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Research Paper

Integrating off-site visitor education into landscape conservation and management: An examination of timing of educational messaging and compliance with low-impact hiking recommendations

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HIGHLIGHTS

- The treatment improved participants' intent to stay on the trail.
- The treatment improved participants' knowledge levels.
- The treatment promoted positive attitudes toward staying on the trail.
- A short time difference did not change the effects of the educational message.
- Results supported the use of off-site visitor education programs.

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ABSTRACT

The protection of landscapes from environmentally-damaging recreational impacts requires planning and design for proactive visitor education. We examined how the timing of off-site educational messaging influences individuals' compliance with, knowledge of, and attitudes towards two low-impact recreation behavioral recommendations (i.e., hiking on muddy or wet trail sections and walking on trail steps rather than around them) using a laboratory-based experiment. The educational message used in the experiment consisted of a video and short summary statements about low-impact hiking recommendations. Participants were randomly assigned to one of three experimental groups: 1) viewing the message at least 24 h before the experiment; 2) viewing the message immediately before the experiment; or 3) not viewing the message at all (control). We assessed participants' hiking intentions by asking them to draw their intended hiking routes on a large LCD display depicting short sections of the Appalachian Trail in North Carolina and Tennessee. Participants' intended routes were coded as either complying or not complying with the low-impact hiking recommendations. For participants who received the educational message, knowledge about and attitudes toward low-impact hiking were measured twice, immediately after viewing the message and at the end of the experiment. Our analyses revealed the educational message significantly improved participants' knowledge levels, attitudes, and intentions to comply with low-impact hiking recommendations. The timing of when the educational message was viewed/read by participants, however, did not influence their knowledge levels, attitudes, or intentions to comply. These findings suggest low-impact recreation behavior can be influenced through educational messages delivered before outdoor recreationists begin their trips.

1. Introduction

Nature-based recreation activities are part of the anthropogenic forces that constantly alter natural landscapes. The environmental impacts of recreation on soil, vegetation, water, wildlife, and other elements of ecosystems may seem trivial at the individual level, but when these impacts are multiplied by the volume of visitation to

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recreation settings and repeated over time, they can interact with each other in complicated ways that alter ecosystem functioning (Marion, Leung, Eagleston, & Burroughs, 2016). For example, if hikers choose to avoid steps on steep trails, their trampling of soils along the trail will likely cause soil compaction and erosion (Moore & Driver, 2005). This soil compaction and erosion, in turn, may cause increased run-off and sedimentation in streams at lower elevations. Over time, the landscape will be marked with deep-cut wide barren trails, damaged vegetation, and decreased water quality. The consequences are degraded aesthetic, natural, and recreational values of the landscape.

To protect landscapes from negative recreational impacts while providing recreation-related and ecosystem services benefits to the public, land and water managers often try to educate recreationists about behaviors to avoid or reduce the negative environmental impacts of recreation with on-site activities and resources such as education programs and signs, posters, interpretation, personal contact and other communication tools (Marion & Reid, 2007). However, with steadily growing visitation levels at many outdoor recreation destinations, it is becoming increasingly difficult for on-site visitor information and education programs to reach rapidly growing numbers of visitors (Jacobi, 2003). As a result, proactive off-site visitor education may serve as an efficient and effective approach to educating recreationists about the negative environmental impacts of recreation, subsequently improving the ability to sustainably manage landscapes used for recreation. Outdoor recreationists who are poorly informed about responsible recreation behavior before they arrive at their destination are more likely to be either ill-prepared to recreate in an environmentally-responsible manner (e.g., not bringing the gear necessary to dispose of waste properly) or simply be unaware of what responsible recreation behaviors are. Either of these situations are likely to lead to high-impact recreation behaviors (Hayes, 2008; Reigner & Lawson, 2009). It is unlikely that on-site signage alone will dissuade recreationists from visiting sought-after parts of destinations they have traveled long distances to experience (Hayes, 2008). Some previous studies suggest visitor information and education programs are more effective when delivered early in the overall recreation experience such as during trip planning (Manning, 2011; Marion, 2014). Off-site visitor education programs may be able to proactively target and communicate with prospective outdoor recreationists, leading to more sustainable landscape management.

Reaching visitors before they arrive at a destination is not a new concept for outdoor recreation planners, resource managers, or environmental educators (Bromley, Marion, & Hall, 2013; Daniels & Marion, 2005; Doucette & Cole, 1993; Manfredo & Bright, 1991). Web-based technologies, such as social media and emails, provide fast and potentially cost-effective avenues for communicating with large and diverse audiences (National Parks Conservation Association, 2009). Electronic communication can deliver educational messages with images and videos that directly demonstrate responsible recreation behaviors. Natural resource managers, such as the National Park Service, have shown growing interest in reaching out to constituents through online communication channels such as emails and social media (National Parks Conservation Association, 2009). Through online pre-trip registration and permitting efforts, such as the Appalachian Trail Conservancy's voluntary long-distance hiker registration system, natural area managers do have the ability to directly target and communicate with prospective visitors. Off-site education programs can also help reduce the need for on-site infrastructure and materials, such as signs or brochures, as well as personnel, such as rangers and interpreters, tasked with educating the public about responsible recreation behavior (labor costs are often among the most substantial and significant in terms of providing outdoor recreation opportunities; Siderelis, Moore, Leung, & Smith, 2012).

Despite the potential for using web-based technologies to educate visitors about low-impact recreation behavior prior to their trips, questions remain about how to successfully plan and design an off-site visitor education program. One important question is how the delay between when individuals receive an educational message and when they arrive on-site and face situations where they must choose to comply with low-impact recreation recommendations influences the educational message's effectiveness. This study set out to examine the relationship between visitor education messaging timing and behavioral change using a theoretically-grounded laboratory-based experimental study.

2. Theoretical background

There are two well-documented lines of research regarding the potential effects of educational messaging timing on individual compliance with low-impact recreation behavioral recommendations: 1) the forgetting-curve hypothesis based on Ebbinghaus' classic memory theory; and 2) the stable-attitude hypothesis based on the Theory of Planned Behavior and the Elaboration Likelihood Model (cited in Eagly & Chaiken, 1993a).

The forgetting-curve hypothesis suggests the longer the time between when a message regarding low-impact recreation behavioral recommendations is delivered and when the targeted recreation behavior occurs, the less likely individuals will be to change their behaviors. This hypothesis is based on Ebbinghaus' negatively accelerating forgetting curve concept, which posits that as time passes, individuals forget much of what they learned when reading or viewing an educational message (cited in Eagly & Chaiken, 1993a). A variety of classic (e.g., Miller & Campbell, 1959; Watts & McGuire, 1964) as well as recent (e.g., Erdelyi, 2010; Murre & Dros, 2015) studies have supported Ebbinghaus' forgetting curve concept.

In contrast, the stable-attitude hypothesis suggests that if an educational message is able to change individuals' attitudes, those attitudes will remain stable and continue to influence behaviors over time. This hypothesis is supported by the Theory of Planned Behavior in which attitudes toward a behavior are a major determinant of volitional behavior (Eagly & Chaiken, 1993c). The hypothesis is also supported by the Elaboration Likelihood Model which proposes attitudinal changes result in temporally-persistent influences on behavior (Eagly & Chaiken, 1993b). Compared to the forgetting-curve hypothesis, the stable-attitudes hypothesis posits the stability of attitudes could overcome the effects of individuals' tendency to forget the content of educational messages as it becomes more temporally remote.

Each of these opposing hypotheses has received some empirical support. However, no previous research has tested the two hypotheses in the same study. Two recreation studies have supported the forgetting curve hypothesis. Manfredo and Bright (1991) found that 76% of visitors to a Wilderness area in Minnesota recalled receiving an information packet sent by a land management agency prior to taking their trip. However, only 11% indicated their behavior changed as a result of receiving the information. It suggests visitors might be able to recall the off-site educational message, but also indicates recall alone is not necessarily enough to change recreationists' behaviors. Bradford and McIntyre (2005) tested how the locations of educational messages as well as the message content influenced visitors' off-trail hiking behavior. They found messages located at undesignated trail sites (where the undesirable off-trail hiking behavior is likely to occur) were most likely to reduce off-trail use, compared to the same messages presented at information booths. A possible explanation for this finding is the temporal delay between when participants received the educational message at