

A Methodological Evaluation of an Environmental Education Survey: Is There a Technological Advantage

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Abstract

Environmental education represents a conceivable way to counter the effects of youth's lack of exposure to the natural environment. However, the effectiveness of these programs is often not evaluated, and when they are, the methods for doing so are not consistent. Without proper and reliable methods of data collection, the results may be inaccurate and lead to false claims. Middle school children were given surveys to measure interest in nature, importance of nature, and environmental stewardship. The students were split into two groups, one that took the survey through a conventional pencil-and-paper method and one that took the survey on a tablet computer (e.g., iPad). The results revealed a difference in how students responded based on how they took the survey. Children may be more willing to provide more truthful responses through digital means and may associate paper surveys with exams or other less desirable activities.

KEYWORDS: environmental education; survey methods; nature

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Children in the 21st century often achieve their connection to the outdoors through school and the media, which are insufficient substitutes for direct encounters with the natural world (Pergams & Zaradic, 2006). A reduction in genuine outdoor experiences modifies how children perceive and interact with the natural world (Kellert, 2005), potentially changing their relationship with the natural environment forever. Environmental education represents a conceivable way to counter the effects of youth's lack of exposure to the natural environment. Currently, limited information is available related to environmental awareness for children in rural areas (Smith-Sebasto & Cavern, 2006). Although the purpose of this study was to identify how children in a rural environment perceive an environmental education program, and the effects this program may have on their pro-environmental behaviors, this paper examines environmental education program assessment methods. Without proper reliable methods of data collection, the results may be inaccurate and lead to false claims.

On-site survey (e.g., intercept) research has traditionally relied on paper-and-pencil surveys to gather information about research participants. With the advent of tablet computer technology (e.g., iPads), many researchers are switching from the more traditional method. The usual rationale for doing so is that tablets save time (reduced data entry burden) and money (lower cost per survey) and may encourage more participation because of the novelty of taking a survey on a tablet (Wilcox, Gallagher, Boden-Albala, & Bakken, 2012). As the use of tablets increases, there is a need to understand how this may affect data collection methods and study results. Recent studies in the health profession (Hohwu, Lyshol, Jonsson, Petzold, & Obel, 2013) have shown little difference in response between paper and tablet surveys, but several studies have also shown that when asked, respondents state they enjoyed taking the survey on a tablet, thus potentially influencing responses. However, few studies have investigated the difference in an environmental education setting and even fewer that include children (who have a different relationship with technology than adults do).

There is reason to believe that the prevalence of technology in the lives of younger generations has led to new ways of learning and interacting with educational materials (Dede, 2005). Also, children have grown up using technology and are often more comfortable interacting with technology than successive generations are (Ng, 2012). In fact, Vodanovich, Shen, and Sundaram (2015) claim that these digital natives are "digitally literate, highly connected, experiential, social and comfortable using a whole host of systems" (p. 5). For these reasons, it is important to understand how information is collected to determine if environmental education programming is different for younger generations than for previous generations. Also, with the advent of online surveys and surveys taken on laptops and tablet computers (e.g., iPads), this study was designed to examine potential differences in how middle school students answered identical questions on a paper survey when compared to a survey taken on a tablet computer.

Method

This study took place during the Fall 2013 and Spring 2014 semesters, and participants were seventh grade middle school students from school districts in central Kentucky. The surveys were administered in the science classes of each middle school by a student from Eastern Kentucky University who was trained in survey administration to remove any administration bias. A convenience sample approach was used to acquire 304 student participants, with 175 students taking the survey through the traditional paper-and-pencil technique and 129 students taking the same survey on a tablet computer. The difference in the number of students reflects the limited number of tablets available to the researchers. The survey replicated the Environmental Attitude Awareness Survey, which uses a 5-point scale (1 = *strongly disagree* to 5 = *strongly agree*) to measure interest in nature, importance of nature, endangered ecosystems, and environmental stewardship (Larson, Castleberry, & Green, 2010). The scale used for this study has been shown to be a reliable and psychometrically efficient method for measuring level of interest in nature

and environmental stewardship of children (Larson, Green, & Castleberry, 2009). To ensure that students did not respond to different formatting of the questions, which may influence the outcome of the study, the researchers made all efforts to replicate the paper survey on the tablet computer. Dillman and Smyth (2007) suggest that the ordering and presentation of responses (e.g., horizontal vs. vertical response ordering) may influence answers, thus the researchers took diligent efforts to replicate the paper surveys on the tablet computers. Additionally, the surveys were uploaded to the tablets prior to students' participation and were not online or Internet based. The researchers utilized the outlier labeling rule (OLR in Table 1) to remove outliers in the data (Hoaglin & Iglewicz, 1987; Hoaglin, Iglewicz, & Tukey, 1986). The researchers ran basic descriptive statistics and independent t tests to determine differences between responses based on survey type. Of the 304 students who participated in the study, 54% were boys, with a mean age of 12.97 years. To ensure testing for difference between survey methods and not other variables, the researchers chose only seventh grade students from two demographically similar middle schools in the same school district, in identical science classes. They also determined that there was no difference in age, $F(1, 303) = 0.27$, $p = 0.60$, and gender, $F(1, 303) = 0.01$, $p = 0.93$, between the groups (these were the only two demographic variables collected).

Results

The researchers utilized t tests to examine if any statistically significant differences in means existed between the paper and tablet surveys. Initially, t -test analysis on all items indicated that the mean responses were different on four items when students took the survey on a tablet versus paper. However, when the researchers examined these four statements for outliers, the analysis changed on three items (see Table 1). Notably, in all but one case, the outliers were on the paper survey. To rule out further issues with a low sample size, the researchers further conducted a post hoc power analysis (Cohen, Cohen, West, & Aiken, 2003). The results are also listed in Table 1 in the last column (PA%). The one remaining statistically significant t test (We need to take better care of plants and animals) had an adequate sample size in detecting the effect.

Table 1

Independent t Test to Determine the Difference in Scores Between Surveys Taken on Paper and on a Tablet Computer

Variable	Paper survey				Tablet survey				t	df	p	PA %
	M	SD	n	OLR	M	SD	n	OLR				
Plants and animals are important to people	4.31	0.64	172	3	4.48	0.69	129	0	2.14	299	0.23	58.8
I like to spend time in places that have plants and animals	4.05	0.75	167	6	4.33	0.75	129	0	3.21	294	0.13	89.0
Nature is easily harmed or hurt by people	4.27	0.67	168	2	4.43	0.68	127	1	2.06	293	0.46	52.1
We need to take better care of plants and animals	3.03	0.29	172	0	4.47	0.62	129	0	26.59	299	0.00	100.0

Note. Based on a 5-point scale: 1 = *strongly disagree*, 3 = *not sure*, 5 = *strongly agree*. PA = power analysis; OLR = outlier labeling rule.

Discussion

Previous studies have focused on adult survey takers, showing little difference between tablet and traditional pencil-and-paper surveys taken by adults. The results of this study highlight that a difference in how surveys are taken, based on delivery method, may affect results in studies involving children. As noted by these study results, children may respond to these methods in different ways. The students that took the survey through electronic means had a stronger agreement for the statements about nature, specifically plants and animals. This suggests that students interacted differently based on the survey type, giving different survey responses with digital surveying than they would with traditional paper surveying. The tablet surveys required more manipulation by the students, creating a situation in which students were less likely to simply tick off a series of answers as they would on a paper survey. This is analogous to why researchers often employ reverse-coded items to identify respondents who are just checking boxes to complete the survey quickly. Perhaps tablets are more deliberate and involved, leading to responses that are more accurate.

It is possible that children, who may be digital natives, are more willing to provide more truthful responses through digital means and may associate paper surveys with exams or other less desirable academic activities. Students may have perceived a level of anonymity to their responses for the tablet-based survey that may have received an unacceptable level of scrutiny for a hard copy, pencil-and-paper survey that cannot be deleted by the stroke of a key. The level of permanence that students may have perceived related to the hard copy survey could have influenced their answers and should be examined further. Additionally, the researchers of this study did not monitor the time difference between tablet and paper surveys, which may be a variable of interest in future studies.

Implications

This study found that mixing methodologies between electronic and paper surveying is troublesome, and further research with youth is necessary to confirm the finding for environmental education. Online and electronic surveys are often implemented as a cost-saving measure and are a less expensive and less time-consuming method to collect data. With the proliferation of technology and continued online presence of younger populations, understanding and identifying ways to solicit feedback digitally in a way consistent with other methodologies is important. If more accurate information can be gathered related to the effectiveness of environmental education programs for youth, practitioners can invest in specific programs that show the most significant effect.

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