-centre clients, since their needs originally motivated this work.

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Homeless Adults, Technology and Literacy Practices

Ewa McGrail, Ph.D.
Georgia State University
emcgrail@gsu.edu

Gertrude Tinker Sachs, Ph.D.
Georgia State University
gtinkersachs@gsu.edu

Tisha Lewis Ellison, Ph.D.
University of Georgia
tellison@uga.edu

Nicole Dukes
Georgia State University
ndukes2@studnet.gsu.edu

Kathleen Zackery
Georgia State University
kzackery2@student.gsu.edu

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Abstract

Some research has explored perspectives held by the homeless on technology use (Borchard, 2010; Eyrich-Garg, 2010, 2011; Harpin, Davis, Low, & Gilroy, 2016; Hersberger, 2002/2003; Pollio, Batey, Bender, Ferguson, & Thompson, 2013). Few studies have however focused on understanding this population's use of technology for literacy purposes (Hendry, 2011; Muggleton & Ruthven, 2012), as distinct from their more general technology use, such as acquiring the skills to improve their station in life or to enhance their health, or utilize social services. Employing symbolic interactionism (Blumer, 1969) as a conceptual framework and using semi-structured interviews, this qualitative study examines technology use for literacy purposes by the homeless. It also investigates the meanings that these participants direct toward technology. The findings suggest diverse technology uses that enhance the participants' access to social services. Other responses indicate differences in the conceptions and uses of technology for literacy purposes. The participants also made recommendations to us for the state and the nearby state university to support their literacy practices and access to technology. The insights from this study should be of value to educators, policy makers, city governments, and social and community personnel in improving adult literacy and social services programs.

Keywords: Homeless adults, technology, literacy, symbolic interactionism

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INTRODUCTION

Technology, whether informational or communicative, has been a ubiquitous facet of life in modern society for some time now (Harrington, 2009; Smith & Marx, 1998; Volti, 2014). This understanding continues to be true today, since social media and other information and communication technologies seem to permeate many aspects of public human endeavor. The report from the Pew Research Center (2014) captures the extent of such influence in the following statement:

> The Pew Research Center has documented this explosive adoption of the Internet and its wide-ranging impacts on everything from: the way people get, share, and create news; the way they take care of their health; the way they perform their jobs; the way they learn; the nature of their political activity; their interactions with government; the style and scope of their communications with friends and family; and the way they organize in communities. (p. 4)

Within such a sociocultural context, having access to the latest technological developments and the affordances they present to their end users can be seen as a form of "economic capital" (Hersberger, 2002/2003, p.45) or property (Muggleton & Ruthven, 2012, p.220). Those who lack such access personally experience the chasm of the digital divide, that between technology haves and have-nots. One demographic group that is most likely to experience the digital divide is the homeless, who by definition are persons who "lack economic capital" (Hersberger, 2002/2003, p.45) and whom Moser (2009) described as "socially 'at risk' people" (p. 705).

Some research has explored the perspectives of the homeless on technology use (Borchard, 2010; Eyrich-Garg, 2010, 2011; Hersberger, 2002/2003; Pollio, Batey, Bender, Ferguson, & Thompson, 2013). Few studies have however focused on understanding this population's technology uses for literacy purposes (Hendry, 2011; Muggleton & Ruthven, 2012), in distinction with more general technology uses that might enhance their access to public health facilities or social services (Freedman, Lester,

McNamara, Milby, & Schumacher, 2006; Rice, Milburn, & Monro 2011; Harpin, Davis, Low, & Gilroy, 2016). Further, much of this research was conducted among adolescent and homeless young adults, who have problems distinct from the homeless in other age groups, such as beyond-quarterlife adults (Eyrich-Garg, 2010, 2011).

This study explores the literacy practices that technology affords homeless adults and the literacy practices which they choose to employ with it. We are also interested in the meanings the homeless make regarding technology and how they engage these meanings to negotiate the social identities they desire for themselves as technology users and as literate individuals and citizens. However, we understand that technology and technological innovations do not influence literacy practices alone, but are also influenced by the social and cultural environments in which end users reside (Kern, 2015). In this work, the social environments were the State and the nearby state university and hence we asked our participants for recommendations for these institutions to support their literacy practices and access to technology. The following questions reflect these research interests:

1) What technologies and media do participants have access to?

2) What literacy practices do participants engage with these technologies and media?

3) What attitudes and meanings do participants have for the technologies and media to which they have access?

4) What recommendations do participants have for the State and university to support their literacy practices and access to technology?

The Definition of Homelessness

Before embarking on the literature review, it is necessary to define homelessness and how it is conceptualized in this study. In the 2016 Annual Homeless Assessment Report (AHAR) to Congress (Henry, Watt, Rosenthal, & Shivji, 2016), a homeless person is defined as “a person who lacks a fixed,

regular, and adequate nighttime residence" (p.2). A person "who is a resident in transitional housing" is also considered to be a homeless individual, according to the U.S. Code § 254b - Health centers, Title 42 of Public Health and Welfare (section 5A) and federal programs include "those living with others because of economic hardship" (Cackley, 2010, p. 85). More recently, the US law has extended the definition to embrace "those who will imminently lose housing" (Carter, 2015, p. 1).

In conjunction with the above, our definition of a homeless person was provided solely by the self-declaration of our participants, in response to the question, "Where do you live?" As such, the definition reflects our participants' interpretation of their lived experiences and daily reality.

At the same time, we recognize that the structural factors cited above, such as "lack of affordable housing and employment opportunities" (Cronley, 2010, p. 319) are certainly contributing influences to homelessness in our population. We view these factors therefore as the larger social and cultural context that defined and delineated the boundaries of homelessness for our participants, who declared that they had been staying in shelters in the nighttime, sleeping on the street, or living in transitional accommodations with friends or relatives.

The Homeless and Access to Technology

It appears that as time has progressed, technology access and use among the homeless has improved and become more varied, even though it still lags behind the levels of access among the US general population (McInnes, Li & Hogan, 2013). In one early survey study among homeless drug users in Long Beach California, Redpath et al. (2006) found computers to be accessed and more often used (55 %) than the Internet itself (19%). Twenty-five percent among these computer users had owned a computer at some point in their lifetime. In Las Vegas, Borchard (2010), who studied homeless young adults, visited a homeless shelter where residents brought all kinds of technology with them, including portable DVD players, laptops, mp3 players, and smartphones.

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Eyrich-Garg (2010) found that a sizable portion of the homeless she studied in Philadelphia had a mobile phone (44 % of the sample) in the month prior to her survey. Access to and computer use among the unsheltered homeless men and women in Philadelphia was on the rise too (Eyrich-Garg, 2011), with almost half (47 %) of the sample reporting that they had access to computers and the Internet through public or university libraries.

More recent studies confirm that there is a great deal of technology use among the homeless. For example, Reitzes et al. (2017), who studied homeless people in downtown Atlanta, found that more than half of the surveyed homeless (60 %) "owned a cell phone, used the Internet, or had email access" (p.145). Guadagno, Muscanell, and Pollio (2013) too found that the use of social media among homeless young adults in two different cities, New York and Los Angeles, was ever-present and roughly the same as among those who were not homeless.

Technology Use Among the Homeless

There is a great deal of research on technology use among the homeless for public health purposes in the U. S. Freedman et al. (2006) recorded the use of mobile phones with homeless people in treatment for drug addiction as a means of keeping in touch and preventing relapses. Redpath et al. (2006) found that the Internet can be a valuable resource for homeless populations with HIV—provided they have access. Rice et al. (2011) have also found that social networking through cell phones and the Internet can help increase condom use and decrease substance use among young homeless adolescents. According to Rice, Kurzban, and Ray (2012), social networking may even benefit the mental health of homeless youth.

A few studies have explored educational technology uses. For example, Woelfer and Hendry (2009) reported on the efforts by nine service agencies in Seattle to provide young homeless adults with access to information on topics such as employment, housing, homeless advocacy, or food, using

traditional technology and resources such as brochures, pamphlets, wall displays as well as newer technologies such as computer kiosks with printers, cell phones, and the Internet. In a later study, Hendry et al. (2011) investigated an initiative, also in Seattle, that brought a curriculum to a homeless shelter that taught technology use to homeless young adults for the purpose of acquiring skills to improve their station in life.

In another study, homeless adults were found to have used email, the Internet and Myspace primarily for connecting "with family (55%) and friends (71%)" (Pollio, Batey, Bender, Ferguson, & Thompson, 2013). Eyrich-Garg's (2010) earlier research on mobile phone technology shows the importance of this technology use in the daily lives of the homeless, including communicative functions such as contacting employers, talking with landlords, or making a call in an emergency. More recently, Buccieri and Molleson (2015) reported on homeless youth developing a mobile app to provide their peers with "improved access to supports and services" (p. 232). The researchers viewed the program as an example of homeless youth empowerment.

Variables that Influence Technology Use Among the Homeless

Reitzes et al (2017) found that for the homeless age was a factor associated with "computer knowledge, Internet frequency, and having email accounts" but not with "cell phone ownership or frequency of use or infrequency of email use" (p. 155). That is, the younger homeless (18-44 years old) tended to know more about computers, own more email accounts and use computers more often than the older homeless, suggesting that generation and computer literacy divides are due to "younger people's greater exposure in school to computers and their greater cohort interest in Internet and email" (p. 155). The researchers also noticed that the concept of ownership and nature of homelessness (e.g., how long, how often and how recently they had become homeless) moderated "the availability and use of cell phones, computers, and emails" (p 145). Specifically, the researchers found that the longer and the more

often the individuals were homeless, the less likely they were to own and use a cell phone, computer or email.

Other research has shown access to be less of an issue within close age groups. For example, Guadagno, Muscanell, and Pollio (2013) have shown that homeless youth in two different cities, New York and Los Angeles, are as technologically savvy as their non-homeless counterparts (college students). Both college students and the homeless youth in this study used the Internet for recreational purposes (e.g., playing games) or for communication such as "private messaging or blogging" (p.88). The homeless youth in this study participated in a program run by multi-service shelter organizations.

Taken together, research has shown that access to technology has improved among homeless adults in U.S., but the purposes to which it has been employed have concerned primarily public health and business-related functions (e.g., communication with social services and agencies) and social networking, with only few studies reporting educational uses and literacy practices, especially among the homeless adults. We thus explore technology-based literacy practices, in the particular social and cultural context of homeless adults. This is because we regard technology and literacy to be in an interconnected relationship, with one influencing and affecting the other. In today's world, this relationship is stronger than ever, as "material **technologies** (emphasis in original) shape how we read and write, how we construe and share knowledge, and ultimately how we understand ourselves in relation to the world" (Kern, 2015, p. 2).

Theoretical Frameworks

We define technology very broadly, including print-based technologies such as books, magazines, hardware (e.g., computer, mobile phone) and software, both newer and older iterations of these and of similar kind.

We view technology as an "object" in the sense employed in symbolic interactionism (Blumer, 1969, p.10), where an object is any and every object "that can be indicated and referred to" and that "consists of the meaning that it has for the person for whom it is an object" (Blumer, 1969, p. 11). Hence the meaning the person associates with a given object defines its use, as it is believed to control the person's attitude about, action toward, and discourse about that object. Accordingly, technology in our study is any and every sort of technology that is referenced by our participants, irrespective of whether or not they avail themselves of this technology. Any technology our participants name also encompasses their attitudes and the meanings that they hold for it. These perceptions in turn shape the use of it by these participants.

It is worth noting, however, that the objects with which individuals deal are not only "physical objects" or technology objects as they are in our study, but may also be "social objects" (e.g., a friend) as well as "abstract objects, such as moral principles, philosophical doctrines, or ideas such as justice, exploitation, or compassion" (Blumer, 1969, pp. 10-11). In our study, it is therefore important to situate the world of technology objects (physical objects) that the homeless adults list in relation to other objects in their immediate environment. These latter objects would include social objects (e.g., the city's and the university's infrastructures and policies that enable homeless adults access to technology, as well as their peers, families and friends) and abstract objects, which are the moral, social and cultural messages that these policies or individuals communicate to the homeless and to outside observers as well.

Access has been defined as a "fit between the individual's needs and preferences and the characteristics of the service system" (Ha, Narendorf, Santa Maria, & Bezette-Flores, 2015, p. 27). In this study, it is a fit between the homeless person's technology needs and preferences and the ability to

obtain and make use of it either independently or through relevant social service providers and libraries, local and university-based.

The uses of technology that are of interest to this study are broadly conceived as literacy practices, which include reading, writing, viewing and listening and other literacies and that involve traditional texts and media as well as multimodal texts and multimedia. As such, our view of literacy practices reflects the New London Group's (Cope & Kalantzis, 2000) notion of "multiliteracies" that relates literacy to "the increasing multiplicity and integration of significant modes of meaning-making, where the textual is also related to the visual, the audio, the spatial, the behavior, and so on" (p.5). We also share with the New London Group the view of literacy practices as the means for participating in "public, community, and economic life" (Cope & Kalantzis, 2000, p.9), and as a result, we explore which literacy practices with technology the homeless adults engage in and towards what aspects of life.

METHODOLOGY

The Research Context and Participants

The purpose of this qualitative analysis (Creswell, 2007; Stake, 2000) was to examine the technology use for literacy purposes among homeless adults. As part of a larger case study, this research explores the literacy practices of people who live, work, study, or play in the parks near a university and the state capital in the southeastern United States. We chose to work in an urban city in this region because it has a large population of the homeless in the downtown area and near the state capital, where our university is located. As an urban institution, the university is committed to supporting "the work of faculty tackling the challenges of an urbanizing nation and world" (University Mission Statement).

The particular sites for our research are three downtown parks where homeless adults socialized and met their fellow homeless friends. In passing through these parks, we noticed that many played chess and some were reading or talking on the phone. Since our background and research interests are in

literacy, we naturally became interested in their literacy practices and their perspectives on these experiences. More significantly, we hoped that this research would shed light on the ways in which the University and the State could support and extend those practices for this population (Tinker Sachs, McGrail, Lewis Ellison, Dukes, & Zackery, 2018).

A selection criterion was then that the participants had to be in the parks at the time of study and be 18 years or older. Tourists were excluded. Using these purposeful sampling criteria (Stake, 2000), we were able to recruit 22 participants, with the majority being homeless or in transition out of it. For this analysis, we included the data that concern technology access and literacy use by the homeless and from those individuals who appeared to be transitioning out of it.

As evident in Table 1: Participant Characteristics, our sample had a mix of male and female participants, with African-American, Black and older participants (older than 41 years) in the majority. The second largest group were middle aged (26-40 years old), followed by just two participants in the 18-25 years old age group. Most participants reported that they had either a high school or a vocational degree or certification and had been residing in the parks for more than 5 years. The length of time our participants spent in the parks, which may or may not be related to their homelessness, ranged from 6 months to 6 or more years. Overall, our population sample is similar in composition by age, gender and ethnicity to the one in a large scale study on homeless in downtown Atlanta (Reitzes et al., 2017).

Table 1. Participant Characteristics

Park	**# of Participants**
Park A	7
Park B	9
Park C	6
Gender	
Males	15
Females	7
Participant Status	
Homeless	12

In Transition	3
Have a Home	5
Not Indicated	2
Ethnic Background	
African American	11
White	3
Asian	1
Latino	0
Black	5
Multiracial	1
Other	1
Does Not Identify	0
Age	
Young- 18-25 years	2
Middle Age 26-40 years	5
Older Than 41 years	15
Highest Level of Schooling Completed	
Elementary School	1
Middle School	1
High School	7
GED	2
Vocational	6
Community College	1
Some Community/Some College	3
Associates Degree	0
BA	1
MA	0
Other	0
How long in the Parks	
Passing through	2
Participating in Activity	1
Few Weeks	0
1-6 Months	3
6-11 Months	1
1-5 Years	5
6 or More Years	8
Not Indicated	2

Data Collection

The primary data used for our analysis included transcriptions from 40-minute interviews with these homeless collected over a six-month period. The interviews were semi-structured and inquired into

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the participants' literacy practices in general (i.e., reading, writing) and with technology (e.g., social media use). Our participants were asked to reflect on access to and literacy practices with media of various kind (e.g., TV, magazines). A few prompts asked for recommendations for the State and the University concerning access to technology and supports for literacy practices for this population. Two researchers were involved in interviewing a participant, one researcher conducted the interview and another took field notes and helped with follow-up questions, where applicable.

Following the principles of symbolic interactionism (Blumer, 1969), observational data (field notes taken during the interview) captured the ways in which our participants interacted with physical, social and cultural objects, including other people such as other homeless individuals within a particular park. As such, these data helped to interpret our participants' lived societal experiences. These two excerpts from the field notes in one park illustrate the interaction of these homeless with physical objects that were in their immediate environments as well as social objects such as persons and institutions (i.e., charity organizations).

> Most homeless people are gathered around the benches located at the top level of the park. They are gathered in small and large groups. They huddle together and seem to be engaged in conversation. In contrast, the homeless who are found in the lower level of the park are more spread around the park. They also tend to be clustered in smaller groups or to keep to themselves, sitting alone on the benches in the park or on grass…
>
> A few cars pulled over to the curb with a group of people who brought a lot of food. They were the members of Little Friendship Baptist Church. They had hot soup and small bags with sweet rolls. Another church group brought sandwiches and fruit. One of the homeless seemed to be particularly pleased with having been given fruit. I heard him say to a fellow homeless person,

"I've got some fruit. I don't want to eat junk food the whole day.[1]" Another homeless person asked me if I had a job for him. When I told him that unfortunately I did not have any jobs to offer, he then asked me to pray for him. I promised that I would do that.

Geographic and historical information on the parks was used as additional sources to provide a larger context for the study. We also gathered information on the university and public libraries as well as their regulations and policies concerning access to their facilities and resources by visitors. (Our participants were frequent visitors to these places and they used the technology and other resources available to them as visitors in these institutions.) These additional data sources were used to help strengthen the external credibility of our study, as recommended by case study methodologists (Creswell, 2007; Stake, 2000).

Data Analysis

Constant comparison methods (Corbin & Strauss, 2008) were employed to identify and analyze patterns across the data and to collapse them into associated clusters of codes and then into themes (Bogdan & Biklen, 2006). Specifically, we identified codes that referenced various types of reading materials such as books, magazines, legal briefs, online databases, websites, television shows, radio programming, and videos. We collapsed these into related groups of technologies which we referred to as the following: traditional technology tools and resources; communication information technology tools and resources; and mass media and popular culture media and technology tools. Next, we mapped out the literacy practices associated with these technologies (See Appendix A: Technology Access and Use by Homeless Adults).

[1] The participants' idiosyncratic language has been preserved in all quoted material to honor their voice and speech preferences.

We categorized the experiences with and attitudes toward technology and their accompanying literacy practices along the continuum, from positive to negative and we also included in between and mixed perspectives. The recommendation codes for the State and the University included institutions such as public libraries, the Capitol, or local businesses and the university library for the University, all of which were collapsed thematically based on technology use or literacy practice.

During open coding, multiple researchers independently coded data and then met together to come to agreement on the emerging categories of codes. Coding collectively served as peer examination and helped in reaching intercoder agreement among the researchers (Stake, 2000). During this process, the researchers discussed their individual analysis, negotiated differences, addressed questions and comments from each other, and recoded the data based on shared understandings. They also modified coding categories and their descriptors, where necessary.

Symbolic interactionism (Blumer, 1969), guided the exploration of the meanings our participants assigned to various technologies (i.e. physical objects) and the accompanying literacy practices, which included reading, writing, viewing and listening to traditional texts and media as well as multimodal texts and multimedia, as our view of literacy reflects a multiliteracies perspective (Cope & Kalantzis, 2000).

Symbolic interactionism informed our analysis of how the influences that social objects, such as the city's infrastructures and library regulations, and other individuals' technology uses affected our participants' access and use of technology. These factors also affected their attendant literacy practices, as well as their underlying nascent ideologies regarding these resources.

The coding assignment for this latter group of influences included the codes for access to technology, thoughts on technology and technology preferences, and literacy practices with technology, which were later collapsed into a larger theme of "differing experiences, attitudes, and understandings

about technology and literacy" among our participants, the homeless adults. This theme also referred to the ways in which these participants used these experiences, positions, and understandings to negotiate the "public, community, and economic life" (Cope & Kalantzis, 2000, p.9) as well as personal life for themselves and in conjunction with those around them, which we illustrate in the Findings.

Limitations and Overview of Key Findings

One limitation of this study is that the data are from one region and it is likely that some of the experiences of our participants might be characteristic primarily of this particular region, and not others, especially concerning the public facilities with technology and services available and the policies regulating access to these resources. Studying the homeless in other regions would allow researchers to explore the degree of variance in experiences with technology and literacy practices among this population in other areas of U.S. Additionally, a larger number of participants from different adult groups, would be helpful for exploring age-related subgroup analyses. The majority of our participants were in the older age group (40+ years old) with two in the age group of 18-25 year old. Studies have shown age-related differences in technology use among homeless (Guadagno, Muscanell, & Pollio, 2013; Reitzes et al., 2017) but less is known about literacy practices of homeless adults from different age groups. These are the areas that need further research.

Nevertheless the findings from this study indicate a range of experiences with technology and literacy practices among older adults within a specific context, revealing trends in literacy practices and technology access-related issues. The findings also reveal the powerful role of the city's and the university's infrastructures and policies (i.e., social objects as per symbolic interactionism) in mediating access to technology and literacy practices they afforded the homeless in our study. At the same time, the findings highlight individual differences, suggesting that not all homeless are the same even within

the same age group because they face different problems and they might show varied literacy and technology use preferences, based on their interest, pleasure and expectations from these engagements.

The insights from this study should be valuable to educators and universities, city governments, and community social services such as libraries and homeless shelter administrators for improving adult literacy and community literacy programs. Thus enriched programs could enable these institutions to provide this group of citizens with better and more individualized opportunities for future employment. They might also provide avenues for the development of both the literary and the whole person—character, mind, and soul, resulting in more fulfilling social interaction and personal lives.

FINDINGS

Our research questions serve as an organizational framework for presenting the findings and even though they are discussed separately, they are interrelated and inform one another.

What Technologies and Media do Participants Have Access to?

The majority of our participants owned a mobile phone. However, they often were unable to make use of this device all the time because they lacked the funds to purchase a service plan with unlimited minutes and for a longer period of time (See Appendix A: Technology Access and Use by Homeless Adults). One participant accessed a stationary phone through the local library.

The most available technology to our participants was the computer, followed by television; however, only two participants owned a computer. Most participants had access to computers through local or university libraries, and a few participants used computers that were available in shelters. Another participant was able to get access to a computer in a wellness center but only one participant had a tablet device, in this case an iPad.

The participants were very creative in securing access to television, which may also be indicative of the importance of this technology in their daily life. For example, some visited friends to be able to

watch it at their homes. Others accessed it at sports bars (e.g., Hooters), as one participant explained, "You stand outside and watch a football game," or at the CNN cable network café. To be able to watch television at the CNN café required making a purchase such as a drink or a sandwich, but only one participant mentioned visiting the CNN café for this purpose.

The participants had limited access to the Internet, social media, and online resources. The participants could access the Internet either in public or university libraries, but access to the Internet in these places was restricted to short periods of time only; "The maximum time in most places is about an hour," reported one participant, and another participant noted that he "would definitely like to see that increase."

The public downtown libraries allowed the participants to use the computer room twice for one hour but the sessions could not be immediately successive. The homeless individuals were required to bring confirmation letters from shelters (they used the shelter address as a substitute for their residency address) in order to be issued courtesy ID cards (Personal Interview with the Librarian, March 2015). This was problematic, because many of our participants "did not do shelters", as one participant remarked.

Two participants accessed Internet on their own computers and one could get it on a phone. Another participant accessed social media in other public places such as chain restaurants and cafés, but she was concerned that access to Wi-Fi in these places was not for all, perceiving it perhaps as a social justice and equality in accessibility issue: "I go to Starbucks, McDonalds, I think most places have Wi-Fi, but not in a sense where you have random people together."

Few participants owned accounts for social media platforms such as Facebook (3 participants) or email (2 participants) and only one participant owned a personal blog, and these were most often the participants who owned a mobile phone and had an active service plan. However, as mentioned earlier,

only a small group of the participants were able to afford a phone service plan for an extended period of time.

More than half of participants had access to radio through their friends and the same number of participants had access to books through the public and university libraries and through the city which provided a portable open-door library in one of the downtown parks. Our homeless participants helped themselves to the newspapers and magazines lying around in various businesses and parks. Neither downtown businesses nor park authorities intentionally provided these reading materials to our participants.

What Literacy Practices do Participants Engage with Technologies and Media?

General Technology Uses

The most frequent communication technology use was a mobile phone even though the participants could not use it all the time because they could not afford long term unlimited service plans. In general, mobile phone use included business communication (e.g., making calls to debt collection agencies) and personal communication. A male participant elaborated on his phone use for business purposes in these words: "My phone usage is probably going to be 911 and maybe check, like I said maybe checking on an apartment and stuff." He avoided using it for personal communication because he felt he had nobody he liked to call to: "But, just to be hanging around just calling, 'Hey, man, where you at and.' Don't know nobody I like that much that, that we need to do that, you know what I mean." Another female participant too "talk[ed] to 'em on the telephone" utilizing the social networking service on her phone but she had a small group of people she could contact. She explained: "Basically, that's it, you know, listen on Facebook, talkin' to uh, like family, I don't have a lot a people that I communicate with on a daily base."

More typically though, personal calls were made to family members and friends, to "stay in touch," or, as another participant put it, for "just talking." Some participants used other features on the phone such as texting, GPS, email, or the Internet. One participant, whose phone had been deactivated because of lack of funds, used his phone for a clock, repurposing this physical object for this sole function. Examples of entertainment television use were watching a football game or a cooking show and an example of viewing for information was watching television to "help me learn what's happening."

The use of radio was next, and the prime purpose of listening to the radio was either "get the news," stay informed," or relaxation. For relaxation, for example, one participant loved listening to R & B stations and another favored jazz.

Less than one third of our participants mentioned the use of Internet. One participant explained: "But, then the purpose of this is for me to be able to email, jobs, information about housing, you know, um, I do more research in areas like that than I do anything."

The uses of online sources such as a Nexus Lexus database or YouTube video database and social media were limited too. Those who availed themselves of these newer technologies, used them for social networking and chatting with friends, to satisfy higher order needs such as social interaction and communication, as it is illustrated in this excerpt:

P: I write pretty much, (laugh) all the time some, type of notes or somethin'.

I: Uh, huh. What kinds of writing?

P: Well, I do bl- blojins ((*blogging))

I: Uh, huh.

P: About my life with medical experiences.

Other uses of the Internet included "looking up local restaurants," study[ing] number theory," finding information on "home remodeling," or emailing.

Literacy Practices with the Traditional Technology

Traditional technologies such as books or magazines meant a great deal to the participants and about half of them accessed them on a regular basis. Some participants were voracious readers, exhibiting sophisticated taste and having preferred authors. For example, one participant called himself a "conscientious reader" and he admitted that he loved reading "legal dramas, um, like John Grisham, uh, I like John Sanford. Um, there are different types" while another participant leaned toward autobiographies and he provided a number of reasons to account for his taste:

> I like reading about Thurgood Marshall. I like reading about Sandra Day O'Connor. I like reading about, uh, Justice Rehnquist, the early pioneers, um, especially, uh, Thurgood Marshall because of where he, where he grew up, he had nothing. He was one of your better civil rights, uh, leaders, and the reason they made him a solicitor in the United States Supreme Court justice is because he used to fight for civil rights and the government was having a, having a hard time back in that time suppressing people of color. They would try to keep them illiterate.

Another participant despised fiction, "I just hate fairy-tales," but he enjoyed reading "medical books," because as he explained: "I'm just fascinated by microbes and parasites, and st- ((+stuff)) you know, stuff that keeps the body healthy, all that stuff (quiet laugh)." He also favored reading the money and political sections in the daily paper as he was interested in "anything that deals with, um, the situation with the dollar bill and the world economy." A female participant offered that she "read the newspaper, or either some type of magazine that you know might be my interest, *Housekeeping* or I might do a book on, uh, what's her name, Katherine, Katherine Higgins?" She had not finished reading her latest book,

Price of a Child, but she found the story, which is about "how people stealin' people children," captivating her interest.

In addition, the *Bible* served as the main text for some participants. For example, this male participant read it daily as he considered it a reliable source of knowledge and also a source for strengthening his spiritual growth. He explained,

> When I lay down at night, I read my Bible cause I want somethin' good to be, see you have to, ((not alone)) we have to feed your body physically, but we have to feed our body spiritually…And that's takin' in accurate knowledge.

Alternatively, this participant used the Bible as inspiration for his writing:

> Uh, most, most of the things would be, uh, spiritual things. Oh, gosh, uh, I wrote something several years ago called "Am I My Brother's Keeper?" and it dealt with how we treat our brothers, you know. Uh, I'm not the most spiritual person, but I, I believe in Jesus. I believe He is my Savior, Lord and Savior. Uh, I think the example that I, that I gave is, you know, we can be obedient, and if a man needs a, a shirt or
> comes to you and he's cold, and you have ac- ((+access), access, you know, if I just give him my shirt, my jacket, then I, I'm being obedient. But if I give him my jacket and my shirt, I'm showing Jesus. I'm showing God love. You know, it's kinda stuff
> like that. You know (( )).

What Attitudes and Meanings do Participants Have for the Technologies and Media to Which They Have Access?

Access - Related Attitudes

When asked about access to technology and the meaning it had for them, the homeless adults in our study communicated differing attitudes and understandings. For example, two of our participants responded in a dismissive tone, perhaps even in a voice of self-doubt and insecurity, with simply "Naw" or "No." One of these participants also expressed a preference for traditional technologies and literacy practices: "… mainly just reading?," perhaps trying to sound more positive or feeling less guilty that she could not offer more information in response to this question.

Another female participant was not sure what kinds of technology to include in her response and she asked the researcher for clarification, "When you [are] saying technology, you mean computer?" When the researcher began to supply prompts "computers, cell phones, Kindles, Smartphones, etc.," she immediately stated her preference for traditional technologies, "I'm not much of a phone person… I am a radio person. I do like the radio, I use the computer somewhat but I'm more of a book person." Another participant had given up technology, especially email, as she feared she was too old: "I'm fifty-seven. No, I don't know how to work all that stuff." She described herself as "computer illiterate" and when asked if she would want to be computer "literate," she explained that she was not planning to change her technology usage: "I'm at the stage where I really don't care. It's, I'm fifty-seven." However, other participants were interested in acquiring technology knowledge, which would have enabled some participants, for example, to obtain and benefit from the information about disability assistance programs, and one participant referred to it as "a hand up and not a handout":

> What I'd like for them to offer is a few skills, computer access, uhhhh. I know for other people clothes, food. And I'm trying to get on my file for disability and because of the work I've done and the money I've made I'm eligible for 17,000 something dollars a month.

Alternatively, one male participant was purposefully vague in his response as he referred to technology as "stuff" and he could not provide any particular technology examples. Based on his

responses about technology, it appeared that discussing technology was a sensitive topic to him as if it might have reminded him of being the homeless or of his lack of access to technology resources. The same attitude was also evident in these two sample statements from other participants: "I have very little access to that stuff." (slight laugh). "But, uh, for someone who doesn't do shelters, uh, you're really, really limited."

The participants' use of vague language, as in "that stuff', combined with pauses and vocalic and prevocalic communication signals (e.g., uh) and laugh, may also imply hidden feelings of discomfort and hesitance when speaking about the technology they do use, potentially reflecting low self-esteem or self-respect for themselves as technology users in their current life situation (i.e., being homeless).

Many participants stated that they did not appreciate the existing access-related measures and policies at public libraries, especially the treatment by the guards there of homeless people, which they perceived as a form of discriminatory behavior. One participant captured this sentiment in these words:

> It's like a giant hemorrhoid to go in there, and you just want to sit down, no disrespect intended, to do your reading or if you've got some legal work to do, then do it,
> like cause who wants people looking in their stuff and, uh, ((or else)) they got metal detectors in there and they got stuff in there sensitive to protect their books, which I understand they got to do that and for the safety of the library. But, again, they're not police officers, or they don't have that right.

The participant explained further his objections to having his personal belongings inspected by the guards:

> You have wanna be, poli- ((+police)), uh guards in there, that's wanna-be police officers, who under Titles 3 and 4 of the uh, (( )) search and seizure rule, that, uh, try to stick their hand in your stuff or try to, um, search your stuff and they don't have police officer status.

This participant considered legal consequences for the university policy:

P: Uh, the police are overaggressive.

R: Overaggressive.

P: Yea.

R: Alright.

P: Uh, I mean, little, small, minor things, ten or fifteen officers come out prepared. I'm, uh, I'm, uh, gonna ((*going to)) say this. In the near future, I expect a lawsuit to be filed against the, uh, [university] police department.

One of the public downtown libraries that our participants frequented had, however, a more flexible policy that allowed a wider range of computer and Internet uses, including "the educational, informational, cultural and recreational needs of the Library System's diverse community" (City Public Library System Internet and Computer Use Policy, 2006, p. 1).

Attitudes toward Mass Media Communication

While most television viewers in our study saw the benefits of television such as "keep[ing] you abreast of what's going on "or "see [ing] visually," some participants were concerned about the negative effects of television as well. For example, this participant argued that the only program worth watching was the news and those other programs, which he identified as "anything else," "would be contaminatin'." Another participant echoed this sentiment yet for another reason. She declared, "I hate T.V. because all the bad messages in it," and then elaborated further on the grounds for her objection to it, which concerned its potential for racial bias and stereotyping. She stated: "Too many bad things going on in television, especially the commercials are ugly, especially against black people." One other participant was not interested in television because he found it extraneous: "So, if, if you're not really geared towards entertainment, then television is irrelevant."

The participant who disliked television for showing programming with racial and stereotypical messages found radio programming problematic for yet another reason: "Uh, (exasperated sound), that's nasty music, but I do listen to the jazz sometimes, but that, the lyrics in most of the music is too nasty for my ears," implying potentially offensive language or content.

This participant disapproved strongly of the Internet use for entertainment purposes in public libraries. He stated:

> Um … I noticed that, and like I say, I don't know. It's, it's just in general observation that a lot of times there are people who are just sitting there instead of reading, or the news, you know, or looking at things like check [checking] things outside of their emails, it's, who are watching videos. You know, all this crap all day long, bobbing their head.

Interestingly, this participant's observation aligns with the university library policy for computer use by visitors, which states that "All computers in the library are intended for research purposes" (IS&T Computer Ethics Policy 3.0) (Policy-Visitors-Computer Use and Policy & Procedures, 2008, p. 2).

Alternatively, another participant refused to use the Internet because he believed that "it's too much … greed on the Internet and there's also too much false, falsified stuff. It's, it's easy to be manipulated by usin' the Internet." This participant's criticism of the content being published on the Internet adds to the earlier discussed critique of the programming delivered through other mass media communication channels such as television and radio.

Context-Related Attitudes

Yet another participant commented how context determines what and how much he reads, explaining how his current social status prevented him from reading avidly from the genres he favored. He stated:

> Uh, when I'm in a structured environment, uh, per se, off the streets, uh, I probably read

> maybe three or four novels, um, usually mystery or, or espionage, or something…But while I'm out here, uh, in the streets, I, I probably don't read at all. … Ooh, boy, uh … I, I guess the newspaper, uh, uh. That would be about it, really, uh.

This response implies that for some homeless adults there is a relationship between the technology and the context, with some contexts and conditions (not being homeless) facilitating the technology use and others (being homeless) thwarting it. The same was true for several participants who engaged in writing practices in the past but not now. One participant stated:

> P: I considered myself years ago to be a, a writer.
>
> I: Uh, huh.
>
> P: I like putting my thoughts on wor- ((+words)) on paper.
>
> I: Do you still write?
>
> P: … Oh, it's probably been, uh, a couple of years since I've written anything.

This participant also admitted that he did not do writing any more even though he used to do a lot of technical writing:

> P: Um, not really, but I have in the past had to, I've assisted people with, uh, writing a résumé, um,
>
> I: Um, hum.
>
> P: I've even done … for the lack of a better term, uh, what they would call paralegal work (laughs).
>
> I: Uh, huh.
>
> P: When I write, um, I can write a legal motion text, from the top of my head. If you told me what it was about, about what you needed, um, preferably not criminal, but like especially, with

civil work. Um, a lot of the statutes, or just, even if I don't know the statutes and codes, I have the, I know the language of proper format for legal motions, and so, I'll write stuff like that out.

These experiences are in opposition to the experiences of the homeless who reported being prolific readers despite their being on the streets, indicating differences among these homeless adults in relating to the print-based technology such as books or magazines and the context where they get access to it. The same held true for one participant who continued to be a prolific writer even when she became a homeless person.

I: Umm, You said you write poetry so how long have you been doing that.

P: I been doing that for years. I just write what's on my mind. That's what poetry is all about. Writing on how you feel so people can understand. You know what I'm saying, how you feel…

Unfortunately, this participant did not get to share her poetry with the audience even though she believed that she had been writing not only for herself but for others as well.

I: Do you ever get a chance to share your writing?

P**:** No, I never get a chance to do that because sometimes I be afraid that people won't listen because they so into they self and not into…being into life. That's what writing is all about. It's about helping somebody else out and not just helping yourself. And that's what writing is all about. It's about helping somebody else.

What Recommendations do Participants Have for the State and the University to Support Their Literacy Practices and Technology Access?

When asked about recommendations for the city, state, and university, the participants shared specific ideas for providing access to technology and media and other resources. For example, one participant clarified a preferable length of time at the computer station, "I would need at least 6-7 hours." The "Policy-Visitors-Computer Use and Policy & Procedures" (2008) in the university library

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confirms the usage time restrictions the participants referenced and it also requires that "Visitors must present a photo ID in order to create a personal ID within the Library's PC Reservation System to reserve time at a community access workstation" (p.1). Many of the participants did not have photo IDs.

The participants had a similar suggestion for the university library whose policies and procedures they perceived as denying the homeless access to technology and resources of the library. One participant communicated:

> I'd like to have more access to library. I'd be able in turn to help other folks. Open a little earlier, keep, keep the doors open. Let folks come in there and read.

This same participant continued with recommendations, as stated:

> Don't stop them from, uh, coming in the library. Letting them, you know, trying (NS- siren) keeping their bags and stuff like that. Have uh, more book stands out here.

Additional recommendations from these participants were that the library should connect the Internet use with "a literacy program that will help people get better at reading" and that "they was helping people with resumes. And they have a job training program that you go in there for two weeks and get on the computer."

A few participants had the same recommendation for the city: "You know, the government need to have some kind of place for the homeless to come, learn how to read and write, learn you know, math and so forth like that." Another participant elaborated,

> I think maybe they should hold more computer classes to make people more computer literate so that people, you know, who didn't finish school or, need to be able to get basic computer skills. This is 2013, so you need to have some type of skills with computers. So, maybe if they could, um, open up some of their facilities, maybe to like a small group of people. Because some people just don't know

> how to work a computer. Not that they don't want to learn. It's there's nobody in place to teach them who wants to do that.

Alternatively, the participants offered recommendations for businesses concerning phone use because they were not sure if the city could help them with access to the phone. Specifically, they proposed that businesses "activate accounts without a two-year contract requirement, because of limited funds." Another recommendation that the participants had for the city was to "put a TV here" (in the park), with news or weather channels."

A few of recommendations for the city and state were less of a technological answer but a relational nature of:

> Try to help them out, you know. Take them where they need to, to be, to lead them the right way, you know, instead of let them hanging out here. You know, find them a job, or some- -Create something. Something has to be done, you know.

> …help us get a job. That's the main, main object ((*objective)), you know, you know, so we can feed ourselves, you know, and you know, get a, get a, get us off the street because there's a bunch of homeless people hanging out in State or, uh, uh, X Park and (uh, where) this park, you know (is for), uh, uh, city of X, you know, they, that's where they hang out, they ain't got nowhere to go.

These two quotes reflect Janks (2013) observation that access to dominant forms of literacy, digital or technological literacies, is not enough, instead it is vital to connect with individuals like these homeless participants to enact culturally specific forms of literacy and agency.

DISCUSSION AND IMPLICATIONS

Technology Access

Access to technology appeared to be a complex and a multifaceted issue for the homeless adults in this study. Most participants admitted that they lacked funds to own a phone or a service plan for an

extended period of time, or a computer, which limited their ability to obtain other technologies on their own. *Affordability* is a term that Penchansky and Thomas (1981) use for this dimension of access. It was understandably a factor for these participants.

According to Penchansky and Thomas's (1981) behavioral model for health service access analysis and that is also salient to this study, affordability falls under the availability and accommodation dimensions of access. In our context, *availabilit*y refers to the supply of technology-sponsoring services in relation to the needs of the homeless, while *accommodation* denotes the rules and structures for technology use and access established by the technology-providing services and the homeless person's ability to meet them. As indicated above, the participants found these areas of library service not satisfactory.

As a result, many of our participants resolved to get access to technology through service-oriented organizations such as public or university libraries. Although these service providers had visitor policies in place which allowed our participants some access to computers and the Internet as well as books, papers, and other reading materials, there were some areas of service that did not necessarily work for our participants, and they made specific recommendations to us as to how to address them. Particularly, they wished that libraries would provide more computer workstations and extend the length of time for use of the computer and the Internet.

Accommodation issues were also evident in the ways in which the library security guards or police officers treated the homeless adults who visited the libraries to get access to computers, the Internet, and other services. Our participants characterized the way they were treated in these spaces as disrespectful and discriminatory. Recall the participants' strong reaction to the use of metal detectors, the searching of their bags and not allowing them to keep their belongings to themselves while on the premises.

Alternatively, some participants wished to use the computer and Internet for entertainment purposes, for example, as in watching YouTube video. Such uses, however, violated the university library computer use policy and regulations that permitted only research activities on the machines supplied by these institutions. This situation embodies yet another dimension of access and that is that of *acceptability* (Penchansky & Thomas, 1981), which refers to the fit between the characteristics of services available and the preferences of individuals availing themselves of these services. As our participants indicated, the computer and Internet use services available to them as visitors to these institutions did not necessarily align with their individual preferences for these services.

Despite this array of challenges with getting access to certain technologies and certain services, overall the homeless in this study had access to older technologies such as books and magazines and related resources, a trend that has been observed in previous research (Borchard, 2010; Eyrich-Garg, 2010, 2011; Reitzes et al., 2017). The participants only infrequently utilized the Internet and web-based tools and social networking sites (email, blog, Facebook), because of limited access to these technologies. Instead, they used offline media and technologies such as television and radio, phone and books and newspapers. Additionally, unlike the homeless in other studies who utilized the technology resources provided in shelters (Borchard, 2010; Hersberger, 2002/2003; Moser, 2009), our participants accessed technology more usually in the public or university libraries and through other sources, such as friends or businesses (e.g., restaurants, cafés, fast food providers, wellness centers).

Age was another factor that appeared to explain why so many participants preferred and were more comfortable with television, radio, phones, books, and other older technologies but not the Internet, social media, and newer technologies. These participants' technology preferences stand in stark contrast to the tendencies by the homeless youth who are often comfortable with using social media (90% of sample) and mobile technology (Harpin, Davis, Low, & Gilroy, 2016; Reitzes et al., 2017). Our

study extends these findings by adding the age differentiation in literacy practices as well, with older homeless veering toward the literacy practices associated with older technologies and traditional texts, many of which were social literacy practices, rather than the literacy practices seen with newer technologies and newer text formats.

These findings suggest then the relative importance of the specific preferences and meanings the homeless people assign to various technologies as well as the expectations they may have from the services that provide access to these technologies and resources. Accordingly, public and university libraries, along with city and community technology providers need to attend not merely to affordability and availability issues concerning technology access for homeless adults, but also to the accommodative and acceptability dimensions of access. In other words, these providers, institutions, and policymakers should be aiming to secure not just the *presence* of technology in communities where the homeless reside but more importantly, the technologies to which these individuals *wish to have access*. They also need to align use policies and regulations more thoughtfully with use preferences by those who arguably are in need of these services the most, homeless persons. So how might one do that?

First, there is a need for removing stubborn attitudinal barriers. This necessitates coaching and empowering staff, security guards and police to becoming welcoming to homeless visitors, respecting and valuing them as users seeking services and as individuals as well. These patrons have "the right to information" and "public libraries have an obligation to serve everyone in their community" (Bardoff, 2015, p. 358). With that accomplished, they can build supportive relationships with these persons and diverse members of the community at large.

Second, there is a need to do more to facilitate access to and to enhance the use of technology and resources by these institutions and service providers. This can be done by modifying restrictive rules and regulations, extending the time length of computer use, and providing access to additional computer

workstations and television viewing areas as well as providing connections to Internet service providers in the area, as is now common in cafés and certain restaurants. Modifying restrictive definitions of acceptable computer use to include other than research activities such as film or video viewing is another form of support for homeless individuals. More importantly, inviting the homeless to serve on the library boards and committees would ensure their technology use needs are met and it will also indicate that their input and voices matter.

Third, for those homeless individuals who do not visit libraries or shelters, city and state authorities should offer alternative access initiatives. For example, one of our participants suggested that the city place a large television screen in the middle of the park. Perhaps the city, with or without help from business sponsors, could also make available portable computer stations or laptop carts with free access to Wi-Fi connectivity and free web-based calling services such *Skype* or *What's App*. We know from our participants that a mobile library in one of the downtown parks to which they had access had been well received and frequently used by them.

Literacy Practices with Technology

On the whole, the literacy practices with technology in which the homeless engaged in this study involved reading and writing texts and media (e.g., television, YouTube videos, magazines and newspapers). As such, these literacy practices are aligned with the theory of multiliteracies as they integrated a multiplicity of meaning-making forms, formats, modality and communication channels (Cope & Kalantzis, 2000).

With the exception of a few younger homeless participants who used technology for school literacies (e.g., doing homework, typing), the majority of participants employed technology mostly for social literacy practices (Lankshear & Knobel, 2003). These are the literacies that enabled them to participate in various aspects of "public, community and economic life" (Cope & Kalantzis, 2000, p. 9).

Locating job openings or housing information on the Internet, calling landlords or businesses on the phone, and inquiring about employment opportunities and their finances are good examples of the social literacies that these homeless adults took up. They used these technologies in an effort to be able to participate yet again in the economy and become contributing members of the communities in which they lived, played and worked.

Several of the social literacy practices of the homeless adults in this study were also embedded in broader social interaction goals and relationship-based practices, such as staying in touch with friends and family via social media tools (e.g., Facebook, email or mobile technology), and, as a result being able to maintain membership in the communities that matter to them and that they wish still to be a part of. Alternatively, some participants' writing practices such as writing legal memos or resume served a primarily social function (Feldman, 2008), which as one participant put it, might entail "helping somebody else out and not just helping yourself."

Still other social literacy practices, especially those that our participants employed to read and view mass media and popular culture on television, radio, and the Internet, reflected a critical stance towards the messages that these communication channels conveyed to the public about the communities in which they live and about the people with whom they share an ethnic background. To use Blumer's (1969) symbolic interactionism terminology, these homeless adults were critiquing the "abstract objects" (p.10), that is, the ideologies and the cultural philosophies delivered in the programming on television and radio, and by extension, the social reality that these programs chose to communicate about the lives of Black people or the trends in the contemporary music scene. Such reading of both the *word* and the *world* by these participants reflects what Freire (2001) would have considered as using these literacies for the purposes of empowerment. We also see the enactment of these literacy practices by our participants as a form of civic engagement in "public, community, and economic life" (Cope &

Kalantzis, 2000, p. 9) as well as participation in literate and cultural events and social practices within the public and community spaces they occupied.

Many homeless participants were reading for pleasure. They were voracious readers and they had developed sophisticated skills and expertise as a result of frequent exposure to certain kinds of texts and media (e.g., some knew a lot about literary genres such as mysteries or legal drama and were otherwise media savvy). Some enjoyed creative writing such as fiction or poetry although one participant found it difficult to engage in fiction writing in the current circumstances (i.e., being homeless). Creative writing allowed these homeless to describe their feelings and emotions, helping themselves and fellow homeless to cope with their current life situation.

Alternatively, they used expressive writing to help others understand homelessness. Research confirms these and other benefits of expressive writing in helping to deal with difficult personal experiences or situations, leading to better mental and physical health (Pennebaker & Smith, 2016). For our participants, expressive writing had a great deal of relational and social value though, in that, it allowed these individuals to help others, in addition to helping themselves through self-disclosure of their own feelings and emotions. One participant used writing for spiritual growth and strength while other participants read the Bible daily and referred to it for spiritual guidance as they considered it as ultimate truth and authority.

There are several implications from analyzing the literacy practices with technology of the homeless adults in this study. First, since the majority of the participants' activities with technology were social literacy practices, providing the tools and resources for supporting and expanding these literacy practices is important. The social literacy practices that our participants would benefit from are, for example, crafting resumes, job search skills, and finding housing information. These were the areas that they attempted to address on their own but in which they faced obstacles or were unsuccessful. They

would also need help obtaining information about financial or disability public assistance programs and homeless programs available to them in their communities. Some of our participants were in the process of finding this information and we believe that they would appreciate support for these searches.

Second, computers, mobile technology, and the Internet, - the newer types of technologies - can better enable access to information about these valuable resources. For example, a simple Google search for job and homeless assistance programs yields pages and pages of results. From examining some of these programs, we found that many have online application forms available and require creating an account or registration in addition to the options to file an application at their offices. However, as we noted above, many of our participants were uncomfortable with or lacked access to the Internet and computer technologies. Importantly, they would need help understanding public assistance programs, since there is a wide of variety of them. Knowing what particular programs offer, who may qualify, and how to fill out a form and application will enable them to choose the programs most relevant to them and that are most impactful in providing support for their individual needs.

Third, social literacy and technology programs should be more informal and more user-customized, taking into account age, technology expertise and personal preferences. They should be offered for free in public places such as libraries and social services and community resource centers. Local universities also have an opportunity to provide free of charge additional social literacy and technology programs to the homeless adults who live around their campuses. Teacher education students and faculty should be encouraged and supported financially by their institutions to develop and deliver community-based social literacy programs and technology instruction. This may require developing interdisciplinary partnerships with colleagues whose expertise is in social work, economics, and technology.

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Such partnerships give the opportunity for graduate and undergraduate students to get involved early on in community-related service, research, education, licensure and entrepreneurship. For example, at our institution, the Community Psychology program and Adult Literacy Research Center, which provide training in various forms of community service, policy and action, are great candidates for forming such interdisciplinary partnerships. Perhaps most importantly, it would mean reaching out to social workers, financial and job trainers in the communities that serve homeless adults.

We have recently learned of such an interdisciplinary partnership between a charitable religious organization and a downtown public library in our city. The library made available one of their rooms for the members from the charitable organization to meet with homeless persons weekly and offer assistance with finding housing and employment and to run health assessments in order to provide medical assistance or refer them to available resources. Such programs and partnerships are even more worthwhile when created with a university's involvement, which can bring on board experts in public assistance government programs, health and wellness, or finance management. As a result, such symbiotic relationships can significantly contribute to the quality of life and future employability for this group of citizenry.

Importantly, literacy support for our homeless participants should go beyond satisfying their basic information needs (Hersberger, 2002/2003) and social literacy needs (Lankshear & Knobel, 2003). It might include searching for employment opportunities or filing an application for disability support. It should also address higher-order needs such as reading and writing for pleasure and self-improvement, in which many of our participants engaged and which they enjoyed. Here again, the state services, including libraries, community centers, and the university might organize and support community reading and writing clubs or reading and creative writing groups, where readers, novelists and poets, and

artists who are homeless might meet and connect to other individuals with whom they share appreciation of certain literary genres and who might be a receptive audience to their creative writing.

The local university writing studios or centers and adult literacy centers might develop community writing support projects that would offer workshops and writer tutoring opportunities for the homeless interested in creative writing in the downtown area. They might also engage their students in helping the homeless writers to locate places to publish and present their creative writing, an area about which our homeless writers had little knowledge.

"Meet the author" (or novelist, in-residence poet or artist) series at a community or university library that is free and open to the general public is another type of event that could be organized and sponsored by the state, with support from the public libraries, local book fairs and festivals, businesses or the university near downtown. For example, at the time of the writing of this article, we identified five such events downtown at no cost and open to the public; one was in the School of Art and Design at the university and four were at one of the county public libraries downtown.

Information about such events needs to get out to the homeless community though. It took us some time and effort to locate it using multiple search engines and accessing the university, library and special events websites from various local organizations. Since the majority of the homeless in the parks in our study had limited Internet access and also preferred print-based technology tools, flyers, posters, and postcards might be a better channel for sharing information about these free and open to literacy programs and events with members of the homeless community. Students from the local university and other volunteers interested in literacy outreach services could also help distribute and publicize these and other literacy support opportunities for homeless adults in the city. Figuring out how to make these members genuinely welcome, engaged, and supported in these free open spaces must then become a

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common practice rather than the exception. We owe that to these fellow human beings and members of our metropolitan communities.

Conclusion

In this study, we engaged in exploring perspectives held by the homeless on technology use and literacy practices in the parks located near the State Capitol and the State University. There is however a need for more research in this area. For example, one issue that emerged from our work with the homeless is the question of societal (and social) responsibility concerning literacy support for those adults who are "socially 'at risk' people" (Moser, 2009, p. 705). What role can and should educators, the city and the university, and their respective institutions such as libraries, literacy centers and other community services, have in supporting the literacy practices with traditional and new technologies for the homeless in the city's downtown area? We asked our participants for recommendations but we did not have the opportunity to ask this question of educators and university administrators and city policy makers.

Another question of interest to this research is the origin of what our participants perceived as disrespectful attitudes and unwelcoming behaviors towards the homeless by security guards, police and library staff (social objects), and the underlying systems of beliefs and ideology contributing to these beliefs (abstract objects). According to a US edition of the Guardian (Gee, Feb 24, 2017), defensive attitudes, including even defensive architecture and landscaping, at the public library, and in other public places where the homeless seek shelter, indicate the worsening of the attitudinal barriers toward the homeless across US. Uncovering these attitudes and their origin is critical to understanding social construction of homelessness and moving toward to greater compassion and future solutions.

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Appendix A: Technology Access and Use by Homeless Adults

Technology	No. of Participants	Access Source	Use	Literacy Practice
Traditional Technologies/Tools				
Computer	9	Library Self (2) Wellness Center (Shelter)	Internet access Schoolwork Text input (Word) Paralegal work	Reading, writing, viewing Academic study Entering info, recording Technical writing
Magazines	1	Local Businesses	Pleasure, self-Improvement	Reading; determining facts vs. opinion
Books	4	Library, Parks	Pleasure, self-Improvement	Reading; literary interpretation
Paper and Pen	1	Personal supplies	Personal journaling, creative writing	Reflective, expressive writing
Communication and Information Technologies/Tools				
Internet	7	Public library (limited) University library (limited) Owner of computer with Internet access (2) On the phone (1)	Email Research on jobs Information about housing Posting resume Studying number theory Looking up information on books or home remodeling Looking up local restaurants Getting most out of information	Social networking & relationships management Locating information Technical writing Locating information
Online data base	1	University library	For study	Reading, locating

(e.g. Nexus Lexus)				information
Blog	1	Owner (1)	Social networking	Social networking & relationships management
Facebook account	3	On the phone (1)	Keeping in touch with friends	Social networking & relationships management
Email account	2	On the phone (1)		Social networking & relationships management
Mobile/Cell Phone	12	Owner (11) Library (1)	Business communication (e.g., calls to debt collection agencies) Staying in touch with family Just talking Texting Internet access Email access GPS access As a clock	Reading numerical information, management of finances, Negotiation and conflict resolution Social networking & relationships management Information technology competence (ITC)
I-pad	1	Family and friends	Internet access	Writing, social networking & relationships management
I-pod	1		Music listening	Appreciating

				music processing sound and audio content; musical aesthetics
Mass Media and Media Technologies/Tools				
Newspaper	3	Local businesses, parks	To get news	Reading, civic engagement; determining facts vs. opinion
TV	9	Home of a friend Hooters (sports bar)- stand outside & watch At the CNN Café	To get news To watch cooking shows For Entertainment To watch a football game	Viewing, civic engagement; determining facts vs. opinion Viewing, Do-It-Yourself (DIY) expertise Viewing, interpreting and processing audiovisual content; media analysis
Radio	8	Friend's home	To get news To stay informed To listen to music (R &B or jazz) To relax	Listening, civic engagement; determining facts vs. opinion Listening, processing sound and audio content; musical aesthetics
YouTube	1	Library (Internet)	To get information on	Viewing, Do-It-Yourself (DIY)

			home remodeling	expertise

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Reading Ability and Multiliteracy among Rural Saskatchewan High School Students

Jennifer L. Briere, M.Ed, Ph.D.
University of Saskatchewan
jbriere@stmcollege.ca

Jay R. Wilson, Ph.D.
University of Saskatchewan
jwilson@stmcollege.ca

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Abstract

What it means to be literate has been changing with time, technology, and culture with a shift towards including multiliteracy in research and teaching. *Multiliteracy* refers to one's skills and abilities beyond reading, writing, and numeracy (e.g., visual, technical, auditory). The current study aimed to create a foundation of understanding of the multiliteracy practices of rural Canadian youth and to identify individual differences that may impact multiliteracy activities. Rural high-school students are traditionally on the periphery of research regarding literacy activities; this study will inform professionals about how to support these students' unique literacy activities. 424 (214 females) rural Canadian Grade 10 and 12 students (M_{age}=16 years, *SD*=1.09) completed a survey regarding their reading abilities, enjoyment, preferences, and practices both in and outside of school when engaging with print and digital mediums. Participants also provided rankings regarding their most preferred multiliteracy activities. Individual differences (age, grade, gender, self-assessed reading ability) were examined from a social cognitive theoretical approach.

Keywords: multiliteracy, literacy, individual differences, gender differences, rural literacy

Reading literacy research has historically focused on one's ability to read and write in a particular language, as well as on one's knowledge and use of grammar, and associated linguistic structures (OECD, 2010; The New London Group, 1996). However, contemporary research efforts have been moving towards examining *multiliteracies* which includes culturally and linguistically diverse discourse delivered through a variety of modalities (e.g., computers, tablets, video, audio, etc.; Anstey & Bull, 2006; MediaSmarts, 2010; The New London Group, 1996). Becoming a global citizen, or one who places his/her identity within a wider global community rather than only with a specific nation (Anstey & Bull, 2006; Government of Saskatchewan, n.d.), is made increasingly easy through technological advancements. Technology is first designed to meet people's needs and the resulting technology subsequently shapes people's habits (MediaSmarts, 2011). As societies' habits and cultural literacy practices change, educational practices should change in tandem in order to allow students to harness and develop their multiliteracies and successfully achieve better levels of global citizenship. High school students are amidst those who are working towards developing their multiliteracy abilities to help them achieve success and these abilities will continue to change and evolve well into adulthood. Refining global understanding of what it means to be literate for particular groups of individuals may lead to literacy improvements for those targeted groups. For example, males have been reported to lag behind females in reading ability (e.g., Baker & Wingfield, 1999; Brozo, 2013; Freedman-Doan et al., 2000) as well as reading enjoyment (e.g., Baker & Wingfield, 1999; Brozo, 2013; Evans, Schweingruber, & Stevenson, 2002; Mallette, Henk, & Melnick, 2004), however, the potential differences in literacy preferences between genders has limited research. It may be possible to improve reading interest and subsequently reading enjoyment in males if the types of reading material used in classrooms more closely suited their literacy preferences

(Brozo, 2013). The primary purpose of the current research was to examine the self-reported reading ability, multiliteracy preferences, and multiliteracy practices of rural Saskatchewan high school students both inside and outside of the classroom. Although classic literacy research has a long history with many of those findings applicable to present day society, only contemporary research can document the changing and emerging multiliteracy practices of Canadians today. The following sections will provide a brief context to the current study while highlighting the rationale regarding the importance of examining individual differences in multiliteracy preferences and practices through the review of research focused on individual differences in literacy. A summary of the current survey and methodology will be provided followed by the results of the study across all individuals as well as within specific participant groups (e.g., younger vs. older, males vs. females, strong vs. weak readers). The paper closes with a discussion of the results, along with the implications and potential applications of the findings. Recommendations for improving youth multiliteracies, limitations of the study, and future directions are also discussed.

Research Context

This research was part of a larger survey examining the multiliteracy practices of rural Saskatchewan high school students (Wilson, Briere, & Nahachewsky, 2015). The project was driven by the understanding that students' options for learning are changing and developing faster than they ever have. Not only are rural students studying in more flexible environments, but they are also engaging with a number of different literary texts and communication tools. For example, use of, and access to smart phones and the Internet continues to increase year to year (Canadian Radio-television and Telecommunications Commission, 2015; MediaSmarts, 2010) with Saskatchewan ranking within the top three provinces in terms of the highest usage (Statistics

Canada, 2009). Saskatchewan students are moving towards learning in a mobile way and as a result are taking their education and work outside of the traditional school-based educational context into dynamic real-word environments. Such developments are consistent with the global trend of moving to a mobile world and thereby indicates the need to promote more than just reading and writing skills in order to achieve success (Glaus, 2014).

This increased use of digital materials and modalities also brings with it new reading technologies and activities that go beyond the printed book. For example, smart phones, iPads, and tablets have made radical changes to how young Canadians interact with information both in and out of the classroom while the vast and affordable access to the Internet makes digital connection a near constant. As new literacy opportunities emerge and proliferate, societies' literacy preferences and practices are also likely to change. Young Canadians now have many more choices about how, on what, and where they spend their learning and literacy time. Taking stock of these changes to get an understanding of the multiliteracy preferences and practices of Canadian youth will help inform educators and policy-makers regarding the multiliteracy needs of students to foster their development in as many areas as possible. Previous research has begun to document these shifts in youth's reading practices (e.g., Chander-Olcott & Mahar, 2003; Maje, Overby, Tysvaer, & Morris, 2008) and the current research adds to these findings by uncovering individual differences in literacy practices of rural Canadian youth.

The types of materials used for literacy practices are not the only things changing and developing as technology advances. The advent of the Internet brought a major shift in how learners everywhere access information; as the reaches of the Internet widen and the speed and cost of access improve, more and more individuals are engaging with digital media. According to *MediaSmarts* (2014; www.mediasmarts.ca), a Canadian organization aimed at providing

digital literacy resources and research to help Canadian youth become global digital citizens, 99% of students surveyed in 2013 had access to the Internet outside of school. Over 5,000 students collectively sampled from every province in Canada provided survey responses regarding their media use and access. From the sample, several individual differences and patterns of responses emerged. For example, access to the Internet using a laptop or smart phone increased with age between grades 9 and 11. Further, males were more likely to access the Internet using gaming consoles than females making both age and gender potential variables of interest. Finding differences in digital media practices suggests that there are also likely differences in multiliteracy practices that accompany media exposure. A brief review of potential individual differences in multiliteracy are discussed next.

Examining Multiliteracy

In the current study, more than traditional literacy practices were examined which allowed for the exploration of possible individual differences in multiliteracy practices (e.g., types of Internet content; types of digital media used and preferred use). The Government of Canada (2015) recognizes the imperative nature of essential skills in order to succeed in society today which is more closely aligned with the multiliteracy concept than traditional literacy. Essential skills include those typically associated with literacy such as reading, writing, and numeracy, but also include less traditional literacy abilities such as document use (interpreting and using print and non-print materials), computer use, and other digital, communication, and learning skills (Government of Canada, 2015). The multiliteracy content that Canadian youth are engaging with today for both pleasure and information seeking, and the content that they will be required to use in the future for these purposes, involve far more than simple reading, writing, and numeracy. For example, youth are creating and combining video and still images with

written words, music, or other artistic impressions on a daily basis. Everyday communication has moved from the written letter, or *snail mail* of the past, to instantly received emails, text messages, and video chats. Multiliteracy activities such as these abound in contemporary daily society. Understanding what these skills are and the preferences and practices of those who need to develop these skills will help inform the methods and means of promoting those abilities. A brief summary of the research documenting various individual differences in youth's literacy is provided next as a foundation for research predictions in multiliteracy.

Individual Differences in Literacy

The direct and indirect influences of one's traditional literacy (e.g., reading and writing) on various health and socioeconomic outcomes has been studied for decades (e.g., Sentell & Halpin, 2006; Statistics Canada, 2005) and a number of individual differences in literacy have emerged. For example, accounting for literacy ability in adult samples has been found to significantly reduce or eliminate the apparent negative influence of race and education on health outcomes (Sentell & Haplin, 2006). In Canada, far more individuals with higher literacy abilities are employed compared to their less literate counterparts (ABC Life Literacy Canada, 2016). Unfortunately, Canadian youth (aged 16-24 years) seem to be underperforming in literacy when compared to other OECD youth (OECD, 2013; ABC Life Literacy Canada, 2016) which suggests possible age and cultural differences in literacy. Research on potential gender differences in literacy reveals somewhat mixed results. In many instances, females appear to have significantly higher beliefs in their own reading ability than their male counterparts (e.g., Baker & Wingfield, 1999; Eccles, Wigfield, Harold, & Blumenfeld, 1993; Freedman-Doan et al., 2000; Gambell & Hunter, 2000; Marsh, 1989), but not always (e.g., Stipek & Granlinski, 1991). Finding consistent gender differences is easier when considering the perceived value of literacy activities, and

personal interest in those activities. Here, females tend to show much higher interest in, and place greater value on, literacy activities than boys (e.g., Baker & Wingfield, 1999; Eccles et al., 1983; Wingfield & Guthrie, 1997), and females are also more likely to read for personal pleasure (Baker & Wingfield, 1999; Coles & Hall, 2002; Greaney & Hegarty, 1987). It was therefore expected that females would assess their own reading ability and enjoyment significantly higher than males and would demonstrate greater interest in literacy activities overall (in and out of school). Gender differences may not emerge when considering multiliteracy activities, however, because students may have the opportunity to engage with their preferred medium, raising the enjoyment of the activity for the individual.

Finding individual differences in literacy is consistent with *social cognitive theory* which would suggest that the individual differences in literacy described above may be influenced by one's self-efficacy in various literacy activities, which in turn influences literacy engagement and achievement. According to social cognitive theory, perceived self-efficacy plays an important role in shaping outcomes associated with the interactions that occur between individuals' behaviours, personal factors, and environmental ones (Bandura, 1997; Schunk, 2003). In other words, our perception of our own abilities in a particular domain is influenced by complex interactions among our personal, and environmental factors, which in turn return to influencing perceived self-efficacy. Literacy self-efficacy may follow a similar process; positive literacy practices may be influenced by motivation and perceived literacy abilities (e.g., Scott, 1996). Literacy motivation and perceived literacy ability may themselves be influenced by other personal and environmental factors such as literacy preference, age, and one's own control of literacy practices both in and outside of the school environment. For these reasons, the current research included an examination of students' multiliteracy preferences and practices both in and

outside of school. Given the lack of research in this area, no specific predictions were made regarding differences in multiliteracies, reading ability, or preferences in and outside of school.

The literacy opportunities available to students (i.e., environmental factors) may vary across individuals (e.g., male versus female) as well as locations (e.g., rural versus urban). For example, access to the Internet has historically varied depending on whether one was in an urban versus rural setting. This gap is reducing in Canada as we move through the 21st century (Canadian Radio-telecommunications and Television Commission, 2015; MediaSmarts, 2010), however, there are a number of potential differences among rural Canadian youth that are not captured in American or urban-dwelling literacy research studies; the current study aims to capture some of these differences from a multiliteracy perspective. Given the unique circumstances and characteristics of rural Canadian youth, individual differences in multiliteracy preferences, practices, and reading ability were expected to be found in the current research but a lack of research in the area made predictions speculative.

Taking all of these factors into account reinforces the need to study specific populations to determine how to best support their needs. In rural settings, learning experiences are different even though students have access to many of the same materials at those in urban contexts. It is important to recognize that although the access may be similar, literacy habits are unique to a rural context. It is important for researchers to examine what rural students are doing to ensure they support unique learning needs and design environments that help rural students achieve the greatest possible learning success. This research grants insight into the literacy activities that are most valued by rural students and can direct educational decision makers in their efforts to do what is best for the rural learner.

Method

Participants

All grade 10 and 12 students (n = 850) from the 16 high- and composite schools within Sun West School Division (Saskatchewan, Canada) were invited to participate in the survey. A total of 424 participants (M_{age}= 16.13, SD = 1.09) provided responses on the survey: 173 males, 219 females, and 32 participants who did not provide gender data. One hundred and eighty-five students were in grade 12 with another 230 students in grade 10 (M_{age}= 16.13, SD = 1.09). The majority (90.6%, n = 384) reported *English* as their first language with 6% (n = 28) of participants indicating that they speak a second language at home (n = 9 speak French). Participants' age, grade, gender, and self-assessed reading ability were used as individual difference variables discussed in the results.

Materials and Procedure

Interested participants completed a 119-item questionnaire examining various forms of multiliteracy practices (Wilson et al., 2015), however, the current research focuses on responses in the following areas. In the *literacy self-perceptions* section, students' perceptions of their own reading ability and enjoyment were assessed. Participants' *multiliteracy activity inside and outside of school* was then assessed by examining what mediums they used to complete their reading (e.g., digital and print reading choices in and outside of school). Finally, demographics were collected to describe the sample and help conduct the individual difference examinations (e.g., age, grade, gender).

Literacy self-perceptions. Students began the survey by completing a self-assessment of their *reading ability* on a 7-point scale ranging from 1 = "I do not read" to 7 = "I am an exceptional reader," as well as ratings of their *reading enjoyment* both *in* and *outside* of school on 5-point scales ranging from 1 = "I never enjoy reading for school/outside of school," to 5 = "I

always enjoy reading for school/outside of school." Participants also indicated if they completed most of their reading using a computer, mobile device (e.g., smart phone, iPod, tablets), or with printed materials (e.g., books, magazines) and were then asked to rank order up to 10 of 20 different sources of material that they read the most (e.g., emails, text messages, magazines, poetry, etc.).

Multiliteracy activity inside and outside of school. To examine multiliteracy activities and the perceived importance of those activities both inside and outside of school, a series of questions were asked. Participants selected and rank ordered their most important sources of information and reading material both in and outside of school from a comprehensive list of literacy materials. Participants provided a self-report rating from "1 = Not important at all" to "7 = Extremely important" regarding the importance of traditional books and digital resources in supporting their learning both in and outside of school.

Demographics. The survey concluded with a number of demographic questions to help describe the participants in the study.

Results

Data screening and analysis revealed that the patterns of results obtained with both parametric and non-parametric tests remained consistent and significant in the few instances where parametric statistical assumptions were violated. Where assumptions were violated, non-parametric tests are reported; parametric tests are reported with the Bonferonni correction applied when applicable.

In addition to using participants' gender and grade as individual difference variables, an *age* grouping variable was created by splitting participants above the median age (Median = 16

years) as *older* participants and those including or below the median as *younger* participants. A *reading ability* grouping variable was also created and is discussed next.

Literacy Self-Perception

Students' *reading ability* was self-assessed as quite average across the sample ($M = 5.14$, $SD = 1.31$) but scores ranged across the entire scale. Males ($M = 4.94$, $SD = 1.33$) reported significantly poorer reading ability than females ($M = 5.38$, $SD = 1.16$), $t\ (387) = 3.47$, $p = .001$. There were no *age* ($p = .612$) or *grade* ($p = .339$) differences in reading ability. A median split was (*Median* = 5) performed on reading ability grouping individuals below the median and *low reading ability* students and those above the median as *high reading ability* students and was treated as an individual difference variable in subsequent analyses.

Students reported somewhat low levels of *reading enjoyment* both *inside* ($M = 3.03$, $SD = 1.00$) and *outside* ($M = 3.09$, $SD = 1.29$) of school. *Reading enjoyment* in the two settings were moderately correlated, $r\ (423) = .62$, $p < .001$. The range of responses again varied quite widely; see Table 1 for frequencies of endorsements for reading enjoyment both inside and outside of school. No differences in reading enjoyment inside school ($p = .428$) or outside of school ($p = .195$) were found between *grades*. There were also no *age* differences in reading enjoyment either at home ($p = .210$) or inside school ($p = .540$). Reading enjoyment was positively correlated with both reading ability *inside*, $r\ (419) = .44$, $p < .001$, and *outside* of school, $r\ (420) = .54$, $p = < .001$.

Gender differences were found in reading enjoyment both *inside*, $t\ (390) = 4.50$, $p < .001$, and *outside of school, t* $(390) = 6.51$, $p < .001$. *Females* reported significantly more reading enjoyment ($M = 3.25$, $SD = .91$) than *males* ($M = 2.81$, $SD = 1.03$) *inside* school, and *outside* of school ($M_{Females} = 3.47$, $SD = 1.21$, and $M_{Males} = 2.67$, $SD = 1.21$, respectively). In light of these

gender differences, the correlational analysis on reading enjoyment was re-run and the relationship for males was slightly stronger, r (173) = .63, $p < .001$, than that for females, r (219) = .54, $p < .001$. Females reading enjoyment outside of school (M = 3.47, SD = 1.21) was significantly higher than their enjoyment in school (M = 3.25, SD = .91), t (218) = 3.08, p = .002. The trend was in the opposite direction for males, t (173) = 1.87, p = .064; reading enjoyment was rated lower inside of school (M = 2.81, SD = 1.03) than outside of school (M = 2.67, SD = 1.21), although it is important to note that only marginal significance was obtained.

Students with *high reading ability* reported significantly more reading enjoyment inside school (M = 3.47, SD = .98) than those with *low reading ability* (M = 2.70, SD = .89), t (417) = 8.39, $p < .001$. This pattern persisted outside of school (M_{High} = 3.75, SD = 1.16, and M_{Low} = 2.57, SD = 1.15), t (418) = 10.37, $p < .001$.

Table 1. Frequency of responses (n [% of sample]) for reading enjoyment both in and out of school.

Item	In School	Outside of School
I never enjoy reading	36 (8.5%)	53 (12.5%)
I rarely enjoy reading	77 (18.2%)	100 (23.6%)
I sometimes enjoy reading	170 (40.1%)	108 (25.5%)
Most of the time I enjoy reading	118 (27.8%)	83 (19.6%)
I always enjoy reading	22 (5.2%)	79 (18.6%)

Multiliteracy Activities Both Inside and Outside of School

Overall, participants placed high value on the importance of digital resources in influencing their learning both inside (M = 5.25, SD = 1.36) and outside of school (M = 5.19, SD = 1.36). The importance of the traditional book both inside (M = 4.65, SD = 1.60) and outside of school (M = 3.84, SD = 1.64) was also rated quite highly, however the traditional book was

significantly less important in both the school, t (410) = 6.11, $p < .001$, and home setting, t (414) = 13.57, $p < .001$, when compared to the importance placed on digital materials.

In the school environment, females (M = 4.84, SD = 1.47) placed significantly more importance on the traditional book in supporting their learning than males (M = 4.37, SD = 1.66), t (344) = 2.77, p = .006, but there were no gender differences with regards to the importance of digital resources in school, t (347) < 1, p = .394. At home, no differences in the importance of digital resources was found between males and females (p = .069), however females (M = 4.10, SD = 1.54) placed more importance on the traditional book than males (M = 3.47, SD = 1.71), t (343) = 3.60, $p < .001$.

Top 10 multiliteracy activities. Participants ranked their top 10 reading choices when they were both inside (Table 2) and outside (Table 3) of school. For the individual difference analyses on these ranking positions, only those participants who ranked the item were included in analysis (i.e., if the item did not make the participant's top 10 list, they were excluded from analysis with that item). Individual differences in average ranking position were then analyzed using a series of independent samples t-tests. Note that lower ranking positions indicate higher preference (i.e., 1 = top ranked position; 10 = lowest rank position).

Table 2. Multiliteracy preferences inside of school. The number of students ranking that item is provided (N) along with the mean (M) ranking position and standard deviations (SD) for ranking positions. Note that lower numbers indicate a higher-ranking position (i.e., 1 = highest ranked item; 10 = lowest ranked item).

Multiliteracy Preferences Inside of School			
Item	**N**	**M**	**(SD)**
Print Books	354	2.57	(2.10)
Online Encyclopedia	309	3.22	(2.51)
Research Studies/Articles	290	3.79	(2.24)
Electronic/Online Newspaper Articles	244	4.07	(2.12)
Print Encyclopedia	253	4.60	(2.42)
E-Books	84	4.68	(2.88)

Print Newspaper Articles	254	4.69	(2.32)
Magazines	243	4.70	(2.74)
Television	97	4.87	(2.90)
E-zines	58	5.07	(3.29)
Electronic/Online Graphic Novels/Manga	52	5.25	(2.92)
Movies	191	5.30	(2.72)
Comics	77	5.43	(3.11)
Graphic Novels/Manga	125	5.70	(2.84)
Blogs	150	5.76	(2.94)
Online Movies	76	6.11	(2.92)
Online Television	102	6.29	(5.56)
E-comics/Online comics	55	6.31	(3.26)

Table 3. Multiliteracy preferences outside of school. The number of students ranking that item is provided (N) along with the mean (M) ranking position and standard deviations (SD) for ranking positions. Note that lower numbers indicate a higher-ranking position (i.e., 1 = highest ranked item; 10 = lowest ranked item).

Multiliteracy Preferences Outside of School

Item	**N**	**M**	**(SD)**
Text Messages	395	2.08	(2.15)
Social Networking Sites	371	3.32	(2.16)
Novels/Print Books	324	4.00	(2.73)
Online Video	345	4.60	(2.55)
EBooks	103	4.64	(2.83)
Instant Messages	252	4.32	(2.66)
Email	316	4.87	(2.46)
Magazines	332	4.81	(2.32)
Print Encyclopedia	52	5.58	(3.32)
Online Shopping Sites	214	5.73	(2.61)
E-comics/Graphic Novels/Manga	77	5.78	(2.74)
Comics/Graphic Novels/Manga	121	5.80	(2.62)
Short Stories	216	5.82	(2.75)
Online Encyclopedia	180	5.84	(2.95)
Blogs	115	6.01	(2.85)
Information Books	159	6.04	(2.91)
Print Newspaper Articles	201	6.17	(2.72)
Poetry	119	6.21	(2.90)
Electronic Newspaper Articles	83	6.25	(3.00)
E-zines	43	6.37	(2.63)

Individual differences in multiliteracy inside of school. When examining multiliteracy practices inside of school, a few individual differences emerged. The only differences found between genders were in regards to magazines where males ($M = 4.08$, $SD = 2.64$) ranked their preference in using magazines significantly higher than females, ($M = 5.15$, $SD = 2.74$), $t\ (221) = 2.92$, $p = .004$. Although quite similar, four multiliteracy activities completed inside of school also differed according to participants' age (Table 4) and grade level (Table 5). The use of online encyclopedias inside of school was found to be ranked significantly higher for individuals wither high reading ability ($M = 2.90$, $SD = 2.27$) than for those with low reading ability ($M = 3.50$, $SD = 2.68$), $t\ (304.94) = 2.11$, $p = .036$.

Table 4. Differences in Top 10 ranked sources of information used inside of school between *older* and *younger* participants. Only results with significant differences are displayed.

	Age		
	Younger	**Older**	
Item	**M (SD)**	**M (SD)**	**T-test**
Magazines	4.28 (2.72)	5.32 (2.72)	$t\ (224) = 2.82$, $p = .005$
Movies	4.85 (2.61)	5.90 (2.78)	$t\ (176) = 2.60$, $p = .010$
Comics/Graphic Novels/Manga	5.23 (3.08)	6.39 (3.29)	$t\ (113) = 2.16$, $p = .033$
Print Encyclopedia	5.16 (2.57)	4.13 (2.08)	$t\ (232) = 3.33$, $p = .001$

Table 5. Differences between Grade 10 and Grade 12 participants' top 10 ranked sources of information used inside of school. Mean rank positions (M), standard deviation (SD, and independent samples t-tests (T-test) are provided. Note that lower numbers indicate a higher-ranking position (i.e., 1 = highest ranked item; 10 = lowest ranked item).

	Grade		
	Grade 10	**Grade 12**	
Item	**M (SD)**	**M (SD)**	**T-test**
Magazines	4.28 (2.70)	5.36 (2.70)	$t\ (239) = 3.03$, $p = .003$
Movies	4.84 (2.57)	5.83 (2.82)	$t\ (186) = 2.52$, $p = .013$
Graphic Novels/Manga	5.26 (2.88)	6.42 (2.58)	$t\ (120) = 2.26$, $p = .025$
Print Encyclopedia	5.10 (2.62)	4.08 (2.07)	$t\ (247) = 3.38$, $p = .001$

Individual differences in multiliteracy outside of school. Independent samples t-tests for multiliteracy preferences outside of school revealed that females ranked e-books significantly higher than males, t (95) = 2.24, p = .028 while females ranked short stories, t (200) = 2.54, p = .012, poetry, t (107) = 2.12, p = .036, print newspaper articles, t (187) = 2.40, p = .017, and online video, t (314) = 4.55, $p < .001$ significantly lower than males. See Table 6 for a summary of these differences.

Table 6. Differences in reading preferences outside of school between male and female participants. The number of students ranking that item as their first choice is provided (N) along with the mean (M) ranking position and standard deviations (SD) for ranking positions across gender. Note that lower numbers indicate a higher-ranking position (i.e., 1 = highest ranked item; 10 = lowest ranked item).

	Reading Preference Outside of School					
	Males			**Females**		
Item	**N**	**M**	**(SD)**	**N**	**M**	**(SD)**
Text Messages	158	1.97	(1.99)	207	2.22	(2.31)
Social Networking Sites	144	3.30	(2.01)	199	3.33	(2.20)
Print Books	117	3.85	(2.66)	192	4.07	(2.75)
Online Video**	139	3.96	(2.45)	177	5.25	(2.52)
Instant Messages	103	4.27	(2.65)	132	4.50	(2.75)
Email	123	4.68	(2.48)	172	5.03	(2.48)
Magazines	125	4.88	(2.58)	183	4.79	(2.16)
Print Encyclopedia	19	5.00	(2.87)	25	5.36	(3.62)
Short Stories*	72	5.18	(2.63)	130	6.18	(2.73)
Poetry*	37	5.38	(3.04)	72	6.61	(2.78)
EBooks*	37	5.46	(2.77)	60	4.17	(2.76)
Blogs	40	5.53	(2.82)	66	6.38	(2.83)
Information Books	68	5.63	(3.02)	81	6.41	(2.80)
Print Newspaper Articles*	88	5.66	(2.67)	101	6.58	(2.62)
Online Encyclopedia	80	5.68	(2.97)	84	6.04	(3.01)
Electronic Newspaper Articles	37	5.68	(3.26)	38	6.89	(2.78)
Comics/Graphic Novels/Manga	63	5.73	(2.61)	49	5.84	(2.73)
Online Shopping Sites	78	5.79	(2.66)	120	5.79	(2.62)
E-zines	23	5.91	(2.52)	18	7.06	(2.69)
E-comics/Graphic Novels/Manga	40	5.93	(2.56)	32	5.31	(2.89)

*$p < .05$, **$p \leq .001$

Several differences in preferred multiliteracy activities outside of school were found between Grade 10 and 12 students (Table 7) as well as number of age differences. Younger students (M = 3.65, SD = 2.63) ranked novels/printed books significantly higher than older students (M = 4.28, SD = 2.75), t (307) = 2.05, p = .041. A similar pattern was found for both online encyclopedias and online video. Younger students (M = 5.00, SD = 2.91) ranked online encyclopedias significantly higher than older participants (M = 6.53, SD = 2.80), t (163) = 3.45, p = .001. Younger participants (M = 4.42, SD = 2.49) also preferred online videos more than their older counterparts (M = 5.01, SD = 2.64), t (316) = 2.07, p = .040. A number of differences in preferred multiliteracy activity was also found between participants with low versus high reading ability, which are summarized in Table 8.

Table 7. Differences between Grade 10 and Grade 12 participants' preferred multiliteracy activities outside of school. Mean rank positions (M), standard deviation (SD, and independent samples t-tests (T-test) are provided. Note that lower numbers indicate a higher-ranking position (i.e., 1 = highest ranked item; 10 = lowest ranked item).

	Grade		
	Grade 10	**Grade 12**	
Item	**M (SD)**	**M (SD)**	**T-test**
Novels/Printed Books	3.68 (2.63)	4.32 (2.79)	t (317) = 2.11, p = .036
Online Video	4.33 (2.47)	4.95 (2.61)	t (339) = 2.23, p = .026
Online Encyclopedias	5.14 (2.93)	6.43 (2.79)	t (175) = 2.98, p = .003
Online Shopping	5.43 (2.70)	6.15 (2.47)	t (210) = 2.00, p = .047

Table 8. Differences in preferred multiliteracy activities outside of school between those with low and high reading ability. Mean (M) rank positions, standard deviations (SD), and independent samples T-test statistics are provided. Note that lower numbers indicate a higher-ranking position (i.e., 1 = highest ranked item; 10 = lowest ranked item) and only results with significant differences are displayed.

	Reading Ability		
	Low	**High**	
Item	**M (SEM)**	**M (SEM)**	**T-test**
Text Messaging	1.68 (.115)	2.59 (.194)	t (389) = 4.25, p < .001

Online Video	4.25 (.181)	5.07 (.206)	t (340) = 3.01, p = .003
Novels/Printed Books	4.39 (.214)	3.61 (.214)	t (319) = 2.55, p = .011
Magazines	4.60 (.169)	5.12 (.195)	t (326) = 2.02, p = .044
Comics/Graphic Novels/Manga	6.21 (.303)	5.25 (.383)	t (117) = 1.99, p = .049
Print Encyclopedia	6.50 (.553)	3.83 (.668)	t (50) = 2.96, p = .005

Discussion

Understanding the multiliteracy preferences and practices of rural students has the potential to influence a wide range of educational and practical decisions and policies. Raising the awareness of school boards, directors of education, superintendents, principals, and teachers can positively impact their decision-making in favor of student needs. For example, specific literacy activities could be selected for schoolwork based on the need to engage a particular group. Alternatively, a policy may be implemented where more than writing assignments would be required for assessments in order to allow students to practice, develop, and demonstrate their multiliteracy abilities. The purpose of the current paper was to identify the multiliteracy preferences and practices of rural Canadian youth both in and outside of school and to examine potential individual differences that may influence these variables. Several trends in participants' multiliteracy practices were identified and a number of individual differences in those patterns emerged. The following sections provide an interpretation of the results along with some of the implications that the data carry for understanding rural students' multiliteracy. A brief discussion of study limitations and possible future directions for research in this area are then provided.

Individual Differences in Rural Students' Literacy Self-Perceptions

Across all students in the study, average levels of reading performance were reported but the range of responses was quite wide with some students deeming themselves exceptional readers and others self-assessing their reading quite poorly. These results suggest that there is

room to improve rural students' reading ability and to find ways to continue to challenge the reading level of exceptional readers while keeping those with poorer reading ability interested. Students' self-assessments of their reading enjoyment was considerably lower than their assessment of their own reading ability yet reading ability and enjoyment were positively correlated for both genders, both in and outside of school. Building confidence in rural students' reading abilities may therefore help build reading enjoyment while increased reading enjoyment may translate into increased engagement (Brozo, 2013). In other words, if rural students' interests and engagement with literacy material can be increased, motivation may also be positively impacted resulting in more interest (Brozo, 2013) and time spent with the material (e.g., Cox & Guthrie, 2001). Educators should work to support the preferred multiliteracy activities of rural students regardless of medium, in an effort to improve engagement and subsequent ability especially in those who may need additional support.

Although no age differences were found, rural male participants reported significantly poorer reading ability than rural females. Females in our sample also reported significantly more reading enjoyment both in and outside of school than their male peers. These findings are consistent with previous work finding gender differences in reading ability where females appear to excel compared to males (e.g., Baker & Wingfield, 1999; Durik, Vida, & Eccles, 2006; Eccles et al., 1993; Freedman-Doan et al., 2000; Marsh, 1989) and highlights the need for educators to help males develop their reading abilities. Perhaps the multiliteracy preferences of males could be engaged more often in the classroom to further boost motivation and interest in literacy material for those males who may be struggling. Educators may also be wise to separate males and females when completing literacy activities so that males do not feel behind when directly compared to females. Rather than challenge their male counterparts, males' self-efficacy and

motivation may decline due to feelings of failure or delay. However, females do not always demonstrate better reading ability than males - the pattern is not consistent in all studies or for all performance outcomes (e.g., Baker & Wingfield, 1999; Yarborough & Johnson, 1980). Thus, more research is still needed in this area.

Being aware of the potential for gender differences in multiliteracy in their classrooms should help educators better plan literacy activities and even target activities towards those who need additional encouragement (e.g., males). By reviewing the current findings regarding preferred literacy materials and comparing it to the literacy materials used by teachers in the classroom, it may be revealed that rural males are not being provided with the opportunities to work with their preferred literature format that rural females are receiving. This lack of exposure to the material they would be most likely to enjoy may subsequently reduce their motivation, interest, and engagement with the material which can negatively impact literacy achievement (Brozo, 2013; Weinstein, 2002). In rural settings, educators may select male preferred materials such as magazines for use in assignments or allow students to choose their own educational materials including videos, to help engage males in multiliteracy activities. Although members both genders ranked text messages and social networking sites, rural males preferred to engage with online videos and magazine materials over the printed book while females preferred the printed book over magazines and videos when outside of school revealing that that males have distinct literacy preferences from females. If the preferred materials such as magazines are not being used during instruction or for assignments while e-books are (a material preferred by females outside of school), females would be experiencing a differential motivational benefit from that material use. By identifying these gender differences in the current study, along with preferred materials for both groups, a variety of professionals can make informed decisions about

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the types of materials to use with students with the goal of maintaining or gaining student interest in literacy activities. Teachers may need to be creative and responsive to the desires of students in their classroom in order to find ways to engage and embed their individual home-literacy interests inside of the classroom (Brozo, 2013).

Multiliteracy Activity Inside and Outside of School

Many materials deemed to be important sources of information inside of school across all participants were traditional literacy materials such as encyclopedias, and printed books or novels. Rural participants also placed significant importance on digital resources in supporting their learning and understanding and rated digital resources as significantly more important to their learning than the traditional printed book. These findings suggest that educators need not be concerned about lack of engagement when introducing digital materials for use in class. Rural Canadian youth appear to desire digital material and value it over many print literacy materials. Thus, increasing the availability of digital material inside of school, and encouraging engagement with preferred digital material outside of school may prove beneficial in fostering literacy engagement.

Age and grade differences in participants' preferences for sources of information were also found where younger rural Grade 10 students tended to adhere to a more traditional literacy preference pattern than older rural Grade 12 participants when in school (e.g., Grade 10 students ranked printed materials as significantly more important to learning than Grade 12 students). It may be that younger rural classrooms tend to model more traditional literacy activities while classrooms with older students permit learners to exercise their ability to choose other literacy mediums and show a shift towards digital media in upper grades. Future research in rural classrooms may aim to examine developmental trends in achieving global citizenship and

multiliteracy through a longitudinal study to help identify the multiliteracy preferences and patterns of youth of all ages.

Understanding the various individual differences in participants' preferred sources of information inside and outside of rural school settings has the potential to inform selections of materials made available to those particular youths. For example, if one is aiming to engage a young rural male with literacy activities, the current data suggest that providing magazines and graphic novels to work with may increase engagement given that these are preferred activities for participants with those characteristics in our sample. Further, encouraging exchanges with other rural students through email and text messaging may also help build multiliteracy skills of young males as these are two of the top activities that they reported engaging with outside of school.

Although there were no gender differences in the perceived importance of digital resources, rural females placed greater value on the traditional book than rural males, further illustrating individual differences in the value of certain formats over others, for some groups of individuals over others. Not only do the current findings demonstrate that males and females in rural learning settings have different multiliteracy preferences but also demonstrate the need to broaden both groups' multiliteracy horizons. Rural females will likely benefit from engaging with digital materials and other mediums beyond the printed book that will likely be used in their professional future. These findings can help provide some evidence to rural educators for the need to encourage females to avoid becoming a *bookworm* and to learn to work and communicate with other mediums.

As expected, participants demonstrated a clear preference for text messaging and social networking when outside of school. The use of videos as a source of information both inside and outside of school was also consistently in participants' top five choice regardless of age, grade,

reading ability, or gender. Whether or not there are ways of including activities such as these in rural classroom activities will be up to individual educators to decide, however, the strong preference in using these mediums and high engagement with them regardless of individual characteristics suggests it would be a worthwhile option to consider. For example, would it be beneficial to encourage texting of questions and discussion items to group members or the teacher? Or, would such an option be overwhelmingly distracting? Would it be possible to offer group work that can be partially completed online, through social networking sites, or require a final product that is posted in an online video format? Rural students in the current study demonstrated a clear and strong preference for these types of activities and materials and are actively engaging with them on a daily basis. Finding ways of developing those preferred out-of-the-classroom skills inside of the classroom (e.g., online seminars, creating digital products) may be extremely beneficial, especially for those who do not have a preference for traditional literacy activities. For example, although the vast majority of rural students are engaging with text messaging, and many with magazines, individuals with low reading ability consistently demonstrated a preference for these materials. Those with high reading ability, on the other hand, engaged more with comics/graphic novels, print books/novels, and print encyclopedias for sources of information. If one wishes to try and draw in rural students with poorer literacy ability into literacy activities, it would be wise to lure them with material they would enjoy! In other words, bring in magazines, allow text messaging, and work to keep those students engaged by catering to their multiliteracy interests. Whether the rural student is working with a printed book or an electronic magazine, the student is still engaging with the written word and images. If the magazine brings more enjoyment and encourages the student to pick another one up in the future, the goal of increased literacy activity is still met regardless of the absence of the printed book.

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The current results help identify specific multiliteracy activities that may help draw in one type of student into literacy activities over another.

Limitations and Future Directions

The current research provides a good first step towards understanding the multiliteracy preferences and practices of rural Canadian youth, however, it is not without its limitations. Data were collected from within only one rural school division with limited cultural and ethnicity variability. Thus, the findings may not capture subtle differences that may be found in a more generalizable sample. In future research, an online survey that can be delivered to a wide range of rural and/or urban school divisions would help increase the generalizability of the sample. The age range of students included in the current study is also quite limited and does not allow for an in-depth examination of potential age differences or trends in the data. Following participants longitudinally to see how their preferences and practice change over time, or examining multiliteracy activities in a cross-sectional manner to examine potential age differences would help develop a developmental trajectory of multiliteracy skills and abilities.

The current study demonstrates that there are subtle but reliable differences in rural Canadian youth's multiliteracy preferences and practices that should not be ignored. Research involving Canadian youth has the potential to fill a large gap in high-school literacy understanding, especially in rural situations. Although urban-dwelling students may have easier access to digital mediums, rural students are also demonstrating a preference for some of these materials and should not be ignored.

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Blended Literature Discussions Increase Preservice Teachers' Enthusiasm for Teaching Reading

Lauren Eutsler, Ph.D.

University of North Texas

lauren.eutsler@unt.edu

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Abstract

In this study, blended literature discussions (face-to-face and blog) were implemented in response to the International Literacy Association's charge to prepare teachers to integrate 21st century technologies. Guided by the basic qualitative research design approach and informed by New Literacies Studies and constructivism, this study examined 24 preservice teachers' blog postings (n = 288) and four group reflection summaries. Analysis revealed initial trepidation about the blended discussion format; the blended discussion model appeared to allow for extended conversations about text; all participants intend to use blended literature discussions in their literacy instruction; blended literature discussions requires detailed planning and teacher scaffolding. Findings offer a promising technique for incorporating digital literacy into teacher preparation programs. Future research might consider examining elementary students' enthusiasm for reading while using the blended literature discussion method.

Keywords: blog, literature discussions, new literacies, reading, teacher preparation

Teacher educators have been charged with integrating digital technologies into their practice to prepare preservice teachers to teach using 21st century literacy skills (International Reading Association, 2009; International Society for Technology in Education, 2017). The revised ISTE (2017) standards have provided some unification of digital literacy practices with the addition of online professional development resources, such as lesson plans, learning scenarios, scaffolding support, and collaborative guides. Borthwick and Hansen (2017) proposed a challenge "to work together as schools, colleges, departments of education, and leaders in professional associations to move educator preparation" (p. 47) toward alignment with similar initiatives, such as the National Educational Technology plan and the Office of Educational Technology. Despite the progression of technology integration standards and guidelines, the integration of digital literacies in higher education remains largely underexplored (Paciga, Fowler, & Quest, 2018).

In light of New Literacies (Lankshear & Knobel, 2011), this study examined how a blended (face-to-face and blog) literature discussion may influence elementary preservice teachers' enthusiasm for reading. New Literacies has been broadly defined as the many forms of representation of language and literacy, with a focus on how people communicate with one another in today's digitally networked world (Lankshear & Knobel, 2011). New Literacies Studies require innovative research in "authentic digital literacy practices in social contexts beyond schools" (Mills, 2010, p. 262). A blended literature discussion model provides an additional space for people to communicate with one another, with the blog acting as a support for traditional face-to-face conversations about text.

The need to investigate digital literacy methods in preservice teacher training is important because researchers have revealed preservice teachers have a lack of enthusiasm for reading. In a

study of 379 elementary education preservice teachers, 52% were found to be unenthusiastic readers (Applegate & Applegate, 2004). The researchers attributed this lack of enthusiasm for reading to The Peter Effect–teachers who are unenthusiastic as readers are unable to motivate and excite readers in their own classroom. A decade later, Applegate and colleagues (2014) revisited the notion of the Peter Effect with 1,000 aspiring teachers and survey results were nearly identical; 53% self-identified as unenthusiastic readers. These findings raise concerns because it is possible teachers who are unenthusiastic about reading could influence their students to lack enthusiasm for reading.

Much has changed in the digital literacy landscape since the initial Applegate and Applegate (2004) research study. National survey results of 1,454 families in the United States found that 98% of families own a mobile device (Rideout, 2017). Additionally, of 120 families with elementary-aged children attending two charter schools in the southeastern United States, 99% reported their child used mobile technology to support reading development in the home (Eutsler, 2018). The growth of digital technologies lends itself to a vision of new literacies, "identified with an epochal change in technologies and associated changes in social and cultural ways of doing things, ways of being, ways of viewing the world" (Coiro, Knobel, Colin, Lankshear, & Leu, 2014, p. 7). This study focuses on how to respond to the changing technologies by incorporating blended literature discussions in higher-education classrooms, which may improve preservice teachers' enthusiasm and engagement with literacy while positively increasing elementary students' reading enthusiasm.

Much of the research associated with literature discussions has focused on the classroom-based context where students read books in separate spaces and come together at a scheduled time to discuss the story, inquire, and make connections with the text and one another (Evans,

2002; Maloch, 2004). Despite the traditional approach to literature discussions, the nature of how people communicate with one another has seen a dramatic change since the release of iPhone and other smartphones in 2007, followed shortly by iPad and similar tablet devices in 2010. Since these technological advances, there is a pressing need for teacher educators to equip preservice teachers with approaches to literature discussion that reflects the current digital landscape.

Face-to-Face Discussions

Face-to-face literature group discussions is an effective instructional strategy known to improve comprehension (Cantrell, 2002) and engage elementary students in discussions about text (Allington, 1984; Davis, Resta, Davis, & Camacho, 2001). Strategies used for planning and implementing traditional literature group discussions have varied greatly, spanning from structured teacher planning to student constructed learning.

Following a collaborative partnership with 20 teachers ranging from kindergarten to college-aged students, Daniels (2002) contends 11 key features should be considered when planning literature discussion groups. Some features include giving students freedom to choose their book, systematic group meetings to discuss the book, teacher as facilitator, and having "natural conversations about books" that lead to open-ended questions and discussions (p. 18). Similarly, others emphasize the importance of giving elementary students a choice of books, instead of forming groups according to reading ability levels (Vacca, Vacca, & Gove, 2000; Worthy, 1996).

Unlike Daniels' (2002) structured approach to literature group discussions, an example of a teacher-led discussion about text is the ABC's of drama: "*A*ll need to face a *B*ig problem that we all *C*are about" (Edmiston, 1998, p. 49). Employing engagement strategy techniques, fourth-grade students worked with their teacher to "use their imagination to question, investigate, and

interpret particular text events to enhance and deepen meaning making with fiction and nonfiction" (Long & Gove, 2003, p. 351). These strategies acted as a scaffolding technique to promote critical responses to text.

In another context of one third-grade teacher planning for literature group discussions, the teacher encouraged students to respond using interpersonal strategies during literature discussion groups (Maloch, 2004). This response-oriented focus helped the teacher understand how students' response to literature and focus on relationships helped students relate to one another and handle group conflict (Maloch, 2004).

While there are a variety of strategies to engage elementary students in face-to-face literature group discussions, shared characteristics have typically included a teacher-led environment where students read and discuss the text together in the classroom.

Blended Discussions

Face-to-face methods of literature group discussions are highly valued and remain the primary method to conduct literature discussions; however, teachers must adapt to meet the demands of 21st century instructional technology standards, such as blended literature discussions (Hicks & Turner, 2013). Hicks and Turner (2013) argue for the need to include blogging in an actionable manner, because "unfortunately, we see teachers using blogs in ways that do not capitalize on the conversational opportunities that blogging offers" (p. 60). Instead, "teachers pose a question and students respond to that prompt" (Hicks & Turner, 2013, p. 60). The present study agrees with Hicks and Turner's (2013) argument that blogging should be an active learning process, particularly that blogging could be considered a blended learning pedagogical adaptation. Blended learning is "any time a student learns at least in part in a supervised brick-

and-mortar location away from home and at least in part through online delivery with some element of student control over time, place, path and/or pace" (Staker, 2011, p. 3).

The blended model of learning can benefit the literature group discussion experience because "those who use blended learning environments are trying to maximize the benefits of both face-to-face and online methods—using the web for what it does best, and using class time for what it does best" (Osguthorpe & Graham, 2003, p. 227). Web 2.0 innovations such as the blog offers an interactive and collaborative style of learning, giving people the ability to connect with one another within the affordances of the "social web" (Wheeler & Wheeler, 2009, p. 1).

Despite the effectiveness of face-to-face literature discussions and their ability to elevate literacy learning in teacher education (Cantrell, 2002; Davis et al., 2001), online communication and the use of a blog has been gaining momentum as a method to support literacy training and development (Handsfield, Dean, & Cielocha, 2009; Penrod, 2007; Witte, 2007). Serafini and Youngs (2013) contend there is a need to extend children's literature discussions beyond the traditional face-to-face application because it "presents new opportunities for readers to discuss literature outside the boundaries of the physical classroom as video conferencing technologies such as Skype, FaceTime, and iChat create spaces for readers to discuss what they have read" (Serafini & Youngs, 2013, p. 402). In one graduate English course, online discussion-based literature groups motivated students to read and talk about text (Bowers-Campbell, 2011).

For elementary students to partake in blended literature discussions, preservice teachers need hands-on training to show them how to incorporate blended discussions. One study by McVee, Bailey, and Shanahan (2008) explored ways to assist preservice teachers with implementing New Literacies practices, and results indicated the need for teacher educators to facilitate shared problem-solving and distributed learning, to support design and multimodal

redesign of texts, and explore literacy and technology as transactional processes. The idea of literacy and technology being transactional could be achieved through preservice teachers' use of a blog to discuss literature.

Another exploration of online literature discussions engaged preservice teachers in the Electronic Reading Workshop (Larson, 2008). In the workshop, participants read e-books and chats were held synchronously and asynchronously, using threaded discussions. Online discussions brought advantages such that preservice teachers had time to reflect on reading and compose meaningful responses to others, ease associated with staying on topic, and the space for safe sharing of personal connections to the book (Larson, 2008).

In a case study of seven preservice teachers participating in digital literature circles with implications for elementary-aged students, researchers found that digital tools offered multiple modalities to explain thinking, improve depth of conversations, and enhance understandings of the book (Bromley et al., 2014). This conclusion was reached because "as students talked, they supported their discussion of the literary elements (setting, character development, themes, plot, and style) with multimodal evidence" (Bromley et al., 2014, p. 234). The blog space afforded learning opportunities that facilitated extended learning outside of the brick and mortar walls, while allowing students to make deeper connections about text. The present study seeks to contribute to Bromley and colleagues' (2014) research. This study examines the experiences of 24 preservice teachers using blended literature discussions for the first time. I investigate how this experience relates to preservice teachers' enthusiasm for reading and, as a result of the blended literature discussion experience, whether preservice teachers' intend to incorporate blended literature discussions in their future classrooms.

Theoretical Perspectives

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This study is grounded in New Literacies Studies (Lankshear & Knobel, 2011) and constructivism as a method for teaching (Schunk, 2008), which provides a space for understanding that student collaboration when engaging in blended literature discussions is inherently a social experience.

New Literacies

New literacies practices include "skills, strategies and dispositions necessary to successfully use and adapt to the rapidly changing information and communication technologies and contexts that continuously emerge in our world and influence all areas of our personal and professional lives" (Leu, Kinzer, Coiro, & Cammack, 2004, p. 1572). The blended literature discussion is an example of how discussions about literacy are evolving in response to innovative communication technologies (Coiro et al., 2014). Engaging in discussions about text within the blog and face-to-face environments is a highly social and collaborative process.

Constructivism as a Method of Teaching

While New Literacies Studies demonstrates how collaborative discussions about text can occur in multiple spaces, positioning this theory within a teaching framework is needed to acknowledge that blended literature discussions are most effective when the teacher acts as a facilitator. Much attention has been drawn to constructivism as a method of teaching (Schunk, 2008). Constructivism has become the method of pedagogical choice because it allows students to engage in authentic, collaborative learning activities (Ertmer & Newby, 2013), especially within the context of Web 2.0 affordances, such as a blog. The use of the blog, with its individual accountability and flexible learning space, may result in increased collaboration and authentic learning experiences. Together, New Literacies and the constructivism epistemology help discern

that preservice teachers may be more enthusiastic about reading while participating in blended literature discussions.

Guided by New Literacies (Lankshear & Knobel, 2011) and constructivism as a method for teaching (Schunk, 2008) to capture the experiences of preservice teachers participating in blended literature group discussions, this study addressed the following research questions:

1. How might preservice teachers participation in a blended (face-to-face and blog) literature discussion influence their enthusiasm for reading?
2. After participating in blended literature discussions, what are their intentions to use blended literature discussions in their future elementary classrooms?

Method

Context and Participants

This study engaged preservice teachers in blended literature discussions to explore how the use of New Literacies might improve their enthusiasm about reading. The study took place between August and December 2015 and included 24 preservice teacher participants enrolled in an intermediate reading methods course at a major public elite university in the southeastern United States. Students were in their third-year of a four-year Elementary Education teacher preparation program, where approximately 80% of students commit to an optional fifth-year master's program before beginning their career as a professional teacher. There were 23 females and one male–20 Caucasian, two Black, and two of Latina origin. The 23 females were between 20-22 years old, with the male between 25-29 years old.

Research Design

This qualitative study was guided by the basic qualitative research design approach (Merriam & Tisdell, 2015), which helped ascertain how the blended (face-to-face and blog)

literature discussion method might have an influence on preservice teachers' enthusiasm for reading. A basic qualitative study has foci on meaning, understanding and process; a purposeful sample is used, documents collected become artifacts, analysis is inductive and comparative, with findings richly descriptive through categorical representation (Merriam & Tisdell, 2015). This method helped to identify the following: "How people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences. The overall purpose is to understand how people make sense of their lives and their experiences (p. 23)." Adherence to the basic qualitative research design approach called for open-ended response-types, which helped reveal the ways in which blended literature discussions influenced preservice teachers' enthusiasm for reading and their intention to use blended literature discussions in their future classrooms.

Data Collection and Procedures

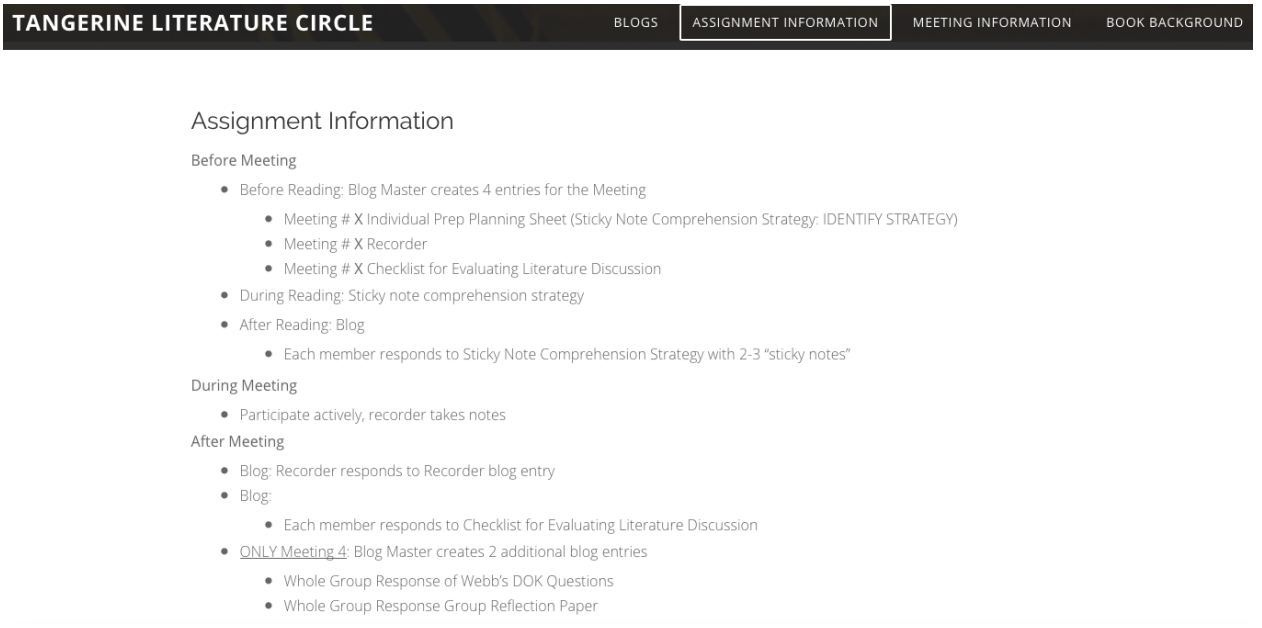
As part of a course assignment, 24 preservice teachers participated in small group blended literature discussions. Though none contested participation in this study, an alternate assignment option was that preservice teachers could complete literature discussions as previous course sections had, by documenting discussions on paper and organizing meeting notes in a paper-based group binder.

To begin the study, preservice teachers divided themselves into four equal groups containing six members each, and agreed on a book to read. Then they created their own group blog on Weebly, a free and user-friendly website creator. Over the span of the study, there were four literature discussion meetings–three face-to-face (synchronous) and one online (asynchronous). Students posted individual discussion posts to their group blog before, during, and after each literature discussion meeting. Following this approach, the blog acted as a blended

discussion support for the three face-to-face meetings and was the only communication medium during the one online meeting.

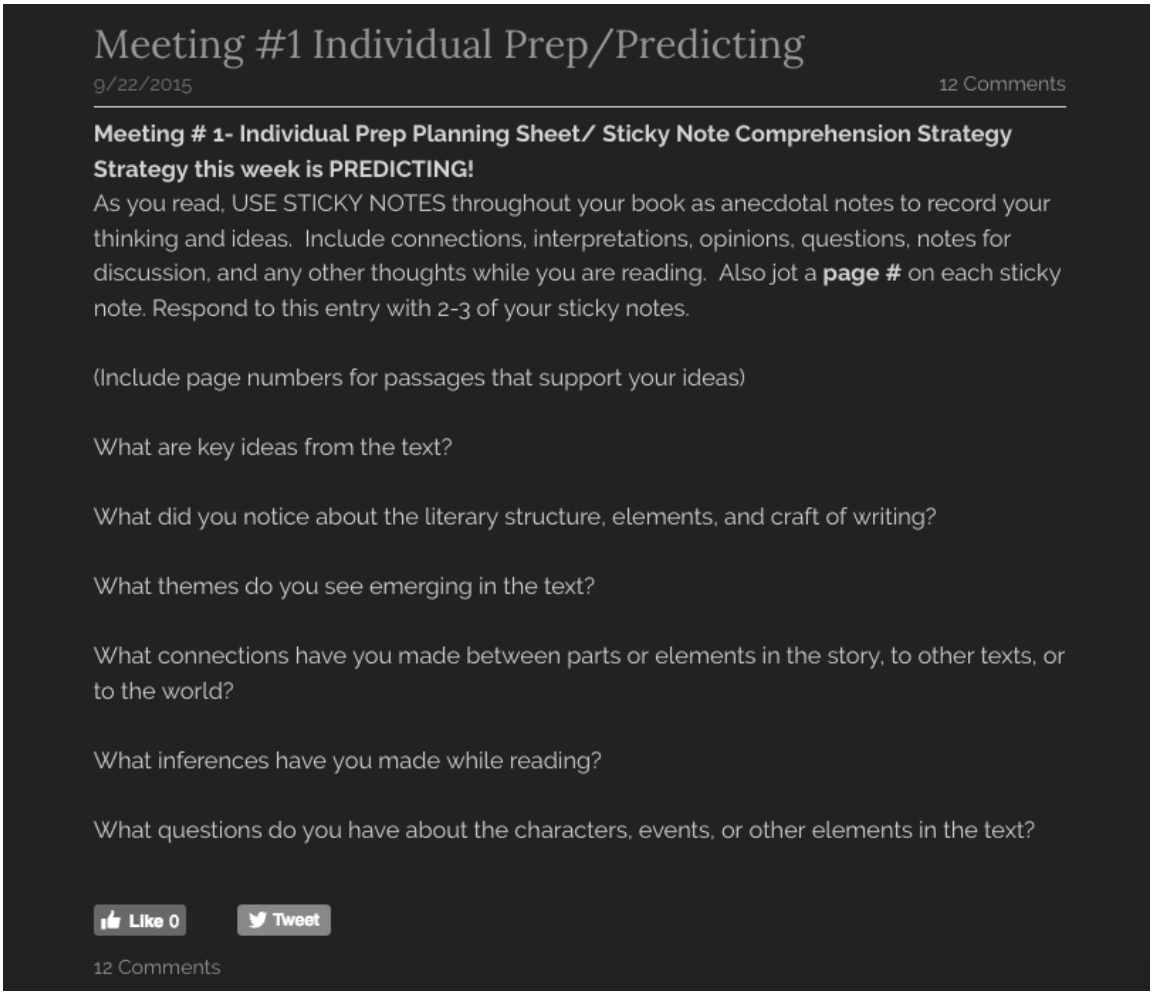
Data collection was consistent for each discussion meeting. Using the assignment description provided by the instructor, each group posted and organized their blog around the assignment guidelines (Figure 1). Prior to each meeting, the Blogmaster composed three blog entries: individual preparation planning sheet; recorder; evaluation checklist.

Figure 1. Assignment Guidelines



Before every meeting, each preservice teacher posted a blog entry which served as their response to the individual preparation planning sheet. This planning sheet required the Blogmaster to choose a reading comprehension strategy to focus on during the assigned reading (e.g., predicting, questioning). While reading the text on their own, preservice teachers annotated two sticky notes that addressed the identified comprehension strategy and then posted these "sticky note" annotations to the individual preparation planning sheet blog entry (Figure 2).

Figure 2. Individual Preparation Planning Blog Entry

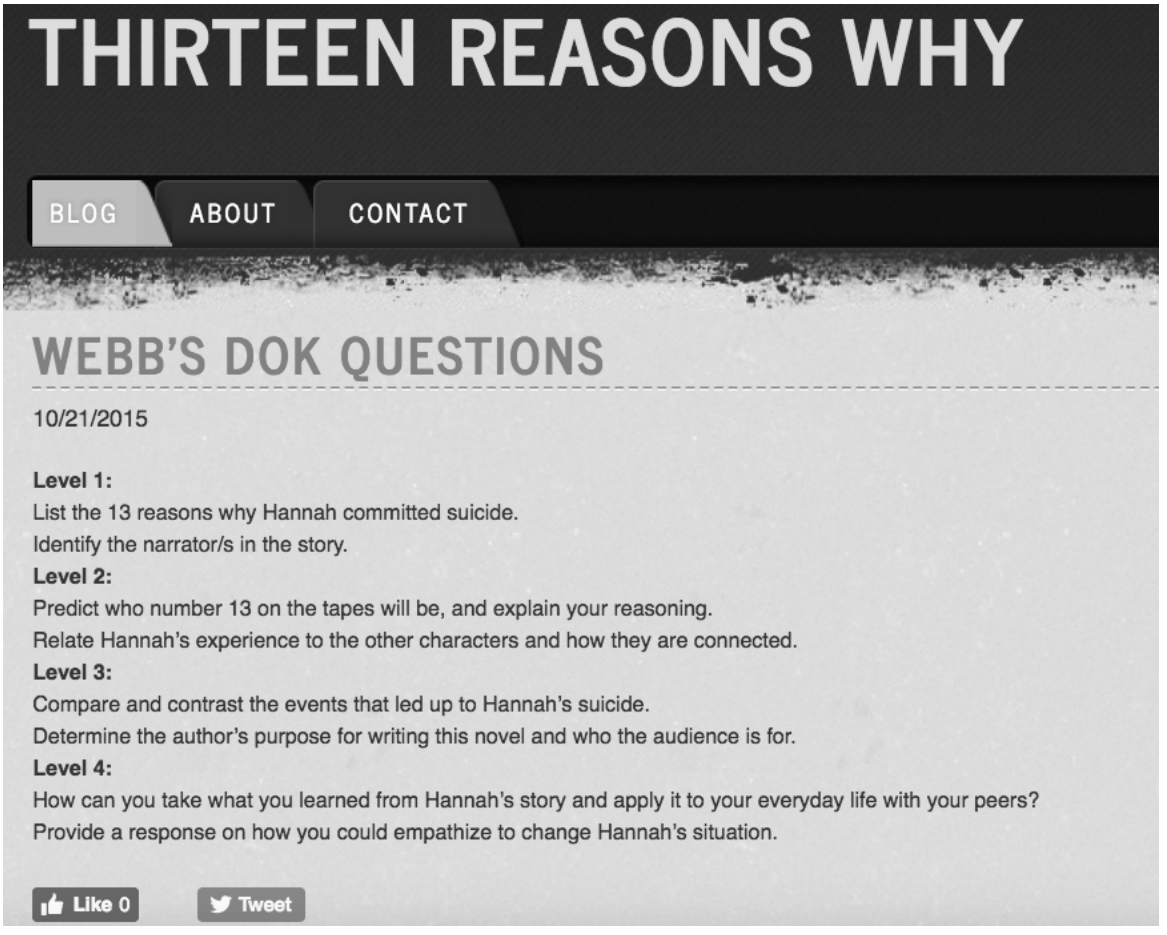


After the group met face-to-face or online for their discussion meeting, the group recorder posted a summary reflection, which highlighted topics of discussion and provided perceptions of the climate of the discussion. Also following each meeting, each preservice teacher chose two areas to reflect on using the discussion resource developed by Fountas and Pinnell (2006) entitled "Checklist for Evaluating Literature Circle Discussions." Areas of focus from the checklist included: preparation; discussion–process; discussion–content; discussion–strategies; assessment.

After the fourth and final discussion meeting, the group completed a guided reading lesson plan (Figure 3) and a group reflection summary. To complete the guided reading lesson

plan, preservice teachers created questions in accordance with Webb's (2002) depth of knowledge hierarchical levels of questioning.

Figure 3. Guided Reading Lesson Plan



Following the fourth and final group meeting, preservice teachers critically analyzed the blended discussion experience and provided explicit feedback in the group reflection summary about the blended method experience used to conduct literature group discussions.

Data Analysis

This study's use of the basic qualitative research design approach (Merriam & Tisdell, 2015) allowed for a six-phase thematic analysis of the blog entries (n = 288) and group reflection papers (n = 4). This approach allowed me to use an inductive and comparative analysis, which

helped to provide depth and meaningful understanding of how blended literature discussions might have influenced preservice teachers' enthusiasm for reading.

Phase one began with reading through the entire qualitative dataset, notating impressions, thoughts, and preliminary interpretations. Following the initial reading, the second phase consisted of rereading the dataset to identify initial patterns codes from the data. From this analysis, a list of nine codes were compiled, which included questioning, curiosity, retelling, and trepidation about using a blog to facilitate discussion.

In phase three, the initial codes were compared to determine meaning based on relationships within the data. Then, terms and phrases were sorted based on connections and relationships. This comparative analysis (Merriam & Tisdell, 2015) led to a collective list of six initial domains. Some of the initial domains included mixed-emotions on the blended method, judgement of the instructor's pedagogy, and inquiry toward future applications of blended literature discussions in the elementary classroom.

Phase four involved delving back into the dataset to determine whether all data fit within the initial domains, and whether new domains may be needed. This was accomplished by sorting data based on the six initial domains. From here, phase five involved revisiting the data to examine terms, examples, and relationships within and across the domains to discover key themes. This deeper analysis resulted in the creation of four key themes. Following the identification of the four themes, the final phase consisted of color-coding the dataset to represent the four identified themes, as presented next in the results section of this paper.

Results

Data analysis (Merriam & Tisdell, 2015) of blog entries and group reflection summaries revealed how blended literature discussions might have influenced preservice teachers'

enthusiasm for reading, in addition to identifying whether preservice teachers intend to use blended literature discussions in their future classrooms. The analysis captured four key themes to: initial trepidation about the blended literature discussion method; the blended discussion model appeared to allow for extended conversations about text; all participants intend to use blended literature discussions in their literacy instruction; blended literature discussions requires detailed planning and teacher scaffolding.

Enthusiasm for Reading During Blended Literature Discussions

The first research question, *How might preservice teachers participation in a blended (face-to-face and blog) literature discussion influence their enthusiasm for reading?* sought to understand how blended literature discussions may have influenced preservice teacher's enthusiasm for reading.

Initial trepidation about the blended literature discussion method. Responses showed preservice teachers had initial trepidation about how reading and participating in face-to-face and online discussions would unravel, but this worrisome hesitation quickly led to excitement about blended literature discussions. Responses exhibiting trepidation contained feelings of nervousness and confusion. Statements filled with trepidation were as follows: "I was very confused about the literature circle at the beginning of class;" "at the beginning of the literature circle portion of class I was extremely nervous because I was confused about how everything was supposed to work and blend together;" "at first I was a little hesitant about the literature discussion groups but I have to say I really enjoyed it."

The blended literature discussion method was perceived as an exciting way to experience literature discussions. Before blended discussions began, one student said, "I am really excited about our literature circles, and to see how this effectively works with the blog aspect." Others

reflected, “the blended discussion process was a fun way to experience our book,” because this method provided “an escape from the rest of our academic duties without the pressure of assessment.” One preservice teacher who was hesitant about the blended literature discussion approach realized, “now, at the end of class, I am excited to use the blog and it's exciting to talk about the book.” Although the blended discussion method induced initial hesitation about the literature discussion experience, preservice teachers were enthusiastic and positive about the ability of blended discussions to foster lively discussions about text.

The blended discussion model appeared to allow for extended conversations about text. The blended discussion method gave preservice teachers time to think about and process text before in-class discussions, which enabled the blog to serve as a reference to deepen text discussions. Preservice teachers described how their roles before and during the literature discussion meetings kept them actively involved in discussions. “Before each meeting, each individual member would respond to the preparation post on our blog by answering the six questions addressing the reading and the sticky note strategy.” Then during the meeting, the “Blogmaster would begin the discussion and the rest of the members would chime in with their thoughts. Then, we would incorporate our reading strategy into our discussion as well by asking questions, making connections, commenting on others’ thinking, etc.”

Preservice teachers also expressed enthusiasm for reading and appeared very willing to participate in the blended discussions. Statements supporting the in-depth discussions attained by blended literature discussions include: “we learned the usefulness of peer groups to review literacy where discussions helped us develop a deeper understanding of the text;” “the literature circle was a really fun way to work reading into collaborative work. It motivates students to read and encourages them to share with group members;” “I enjoyed the blogging and meetings to

discuss different opinions and see how we all could infer the same sections differently;" "students can build the responsibility, communication skills, and connectedness that we saw with our literature circle discussion experience." Blended discussions allowed for in-depth analysis of the text, as indicated in the group reflection, "our experience with the literature discussion group has helped us understand how our students can benefit from an in-depth discussion at specific points in a reading with their peers."

Intention to Use Blended Literature Discussions in Future Elementary Classrooms

To address research question two, *After participating in blended literature discussions, what are their intentions to use blended literature discussions in their future elementary classrooms?*, preservice teachers expressed their intention to use blended literature discussions in their future elementary classroom, but emphasized the importance of detailed planning and teacher scaffolding.

All participants intend to use blended literature discussions in their literacy instruction. Response data revealed that preservice teachers intend to use blended literature discussions in their future elementary classrooms. For some, reasons to include blended literature discussions centred on enjoyment and affirmation of the blended literature discussion format: "the literature circle has been a very fun experience. I will definitely use literature circles in my classroom;" "I like the format of it and I want to be able to use a similar concept with my students;" "getting to choose our own book definitely made it more enjoyable;" "I can see how great this would work in an elementary classroom [elementary school] and look forward to implementing it in my class!"

Others perceived the blended literature method as a helpful teaching strategy to gauge student participation and monitor academic progress: "I really like the idea of posting on a blog

so participation and professionalism is accurately recorded;" "we learned the usefulness of peer groups to review literacy. Literary assessments shouldn't be individually summative, but rather formative with peers over time to correct misunderstanding and for each individual to share and improve the overall group understanding."

Blended literature discussions requires detailed planning and teacher scaffolding. Although preservice teachers envisioned themselves using blended literature discussions in their future elementary classrooms, they cautioned that successful implementation requires detailed planning and ongoing teacher involvement.

Preservice teachers reflected on the structured and organized nature of their own blended discussion experience: "each week, we assigned a specific reading strategy to think about and use while completing our weekly reading. The four strategies we focused on included questioning, making predictions, making connections, and summarizing;" "each member had the responsibility of being the blog master or the recorder for a specific meeting;" "we would typically begin by discussing the important events that occurred in that week's reading using evidence from the text;" "after each meaningful discussion, we individually evaluated the meeting addressing the checklist."

Perhaps as a result of the structured-nature of their own blended literature discussion experience, preservice teachers relayed recommendations to facilitate explicit teacher-guided instruction. There were "some concerns about the amount of autonomy students should have to successfully conduct literature circles;" "structure is key to student success in this strategy;" "we all agreed the level of independence will differ for each class…the more mature and organized students are the more they will be able to do on their own;" "with additional scaffolding, students

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could easily conduct literature circles;" "strategies for each meeting can provide some of the scaffolding."

There was group consensus that teacher-guided instruction is critical to maintain student engagement in blended literature discussions because "younger children would be far more dependent on the teacher to facilitate discussions. It can probably be done, but the appropriate environment would have to be set up and it would likely need more structure compared to what older students would need." Literature discussions "can be a very useful tool to help students understand text while still having fun. However, it is crucial that the teacher explicitly explains how the process should look to make sure students are prepared before the meeting."

Discussion

This study's implementation of blended literature discussions among 24 preservice teachers' helped to engage them in reading and elevated discussions about text. Based on the findings that more than half of preservice teachers' lack enthusiasm for reading (Applegate & Applegate, 2004; Applegate et al., 2014), using blended literature discussions to engage preservice teachers in New Literacies (Lankshear & Knobel, 2011) as guided by a constructivist approach (Schunk, 2008) offers a promising technique for incorporating digital literacy into other teacher preparation programs.

Although recent research found 99% of elementary education families permitted their child to use mobile technology to support reading development in the home (Eutsler, 2018), it is interesting that all 24 preservice teachers in the present study were unfamiliar with the New Literacy method of using blogs to facilitate literature discussions. However, after preservice teachers engaged in the blended literature experience, each one shared that they felt equipped and excited to integrate blended literature discussions into their future literacy instruction. Since 98%

of children have access to a mobile device in the home (Rideout, 2017), it is important for teachers to include New Literacies into their teaching to prepare students to navigate 21st century digital literacies within educational contexts (International Reading Association, 2009; International Society for Technology in Education, 2017).

Most compelling, the flexible nature of the blog engaged preservice teachers in reading and discussing literature in and outside of class. The blog was easily accessible via the Weebly app, and preservice teachers used their smartphones to read and respond to other group members. It is also likely that because preservice teachers constructed their own learning spaces by creating their own group blog and were given freedom to complete discussions in their shared space, this may have contributed to their enthusiasm for reading and willingness to engage in the discussions. The blog space fostered opportunities to thoughtfully reflect on and analyze the text and peer discussions (Larson, 2008), which also enabled preservice teachers to collaborate and extract meaning from text. "Meaningful discussion, planning, and practice help learners delve more deeply" (Garet, Porter, Desimone, Birman, & Yoon, 2001, pp. 925-926).

Whereas traditional face-to-face discussions require turn-taking, the blended method afforded each group member time to think critically about the text, individually respond, and read and reflect on each other's blog postings. Blended literature discussions allow for extended discussions about text beyond school contexts (Bromley et al., 2014). In the present study, the blog acted as an individual accountability measure where preservice teachers posted initial reactions to the text, read and responded to each other's thinking, and reflected on the discussions before coming together for a face-to-face meeting. During face-to-face meetings, discussions were lively since there was no concern or contentions about who had completed their reading and

discussions. The blended literature discussion format increased enthusiasm for reading because it gave each member a guided sense of belonging throughout the reading and discussion process.

This study also contributes to earlier findings that preservice teachers require explicit scaffolding to implement new literacies methods (McVee, Bailey, & Shanahan, 2008). Although preservice teachers in this study exhibited trepidation about participating in blended literature discussions because it was a new experience, all 24 preservice teachers said they planned to include blended literature discussions in their future elementary classrooms. Giving preservice teachers an opportunity to collaborate about literature in a blended discussion format contributed to the realization that blended literature discussions can be an innovative strategy to improve digital literacy practices within teacher preparation programs.

Implications and Future Research

The infusion of digital literacy into teacher preparation programs needs to reflect the demands of technology standards and consider an individual's access to technology. Future research might consider a larger sample of preservice teachers using blended literature discussions to compare the experience to a group of preservice teachers who engage in a traditional face-to-face literature discussion method. Additional research may also examine the ways in which preservice teachers use blended literature discussions in elementary classrooms. In this future research, studies might explore how elementary students' and the classroom teacher's enthusiasm and interest for reading may be influenced by blended literature discussions, and how the blended literature discussion experience compares with elementary students' and the classroom teacher's perceptions of face-to-face literature discussions.

Conclusion

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In response to stakeholder requests for the application of New Literacies into literacy instruction (International Reading Association, 2009; International Society for Technology in Education, 2017), teacher preparation programs must train teachers to integrate technology into literacy by engaging them in hands-on experiences that could be applied within their future classrooms. The importance of preparing digitally literate teachers (Harrison, Dwyer, & Castek, 2010) who are enthusiastic about reading has never been greater than the current time. Online discussions about literature should not replace the teacher or face-to-face discussions; rather, blended literature discussions offer an extended learning space to help readers connect with one another and think more deeply about text.

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