Journal of Outdoor Recreation, Education, and Leadership 2017, Vol. 9, No. 2, pp. 181–196
https://doi.org/10.18666/JOREL-2017-V9-I2-8228

An Investigation of Mobile Technologies and Web 2.0 Tools Use in Outdoor Education Programs

Doris U. Bolliger
Craig E. Shepherd
University of Wyoming

Abstract

This study examined how instructors and learners in residential outdoor education programs utilized mobile technologies and Web 2.0 applications. Twenty semistructured interviews were conducted with instructors, support staff, and administrators at a nonprofit institution that provides outdoor education programs. Sixty-five participants in those programs completed a questionnaire with open-ended questions. Results indicate that full-time instructors who were assigned an iPad utilized mobile technologies effectively and frequently. In contrast, seasonal instructors who had to check out iPads used them less frequently. Most instructors encouraged program participants to share digital media and use Web 2.0 tools. Program participants utilized a variety of mobile devices and applications during the programs. There was disagreement among instructors and staff, however, pertaining to the need for and the use of mobile technologies in outdoor education on public lands and in wilderness areas.

KEYWORDS: outdoor education; instruction; mobile technologies; ubiquitous learning; Web 2.0

Outdoor education emerged in the later 1800s to teach individuals of all ages about nature, its inhabitants, and the interrelationships among them (Gilbertson, Bates, McLaughlin, & Ewert, 2006; Hammerman & Hammerman, 1973). "The objective is to teach the student to see the land, to understand what he sees, and enjoy what he understands" (Leopold, 1942/1991, p. 302). Learning in the outdoors can be more active, relevant, personal, and meaningful than textbook learning because students use all their senses to interact with and explore their surroundings (Day & Petrick, 2006; Gilbertson et al., 2006; Hammerman & Hammerman, 1973). However, Louv (2008) found that many individuals, regardless of age, experience a disconnect with nature. Indeed, when investigating trends in outdoor education and adventure programs in the United States, Bobilya, Holman, Lindley, and McAvoy (2010) found that youth are increasingly disconnected from nature and outdoor leaders may lack sufficient training to engage their audience.

Some people blame technology for this disconnect (Day & Petrick, 2006; Shultis, 2012). Pergams and Zaradic (2006) found that 16-year reductions in nature-based recreation at U.S. national parks negatively correlated with rises in Internet, video-game, and media consumption. They further suggested that when adults failed to spend time in nature-based settings, a "generation of children is also likely to follow suit" (Pergams & Zaradic, 2008, para. 5). Additionally, 21% of 368 surveyed National Wilderness Preservation System Managers stated that visitor experiences management, including "dealing with new technology," was a major challenge they would face over the next 20 years (Ghimire, Green, Cordell, Watson, & Dawson, 2015, p. 25). Yet, others view technology as instrumental for teaching wilderness and outdoor learning principles to individuals (Dawson, 2007; Oblinger, 2003; Walter, 2013).

Abundant literature describes the selection, integration, and utilization of technologies in learning environments and the appropriate design of technology-enhanced instruction (e.g., Smaldino, Lowther, & Russell, 2012; Smith & Ragan, 2005). However, in a topic analysis of major outdoor education journals, Poff, Stenger-Ramsey, Ramsing, and Spencer (2013) failed to mention the integration of technology in outdoor education programs, focusing instead on program outcomes, curriculum, orientation programs, place, environmental ethics, experiential learning, leadership development, learning, risk, service learning, and wilderness therapy. A comprehensive literature search revealed that literature on the integration and utilization of mobile technologies and Web 2.0 tools in outdoor education programs is scarce. The purpose of this article is to report results of an investigation pertaining to the use of mobile technologies and Web 2.0 tools by instructors and program participants in outdoor education programs delivered at a U.S. national park.

Mobile Learning

The ubiquity of portable, wireless computing devices (e.g., tablets, smartphones, media players) allows individuals to consume and produce information constantly while they connect to others (Koole, 2009; Traxler, 2011). Mobile learning occurs when learners interact and engage with curricular, pedagogical, and social resources at various locations through portable electronic devices (Crompton, 2013; Koole, 2009; O'Malley et al., 2003). Though often associated with informal, spontaneous, and on-the-go learning, mobile learning can occur in face-to-face, formal settings (Brown & Mbati, 2015; Kukulsa-Hulme & Traxler, 2005).

Through mobile learning, individuals can study in flexible and interactive ways; immerse themselves in meaningful, applicable learning environments; work toward immediate learning goals by completing meaningful real-world activities; engage with the location that is being studied; and respond to tailored learning activities based on individual differences (Brown & Mbati, 2015; Traxler, 2011). Mobile learning can extend communication and leverage student downtime.

Museums use mobile technologies to highlight collections and vary patron experiences. Naismith and Smith (2009) and Rennick-Egglestone et al. (2016) leveraged mobile devic-

es to present varied museum tours to patrons without compromising the curated aesthetics. Interested patrons leveraged Internet devices to receive audio commentary about specific exhibits, to role-play events, and to differentiate collaborative experiences. Through tablet computers, social media, and related technologies, learners can interact with rich content when they desire uniquely tailored learning opportunities, troubleshoot problems with help from support staff and instructors, and expand learning environments without affecting the aesthetics of existing spaces (Alden, 2013; Brown & Mbati, 2015).

K–12 Education

Mobile technologies are also gaining traction in K–12 education settings. A survey of 2,462 Advanced Placement and National Writing Project teachers in both middle and high school settings revealed that 73% use and/or allow their students to use mobile phones in their classrooms, 45% use e-readers, and 43% use tablets, mostly for Internet research (Purcell, Heaps, Buchanan, & Friedrich, 2013). K–12 teachers use mobile devices to extend lessons beyond the schoolroom, differentiate learning, manage resources and grades, give feedback and support, and provide supplemental activities (Ferrer, Belvís, & Pàmies, 2011; Kennedy & Levy, 2008; Liu et al., 2014). Mobile devices create a playing field where individuals can communicate and connect with others, express themselves, share ideas, and create knowledge collaboratively (Caladine, 2008; Jones, 2008). This phenomenon has considerable social impacts and has redefined the production of knowledge.

Yet mobile technologies are not without challenges in educational settings. Although teachers allow for their uses in formal activities, they often worry about students' abilities to filter results and identify relevant and credible information (Purcell et al., 2013). Mobile devices may also exacerbate socioeconomic differences among students, labeling those with older or rented devices and preventing them from the same level of access as their peers (Liu et al., 2014). However, Ferrer et al. (2011) mention that these differences are erased through one-to-one computing policies in which all students receive the same device. Additionally, mobile devices may serve as distractions to learning if the environment is not adequately designed (Eliasson, Cerratto-Pargman, Nouri, Spikol, & Ramberg, 2011; Nouri, Cerratto-Pargman, Eliasson, & Ramberg, 2011). These authors found that mobile devices can interfere with student interactions in the physical environment because of the many apps, tools, and features on the device (Eliasson et al., 2011; Nouri et al., 2011). Additionally, they found that interpersonal communication and collaboration can be compromised by mobile devices if the learning tasks are not planned effectively (Eliasson et al., 2011; Nouri et al., 2011).

Outdoor Education

Mobile learning and Web 2.0 tools are used in outdoor education programs similarly to how they are used in other settings. Blackwell (2015), Dawson (2007), and Walter (2013) indicate that outdoor educators use mobile devices to access maps and location services, access guidebook information, document surroundings through photography and video footage, disseminate information, offer just-in-time support, and communicate with emergency personnel. Thus, educators use mobile devices to supplement the physical environment. Lai, Chang, Li, Fan, and Wu (2013) for example used QR codes to provide additional information in location-based settings for elementary students completing outdoor training. Hsiao, Lin, Feng, and Li (2010) also used Internet resources to provide multimedia information about physical surroundings. In their situation, those who used mobile devices to access learning resources outperformed on subsequent assessments than a group that relied on a knowledgeable guide that interpreted the surroundings (Hsiao et al., 2010).

Yet challenges with mobile technologies also arise in outdoor education settings. Although Dyment, O'Connell, and Boyle (2011) found that Web 2.0 tools can facilitate reflective processes in outdoor programs, they questioned the expense of tool integration. Others feel that an expectation for instant feedback and/or support results in a false sense of security and leads to careless and potentially dangerous behavior in outdoor settings (Blackwell, 2015; Shultis, 2012). Becoming overly reliant on electronic devices, at the expense of orienteering skills and common sense, may put individuals at risk if these devices fail or become unusable in harsh conditions (Dickson, 2004).

Program Evaluation

Program planners need to document the effectiveness of programs and their outcomes (Bobilya et al., 2010). They should also pay attention to outcomes that program participants expect. Hence, evaluators express the need for "evidence-based research" to establish literature on and about program evaluations and to improve practice over time (Bobilya et al., 2010; Patton, 2002). There are several challenges associated with conducting research in field-based outdoor education settings because of their dynamic nature (Bialeschki, Henderson, Hickerson, & Browne, 2012). These challenges include gaining access to sites and support from association staff, obtaining permits from national park services and approval from institutional review boards at higher education institutions, dealing with unforeseeable events, creating appropriate instruments for data collection, and conducting research across multiple sites and/or programs. To reduce these challenges, Bialeschki et al. (2012) suggested selecting a "window" or specific time to collect data. They also suggested involving staff and ensuring that there are no discrepancies between expectations of administrators and researchers.

The purpose of this study was to investigate the use of mobile technologies and Web 2.0 tools by instructors who teach place-based outdoor education programs and by individuals who participate in those programs. Research questions included the following:

- How important are mobile technologies in outdoor education programs?
- How are instructors using mobile technologies?
- How comfortable are instructors with mobile technologies?
- How do instructors and program participants personally use mobile technologies?
- How do instructors and program participants share information using digital media and Web 2.0 tools?

Method

Setting

Data were collected during a 16-day period in January 2014 at one U.S. national park. The participating organization was a nonprofit educational institution that offers outdoor education programs in the national park and surrounding areas. The organization offers youth, college, and family programs; residential seminars for which participants are housed in hotels or a field campus; and private tours. Instructors are hired permanently, on a seasonal basis, or through contract work (e.g., for specific programs based on their expertise).

The organization recently integrated mobile devices in their outdoor education programs. Eight iPads were purchased after obtaining grant funding in 2013. These were issued to permanent instructors. Seasonal instructors were able to check out iPads for the duration of their program. Contract instructors provided their own equipment. At the beginning of the summer season, returning instructors participated in a 1-week refresher training course; new instructors received training for 2 weeks. In these training sessions, seasoned instructors provided training on the use of iPads, including file management, applications, and potential uses. These instruc-

tors also served as user support to answer questions and troubleshoot iPad issues. Additionally, the organization utilized a variety of Web 2.0 tools such as Facebook, Twitter, Pinterest, Flickr, and Instagram. Park visitors had cell phone reception in developed areas only, and wireless Internet access was limited to hotel guests.

Data Collection and Analysis

After obtaining permission from the university's institutional review board, members of the organization (directors and managers) and the researcher engaged in dialogue to explore issues and possibilities (Bobilya et al., 2010). One of the directors and the researcher collaboratively narrowed the scope of the study, selected research methodology, and developed interview and survey questions. Additionally, the director chose the time during which data collection took place. This decision was based on the number of program offerings and enrollment numbers.

A qualitative case study strategy was used during natural inquiry to collect data from administrative and instructional participants (Creswell, 2012; Patton, 2002; Yin, 2003). Semistructured interviews were conducted with instructors, administrators, and support staff during work hours. The interview protocol included 13 questions and interviews lasted between 20 and 40 min. The main researcher took extensive notes during each interview and transcribed them immediately after the interview concluded. Data from outdoor program participants were collected with a 16-item questionnaire that included one 5-point Likert-like item, three polar questions, eight open-ended questions, and four demographic questions (Guba & Lincoln, 2005). The survey was distributed to participants at several sites within the park, depending on the type of educational program and lodging facility selected.

Responses to interview and open-ended survey questions were coded by the main researcher according to Flick (2006) to find common themes among two units of analysis, administrators/faculty and students (Yin, 2003). Data were initially organized by research questions. Responses that aligned with these questions were grouped together in worksheets in Microsoft Excel. An initial read through these grouped responses allowed the researcher to further code them based on statements made (Richards, 2009). This resulted in a set of initial codes grouped by data from interview and open-ended responses. The Excel workbook was then given to another researcher who was asked to examine it for agreement and make modifications to the codebook as needed (Patton, 2002). Following this review, both researchers continued to examine codes and refine categories, subcategories, and emergent themes using constant comparative techniques (Creswell, 2012). Descriptive statistics were generated for responses to the four demographic questions on the survey to describe characteristics of the sample.

Sample

Participants included instructors employed by the organization to teach outdoor education programs, support staff, administrators (directors and managers), and program participants. Twenty individuals participated in interviews: nine instructors, six administrators, and five support personnel. Of the instructors, five were full-time, permanent instructors; three were hired for the winter/spring season; and one taught programs on a contract basis. Twelve individuals were female; eight were male.

Participants who enrolled in hotel-based programs and field-campus seminars were invited to participate in the study. The foci of the eight winter programs were photography, skiing, snowshoeing, and wildlife watching. Sixty-five program participants completed the paper-based survey, which resulted in a 68.4% response rate.

Most survey respondents were female (66.1%), 29.0% were male, and three individuals (4.8%) preferred not to answer the question. Their ages ranged from 22 to 94 ($M = 57.1$) and they lived in 20 different states; only one person lived outside of the United States. Individuals had participated in one to 25 educational programs offered by the organization ($M = 2.65$); however,

36 people (57.1%) were new to the organization's programs, and 13 individuals (20.1%) were completing their second program.

Results

Importance of Mobile Technologies in Outdoor Education Programs

Perspectives of instructors. Participants indicated the use of mobile technologies in educational programs offered by the organization was anywhere from *moderately important, important*, to *very important*. One instructor mentioned it was "a toss-up." Individuals saw the value of using mobile technologies, but also stated that programs without them did not lack anything. In the past, instructors had to carry field guides, books, and laminated pictures in their backpacks. Today, they are able to store this information on an iPad.

Permanent instructors were issued personal iPads. Seasonal instructors were able to check out one of three iPads for the duration of their program. Contract instructors were not able to utilize organization-supplied iPads. The use of iPads, therefore, varied. Most permanent instructors used their iPads "a lot," whereas seasonal instructors had just begun to work with them. One person did not use iPads at all, and one instructor mentioned she would like to use them more often. Another instructor preferred to use his smartphone; another used his own iPad in addition to other devices.

Seven individuals spoke about the use of mobile technologies in programs with children. Five instructors felt iPads were a good tool to connect with children and helpful or fun to use with them in the field. They liked introducing children to applications and showing them videos. However, two instructors wanted to "unplug kids completely," believing that children "should look out there [in the wilderness]" rather than at the iPads.

Perspectives of support staff. Answers from support staff to the question how important is instructors' use of mobile technologies ranged from *super important* or *very important* to *not important at all*. Two interview participants did not want instructors to use mobile technologies in the field, because "the whole point about outdoor education is 'outdoors.'" Those who thought it was important to use mobile technologies mentioned it was pertinent for the organization to use more modern technologies and that instructors connect learners.

Some had mixed emotions about technology use or thought its use depended on the program. In their opinion, instructors used iPads to supplement instruction—to help participants understand or visualize a concept; however, "courses," they said, "can run without them." One person was less concerned about the integration of mobile technologies as opposed to the proper selection and appropriate use of devices.

Use of Mobile Technologies by Instructors

Responses of instructors. Five instructors used the iPad provided by the organization and two used their personal iPads. Two participants used personal cell phones or smartphones in addition to iPads, and two others used personal smartphones instead of iPads. Mobile devices (iPads or smartphones) were heavily used by five instructors; they used them in each program and indicated the devices were used several times a day but not all day. Others either did not use them often or rarely used them. Devices that were used in addition to iPads and smartphones included temperature guns, radios, Global Positioning Systems (GPS), geographic information systems (GIS), and digital cameras.

Seven instructors used iPads on the bus and/or snow coach. They passed the device around while driving or discussing topics of interest. One person used a cell phone to call a local event hotline or access the park's website. These individuals mentioned they do not take iPads on hikes because the screen cannot be viewed in sunlight. Individuals, however, had other reasons for not taking iPads on hikes. One instructor thought it was not a proper setting; others had too

many other things to carry in their packs or feared they might break the equipment. One person never used iPads on private tours because the outings were of relatively short duration. Another instructor preferred to use his smartphone because he could access the Internet.

Seven instructors showed animal videos or videos of animal and human interactions to entertain and educate about safety issues. Videos were usually used on the bus at the end of the day when program participants were tired. Six instructors used digital field guides to identify mammals, flowers, and birds based on images and sounds. The same number of instructors used images to show historical pictures, maps, and geological features or to illustrate an idea. The integrated iPad application Notes was used by three instructors to write down field sightings, inspirational quotes, or interesting facts. Two instructors used Night Sky, primarily in the early morning or late night, to identify stars. Other applications included PeakFinder, iPhoto, Google Drive, and NASA's Earth Now. One instructor used interactive quizzes to identify animal species.

One instructor selected a technology savvy participant to pull up files while the instructor drove. Another loaned his smartphone to children in his group and encouraged them to find information about certain topics or animals. According to the interviewee, these materials generated interesting discussion and dialogue. One instructor used mobile technologies to collect data for participant-generated reports.

Responses of support staff and administrators. According to administrators and support staff, resident instructors used mobile technologies frequently, whereas seasonal instructors used them rarely. Contract instructors did not use the organization's devices. However, they may have provided and used their own equipment.

Instructors used iPads primarily on the bus because a large amount of time was spent touring the park. While program participants were on the bus, the iPads were passed around. Most administrators or support staff indicated instructors did not use iPads on the trail; only one person believed they used them in the field. For the most part, mobile technologies were used as enrichment items. Instructors used iPads when program participants had special interests, had specific questions, or asked about something that they did not encounter. They also indicated that some instructors used mobile phones in the field, for example, to take a picture through a telescope.

Support staff stated that instructors used digital field guides to show pictures, identify animals or plants, play animal sounds, or provide information about animals (e.g., tracks or scat). They also confirmed the use of video clips to demonstrate animal interaction or interaction between animals and humans. Some used topographic applications or pulled up poems or quizzes. One person did not know how instructors used mobile technologies.

Responses of program participants. Thirty-three participants indicated their instructors used mobile technologies, whereas 32 persons responded no to the question. Instructors used iPads or tablets, smartphones, and GIS systems during programs to support "narrative explanations," "enhance" instruction, and "help" participants "understand" what they experienced. Program participants mentioned that instructors used photos, graphs, videos, and maps. Photos were used to identify animals and plants, show historical events, show geological formations, or provide technical details. A GPS device was used for tracking. Participants also used instructor-provided tablets for data analysis.

Most participants (69.7%) were either *satisfied* or *very satisfied* with their instructor's use of mobile technologies; only 18.2% were *neither satisfied nor unsatisfied*, and 12.1% were either *unsatisfied* or *very unsatisfied*. The majority of participants (91.7%) did not have expectations regarding mobile technology use during programs; only five (8.3%) expected their use. Only 19 of the 65 participants offered instructors suggestions for the use of mobile technologies.

Participants thought mobile technologies could be used to share trail and topography maps or routes for daily activities; provide interactive maps, tables, and charts; view more information and pictures on the tablets; locate and identify wildlife; record animal videos; create documenta-

tion and share pictures; and serve as a resource for instructors to search for answers to participants' questions. Others suggested tablet use to show examples while in the field, load applications on participants' devices, or use the GPS *a lot* more.

Instructors' Comfort With Mobile Technologies

When asked about their level of comfort with mobile devices, two instructors responded they had a *very high* comfort level, two said they had a *high* comfort level, and one felt her level of comfort was *good*. Two individuals were *not very* comfortable; these individuals commented that they were not technology savvy and struggled personally.

When speaking about use of iPads, one instructor was pretty comfortable with the iPad. Another indicated she has not had the time to go through the iPads and create her own "flow." The other instructor was not comfortable syncing the iPad with the desktop computer and creating folders. The owner of the iPod Touch was comfortable using it. Three individuals mentioned they were comfortable with their smartphones; however, one mentioned she was not comfortable using smartphones for teaching purposes. One suggestion was that the organization should pay for seasonal instructors to purchase applications for their personal smartphones instead of purchasing additional iPads.

Instructors were asked what additional technology tools they would like to use in their teaching. Four instructors were content with the tools they used. One stated he was not able to see the iPad screen in bright sunlight and indicated that it would be nice to find ways to use iPads in outdoor field-based activities. Two individuals wanted additional iPads assigned to them. Others wanted smartphones "because of Internet connectivity" and because they "would be much easier to carry." The need for two to three additional radios was mentioned by two participants. Two instructors stated that they wanted two digital cameras or tablets with scope mounts, and one person wanted a GoPro camera in the field for wildlife watching and recording.

Other suggestions focused on how instructors interacted and shared information with program participants; however, participants did not suggest specific programs or applications. One instructor wanted to connect with program participants before the program began. She mentioned participants would be able to get their questions answered "before they get here." Another instructor wanted to discover easier processes to collect and share participants' media with each other. She also wanted future participants to be able to access previous program participants' media from a shared space.

Personal Utilization of Mobile Technologies

Instructors. Seven individuals used iPads and six had their own personal smartphones or iPhones. One person owned an iPod Touch. Three of them described their level of use with iPads, smartphones, or iPods as *a lot* or *to the fullest extent*. Only one person said he did not use it constantly. The iPads—whether they were assigned or personally owned—were used to surf the Internet, visit social networking sites, create photo albums, watch videos or movies, check or send e-mails, and connect to friends and family with FaceTime or Skype.

Smartphones or iPhones were used to access social networking sites or websites; send e-mails or text messages; listen to music; play games; write notes, reminders, or lists; read documents including recipes; and take pictures. One person used her smartphone to teach outdoor education programs for school children in a neighboring state. Another instructor said she recently started blogging and tweeting.

Program participants. Some users reported their general use of mobile technologies; others listed the devices they used. The level of use varied considerably (Table 1), and participants utilized a variety of devices. Many individuals reported using smartphones or tablets (Table 2). Twenty-two individuals did not use mobile devices while they were in the park; however, five of them stated they did not use them because they did not have cellular reception. Program participants who used mobile technologies used them for the purposes listed in Table 3.

Table 1
Level of Use

Usage	Number of responses
Very high	6
High	5
Average	7
Low	6
None	1

Table 2
Devices Utilized by Program Participants

Device	Number of responses
Smartphone	40
iPad	25
Tablet	6
Cell phone	5
All kinds	3
Kindle	2
iPod	1
Satellite phone	1
Global Positioning System	1
Ultra book	1
Laptop	1

Table 3
Program Participants' Activities

Activity	Number of responses
check/send e-mails	12
read	6
search the Web	5
check the weather	5
send/receive text messages	4
take pictures	4
check in with home	3
e-mail pictures	2
record videos	2
use travel applications	1
listen to music	1
write a journal	1
play games	1
bank	1
check with work	1
take notes	1
listen to books	1
listen to podcasts	1
download podcasts	1
check news	1
download mobile applications	1

Instructor Satisfaction With Access to Mobile Technologies

The satisfaction with access to mobile devices varied based on employment type. Permanent instructors with issued devices were satisfied with their access. They mentioned they were able to select applications and organize files; they liked to have control over their iPads. Seasonal instructors were less satisfied because they were not always able to check out devices and could not check them out for long periods. Limited availability was the reason why one person used his personal smartphone instead of an iPad. Another person wished that more iPads were available for check out. During the winter season, only three seasonal instructors are employed; however, during the summer, 10–12 seasonal instructors compete for the same number of iPads.

Satisfaction With Internet Access in the Park

Instructors. When asked how satisfied they were with Internet access points in the park, four instructors rated their level of satisfaction as *satisfied*, one was *very satisfied*, and one was *not satisfied*. One instructor was *not at all satisfied* with access at the field campus. One person described access issues as "a give and take." Two individuals expressed that as employees, they need and want to have good access; however, visitors do not need access everywhere during the programs. Others thought that "access is sufficient as it is." There were two areas of improvement that interviewees mentioned. One was emergency and safety issues. Three individuals described the importance of having a signal for safety reasons and emergencies. "Better access," one individual explained, "would be better for radio systems with emergencies." The other was the insufficient access at developed areas. In areas with hotels, campgrounds, restaurants, visitor centers, and retail stores, "there should be better access."

Program participants. The majority of individuals (63.3%) were satisfied with Internet access. Twenty-nine program participants were *satisfied* with Internet access, and two were *very satisfied*. Five individuals were *not very satisfied*, eight were *not satisfied*, and five were *not at all satisfied*. Two participants stated the question was *not applicable,* and one person was *not sure*. Not everyone was aware that Internet access points existed in the park or knew where they were located. One person wrote she had reception for her mobile phone only. Others were satisfied that access was very limited.

Media Sharing

Instructors were asked whether they encourage program participants to share media during or after the program. Eight instructors encouraged participants to share media after the program. Some passed around an e-mail sign-up sheet and e-mailed everyone on the list after the program. Others e-mailed the entire group with a thank-you note and, perhaps, additional information requested. One instructor asked a program participant to collect e-mail addresses. Most participants shared photos via e-mail or created photo albums on photo sharing websites (e.g., Shutterfly, Flickr, Google Photos). One instructor, instead of using e-mail, created a Google+ events page and signed up everyone in a particular program. Seventy percent of program participants were interested in sharing media with other program participants via social media sites, 27.9% were not interested, and 1.6% did not know.

Use of Web 2.0 Tools

Instructors. Six instructors encouraged program participants to use social media to access the organization's information or stay in touch. Those who did mentioned Facebook or Twitter; others either forgot or did not mention it unless someone asked. One instructor handed out a two-sided sheet with websites that participants could access to learn more about various topics. Others shared websites about citizen science projects, park reports, U.S. Geological Survey sites, and the organization's website.

Support staff. The organization uses Facebook, Flickr, Instagram, Pinterest, and Twitter. Ten of the 11 interview participants thought that social media—particularly Facebook—was valuable, beneficial, or important. Four of those individuals, however, were not sure how effective or valuable social media was. Staff members mentioned several benefits of social media. They stated that participants have the ability to share information and experiences with others. People with similar interests can connect with one another or get involved in programs such as citizen science programs. Organizations can use social media to market programs through word of mouth (important to nonprofit organizations that may not have large marketing budgets). It allows organizations to reach new, diverse audiences for field education. Individuals may access online rating sites, and if programs are rated highly, this can have a positive effect on enrollment numbers.

Currently the use of social media is very structured in the organization. Some felt the need for structure because the organization needs to project and protect an image and to send a consistent message. Others wished their use was less structured. One person thought that "social media has more impact when the administrator *and* other people input information."

One person mentioned that the organization shares interesting and timely stories (e.g., wildlife sightings) with the use of social media. Two individuals did not know how the organization used social media. Two individuals cautioned that they need to be hesitant with its use. Instructors should keep it in the forefront of their minds, however, and share the information with program participants. Another person thought that the use of social media needs more attention in the organization and that a strategy for its use is necessary.

Program participants. Sixty-one individuals completed the questions regarding the use of social media. Forty-five program participants (73.8%) did not use it to stay in touch with the organization; 16 individuals (26.2%) did.

Discussion and Conclusion

Some outdoor education organizations have recently integrated mobile devices, applications, and Web 2.0 tools in field-based programs to support and enhance instruction; to provide rich, meaningful learning experiences; and to actively engage learners (Dawson, 2007; Walter, 2013). It is possible that others may consider integrating them in the near future.

Results of this study show that full-time instructors who utilized mobile technologies used them effectively and frequently. Part-time instructors used devices and applications much less. Support staff and administrators confirmed these results. Part-time instructors who had limited access to mobile devices were less experienced and less comfortable with them than those who either were assigned or owned a mobile device. This finding is important in light of research by Eliasson et al. (2011) and Nouri et al. (2011), who found that mobile technologies get in the way of outdoor education if insufficient time is spent considering the role of the devices and desired communication and collaboration with them. To effectively integrate mobile technologies, instructors must have sustained access and training. Researchers found that comfort with computer technologies is an important predictor of their successful integration (Mueller, Wood, Willoughby, Ross, & Specht, 2008). Because technology use is expected to increase in wilderness areas (Ghimire et al., 2015; Oblinger, 2003), instructors need to have access to the ubiquitous technologies others are using. Otherwise, they may continue to lack proper training and implementation strategies to engage their audiences, particularly youth (Bobilya et al., 2010).

One issue associated with using iPads in outdoor settings was that instructors could not read the screen in direct sunlight. Kukulsa-Hulme and Traxler (2005) noted this issue in their handbook. Because of this usability issue, the use of smartphones may be more appropriate in field-based settings because their small size can be more easily shielded.

In general, the benefits of mobile devices include being able to connect to others and share and access information—instant and just-in-time information—independently of time

and location (Malladi & Agrawal, 2002). However, even with the use of smartphones, access in national parks and wilderness areas may be limited because not all areas provide Internet access (Bialeschki et al., 2012; Shultis, 2012). Therefore, users cannot always rely on using their Internet-enabled devices, particularly in emergency situations (Blackwell, 2015).

Many program participants were satisfied with their instructor's use of mobile technologies. They thought instructors used them appropriately and their use enhanced instruction. These findings are consistent with those of Walter (2013) and Dawson (2007), who believe that digital technologies and media can be used to enhance adult learning in outdoor education and actively engage them in meaningful ways. Most instructors encouraged program participants to share digital media and stay connected with the organization, its members, and the park through Web 2.0 tools. Web 2.0 tools, in general, were perceived as valuable marketing and communication tools. Thus, consistent with research by Liu et al. (2014), mobile devices were often used to extend the learning environment and community beyond the confines of the course.

Consistent with the participants in Purcell et al. (2013), many program participants in this study utilized mobile devices, mobile applications, and Web 2.0 tools in their personal lives and were comfortable using them. Although Dyment et al. (2011) pointed out that instructors may be ill-prepared to integrate mobile technologies into their educational programs, this appears to not be the case among program participants. An entire generation of young adults has grown up with computers and the Internet. Technology is deeply integrated into their lives and they desire connectivity with friends and family via Internet-enabled mobile devices (Black, 2010; Oblinger, 2003).

Some respondents were satisfied with Internet access throughout the park, whereas others were dissatisfied. However, satisfaction (or lack thereof) was based on different personal values. Some were satisfied with Internet access points because they could utilize the service in a few areas, whereas others experienced satisfaction because access was limited to developed areas only. Others were dissatisfied because there was Internet access and/or cell phone reception in the park; these individuals came to the park to *disconnect* from busy lives or *get unplugged*. They perceived the impact of technology use in wilderness areas as negative, a major theme that can be found in literature pertaining to wilderness experiences (Day & Petrick, 2006; Pergams & Zaradic, 2006). Yet, these same participants might rely on other devices (locator beacons and GPS units) to feel secure in outdoor areas (Blackwell, 2015; Shultis, 2012).

Not all respondents in this study agreed that mobile technologies and Web 2.0 tools were valuable or *had a place* in outdoor education programs. Based on participants' responses, their use may even be considered *controversial*. For example, respondents' perspectives about the use of mobile technologies varied greatly, ranging from "they have no place in outdoor education" to "they are super important." These wide ranging and contrasting perspectives warrant additional research in this area. Practitioners, however, need to carefully balance the use of mobile devices in outdoor settings in order to not take away from the full outdoor experience of program participants. The use of devices needs to have a purpose; support a specific learning objective; and create meaningful, enjoyable learning experiences for participants.

Additionally, unlike mobile technology uses in museum and K–12 settings reported by Liu et al. (2014), Naismith and Smith (2009), and Rennick-Egglestone et al. (2016), some mobile technology uses require changes to the physical landscape of wilderness areas to foster those changes (e.g., cell towers, unnatural noise through technology use, increased traffic in areas with wildlife sightings). It is important to consider and *weigh* perspectives of naturalists in the integration and appropriate use of technologies in outdoor education.

Practitioners need to select and integrate devices and applications carefully because the focus must be on the methods, not media. Lessons need to be based on sound instructional design principles. Training and support should be provided to educators throughout these phases. Once the integration process is complete, it is important to evaluate the use and effect of these

devices and applications during formative and summative evaluation phases (Smaldino et al., 2012; Smith & Ragan, 2005). The use of technology in outdoor education programs should support active learner engagement; it cannot distract from participants' educational experiences or interfere with others' enjoyment of the setting or ethical considerations and park resources.

Some study limitations need to be pointed out. First, the study was geographically limited to one national park in the United States and one outdoor education institution. Other researchers may collect data from a number of institutions of similar nature to validate the findings of this study. Second, the data collection period included a 16-day window. This enabled the researcher to collect data from participants enrolled in eight winter courses. Future research could include a longer data collection period or data collection phases at different seasons (because they may attract participants with different perspectives or preferences). Third, the data were self-reported and of qualitative nature. Therefore, results of this study may be applied to settings of similar nature, but are not generalizable to other outdoor education programs.

As illustrated in the literature and reflected in the findings, the integration and utilization of mobile technologies and Web 2.0 tools in outdoor education programs is a complex issue. Future research is needed to investigate perceptions of educators and learners pertaining to the appropriateness of the use of mobile technologies in wilderness areas, particularly outdoor education programs. How much technology can be used without affecting users' wilderness experience negatively? Which mobile devices and applications can be used to support or enhance learning? How can Web 2.0 tools be used by nonprofit organizations to connect program participants to the park and market programs? Which user behaviors are deemed appropriate or inappropriate? Which technologies, if any, should be banned because they may diminish other visitors' enjoyment? These are questions to which we seek answers.

References

Alden, J. (2013). Accomodating mobile learning in college programs. *Journal of Asynchronous Learning Networks, 17*(1), 109–122.

Bialeschki, M. D., Henderson, K. A., Hickerson, B. D., & Browne, L. (2012). Challenges to field-based outdoor research: Pitfalls and possibilities. *Journal of Outdoor Recreation, Education, and Leadership, 4,* 74–83. https://doi.org/10.7768/1948-5123.1094

Black, A. (2010). Gen Y: Who they are and how they learn. *Educational Horizons, 88*(2), 92–101.

Blackwell, J. L. (2015). *Influences of hand-held information and communication technology on risk behavior and the experience of wilderness visitors* (Master's thesis). Retrieved from http://humboldt-dspace.calstate.edu/bitstream/handle/10211.3/142887/blackwell_jessica_l_Sp2015.pdf?sequence=1

Bobilya, A. J., Holman, T., Lindley, B., & McAvoy, L. H. (2010). Developing trends and issues in U.S. outdoor and adventure-based programming. *Journal of Outdoor Recreation, Education, and Leadership, 2,* 301–321.

Brown, T. H., & Mbati, L. S. (2015). Mobile learning: Moving past the myths and embracing the opportunities. *International Review of Research in Open and Distributed Learning, 16,* 115–135. https://doi.org/10.19173/irrodl.v16i2.2071

Caladine, R. (2008). *Enhancing e-learning with media-rich contents and interactions.* Hershey, PA: Information Science Publishing. https://doi.org/10.4018/978-1-59904-732-4

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Upper Saddle River, NJ: Pearson.

Crompton, H. (2013). A historical overview of m-learning: Toward a learner-centered education. In Z. L. Berge & L. Y. Muilenberg (Eds.), *Handbook of mobile learning* (pp. 3–14). New York, NY: Routledge.

Dawson, C. P. (2007). New opportunities for educating future wilderness and wildland managers in a changing technological world. *International Journal of Wilderness, 13*(3), 36–39.

Day, M., & Petrick, E. M. (2006). *Designing residential wilderness programs for adults.* Malabar, FL: Krieger.

Dickson, T. J. (2004). If the outcome is predictable, is it an adventure? Being in, not barricaded from, the outdoors. *World Leisure Journal, 46*(4), 48–54. https://doi.org/10.1080/04419057.2004.9674373

Dyment, J. E., O'Connell, T. S., & Boyle, I. (2011). The intersection of Web 2.0 technologies and reflective journals: Possibilities, potential, and pitfalls. *Journal of Outdoor Recreation, Education, and Leadership, 3,* 137–150.

Eliasson, J., Cerratto-Pargman, T., Nouri, J., Spikol, D., & Ramberg, R. (2011). Mobile devices as support rather than distraction for mobile learners: Evaluating guidelines for design. *International Journal of Mobile and Blended Learning, 3*(2), 1–15. https://doi.org/10.4018/jmbl.2011040101

Ferrer, F., Belvís, E., & Pàmies, J. (2011). Tablet PCs, academic results, and educational inequalities. *Computers and Education, 56,* 280–288. https://doi.org/10.1016/j.compedu.2010.07.018

Flick, U. (2006). *An introduction to qualitative research* (3rd ed.). Thousand Oaks, CA: Sage.

Georgina, D. A., & Olson, M. R. (2008). Integration of technology in higher education: A review of faculty self-perceptions. *Internet and Higher Education, 11,* 1–8. https://doi.org/10.1016/j.iheduc.2007.11.002

Ghimire, R., Green, G. T., Cordell, H. K., Watson, A., & Dawson, C. P. (2015). Wilderness stewardship: A survey of National Wilderness Preservation System managers. *International Journal of Wilderness, 21*(1), 23–27.

Gilbertson, K., Bates, T., McLaughlin, T., & Ewert, A. (2006). *Outdoor education: Methods and strategies.* Champaign, IL: Human Kinetics.

Guba, E. G., & Lincoln, Y. S. (2005). Paradigmatic controversies, contradictions, and emerging confluences. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research* (3rd ed., pp. 191–215). Thousand Oaks, CA: Sage.

Hammerman, D. R., & Hammerman, W. M. (Eds.). (1973). *Outdoor education: A book of readings* (2nd ed.). Minneapolis, MN: Burgess.

Hendee, J. C., & Dawson, C. P. (2001). Stewardship to address the threats to wilderness resources and values. *International Journal of Wilderness, 7*(3), 4–9.

Hsiao, H.-S., Lin, C.-C., Feng, R.-T., & Li, K. J. (2010). Location-based services for outdoor ecological learning system: Design and implementation. *Educational Technology & Society, 13*(4), 98–111.

Jones, B. L. (2008). *Web 2.0 heroes: Interviews with 20 Web 2.0 influencers.* Indianapolis, IN: Wiley.

Kennedy, C., & Levy, M. (2008). L'italiano al telefonio: Using SMS to support beginners' language learning. *ReCALL, 20,* 315–330. https://doi.org/10.1017/S0958344008000530

Koole, M. L. (2009). A model for framing mobile learning. In M. Aly (Ed.), *Mobile learning: Transforming the delivery of education and training* (pp. 25–47). Edmonton, Canada: Athabasca University Press.

Kukulsa-Hulme, A., & Traxler, J. (Eds.). (2005). *Mobile learning: A handbook for educators and trainers.* New York, NY: Routledge.

Lai, H.-C., Chang, C.-Y., Li, W.-S., Fan, Y.-L., & Wu, Y.-T. (2013). The implementation of mobile learning in outdoor education: Application of QR codes. *British Journal of Educational Technology, 4*(2), E57–E62. https://doi.org/10.1111/j.1467-8535.2012.01343.x

Leopold, A. (1991). The role of wildlife in a liberal education. In S. L. Flader & J. B. Callicott (Eds.), *The river of the mother of God and other essays by Aldo Leopold* (pp. 301–305). Madison: University of Wisconsin Press. (Original work published 1942)

Liu, M., Scordino, R., Geurtz, R., Navarrete, C., Ko, Y., & Lim, M. (2014). A look at research on mobile learning in K–12 education from 2007 to the present. *Journal of Research on Technology in Education, 46,* 325–372. https://doi.org/10.1080/15391523.2014.925681

Louv, R. (2008). *Last child in the woods: Saving our children from nature-deficit disorder* (2nd ed.). Chapel Hill, NC: Algonquin Books of Chapel Hill.

Malladi, R., & Agrawal, D. P. (2002). Current and future applications of mobile and wireless networks. *Communications of the ACM, 45*(10), 144–146. https://doi.org/10.1145/570907.570947

Mueller, J., Wood, E., Willoughby, T., Ross, C., & Specht, J. (2008). Identifying discriminating variables between teachers who fully integrate computers and teachers with limited integration. *Computers & Education, 51,* 1523–1537. https://doi.org/10.1016/j.compedu.2008.02.003

Mumtaz, S. (2000). Factors affecting teachers' use of information and communications technology: A review of the literature. *Journal of Information Technology for Teacher Education, 9,* 319–342. https://doi.org/10.1080/14759390000200096

Naismith, L., & Smith, M. P. (2009). Using mobile technologies for multimedia tours in a traditional museum setting. In M. Aly (Ed.), *Mobile learning: Transforming the delivery of education and training* (pp. 247–264). Edmonton, Canada: Athabasca University Press.

Nouri, J., Cerratto-Pargman, T., Eliasson, J., & Ramberg, R. (2011). Exploring the challenges of supporting collaborative mobile learning. *International Journal of Mobile and Blended Learning, 3*(4), 54–69. https://doi.org/10.4018/jmbl.2011100104

Oblinger, D. (2003, July–August). Boomers, Gen-Xers, and millennials: Understanding the new students. *Educause Review, 38*(4). Retrieved from http://er.educause.edu/articles/2003/1/boomers-genxers-and-millennials-understanding-the-new-students

O'Malley, C., Vavoula, G., Glew, J. P., Taylor, J., Sharples, M., & Lefrere, P. (2003). *WP 4 – Guidelines for learning/teaching/tutoring in a mobile environment.* Retrieved from http://www.mobilearn.org/download/results/guidelines.pdf

Patton, M. Q. (2002). *Qualitative research & evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage.

Pergams, O. R. W., & Zaradic, P. A. (2006). Is love of nature in the U.S. becoming love of electronic media? 16-year downtrend in national park visits explained by watching movies, playing video games, Internet use, and oil prices. *Journal of Environmental Management, 80,* 387–393. https://doi.org/10.1016/j.jenvman.2006.02.001

Pergams, O. R. W., & Zaradic, P. A. (2008). Evidence for a fundamental and pervasive shift away from nature-based recreation. *Proceedings of the National Academy of Sciences of the United States of America, 105,* 2295–2300. https://doi.org/10.1073/pnas.0709893105

Poff, R., Stenger-Ramsey, T., Ramsing, R., & Spencer, S. (2013). Outdoor recreation journals: A topical analysis from 2009–2012. *Journal of Outdoor Recreation, Education, and Leadership, 5,* 151–154. https://doi.org/10.7768/1948-5123.1215

Purcell, K., Heaps, A., Buchanan, J., & Friedrich, L. (2013). *How teachers are using technology at home and in their classrooms.* Retrieved from Pew Research Center website: http://www.pewinternet.org/2013/02/28/how-teachers-are-using-technology-at-home-and-in-their-classrooms/

Rennick-Egglestone, S., Brundell, P., Koleva, B., Benford, S., Roussou, M., & Chaffardon, C. (2016). Families and mobile devices in museums: Designing for integrated experiences. *Journal on Computing and Cultural Heritage, 9*(2), 11.1–11.13. https://doi.org/10.1145/2891416

Richards, L. (2009). *Handling qualitative data: A practical guide* (2nd ed.). Thousand Oaks, CA: Sage.

Shultis, J. (2012). The impact of technology on the wilderness experience: A review of common themes and approaches in three bodies of literature. In D. N. Cole (Ed.), *Wilderness visitor experiences: Progress in research and management* (RMRS-P-66, pp. 110–118). Retrieved from U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station website: http://www.fs.fed.us/rm/pubs/rmrs_p066/rmrs_p066_110_118.pdf

Smaldino, S. E., Lowther, D. L., & Russell, J. D. (2012). *Instructional technology and media for learning* (10th ed.). Boston, MA: Pearson.

Smith, P. L., & Ragan, T. J. (2005). *Instructional design* (3rd ed.). Hoboken, NJ: Wiley.

Traxler, J. (2011). Introduction. In J. Traxler & J. Wishart (Eds.), *Making mobile learning work: Case studies of practice* (pp. 4–12). Retrieved from the ESCalate website: http://escalate.ac.uk/8250

Walter, P. (2013). Greening the Net generation: Outdoor adult learning in the digital age. *Adult Learning, 24*(4), 151–158. https://doi.org/10.1177/1045159513499551

Yin, R. (2003). *Case study research: Design and methods* (3rd ed.). Thousand Oaks, CA: Sage.