

National Youth-At-Risk Journal

Volume 2
Issue 1 Fall 2016

Article 3

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Recommended Citation

Gutierrez de Blume, A. P., Akcaoglu, M., & Chambers, W. L. (2016). Supporting Metacognitive Awareness and Strategy Use Through Digital Photography in a Rural Title I School. *National Youth-At-Risk Journal*, 2(1). <https://doi.org/10.20429/nyarj.2016.020103>

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Supporting Metacognitive Awareness and Strategy Use Through Digital Photography in a Rural Title I School

Abstract

The Photography and Media Literacy Project (PMLP) was an after-school program designed to teach fourth and fifth grade children about the science and art of photography in a Title I school in rural southeast Georgia. Through the completion of a problem-based applied project, we endeavored to further enhance and develop students' media literacy, critical thinking, and metacognitive skills. The project involved having students consider some aspect of their environment (i.e., a problem from the natural, physical, school or social environment) and develop a media presentation about the topic (e.g., a movie), which included images that they took (with iPods that we provided), as well as a narrative that described their observation, research, argument and/or experience. Through the use of technology and various other media, our purpose was to help these young learners improve their metacognitive planning and monitoring skills, as well as their problem-solving and reasoning ability, all foundational skills critical for success in high stakes assessments such as Georgia Milestone Assessment. Although no significant differences were found in pre-posttest assessments, we believe that with minor modifications, this type of program shows promise in its potential for boosting participants' metacognitive functioning and other skills related to critical evaluation of information, which have been found to enhance learning outcomes.

Keywords

metacognition, media literacy, photography, Title I school

Cover Page Footnote

The author order as listed is for convenience only. We would like the reader to know that all authors provided equal contribution to the preparation of this report.

Supporting Metacognitive Awareness and Strategy Use Through Digital Photography in a Rural Title I School

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Educators often struggle teaching higher-order thinking skills in regular classroom contexts (Pressley, Goodchild, Fleet, Zajchowski & Evans, 1989; Resnick, 1987). In some contexts, this lack of focus on teaching important higher-order thinking skills can be explained by a shift in focus to teach more content knowledge (Martinez & Stager, 2013). With this shift, students do not get enough chances to tackle complex problems; instead they are provided with simple problems in the form of knowledge retention or information reproduction (Perkins, 1986).

Metacognition is a higher-order reflective set of skills and was originally defined broadly by developmental psychologists in the 1970s as the process of learners taking their own cognition as the main focus of their attention (Brown, 1978; Flavell, 1976; Flavell, 1979). Thus, learners with strong metacognitive skills show awareness of various processes involved in their own learning and remembering. Research has found a positive relation between metacognition and utilization of learning strategies. For example, Ford, Smith, Weissbein, Gully, and Salas (1998) found that learning strategy use was positively and moderately related to metacognitive awareness. Borkowski, Carr, and Pressley (1987) found that, among children with attention deficit disorder, self-regulatory skills training was positively related to spontaneous strategy development and application. Likewise, Phakiti (2003) found that cognitive strategy use was positively associated with metacognitive strategy use and performance, a conclusion echoed by Pintrich and De Groot (1990), Pressley, Borkowski, and Schneider (1987), and Zimmerman (1990). Along a similar vein, Paris

and Oka (1986) found a positive association between reading strategies and metacognition.

Due to the failure of schools to provide students with opportunities to use their creativity and problem-solving skills, researchers and educators looked at creating alternative curricula with a focus on teaching thinking skills through design and construction. One popular venue was using technology as design contexts to teach these skills (e.g., Harel, 1991). Although these alternative curricula have received attention from researchers and practitioners over the last three decades, the attempts produced mixed results (Mayer & Wittrock, 1996; Salomon & Perkins, 2005), especially when the students could not see an open connection between design tasks and thinking skills (e.g., Pea & Kurland, 1984).

In addition to their versatility in providing students with meaningful learning experiences, being able to use digital media (i.e., digital media literacy) is equally important for young learners to be successful 21st century citizens. The New Literacies Framework (NML) specifically establishes digital citizenship as a vital skill that leads to participation of youth in the creation of media and content (Jenkins, Clinton, Purushotma, Robison, & Weigel, 2006). Given the emphasis on digital literacy by both 21st century frameworks (Mishra & Kereluik, 2011) and NML, it is essential that these skills are emphasized in formal and informal educational contexts.

In this paper, we report on findings from an after-school photography and media literacy project (which we refer to as PMLP), targeting improvement of metacognitive skills in fourth and fifth grade students at an elementary school

located in a rural Title 1 district in southeast Georgia. Our aim was to provide relevant digital media literacy instruction throughout the program, while explicitly encouraging and supporting metacognitive awareness, planning, and problem solving skills, as well as promoting self-efficacy for learning and critical evaluation of information.

METACOGNITION

Metacognition, or “knowing about knowing” (Brown, 1978; Nelson & Narens, 1994), is a multifaceted concept that includes one’s knowledge about mental states and thinking processes as well as awareness and control of strategies involved in learning and memory (see, e.g., Flavell, Miller, & Miller, 1993). Before the concept of metacognition was identified and researched by theorists in the field, John Flavell (1971) originally coined the term metamemory to refer to the metacognitive processes involved specifically in memory. Metamemory can further be broken down into different types of cognitive processes and understandings. The first of these, often referred to as “declarative” metamemory, involves one’s knowledge about variables that might affect how well something might be remembered, such as the amount and complexity of information, and also strategies that might or might not be effective in assisting memory. Developmental studies of declarative metamemory have found that significant improvements in this type of understanding occur particularly during the middle childhood elementary school years (see Schneider & Lockl, 2002 for an excellent historical review of research on this and other aspects of metacognition).

The other type of metamemory is often referred to as “procedural” metamemory (e.g., Flavell & Wellman, 1977) and involves executive processes that are engaged when one is faced with a memory task (see Schneider & Lockl, 2002, and Schneider, 2008 for a useful taxonomy of these components). As Schneider (2008)

points out, much of the contemporary research in the area of procedural metamemory has been conducted by cognitive and educational (rather than developmental) psychologists, who have studied these processes in adult learners. These investigators have tended to use the term procedural metacognition (and sometimes simply metacognition); therefore, in our paper we will also use this language for the sake of clarity.

Generally, there are two main processes that are invoked when engaged in procedural metacognition: monitoring and control. Nelson and Narens (1990, 1994) proposed a seminal two-process model of metacognitive monitoring commonly known as the Nelson and Narens Model of Metacognition, which illustrates the theoretical framework that situates goal-directed action and volition (i.e., expression) as individuals use metacognitive processes to regulate their learning. Control, or executive processes, refer to the manipulations learners impose on their learning environment in order to achieve some goal-directed action. Monitoring can be defined as the process by which learners use information from their environment to track progress toward the achievement of learning goals. The importance of these two cyclical metacognitive processes for the success of learners can be characterized by learners’ learning judgments. Presumably, accurate monitoring allows learners to construct a more complete mental model of their environment, and, thus, more adequately monitor progress and make necessary adjustments if progress stalls.

Research with adult learners suggests that metacognitive monitoring is poor among learners and that monitoring judgments affect strategy use. For example, many studies reveal the need to teach learners how to more effectively monitor their comprehension (see Brannick, Miles, & Kisamore, 2005 and Glenberg, Sanocki, Epstein, & Morris, 1987 for a review). In a series of experiments, Glenberg and associates

(1987) found that poor monitoring is not related to a particular type of performance test but rather it is found across several types of tests. Moreover, poor monitoring accuracy was found when the test was provided immediately after reviewing material as well as when the test was scheduled after a delay. Findings by Schraw, Potenza, and Nebelsick-Gullet (1993) suggested that individuals exhibit a strong response bias as they monitor their performance; in other words, individuals were prone to report their monitoring consistently irrespective of item difficulty and accuracy of response, indicating that negative feedback was not integrated to improve all aspects of metacognitive monitoring.

A second general finding is that feedback is related to college students' use of strategies, and performance on cognitive tasks (Pintrich, 2002; Schraw et al., 1993; Thomas & McDaniel, 2007; Tobias & Everson, 2002–2003; Yates, 1990). Research on this topic has indicated that metacognitive monitoring can be improved if students are provided with a pretest that furnishes self-generated feedback (Brannick et al., 2005; Glenberg et al., 1987). However, monitoring was improved only when the processes and knowledge invoked by the test are closely related to the processes and knowledge required on the criterion task (Glenberg et al., 1987).

Metacognition in younger learners.

As noted above, most of the research on metacognitive development in children over the past 30 years has been focused on assessing their understanding of the variables that affect learning and memory (i.e., declarative metamemory). Research on the development of *procedural* aspects of metacognitive knowledge has been relatively scarce in recent years, and has traditionally focused on components related to self-monitoring, such as “feeling-of-knowing” judgments, where participants are provided with a recall task and afterwards are asked to judge the likelihood of remembering items that they were previously unable to recall, on a

future test (e.g., Cultice, Somerville, & Wellman, 1983). Other related lines of research have examined “ease-of-learning” judgments, asking children to predict how easily they would be able to learn and remember information on a particular memory task. These studies have for the most part focused simply on age differences in performance, and the findings have been mixed; there is not a clear-cut developmental increase in task performance throughout the middle childhood years. This lack of a clear developmental pattern is consistent with findings reported above with adult learners (i.e., even adult learners often do not effectively monitor their performance on learning tasks). However, other studies investigating self-regulation or “control” skills in children (such as effective allocation of study time) have found that older elementary school-aged children can and do use these types of metacognitive strategies in certain situations, and these skills appear to further improve in the middle school years (see, e.g., Lockl & Schneider, 2002, as cited in Schneider & Lockl, 2002).

Metacognitive training efforts in school-age children. Studies examining the effects of metacognitive training in children have for the most part focused on training participants in the use of a particular learning strategy and then assessing metacognitive awareness of the usefulness of the strategy in a posttest. In some of these studies, explicit training in metacognitive awareness (i.e., monitoring the effectiveness of the strategy) was also implemented and was found to be effective in supporting this process even in young learners, particularly when the training included constant reminders to reflect on and be aware of whether strategies are effective (Ghatala, Levin, Pressley, & Goodwin, 1986). It has also been found that older elementary school children who are trained in the use of a particular learning strategy (such as visual imagery) can and will generalize and transfer the strategy to other learning contexts, but only if they are provided

with explicit information that encourages metacognitive reflection on when and how to use the strategy (O'Sullivan & Pressley, 1984).

These findings raise the question of whether elementary school classroom teachers typically include instruction on the use of learning strategies, along with explicitly emphasizing the importance of constantly monitoring and evaluating which strategies have been particularly helpful. Pressley et al. (1989) have investigated this issue and have concluded that generally, classroom teachers rarely infuse this type of instruction into their lessons, perhaps due to the many challenges in successful implementation of strategy and metacognitive instruction for entire classes of students (see also Moely et al., 1992). However, on the other hand, it has been found that "effective" teachers, who frequently focus their instruction on when and how to utilize learning strategies as well as emphasizing the importance of monitoring their effectiveness, can positively impact student strategy use, metacognitive awareness, and performance (e.g., Moely et al., 1992). In the present study, we hoped to demonstrate that this type of intervention can also be successful in an after-school program conducted at a Title I school.

DIGITAL MEDIA LITERACY

Today's youth are connected with one another and the rest of the world in many more ways than ever before. Social network sites, such as Facebook, Twitter, Snapchat, playing online games, sharing photos and videos, and tools like iPods and mobile phones are now a regular part of the youth culture (Ito et al., 2008). This connectedness requires increased levels of content consumption, critical evaluation, and production, also known as *media literacy*. Media literacy can be defined as the skill to "access, analyze, evaluate, and communicate information in a variety of forms, including print and non-print messages" ("Media literacy defined", n.d.). Being "media literate" enables

one to access, analyze, and produce both print and digital media (Koltay, 2011).

Becoming media literate, however, extends beyond consumption, into production. By creating, the students get a chance to challenge norms of the existing worlds around them (Garcia, Seglam, & Share, 2013). The increasing amount of media production by youth in informal settings (Peppler & Kafai, 2007) has led to the creation of a new culture among youth: participatory culture (Jenkins, Purushotma, Weigel, Clinton, & Robison, 2009), and education in such culture should become a part of formal schooling. As Garcia et al. (2013) noted, participatory culture "can increase peer learning, shift attitudes about intellectual property, diversify cultural expression, develop workplace skills, and empower conceptions of citizenship" (pp. 112–113).

In the present study, we sought to teach media literacy skills in the context of an after-school digital photography program. We chose digital photography as a medium for instruction in part because of the freedom that digital cameras (or in our case, iPods) afford, to empower learners to explore their environment while creating their own digital media (in our case, movies). As Ching, Wang, Shih, and Kedem (2006) pointed out, traditional technology tools in schools are often immobile, in locked up labs, and are used as "peripheral" activities. In contrast, a digital camera, or an iPod in our case, is a portable technology tool that can easily become a part of existing physical spaces and works within the limits of the "social fabric" of a classroom (Ching et al., 2006). Ching et al. worked with kindergarten and first grade children, where they used a digital camera to create individual photo journals that reflected their unique personal experiences. A qualitative analysis of the quality and types of reflections that the children provided in the context of sharing and talking about their journals supported the notion that technologies such as these can serve as powerful tools for

enabling even young learners to meaningfully explore and understand their environment. Using iPods for taking photos not only allows for seamless interactions between students and the teachers, but it also facilitates “just in time” learning of technology by forcing students to learn new methods to transfer their photos to their computers and use a new software to create movies with the photos they have taken. Finally, within their final movies, “peers, teachers, and other parts of the classroom environment are visually represented on-screen and are the explicit topics of adult–child and peer–peer conversations” (Ching et al., 2006, p. 349).

Another important reason that we utilized digital photography and media literacy instruction for this program is because successfully engaging in these types of activities requires effective use of metacognitive skills such as planning, monitoring, and critical problem solving. For example, deciding on a topic involves awareness of the relevance of the issue as well as a pragmatic reflection on the feasibility of gathering photos for the topic within the confines of the school and surrounding school grounds. The process of taking the images involves monitoring whether the images appropriately fit within the chosen topic, as well as determining the factors that produce effective images. Creating a movie involves first deciding on the order of presentation of selected photos, and then adding appropriate text and music to effectively convey the desired message. Throughout these processes, students need to plan ahead, be aware of their own learning, and understand when they are not sure about how to approach the task. Therefore, we believed that this program created an ideal opportunity to teach students about the importance of these metacognitive skills, and to continually support the development and utilization of these skills with reminders, questions, and modeling.

PURPOSE AND RESEARCH QUESTIONS

The purpose of the present investigation was to determine whether teaching elementary school students in a Title I school about media literacy skills improved their metacognitive awareness. Thus, the guiding research questions and hypotheses were as follows:

1. Is there an effect of media literacy instruction on fourth and fifth grade students’ perceptions of self-efficacy to learn, use of learning strategies, and metacognitive knowledge and regulation?
2. How does media literacy instruction affect fourth and fifth grade students’ critical evaluation of information?

Hypothesis 1: We predicted that media literacy instruction would improve fourth and fifth grade students’ self-efficacy to learn, use of learning strategies, and metacognitive knowledge and regulation. More specifically, we expected students’ responses on self-report surveys assessing metacognitive awareness, learning strategy use, and self-efficacy to reveal an increase in these components of effective learning from pretest to posttest.

Hypothesis 2: We predicted that fourth and fifth grade students’ ability to demonstrate an increased awareness of the importance of critically evaluating online information would occur following participation in our PMLP project, as measured by their responses on an open-ended problem scenario.

METHOD

Participants

A total of 28 fourth and fifth grade students participated in our after-school program, 16 of whom were girls. The students were recruited via a flyer that was posted at the school, as well as through encouragement from our

collaborating P–12 teacher, who assisted us with supervision of the children throughout the program. Participation in the program was on a first-come, first-serve basis, with students being required to return signed parental permission forms as well as child assent forms before being allowed to participate. Due to this open-enrollment policy, the participants were of a mixed ability group based on the collaborating teacher’s knowledge of the students’ academic achievement. The school is a public, Title I designated elementary school, located in an extremely rural area of southeast Georgia, and serves a predominantly white (78%), low SES population, with over 50% of the children qualifying for free or reduced lunch.

Materials

Students in the after-school program were assessed using a pre-posttest design, where they responded online to survey questions that were aimed at examining the degree to which they believed that they engaged in self-monitoring and effective learning strategies. The instruments included an 18-item *Jr. Metacognitive Awareness Inventory* (Jr. MAI) questionnaire, adapted from Sperling, Howard, Miller and Murphy (2002), and selected questions from the *Meaningful Strategy Use* (MSU) questionnaire, adapted from Greene, Miller, Crowson, Duke, and Akey (2004). Additionally, students responded to five items that were adapted from the Self-Efficacy for Learning and Performance (SE-LP) scale of the *Motivated Strategies for Learning Questionnaire* initially developed by Pintrich, Smith, Garcia, and McKeachie (1991). Students responded to the survey items by using a slider from 0 to 100. They were instructed that the closer the item is to 0, the less the item applied to them whereas the closer the item is to 100, the more the given item applied to them. Internal consistency reliability coefficients, Cronbach’s alpha, for the outcomes were adequate to high as follows: Jr. MAI knowledge -.75 (pretest), .71 (posttest);

Jr. MAI regulation -.92 (pretest), .85 (posttest); MSU -.90 (pretest), .89 (posttest); and SE-LP -.90 (for both pretest and posttest). Finally, students were asked to respond in writing to an open-ended question that was designed to assess their understanding of the process of gathering and critically evaluating information that is found online. More specifically, they were presented with a hypothetical scenario about debating the use of cell phones in school and asked how they would determine whether information found online would be appropriate to support their argument. The specific questions from these inventories as well as the open-ended question are included in Appendix A.

For the photography instruction part of the program, 14 iPods were assigned to the participants, who worked in pairs to develop and present their multimedia presentations. They utilized the iPods to take photos, which were transferred to their individual Google Drives via computers located in the computer lab at the school, for further development of the multimedia presentations.

Procedure

The after-school program took place at the school, with 10 weekly sessions that lasted one hour each. A detailed week-by-week description of activities is included in Appendix B. In Session 1, the students first took the pretest in the computer lab (which lasted about 25 minutes), and then were introduced to the plan for the program. They were told that they would be learning about techniques for taking effective photos (such as composition, light, and focus), and then they would develop a project where they were to choose a theme that was related to something in their environment, and take images using iPods that were assigned to them. They would then use these images to create a multimedia presentation (a slideshow “movie”), which would include images, music and text that they would write, in order to present an argument or describe a topic. The session

wrapped up with 15 minutes of practice “free time” with the iPods, primarily for the purpose of familiarizing the students with how they worked.

Sessions 2–5 involved instruction in the use of the iPods, as well as training in taking effective images for the purpose of telling a story or making an argument. Plenty of time was allotted for image gathering throughout the school and outside on the surrounding school grounds. A particular emphasis was placed on the importance of effective planning, self-monitoring and evaluation, in the context of the formal “lessons” on image gathering (which included brief PowerPoint presentations) as well as during informal supervision of the students as they were working on their respective projects. For example, we individually accompanied the students around the school grounds as they were taking their photos, making sure to question them about whether the photos would be a good fit for their topic and reminding them about the importance of “thinking before you click the shutter” to be aware of whether the image was well-composed and in focus. In addition, at the end of Sessions 2 and 4, students were presented with scenarios that were read aloud to the entire group, and asked to reflect on and discuss strategies for solving the problems posed. For example, in Session 2, they were told a short “story” about a boy who did not plan ahead wisely to allow time for studying for an upcoming test, and he ended up failing the test. Students were asked (in the context of a whole-group discussion) to identify the problem and suggest strategies that the boy might have implemented, for a more successful outcome. The purpose of these group discussions was to further support the development of awareness of the importance of self-reflection, planning and monitoring one’s performance, as well as critically evaluating information.

In Sessions 6–8, students worked in the computer lab, researching their topics

online (with our assistance and under close supervision) for related information to include in their multimedia presentations, as well as uploading their images and learning how to use the Windows MovieMaker software program to create their presentations. The posttest was administered in Session 9, and was followed by a wrap-up work session for students to complete their multimedia presentations. In Session 10, students presented their movies (which were projected on a screen in the classroom for everyone to view) and were individually presented with a certificate of completion of the program.

Data Analysis

Data were submitted to a series of dependent samples *t*-tests to ascertain whether there were statistically significant changes in students’ outcome scores from pretest to posttest. In each of these analyses, students’ self-reported scores regarding metacognitive knowledge and regulation, learning strategy use, and self-efficacy to learn served as outcome measures respectively. Data screening and assumption testing procedures indicated that the data approximated a normal distribution for all outcomes and that no outliers that would otherwise undermine the trustworthiness of the data were detected, and thus, data analysis proceeded without making any adjustments to the data.

Responses to the open-ended pre-posttest question about how to determine whether information found online is appropriate when making an argument about the use of cell phones in school were scored using a rubric that included the following criteria: a) a reference to the importance of determining whether the content of the information gathered online was factual and/or accurate; b) a reference to the importance of checking the credibility of the source of the information gathered online; and c) a reference to the strategy of asking knowledgeable others, such as teachers and

parents, whether the source was credible and/or the content was accurate. Responses were scored on a scale of 0 to 3, with scores being assigned as follows:

3 = Response that included references to a) and b) above with c) being optional.

2 = Response that included a reference to either a) or b) above, with c) being optional.

1 = Response that included a reference only to c) or referring to some type of "internal" validation of the information, such as rereading it.

0 = A response that included no reference to any of the above.

We carefully reviewed and discussed all responses before assigning scores, to ensure consistency and inter-rater agreement. Responses were blind reviewed, in the sense that all identifiers and information about whether each response was provided during the pretest or posttest were removed before scoring.

RESULTS

To answer the first research question, dependent samples *t*-tests were conducted. The results revealed that the change in score from pretest to posttest did not reach statistical significance for any of the measures, all *p*-values > .46, suggesting that students' scores remained fairly stable across time. Table 1 shows that with the exception of self-efficacy, which increased from pretest to posttest, all other scores decreased from pretest to posttest, albeit none reached statistical significance. Correlations in Table 2 show that all but one correlation ($r = .29$, between regulation and self-efficacy at pretest) reached statistical significance. All correlations beyond this exception were moderate to strong and positive, indicating that the variables were related in the theoretically expected direction.

Analysis of the students' open-ended responses revealed that students exhibited

a higher score at posttest ($M = 1.14$) when compared to pretest performance ($M = 0.93$). However, this growth in scores for the open-ended reflection question was not statistically significant. The character count of the pretest responses from the participants averaged 2,055 compared to the 1,952 characters at posttest. In spite of the smaller character count at posttest, students demonstrated enhanced responses at posttest with respect to the complexity and robustness of the concepts students conveyed. Following are sample responses that underscore the change in complexity and understanding of students from pretest to posttest:

Student A

Pretest: I think I would look at several different articles and think about which (sic) had the most.

Posttest: To make sure that it is a good article I make sure that it says reasonable things, has a reasonable author and that it makes a reasonable statement.

Student B

Pretest: I would write it down on a piece of paper and check multiple websites to make sure it wasn't a fake article. Then I would add some sentences and take some out to make sure it is in my own words.

Posttest: First, I would ask myself if the information was reasonable for this topic. An example would be if I was looking for information on dogs and it said that dogs make rainbows when they bark, I would know that the information would be false because it is scientifically impossible. I would also check some other websites to make sure that the information was correct.

DISCUSSION

Literacy in digital media requires not only being critical in consumption of media, but also being

Table 1

Descriptive Statistics of Pretest and Posttest Survey Responses for the Sample

Variable	Pretest		Posttest	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Jr. MAI Knowledge	70.65	20.13	67.88	18.34
Jr. MAI Regulation	61.27	24.42	58.44	24.34
Meaningful Strategy Use	63.31	22.08	62.24	21.85
Self-Efficacy for Learning and Performance	70.90	27.03	73.48	22.29

N = 23

Table 2

Zero-Order Correlation Matrix of Pretest and Posttest Scores

Variable	1	2	3	4
1. Jr. MAI Knowledge	-	.59*	.67*	.62*
2. Jr. MAI Regulation	.70*	-	.78*	.29
3. Meaningful Strategy Use	.72*	.75*	-	.72*
4. Self-Efficacy for Learning and Performance	.75*	.45*	.73*	-

N = 23 * $p < .01$

Note. Correlation coefficients above the diagonal are for pretest scores and those below the diagonal are for posttest scores.

empowered to create and produce messages to become a part of the digital culture (Garcia et al., 2013). Photography, in such contexts like PLMP, can become an effective tool for digital media literacy education, where students critically evaluate photos, but also create digital artifacts going through multiple layers of evaluation. Through photography, children can learn to look at their surroundings in different ways and explore their physical and social surroundings in new and improved ways (Ching et al., 2006). It should be also mentioned that contexts like PMLP can be gender-neutral and can attract female students (Ching et al., 2006), who often trail behind in digital media and STEM domains.

The purpose of the present investigation was to evaluate whether the PMLP is an effective

approach to improve fourth and fifth grade students' metacognitive awareness (knowledge of metacognitive strategies, including how and when to apply them, and regulation of cognitive processes while learning), cognitive strategy use, and self-efficacy for learning and performance. To this end, we used a one-group pre-experimental pre-posttest design to investigate students' change in self-reports on these outcomes across time as a function of our PMLP educational intervention. We further examined whether the PMLP positively influenced students' critical evaluation of information.

With respect to our first research question, findings did not support our hypothesis that the PMLP would enhance students' metacognitive

awareness, meaningful strategy use, and self-efficacy for learning and performance. Students' self-report scores in these outcomes did not significantly change across time, although self-efficacy reports did increase from pretest to posttest. Results of the open-ended question revealed that overall there was growth in terms of quality of responses (i.e., the degree to which students demonstrated understanding of the importance of critically evaluating information that is found online) from pretest to posttest, although some students had no change in their scores, either because scores were already high or the quality of students' responses remained low.

LIMITATIONS OF THE CURRENT STUDY

One of the limitations of our study was the relatively small sample size ($N = 23$) of students who were present for both the pretest and posttest sessions. It should be noted, however, that although in theory a larger sample might provide additional statistical power, in practice we believe that an after-school program such as this one requires working with small groups of students in order to allow for effective instruction and supervision, along with plenty of opportunities for individual encouragement and support of metacognitive processes. A related limitation is that, as with any voluntary after-school program that extends over a several week period, attendance was not perfect, with roughly two-three students (on average) who were absent on any given week. In response to these occurrences we made sure to keep track of which students were absent, and worked individually with them to get them "caught up" with the rest of the group in the following session.

Another limitation of our study pertained to the design itself. Although we did utilize a pre-posttest design with a well-planned and executed intervention between the two testing sessions, our study was pre-experimental in the sense that a) we did not have a randomly

selected group of participants (the first 28 fourth and fifth graders who signed up for the program were admitted) and b) we did not have a control group of participants representing the same population, to take the pretest and posttest without the PMLP intervention. Thus, we knew at the outset that we could not be absolutely certain whether any potential changes from pretest to posttest were in fact due to participation in our after-school program as opposed to, for example, simply attending school for a two month period of time (or even developmental growth). However, given the observational research findings presented in the Introduction revealing the relative scarcity of explicit metacognitive instruction in elementary school classrooms, paired with the findings showing lack of a clear-cut age-related developmental pattern in metacognitive monitoring of strategies, we had reason to believe that these potentially confounding variables would not play a strong role in affecting the outcome in terms of pre-posttest measures.

Furthermore, given findings noted by Moely et al. (1992) and others that effective instruction in strategy use and metacognitive monitoring can have clear academic benefits, our stance was that the potential advantages of this after-school program clearly outweighed any concerns pertaining to issues relating to strict experimental research design, particularly for students living in a very rural area of a Title I district in southeastern Georgia. Along a similar vein, research has shown that teaching children about media, such as through computer-based simulations, has been shown to improve learning processes like discovery learning (Leutner, 1993), mathematics (Balacheff & Kaput, 1996), and cognitive-affective states (Baker, D'Mello, Rodrigo, & Graesser, 2010). In addition, research by Azevedo and his colleagues (e.g., Azevedo & Hadwin, 2005; Mayer & Moreno, 2002; Moos & Azevedo, 2009; Winters, Greene, & Costich, 2008; Zimmerman & Tsikalas, 2005) has demonstrated the beneficial effects

multimedia environments have on incidental learning and self-regulated learning skills such as metacognition and evaluation.

Nonetheless, there is one aspect of our design that we feel can be improved for future programs: the sole reliance on self-report surveys as measures of metacognitive monitoring and strategy use. As noted in the Results, no significant increases were found on these measures, and in fact, the data revealed slight decreases in scores on these measures from pre- to posttest. Given that students in this age group have been found to be relatively poor at metacognitive monitoring in general, one interesting possibility is that our training actually encouraged the children to *more* accurately reflect on their lack of strategy use and monitoring in other learning situations, leading to a slightly lower, rather than higher, scores on these self-report measures. Similar results have been reported in a recent study (Gutierrez de Blume, 2016) where self-report scores of elementary school students on metacognitive awareness decreased following a metacognitive monitoring training. At any rate, it can be argued that the self-report surveys are actually measures of metacognitive awareness in-and-of-themselves, and as such they should not be relied upon exclusively as accurate indicators of metacognitive growth in-context. In other words, it is possible that students are learning to become more aware of their planning and other types of learning strategies, in addition to more consistently monitoring their performance and effectiveness—but when asked to *reflect* on whether they are reflecting (in a recursive sense), they might struggle to provide accurate responses. Additional, more direct measures of engagement of metacognitive processes (such as think-aloud protocols and other activities that require students to demonstrate an awareness of their thought processes in “real time,” while they are engaged in relevant learning activities) might provide more accurate information

about the potential effectiveness of this type of program.

In spite of these limitations, we believe that this after-school program was successful in engaging students and promoting their motivation to learn media literacy skills in the context of a fun photography-related project. Students were highly motivated and enthusiastic every week throughout the program, and unsolicited anecdotal reports from parents and teachers at the school indicated that the program had a beneficial effect in terms of supporting children’s interest in new technologies and media literacy. The fact that increases in scores on a measure of self-efficacy for learning was found (although the difference was not statistically significant) further supports this conclusion.

IMPLICATIONS FOR FUTURE RESEARCH

Many students in rural contexts are at an increased risk of facing adversities that limit intellectual achievement. We believe that after-school programs such as our Photography and Media Literacy Project have far-reaching potential for improving metacognitive awareness and monitoring of learning strategies of children in similar settings. Such opportunities also provide much needed instruction in media literacy and skills related to critical evaluation of online information. Although we utilized 14 iPods that were purchased with research grant funds for our program, Ching et al. (2006) and others have demonstrated that effective photography-related projects can easily be implemented, even in regular classroom settings, with only one digital camera, iPod or iPhone. Based on findings from this preliminary study, we recommend including assessments of metacognitive functioning that more directly and objectively measure the processes that learners are engaging in while creating their multimedia presentations. For example, in addition to self-report surveys, researchers and

practitioners could utilize think-aloud protocols, where students are individually interviewed at various stages of development of their project, and prompted to reflect on the specific metacognitive processes and learning strategies that they are engaging in to ensure that they are successful. Additionally, pre-post assessments on problem scenarios that require students to actively keep track of multiple pieces of information, which encourage the use self-questioning and monitoring of strategies, could be included as another, more objective measure of improvement from the training.

Due to the popularity of our after-school program, we have already begun making some of these modifications to our original PMLP program and have continued to work with new groups of students during the current school year to develop it for full-scale implementation in subsequent semesters. We have also worked to more explicitly link our instruction and training to our learning goals, in an effort to increase the likelihood of finding statistically and practically significant differences in the full scale deployment.

CONCLUSION

Today's youth are connected with one another and the rest of the world in many more ways than ever before and this requires them to be more critical in their creation and consumption of digital media. The Photography and Media Literacy Project was intended to provide elementary school students with an opportunity to improve their cognitive (strategy use), metacognitive (knowledge and regulation), and motivational (self-efficacy) skills through a media literacy educational intervention. Despite the fact that our statistical analyses demonstrated no growth in students' cognitive strategy use or metacognitive awareness, there were modest increases in students' judgments of self-efficacy to learn in academic settings. Moreover, these students demonstrated an increased interest

and appreciation for photography and other media literacy skills. In this report, we have shown that educational interventions such as the PMLP can be effectively and efficiently implemented in authentic educational settings such as schools and classrooms. Hence, elementary educators can employ the PMLP in their own classrooms in an effort to increase essential learning outcomes necessary to face 21st century problems. Based on the findings of previous studies and examination of our own results, we suggest that programs such as these have potential to be successful, particularly if students are provided with a lot of direct, task-specific instruction as well as constant support and encouragement for development of these important skills.

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Appendix A

Pre-Posttest Online Questionnaire

Part 1:

- What is your age? (open ended)
- What is your gender? (Male, Female)
- What grade are you in?
- Type your name here. (Note: Names were recoded as participant numbers for data analysis purposes.)

Please drag the sliders to show to what degree you agree or disagree with the following statements. 0 indicates you **fully disagree** with the statement. 100 shows you **fully agree** with the statement. These statements are about your learning in the school in general.

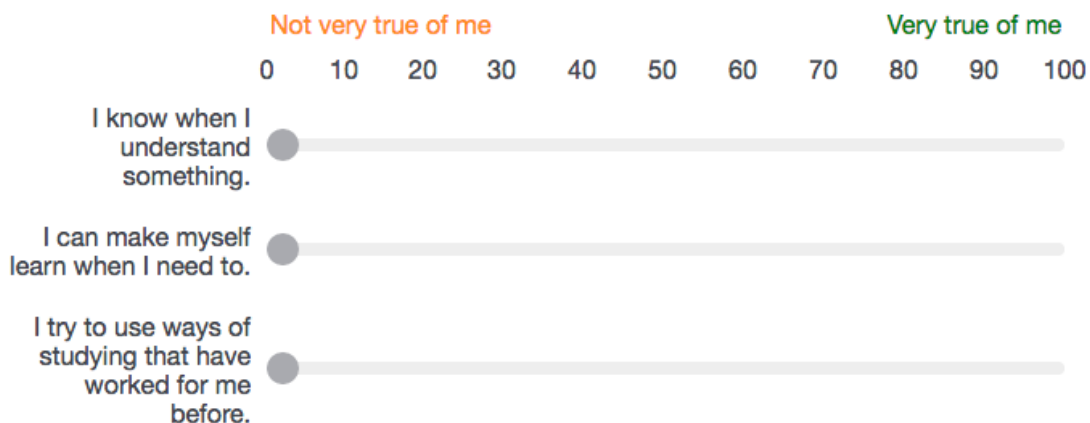


Figure. Screenshot from survey

Part 2:

Instructions: "Please click and move the slider to the point on the continuous line under each statement that best corresponds to how true each statement is about you. For instance, the closer the slider is to 'Not at all true of me' the LESS true that statement is about you. On the other hand, the closer the slider is to 'Very true of me' the MORE true that statement is about you. Likewise, moving the slider to either end of the line (0 or 100) indicates that the statement is either not at all true of you (0) or very true of you (100). Please be as honest and accurate as possible to each of the statements, as your responses will be grouped and we will not be able to tell your individual responses to the items.

For example, for the following statement: 'I can play basketball very well,' a professional basketball player like LeBron James would rank himself close to 100, while a 5-year old child would rank himself/herself close to 0."

- I know when I understand something.
- I can make myself learn when I need to.

- I try to use ways of studying that have worked for me before.
- I know what the teacher expects me to learn.
- I learn best when I already know something about the topic.
- I draw pictures or diagrams to help me understand while learning.
- When I am done with my schoolwork, I ask myself if I learned what I wanted to learn.
- I think of several ways to solve a problem and then choose the best one.
- I think about what I need to learn before I start working.
- I ask myself how well I am doing while I am learning something new.
- I really pay attention to important information.
- I learn more when I am interested in the topic.
- I use my learning strengths to make up for my weaknesses.
- I use different learning strategies depending on the task.
- I occasionally check to make sure I'll get my work done on time.
- I sometimes use learning strategies without thinking.
- I ask myself if there was an easier way to do things after I finish a task.
- I decide what I need to get done before I start a task.

Part 3:

Instructions: "Please click and move the slider to the point on the continuous line under each statement that best corresponds to how true each statement is about you in general for all your classes. For instance, the closer the slider is to 'Not at all true of me' the LESS true that statement is about you in general. On the other hand, the closer the slider is to 'Very true of me' the MORE true that statement is about you in general. Likewise, moving the slider to either end of the line (0 or 100) indicates that the statement is either not at all true of you (0) or very true of you (100) in general. Please be as honest and accurate as possible to each of the statements, as your responses will be grouped and we will not be able to tell your individual responses to the items."

- Before a quiz or exam, I plan out how I will study.
- When I finish working practice problems or homework, I check my work for errors.
- I plan my study time for my classes.
- I have a clear idea of what I am trying to accomplish in my classes.
- If I have trouble understanding something I go over it again until I understand it.
- I try to plan an approach in my mind before I actually start homework or studying.
- When learning new information I try to put the ideas in my own words.
- When doing an assignment I make sure I know what I am asked to do before I begin.
- When I study I am aware of the ideas I have or have not understood.
- It is easy for me to establish goals for learning in my classes.
- I answer practice problems to check my understanding.
- I make sure I understand the ideas that I study.

Part 4:

Please drag the sliders to show to what degree you agree or disagree with the following statements. 0 indicates you fully disagree with the statement. 100 shows you fully agree with the statement. These statements are about your learning in the school in general.

- I'm certain I can master the skills taught in school this year.
- I'm certain I can figure out how to do the most difficult school work.
- I can do almost all the work in school if I don't give up.
- Even if the work is hard, I can learn it.
- I can do even the hardest work in school if I try.

Part 5 (open-ended response):

"Imagine you are having a debate with one of your friends about whether cell phones should be allowed in the classrooms or not. To support your points, you find an article on the internet. How would you justify that the article you found is a good one?"

Appendix B

Weekly Schedule of Activities for PMLP After-School Program (Thursdays, 2:15–3:15 p.m.)

Week 1: Introductions (10 minutes) and Pretest (25 minutes); then brief overview of the program (10 minutes) and practice using iPods (15 minutes).

Week 2: Brief (10 minutes) reminder/overview of program, telling participants that they will be using iPods to take photos of something in their environment (i.e., either physical, social, school or natural environment) in order to create a movie that tells a story or makes an argument. Once they gather images, they will go online and look up research and/or other relevant information to include (as text) in their movies. PowerPoint presentation (10 minutes) of examples of photos of people's faces (obtained from publically available social media sites), with whole group discussion of how photos can be used to tell stories or send messages. Practice using iPods to take photos (30 minutes). Wrap up and whole group discussion about importance of planning ahead, using a made-up scenario of a child who did not plan ahead and failed a test as a result (10 minutes).

Week 3: Brief reminder of plan for the upcoming weeks (5 minutes). PowerPoint presentation (15 minutes) on 3 elements of good photos (i.e., composition, light, focus). Practice using iPods to take photos (around the school and outside on the school grounds), with emphasis on awareness of the 3 elements (30 minutes). Wrap up: back to the classroom to self-evaluate images (10 minutes).

Week 4: Presentation of examples of short movie clips (found online) created using Windows MovieMaker (10 minutes). Pair up and choose topics/themes (10 minutes), then begin image gathering for movie creation, throughout the school and outside on the school grounds (25 minutes). Wrap up and whole group discussion about importance of critically evaluating information that is found online, using a made-up example of a student who is looking up information online for a homework assignment (15 minutes).

Week 5: Completion of image gathering, throughout the school and outside on the school grounds (50 minutes). Wrap up and self- evaluation of images, choosing the best ones for creation of the movie (10 minutes).

Week 6: Brief presentation on the importance of critical evaluation of information that is found online, including a discussion of different types of websites as well as the importance of questioning the source and validity of the content (20 minutes). Online work in the school computer lab, finding relevant and legitimate online information to add to movies (with extensive supervision) (40 minutes).

Week 7: Wrap up image gathering and online information-seeking for any groups who still need additional photos and text for their movies (15 minutes). Windows MovieMaker demonstration

(20 minutes), followed by practice with MovieMaker and finding music from free music sites (25 minutes).

Week 8: Upload photos to Windows MovieMaker program and work on creating movies, putting images together and adding text and music (60 minutes).

Week 9: Posttest (25 minutes); then finish making movies (20 minutes) and begin presentations of movies (15 minutes).

Week 10: Presentations of movies (cont'd—45 minutes); distribute certificates of completion (15 minutes).