

Connecting out-of-school learning to home:

Digital postcards from summer camp

By Heather Toomey Zimmerman, Christopher Gamrat, Simon Hooper,
Penn State University

Abstract

Parents and children are rapidly adopting mobile technologies, yet designs for mobile devices that serve a communication function to connect parents to children's out-of-school time activities are limited. As a result, our team designed the Digital Postcard Maker so that children attending summer camps can create digital photographs to send home to their parents. These digital postcards help to connect children's home life with out-of-school learning experiences and also support 21st Century Skills' media literacy practices. The research design included two iterations of a design-based research project with 58 children from 55 families. Design implications related to supporting informal science learning with mobile computing relying on digital photography are shared, including (i) the need for additional support to transform an out-of-school recreational activity into an out-of-school learning activity, and (ii) the utility of photographs as a means to connect parents and children to talk about environmental sciences topics.

Keywords: digital photography; informal learning; intergenerational learning; mobile computing; parent-child interaction; science education

Design recommendations for informal science education (Bell, Lewenstein, Feders & Shouse, 2009) suggest that to support children's science learning, adults should help children to connect educational experiences across different settings, such as homes, after-school programs, schools and communities, to extend learning over time. However, as many parents lament, making connections between home- and out-of-school-time activities (e.g., summer camps) can be challenging, because when parents are not present, elementary-aged children (5–11 years old) can struggle to articulate their experiences after the fact. Consider this common scenario: A child comes home from a

day at summer camp, and when the parent asks, "What did you do today?" the child's response is, "I had fun." But when asked for details, the child says, "I don't remember."

To connect children's learning at home and at summer camp, we designed a website and database, based on the metaphor of a postcard sent from children to parents. The Digital Postcard Maker project addresses the need to increase parents' awareness of children's out-of-school activities as a means to extend learning experience into the family setting through a "seamless" design for mobile computing (Looi, Seow, Zhang, So, Chen, & Wong, 2010), where the normal boundaries between learning settings are reduced through the use of handheld devices. Our strategy utilizes a mobile learning pedagogy (Park, 2011) related to distance learning in which a goal is to decrease the transactional distance (Moore, 2007) defined as increasing interactions between teacher and student—or as in this case, increasing parent and child interactions. Theory from informal science education about the role of parents in supporting children's science-related interests (Barron, Martin, Takeuchi, & Fithian, 2009; Crowley & Jacobs, 2002; Zimmerman, Perin, & Bell, 2010) was used to guide the design of the interface prompts. In this article, we describe the design of the Digital Postcard Maker, the educational theoretical principles driving its development, and the results of two iterations of research in which the Digital Postcard Maker was administered with 58 summer camp children (aged 8 to 11). Finally, we discuss design implications for others seeking to design technologies to bring families together outside of school.

Digital Postcards from Camp

Given the increasing ubiquity of mobile computers in children's educational lives (Warschauer & Matuchniak, 2010), our research team sought to design a digital tool to

connect families' out-of-school learning with youths' out-of-school camp learning. Although cellular phones can be used to send text pictures or access photo-sharing sites, most elementary-aged children are not permitted by "use agreements" to access social media sites and many parents in the USA do not provide 5–11-year-old children their own Internet-enabled cellular phone. Using the Digital Postcard Maker, children are able to communicate with their parents the things that the children learned at summer camp through an access-controlled website.

Given that the parent was not present during the summer camp, the digital postcard captured the children's experiences—in their own words—to communicate to their parents what they enjoyed and learned, with the intention of extending the environmental sciences learning beyond the week-long camp program.

Design considerations from learning theory

Principles from learning theory drove the design of the Digital Postcard Maker, and the project used a pedagogy supporting learning with mobile devices (Park, 2011). Park's pedagogy examines teaching using mobile devices along two axes: the *transactional distance* (Moore, 2007) between teachers and students (adapted here to parents and children) and the *social nature* of the learning activity versus independent nature. Our pedagogical perspective here is to lessen the transactional distance between parents and children through increasing communication and to increase the social nature of the child's summer camp by connecting it to family. We increased the social interaction and lessened the distance between parents and children by turning a child's interests from camp into a shared digital postcard. When receiving the postcard, the parents gain insight into their children's interests outside the home as the child makes his or her thinking visible (Bell, 1997).

Although the primary aim of the digital postcard is to increase communication, the secondary intention is to support future learning through providing parents with information to further the development of their children's interests (Barron, et al, 2009; Crowley & Jacobs, 2002; Zimmerman, Perin, & Bell, 2010). The project focuses on interest development and future learning through providing a means for parents to connect the camp experience to prior family experiences, fostering their children's knowledge integration (Linn,

1995). By integrating new experiences outside the home into family conversations, parents have the opportunity to connect new and old learning, which has the potential to support the development of environmental and scientific concepts for children (Eberbach & Crowley, 2005). Families have been shown to engage in science-related conversations around the dinner table (Ochs & Taylor, 1992), in support of hobbies at home (Zimmerman, 2012), in museums (Palmquist & Crowley, 2010), or on family walks (Goodwin, 2007) to extend conceptual understandings.

Finally, this program was also designed to give children opportunities to engage in media literacy practices during out-of-school time. These are important 21st Century Skills (Institute of Museum and Library Services, 2009). Prior work in school and afterschool programs (Land, Smith, Park, Beabout, & Kim, 2009) has shown that learners can take and describe their own science-related photographs. By designing their own digital postcard—taking photographs, selecting images, and composing text—children communicated their ideas to their parents visually and with text, thus gaining media literacy experience.

Digital postcard intervention

Children were recruited from normal summer camp over two weeks of camp (one week for Iteration One and one week for Iteration Two). Campers created their own digital postcards to be sent to an email address provided by a parent or legal guardian. Children worked in pairs, using digital cameras and iPod Touches to take digital photographs. Children were asked to take pictures of things that interested them, especially things that they wanted to share with their parents. The campers spent sixty to ninety minutes exploring outdoors with the handheld devices. Afterwards, the children went into the nature center building to review their photos. The children each selected one image to share with their parents about their experience at summer camp.

Adult camp counselors and two researchers assisted children with typing and navigation through the Digital Postcard Maker. The Digital Postcard Maker was built within a few webpages that are attached to an underlying database, stored on a secure university server. The website and database are capable of storing photographs and text as well as sending graphical emails. The Postcard Maker webpages were designed to be incorporated into a summer camp's website and accessed from anywhere with an Internet connection. The web-based interface had a third-

grade reading level (using Flesch-Kincaid Grade Level statistics) and a simple site navigation to aid usability by children.

Children checked a box to submit their message to the research team. This opt-in research option was included as a means of obtaining children's assent (after parents provided consent) and so that non-consented children could participate in the postcard experience during camp too.

Study Design

To understand how digital postcards could connect the children's out-of-school activities to family/home-based activities, the team conducted two iterations of a design-based research (DBR) project at a nature center's summer camp. DBR methodology was chosen to inform practice through design recommendation as well as to inform theory, in our case, related to supporting parent-child interactions outside of school via mobile computing. The Design Based Research Collective (2003) states that DBR is a method that includes "researchers working in partnership with educators seeking to refine theories of learning by designing, studying, and refining rich, theory-based innovations." DBR suggests that researchers look both at the processes of how people learn and use technologies as well as at the outcomes. As a result, our DBR study included ethnographic shadowing and field noting along with an analysis of the children's postcards and a parent survey.

The research questions were:

- How did children make digital postcards during the summer camp to reflect their interests? Were there barriers that could be identified and overcome?
- Were the postcards helpful to parents to identify children's interests or to support future family learning activities?

Summer camp setting

The study occurred at a Shaver's Creek Environmental Center (SCEC) located in the Mid-Atlantic region of the USA. SCEC is a nature center with an indoor welcome center, amphitheater, hands-on exhibit room, herb and flower gardens, animal rehabilitation center with twenty nonreleasable raptors and several kilometers of outdoor trails. SCEC offers multiple sessions of summer camps to children from preschool to middle school over 8 weeks. SCEC's day camps are low-cost compared to other camps in the area, attracting families from various socioeconomic backgrounds.

Data collection and analysis

The Digital Postcard Maker project was implemented with 66 children entering grades 3 to 5 (aged 8 to 11) who attended a summer camp at the SCEC. In Iteration One of the Digital Postcard Maker project, 18 children were consented into the study by their parents but only 11 children completed digital postcard activities. In Iteration Two, the Digital Postcard Maker project was redesigned and implemented with 48 consented children; 47 children completed all digital postcard activities. Across both iterations, 58 completed digital postcards were collected and analyzed from a total of 58 children from 55 families. The data included field notes from observation of people using the Digital Postcard Maker, the postcard artifacts and a brief online survey sent to 55 parents after they had received the postcard from their child. Two of the 11 Iteration One families responded to the survey, and 21 of the 44 Iteration Two parents responded to the survey.

Data analysis included a thematic analysis of field notes with codes for use of technology, interests in science or environment and any science or environmental concepts shared. The postcards were qualitatively analyzed for image and text composition. The message content included concepts related to science, statement of wanting to learn more and personalization of the statement. The survey responses were tabulated as frequency counts.

Data and Findings

Across the two iterations of our study, we analyzed our data to understand the usefulness of a digital postcard so that children could inform their parents about what they learned at camp and what topics they were interested in for further exploration.

Iteration One: The postcard activity needed additional structure

In Iteration One, we found that adopting the metaphor of a postcard directly resulted in a task that was too unstructured for the children in our study. Seven children struggled to complete the activity in the time provided, and consequently, only 11 out of 18 children completed the digital postcard activity.

For the 11 children who completed postcards, the postcard images included pictures of SCEC's facilities, frogs, turtles, an eagle and other animals. The campers who did complete the postcard responded to one written prompt: "Today at Shaver's Creek, I learned..." The children's responses to the "Today at Shaver's Creek,

I learned” prompt focused on describing the picture, rather than on what was learned. Typical responses included (as typed by each child; misspelling and capitalization preserved):

- Today I took a picture of a frog. It was at Shaver’s Creek. It was in the frog pond.
- I took a picture of turtle. I love turtles but DON’t get me one for my birthday.
- This is the great oak tree at Shaver’s Creek.
- hey granny. i love Shaver’s Creek! that’s a golden eagle! love you, (child’s name)

As illustrated above, the children’s typed postcard comments were brief. Comments focused exclusively on describing a picture or adding a personal note, with little information about what the children learned at camp or what they wanted to learn more about. Given that our data showed: (i) a brevity of responses, (ii) a focus on naming the picture (rather than talking about what was learned) and (iii) only eleven out of eighteen consented children completed the postcard, we interpreted this to suggest that our initial interface design was too unstructured to be a learning tool to connect camp to home. Although the design mirrored the open-ended nature of a paper postcard, the 8–11-year-old children needed more directions to use this digital postcard to communicate to their parents about their summer camp interests. Given the goal to increase parent-child communication, we reworked the postcard prompt before implementing it with additional summer camp learners in Iteration Two.

Iteration Two: Children shared their interest and activities with their parents

Because our design metaphor of a postcard was too open-ended in Iteration One, we added two more targeted questions in addition to our general prompt in Iteration Two. The one prompt of “Today at Shaver’s Creek, I learned...” became three prompts: (1) “My picture is of . . .”, (2) “Today I learned . . .” and (3) “I want to learn more about . . .”.

Summer campers’ media literacy practices

In Iteration Two, we found that the campers could engage in describing what they learned during camp. Typical responses to the prompt, “Today I learned” were: “That caterpillars eat Milkweed and that they can get fatter very fast and a little caterpillar can be the size of half of your pinky,” “I learned how to tell male and female turtles apart,” and “Shaver’s Creek only keeps wounded birds and animals.”

The children expressed media literacy skills as they curated their postcard with engaging images shared with their parents. There was diversity in the content of 47 pictures (Figures 1-3) that children selected for their postcard, which we in-

terpret to mean that children were able to focus on personal interests. The majority (24 images) of children’s interests were outdoor trail-based objects: aquatic animals, insects, flowers, panorama shots of the woodland area, beaver lodge on stream, wetland areas and trees. The children expressed slightly more interest in animals than plants. About one out of three images (18 total) showed one of SCEC’s indoor or outdoor exhibits—most commonly raptors, snakes and turtles. A small number of children (five) shared an image of SCEC’s facility, including the group lunch picnic pavilion, the camp’s “iron owl” mascot, and a recycling display.

Parent-child learning

In addition to analyzing the children’s postcards, we surveyed parents. In Iteration Two 21 of 44 parents responded. All responding Iteration Two parents who received an electronic postcard said that they enjoyed receiving a postcard from their children during summer camp. Combining our field notes of the children making the postcards with the survey responses from parents, families enjoyed making and receiving postcards. Parents appreciated the postcard because it gave them insights into their children’s camp activities that they did not otherwise have.

Twenty of the 21 parents who completed the survey said that they talked about the digital postcard with their child. Most often, families discussed various animals the children saw at camp and then together the family did research online to learn more about these animals. Plants were a second common topic. In addition to learning about nature, some parents appreciated the child’s exposure to media literacy skills, commenting on the technological process of taking a digital picture and sending the postcard from camp. A few families said their child was more interested in talking about how he or she selected the photo and message for the postcard than talking about the environmental sciences learning experience.

The parental survey responses identified several conversational contexts that the postcards created for children and parents based on the children’s camp experiences. Animals were the most common conversational topic that the parents said the postcard started at home. To a lesser degree, the postcards also sparked conversations about plants, media literacy and technological skills. As a result of this finding, we interpreted the Digital Postcard Maker meeting its primary goal of enhancing family conversations about camp.

In regard to the Digital Postcard Maker’s second goal of extending learning and focusing on children’s interests, the parents who completed



Figure 1: a picture of the plant black-eyed susan (*Rudbeckia hirta*) taken by a child and used in a digital postcard.



Figure 2: a picture of a landscape, a stream, taken by a child and used in a digital postcard.



Figure 3: a picture of a frog in a pond taken by a child and used in a digital postcard.

the survey reported that the postcard helped them understand their child's interests because the child could visually elucidate their summer camp experience. Parents reported their children articulated broad environmental interests as a result of sharing the postcard, including birds, plant-animal ecological relationships, natural processes (e.g., photosynthesis), aquatic animal life and plants. Given the wide variety of interests that the parents distilled from the postcards and subsequent conversations, the children expressed their unique interests in a manner that the parents could understand and then later support. In this way, the digital postcards met its secondary goal to allow parents to foster their child's science-related interests (Crowley & Jacobs, 2002; Zimmerman, Perin, & Bell, 2010). Nearly all of the families who participated would recommend using the email postcards in the future.

Digital Postcards from Summer Camp: Issues for Research and Design

The Digital Postcard Maker provided parents insights into their children's activities and interests during summer camp to support parent-child communication about science and environmental topics outside of school. Given the research on parents as learning partners (Barron, et al, 2009), digital postcards were an effective way to enhance children and parents conversations with a consequential task that was adapted into SCEC's summer camp program. Our study showed that translating the postcard metaphor into a digital learning tool required structured learning support. We found using only one open-ended prompt did not work well for the digital postcard with elementary-aged children. Additional structure was needed to bridge the everyday use of postcards to an educational use (i.e., three prompts in Iteration Two increase postcard

completion compared to one general prompt in Iteration One). Given the SCEC children's success in making postcards and the SCEC parents' reported success in learning about children's interests and activities from camp, we posit this activity increased parent-child communication about science by supporting future family learning conversations.

Designing for parents

Given the focus on parents, the project tested the postcard maker on multiple browsers, and we found that design for everyday life presented extra challenges. When designing for education using mobile devices for a workplace or specific school environment, a team can design for the in-use browsers and known firewall issues; however, when designing for use in unpredictable parental access points for email, more challenges are presented. Two parents from Iteration Two reported that they did not receive postcards, indicating the need to address spam filters and/or to provide parents with the postcard maker email address to save in their online address books.

Designing for summer campers

From our field notes and feedback from parents, we found the process of taking digital pictures worked well for most children, although one parent reported this was difficult for her child. The children expressed much pleasure and pride in the photographs and expressed excitement about making a postcard to email to their parents. Sending the postcard by email added excitement for the children.

The postcard project was implemented as part of the normal summer camp program at SCEC during one station available during campers' free-choice time. Incorporating the digital photography into existing summer camp routine of campers' free-choice activity, we posit in-

creased its success. When considering adopting digital postcards in future camps, we found that the process of creating digital postcards was time-intensive; children needed to select a photograph, type their message and articulate their interests to their parents through typing three sentences. An out-of-school environment—such as this summer camp—serves children of multiple ages and from multiple schools: a uniform level of experience of digital literacies, typing and writing sentences cannot be presumed. We found the additional help from two research team members was useful to assist the existing camp counselors with this group of 48 children — especially for the younger children. If others would like to adopt this type of intervention, we suggest bringing in one volunteer per 20 to 25 children for this kind of learning with mobile devices program, especially for the first implementation during a summer camp.

Conclusion

The Digital Postcard Maker created an opportunity to connect home and summer camp. It provided parents insights into their children's interests and activities in out-of-school time that fostered family conversation. Because when receiving the postcard, the parents gained insight into their children's interests outside the home and conversations, we posit for these 55 families, the Digital Postcard Maker increased the families' social interaction and lessened the distance between parents and children's out-of-school time by turning a child's interests from camp into a shared digital artifact. From this small scale study that shows the digital postcard has promise as a conversational catalyst, there are possibilities for future research: (a) what sort of conversations have occurred between the sender and the recipient of digital images?, (b) what the families do next based on the conversation once receiving a postcard? , (c) does a digital postcard experience result in an increase in children's curiosity or interest in returning to the informal learning center or other related informal educational settings?, and (d) if a child sends multiple digital postcards home from camp over a week or summer, does a parent gain greater insights into a child's activities and interests?

Correspondence in regard to this article should be addressed to: Heather Toomey Zimmerman, Penn State University, University Park, State College, PA 16801, Email: heather@psu.edu

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