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To cite this article: David Hills & Glyn Thomas (2019): Digital technology and outdoor experiential learning, Journal of Adventure Education and Outdoor Learning, DOI: [10.1080/14729679.2019.1604244](https://doi.org/10.1080/14729679.2019.1604244)

To link to this article: <https://doi.org/10.1080/14729679.2019.1604244>



Published online: 13 Apr 2019.



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Digital technology and outdoor experiential learning

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ABSTRACT

Any use or non-use of digital technology in outdoor experiential learning requires critical examination. Digital technology can undermine the aim of being outdoors, but it can also create opportunities to enhance outdoor learning experiences. This paper presents a conceptual framework, based on a systematic review of the literature, that facilitators can use to think critically about their use (or non-use), of digital technology in outdoor experiential learning. The three key parts of the framework are pedagogical considerations, affordances of digital technology and consequences of decisions. The framework is designed to help facilitators of outdoor experiential learning make informed decisions or retrospectively review the decisions they made about the use (or non-use) of digital technology. The strength of the framework is that it encourages facilitators to engage in the critical evaluation of the intended and unintended consequences of digital technology use (or non-use) in outdoor experiential learning.

KEYWORDS

Technology; digital technology; outdoor learning; outdoor experiential learning; outdoor education

Introduction

With the increased availability and affordability of digital technology, facilitators of outdoor experiential learning are being confronted with the need to make choices about whether or not to use these tools in their programmes. Location devices, digital cameras, drones, tablets and augmented reality are just a few examples of the tools being used in outdoor experiential learning (Bolliger & Shepherd, 2017) and the range of digital devices is set to increase in the future (Poh, 2017). Digital technologies have the potential to both be a distraction to, and enhancer of, outdoor experiential learning depending on how they are used (Cuthbertson, Socha, & Potter, 2004; Thomas & Munge, 2017).

It is suggested that a tipping point has been reached with digital devices now integrated in many, if not all, outdoor experiential learning experiences (Shultis, 2012). One example of this is the introduction of wearable, connected devices (e.g. smartwatches that are also phones) which means that now, facilitators may have to intentionally remove digital technology as opposed to just choosing whether to apply digital technology or not (Smith, Parks, Parrish, & Swirski, 2016). Although digital technology can create a wealth of additional learning opportunities in outdoor experiential learning (Bolliger & Shepherd, 2017), for some facilitators, the outdoors is one of a few remaining refuges from digital technology (Shultis, 2012). These arguments for and against digital technology in outdoor experiential learning create a dilemma for facilitators (Bolliger & Shepherd, 2016). How do they know when to use digital technology, and how do they know when to avoid it? Novice facilitators find this choice even more challenging (Stokes et al., 2012) and currently it is difficult to process the disparate advice offered in the outdoor experiential learning literature.

Objective of the paper

The objective of this paper is to introduce a conceptual framework that will enable facilitators to think critically about the use, or non-use, of digital technologies in outdoor experiential learning. The framework can help facilitators to provide a justification for their choices as well as consider the consequences of their decisions. The conceptual framework can be used either prospectively or retrospectively and applies whether digital technology is used (or not used) by the facilitators, the learners or anyone involved in the learning process. By integrating the various theories and models in one conceptual framework, this paper can help facilitators to develop a more complete understanding of the implications of digital technologies in outdoor experiential learning.

Structure of the paper

This paper will first review the literature from a historical perspective highlighting how perspectives towards the use of digital technology have changed over time. Key arguments for and against the use of digital technology will be analysed based on the review of over 100 different sources. The emerging framework will be presented outlining its three components of pedagogical considerations, affordances of digital technology and consequences of decisions. The application of the framework will be described and finally, the limitations of the framework, and implications for practice and future research will be discussed.

Terminology

In this paper, we will use the all-encompassing term *outdoor experiential learning* to include any structured, experiential learning activity conducted outdoors that aims to achieve predetermined objectives. Outdoor experiential learning may include outdoor education, environmental education, adventure therapy, placed-based learning, adventure education and adventure sports coaching. For simplicity, the term *facilitator* will be used to refer to the teacher, instructor or leader of the structured experiential learning activity and *learners* to describe students or participants. The term *digital technology* is used to describe any electronic device that can record, store and present information (Rouse, 2005). For example, a mobile phone, a digital camera, a drone or a tablet would be classed as digital technology. A compass, a tent and a waterproof jacket are recognised as technology but as they are not digital, they are not the focus of this study.

Key literature

This section will outline the methodology used and the background of digital technology in education and the outdoors in general before looking at outdoor experiential learning specifically. It will then provide a summary of the key arguments for and against the use of digital technology in outdoor experiential learning before introducing the framework.

Methodology

The literature reviewed in this paper included 70 peer-reviewed papers, two blogs, 15 book chapters, nine conference papers, four conference proceedings and seven magazine articles. Key journals of outdoor experiential learning were searched most notably the *Journal of Adventure Education and Outdoor Learning* (JAOE), *Journal of Outdoor Environmental Education* and the *Journal of Outdoor Recreation, Education and Outdoor Leadership*. Following the guidelines of Creswell (2012) key words used to search for these sources included the combination of either technology or digital technology with one of the following terms: outdoor experiential learning, outdoor education, environmental education, adventure therapy, placed-based learning, adventure sports

coaching or fieldwork. Studies with key words relating to education or digital technology were included for the introduction and the background but were not reviewed specifically as part of the framework.

Technology and the outdoors

Technology has been used in the outdoors in some form for many years (Wattchow, 2001) and historically, research has mainly focused upon technology in a general sense as opposed to digital technology specifically. Clothing and other outdoor equipment, such as walking boots and compasses, are examples of technology, but because they are so commonplace they have achieved a 'transparency of perception' (Bruce & Hogan, 1998, p. 61) and the long history of using walking boots and compasses has allowed them to become acceptable and 'normal' uses of technology for most facilitators of outdoor experiential learning. Wattchow (2001) supported this notion of normalised technology and explored the concept that the human body inhabits a technological lifeworld suggesting that there is no world without some technology. He suggested that the outdoors is not a break from technology as it is impossible to make that total separation. Contrary to this argument, Strong (1995) opposed the use of any technology in the outdoors and argued it detracts from the overall experience. In his opinion, technology 'insulates one from the conditions of the place, smoothing out even the forbidding ruggedness of the crazies, narrowing ones contact with them.... making wilderness an easily consumable package' (p. 8). Somehow, facilitators of outdoor experiential learning consciously or unconsciously weigh up these two opposing perspectives to make decisions about what, how, and when to use technology in their programs. With the change of the millennium there has been a boom in the use of digital technology (Bonk, 2009) as tablets and smartphones become commonplace items. For facilitators of outdoor experiential learning, mobile digital technologies are fast becoming the new 'normal' (Bruce & Hogan, 1998), just like the walking boot and the compass.

Digital technology in education

There have been many efforts to implement digital technology in the classroom to enhance the learning process and these devices are often personalised and wearable by each student (Fauville, Lantz-Andersson, & Säljö, 2014). Fauville et al. (2014) were strong advocates for digital technology in education and outlined six ways in which it enhanced the learning process. They proposed that digital technology can; increase communication between learners and teachers, increase student motivation, expand the range of pedagogical resources available, help facilitators become experts in actively searching for information rather than passively receiving facts, deepen the understanding of principles and concepts and reduce learner dependency on the teacher. However, despite the promise of a radically improved pedagogies, the impacts of digital technologies on learning outcomes is unclear and contested in the literature (Cuthbertson et al., 2004 & Fauville et al., 2014) and there is as much debate about the effectiveness of digital technology inside the classroom as there is in the outdoors.

Digital technology and outdoor experiential learning

At the turn of the century, the effects of digital technology on outdoor experiential learning piqued the interest of both facilitators and researchers alike. This was catalysed by digital technology becoming more compact and mobile, making it possible for individuals to use these tools almost anywhere, anytime and even in remote locations (Bolliger & Shepherd, 2016). Digital technology has been introduced by facilitators in many ways including: recording the experience with digital cameras, navigating with global positioning system (GPS) devices, processing information with tablets and connecting to the outside world with smartphones (Fauville et al., 2014). However, the impacts of

these tools on the outdoor learning experience are unclear, and numerous authors have expressed their concerns. Cuthbertson et al. (2004) highlighted many issues and assumptions underpinning the use of digital technology and outdoor experiential learning and one of their key points is that digital technology is often accepted and embraced by educators with little thought. Other authors (e.g., Borrie, 1998; Strong, 1995) have shared the same concern and there is a clear need for more structured approach for this decision. Moreover, the extensive use of new digital technology has raised concerns that children's face-to-face communication skills may be negatively affected (Uhlis et al., 2014) alongside distraction as other unintended consequences (Thomas & Munge, 2017). Cuthbertson et al. (2004) categorised digital technology as a 'double-edged sword' (p. 1), and there is growing consensus that digital technology creates both opportunities and threats for outdoor experiential learning (Shultis, 2012). A summary of the arguments for and against the use of digital technology in outdoor experiential learning follows.

Key arguments against the use of digital technology

Typically, authors who have argued against the use of digital technology in outdoor experiential learning have expressed two main concerns. The first concern is that digital technology is not part of the outdoor experiential learning process, that it distracts learners, and diminishes what can be learned in the outdoors (Smith et al., 2016; Wattchow & Brown, 2011). Distraction is the most cited negative consequence of using digital technology in outdoor experiential learning (; ; Shultis, 2012). Some authors have suggested that even when facilitators use digital technology to achieve specific learning goals (such as using a tablet for a reflective journal), learners can easily become distracted by the device and lose their connection with the environment or task (Dyment, O'Connell, & Boyle, 2011; Smith, Dyment et al., 2016).

The second main concern expressed in the literature is that digital technology places a barrier between the learner and the outdoor environment (Cuthbertson et al., 2004). It is suggested that this separation threatens an otherwise direct experience with the natural world (Wattchow & Brown, 2011) as this is now mediated by a third party (French, 2016). While the evidence and opinion against digital technology in outdoor experiential learning is substantial, not all writers share this view, and there has been support for digital technology in outdoor experiential learning.

Key arguments for the use of digital technology

In the literature, there were also two key arguments supporting the use of digital technology in outdoor experiential learning. The first is that digital technology can enhance and create additional opportunities in outdoor experiential learning (Wattchow, 2001; Miner, 2012; Thomas & Munge, 2017). For example, a GPS device can provide excellent feedback to a student learning to navigate with a map and compass by confirming their location and showing how accurately they followed a bearing. The second argument supporting the use of digital technology is that it can more fully engage and connect learners with both the outdoors and each other (Bolliger & Shepherd, 2017; Veletsianos & Doering, 2010). An example of this is learners finding and taking pictures of specific plants and then reflecting upon and sharing these images after the experience with their peers.

This summary of the main arguments cited for and against the use of digital technologies in outdoor experiential learning highlight the need for a conceptual framework that can guide a facilitators decision making about their use (or non-use) of digital technologies.

A conceptual framework: digital technology in outdoor experiential learning

The Digital Technology in Outdoor Experiential Learning (DTOEL) framework, displayed in Figure 1, emerged from a review of the literature and the synthesis of key research and writing. . The

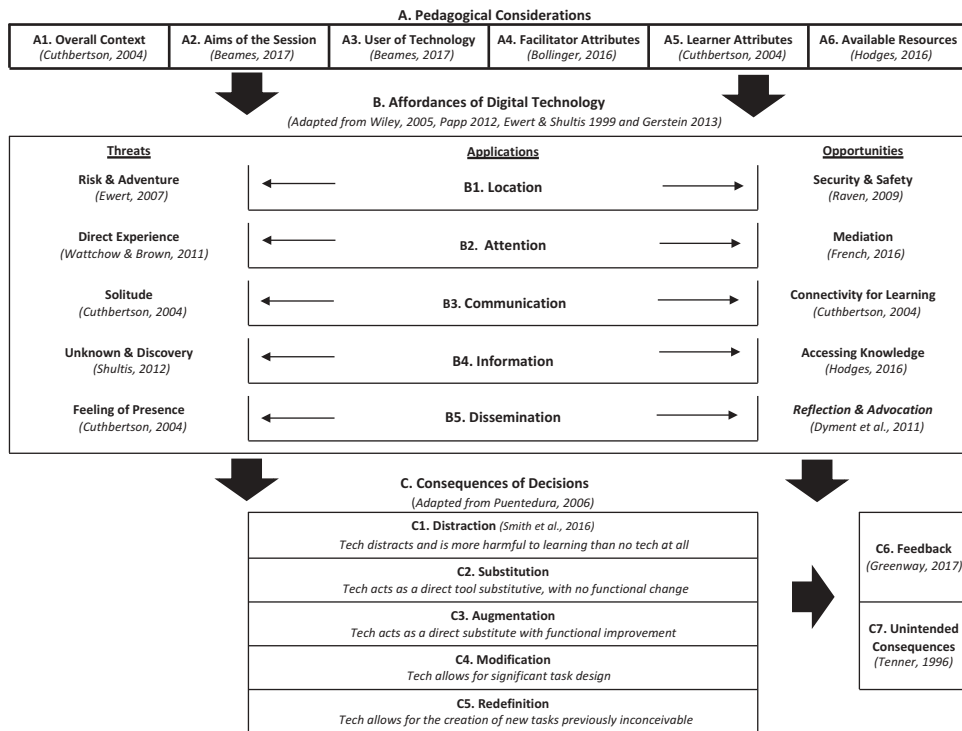


Figure 1. The digital technology and outdoor experiential learning framework (DTOEL, Hills & Thomas, 2019).

framework was generated by identifying the pattern in the way that digital technology was used or not-used in each paper. Each case study reviewed fitted each of these three areas, so it was adopted as the first layer of the framework. The order reflects time and the decision-making process that a facilitator would follow in an experiential learning cycle (Kolb & Kolb, 2017) including *plan* (Pedagogical considerations), *do* (affordances) and *review* (consequences of decisions).

The three key areas of the framework are: A) pedagogical considerations, B) affordances of digital technology and C) consequences of decisions. The pedagogical considerations highlight the variables that warrant attention in the program design, the affordances of digital technology allow the facilitator to identify the full range of gains and losses that may be experienced by using (or not using) digital technology, and the consequences of decisions provide a means to consider the effectiveness of decisions.

(A) Pedagogical considerations

The pedagogical considerations section of the DTOEL framework outlines six factors that shape or inform program design and potentially influence the decision to use or not use digital technology. Each consideration emerged from a review of the literature as something that facilitators should weigh up when making decisions about technology and which may impact on the decision to use, or not use, digital technology in outdoor experiential learning. Each pedagogical consideration will now be described.

A1. Overall context. Some forms of outdoor experiential learning may be more suited to the use of digital technology than others (Fauville et al., 2014). Whether outdoor experiential learning is being viewed as a subject or a method may shape the use and effectiveness of technology (Challis, Holt, & Rice, 2005; Dymont & Potter, 2015). If you are using outdoor experiential learning as a subject

(Dyment & Potter, 2015) to acquire skills and knowledge for example, digital technology may be more applicable to learn and review in a more formalised setting. However, if you are using outdoor experiential learning as a method to develop values and virtues via interactions with the environment and peers then any digital technology used may be a barrier to this process (Challis et al., 2005). Furthermore, digital technology may be more or less relevant depending on the stage of the outdoor experiential learning cycle (Cuthbertson et al., 2004). Any use of digital technology will impact the experience phase (Wattchow & Brown, 2011) and some studies that support digital technology cite the post-experience or reflective phase as the most appropriate to use digital technology to enhance learning (Dyment et al., 2011).

A2. Aims of the session. This pedagogical consideration should be the major underpinning factor in the decision regarding the use of digital technology (Wattchow & Brown, 2015). For example, there may be a specific learning outcome to develop a technology-based skill (like using a satellite navigation device) in an otherwise digital technology free program.

A3. User of digital technology. This pedagogical consideration looks at who the actual user of the technology is. Some literature suggested that if the facilitator is using the digital technology, there is a higher chance of a more favourable outcome as they can exercise a greater degree of control of the situation and minimise any negative impacts on the experience (Houge Mackenzie, Schwab, Greenwood, & Hendricks, 2017).

A4. Facilitator attributes. The facilitators' confidence with digital technology has been a predictor of success and having up to date knowledge of the digital device is essential the ever evolving world of digital technology (Raven, 2009). For example, the software on many digital devices is often updated annually and this requires constant learning by the facilitator. The literature also suggested that inexperienced facilitators may incur negative consequences if the digital technology dysfunctions due to their lack of expertise. This risk could be in terms of either failure to realise learning outcomes or compromised personal safety in the outdoors for learners or facilitators (Wiley, 2005).

A5. Learner attributes. The skill levels and expertise of the learners can also influence programming decisions about the use of digital technology. If learners are unable to work the digital technology this can create an additional barrier to engaging in the task (Medzini, 2015). On other occasions, the abilities of the learners to successfully use digital technologies may exceed that of the facilitator and make technology use simple and less distracting (Bolliger & Shepherd, 2017).

A6. Available resources. Using digital technology in outdoor experiential learning can reduce the physical dependence upon cumbersome resources. For example, a tablet or smartphone can eliminate the need to carry multiple guidebooks and maps (Bolliger & Shepherd, 2016). However, like any other teaching aid, the level of resource availability can be an important determinant of the success of any initiative using digital technology (Munge, 2005). The range and number of digital technology resources available to facilitators of outdoor experiential learning have burgeoned in the last decade, but their accessibility might be determined by the availability of funding and support (Hodges, 2016).

(B) The affordances of digital technology

Affordance theory was first proposed by Gibson (1977) to illustrate a balance between technological determinism and social constructivism. It recognises both positives and negatives from the use (or non-use) of digital technology. The five affordances of digital technology in outdoor experiential learning shown in the DTOEL framework in Figure 1 were synthesised primarily from the work of Wiley (2005), with additions from Papp, Vella, Edwards, and Rasborsek (2012), Ewert and Shultis (1999) and Gerstein (2013). Wiley (2005) identified four threats and opportunities between the outdoors and digital technology. These include *risk vs security*, *solitude vs connectivity*, *mediation vs direct experience* and *knowledge vs the unknown*. These are depicted in the framework as the affordances of location, communication, attention and information. Ewert and Shultis (1999)

also discussed the issues of safety, communication and information and the writing of Gerstein (2013) and Papp et al. (2012) prompted the inclusion of a fifth dimension of a *feeling of presence vs advocacy and reflections* which was labelled *dissemination* to complete this part of the framework. Each affordance addresses the balance of the opportunities and threats of digital technology use in outdoor experiential learning. In many cases, a balance may be aimed for between the opposing affordances and the five affordances will now be explained in more detail.

B1. Location: risk and adventure vs safety and security. The first affordance addresses the amount of location or safety information that the learners or the facilitators receive about the environment. The right end of the affordance (security and safety) represents the opportunities that digital technology creates for immediate information on their location via GPS. GPS data have been shown to enhance the process of learning to map read and give feedback on bearing accuracy (Raven, 2009). The literature also suggested that GPS data increases the security and safety of participants by giving them an exact location all of the time (Raven, 2009). The left side of the affordance (risk and adventure) represents a potential threat to the feeling of adventure in the outdoors that this geographic certainty creates and evidence suggests that an overreliance on location devices can increase the risk of the outdoor experiential learning activity (Ewert & Shultis, 1999). Some accidents have been recorded after the failure of location devices was conflated with an absence of map-reading skills (Ewert & Shultis 1999). Examples of this affordance are GPS devices which are the most commonly referenced applications of digital technology in outdoor experiential learning (Beames, 2017; Bolliger & Shepherd, 2017; Drader, 2014; Smith et al., 2016; Wattchow & Brown, 2011)

B2. Attention: direct experience vs mediation. This affordance addresses the cognitive focus of the facilitator and/or learner and is the second most referenced issue of digital technology in outdoor experiential learning (Beames, 2017; Bodsworth & Goodyear, 2017; Dymont et al., 2011; French, 2016; Loeffler, 2004; Palaigeorgiou, Malandrakis, & Tsolopani, 2017; Sattar, Tamatea, & Nawaz, 2017; Stokes et al., 2012; Wattchow & Brown, 2011). The right end of the affordance (mediation) represents opportunities that digital technology provides to facilitate the interpretation of the environment (Wattchow & Brown, 2011). It can provide feedback on performance (French, 2016), highlight aspects of the environment to attend to (Akçayır & Akçayır, 2017), and increase engagement (Beames, 2017). The left side of the affordance (direct experience) represents how viewing the environment through a lens or digital overlay, creates a membrane or a barrier to a direct experience of the outdoors (Wattchow & Brown, 2011). This is seen by many as being incompatible with effective outdoor experiential learning experience (Dewey, 2007; Ord & Leather, 2011) and that the outdoors should be experienced first-hand without any filters. Examples of this affordance include viewing the environment through augmented reality, smart glasses or any digital overlay.

B3. Communication: solitude vs connectivity for learning. The third affordance addresses how much the learners or facilitators in the environment should be linked to others during the experience. The right end of the affordance (connectivity) represents the opportunities that digital technology provides to pass on data, and analyse results for other learners to interpret (Palaigeorgiou et al., 2017). Furthermore, GPS trackers can help facilitators to track learners from a distance, which creates new opportunities for remote supervision without the need for a facilitator to be physically present. The left side of the affordance (solitude) highlights how cell phones, the most complained about application of digital technology in outdoor experiential learning (Bolliger & Shepherd, 2017; Peffer, Bodzin, & Smith, 2013; Shultis, 2012; Smith et al., 2016; Uhls et al., 2014) can disconnect learners from nature (Smith et al., 2016) and threaten the solitude of the outdoor experience.

B4. Information: unknown and discovery vs accessing knowledge. This affordance addresses how much additional information the facilitator or the learner should have access to during the experience. The right side of the affordance (accessing knowledge) represents full access to almost unlimited data with a digital device. This has been shown to increase student-centred learning (Hodges, 2016; Jackie Gerstein, 2013) with less reliance upon direction from the facilitator. This application has also been shown to increase the efficiency of transporting information outdoors without the need to carry cumbersome guidebooks and maps (Thomas & Munge, 2017). The left

side of this affordance (unknown and discovery) represents how digital technology can provide too much information to learners (Dyment et al., 2011), threaten feelings of the unknown (Shultis, 2012), and the sense of discovering unique parts of the natural world (Bodsworth & Goodyear, 2017). Examples of this affordance are using tablets and laptops in the field which are described by some supporters as digital swiss army knives (Hodges, 2016).

B5. Dissemination: feeling of presence vs reflection and advocacy. The final affordance addresses how facilitators and learners can use recorded media after the experience against the impact of recording the media on that experience. The right side of the affordance (reflection & advocacy) represents opportunities for digital technology to be used to increase participation (Beames, 2017) and highlight the importance of outdoor experiential learning to key stakeholders (Hodges, 2016). Reflections and reviewing are accepted as key parts of the experiential learning processes (Kolb & Kolb, 2017) and digital technology may enhance this post-experience process by recalling the experience engagingly (Dyment et al., 2011; Greenaway, 1998). The left side of this affordance (feeling of presence) represents the cost of recording media in the field at the time (French, 2016). The acquisition of media may come at the expense of the feeling of presence (Cuthbertson, Socha & Potter 2004) or flow (Boniface, 2000) of the experience. For example, the posed or group picture is a common event, but sometimes interrupting learners in their experience have adverse effects on their performance and overall experience outdoors (Boniface, 2000).

All of these affordances illustrate both sides of the digital technology and outdoor experiential learning relationship and the threats and opportunities that are being balanced. Ultimately, the combination of decisions made about pedagogical considerations and the affordances produce consequences for the learners and facilitators. The consequences of decisions will now be discussed.

(C) Consequences of decisions

This section of the DTOEL framework is concerned with outcomes, and is based on a model developed to categorise the educational objectives in the field of technology education. Puentedura (2006) encouraged technology educators to consider the effects of using digital technologies on their practice, and he used four levels to describe the potential impacts as either substitution, modification, augmentation and redefinition. Colloquially known as the SMAR model (derived from the four steps of substitution, modification, augmentation, redefinition), it has been adapted in the DTOEL framework to categorise the impact of the overall decision to use digital technologies in outdoor experiential learning. In the original model (Figure 2), Puentedura (2006) described the lower two categories of the model (substitution and modification) as *enhancement*, and the use of digital technologies at this level have less impact on the learning opportunities provided. For example, global positioning system (GPS) devices used as compasses would be an example of substitution with little added benefit to the

Redefinition <i>Tech allows for the creation of new tasks, previously inconceivable</i>	Transformation
Modification <i>Technology allows for significant task redesign</i>	
Augmentation <i>Technology acts as a direct tool substitute with functional improvement</i>	Enhancement
Substitution <i>Technology acts as a direct tool substitute, with no functional change</i>	

Figure 2. The substitution, modification, augmentation and redefinition (SMAR) ladder (Puentedura, 2006).

learning process. However, using the GPS device to find waypoints and track progress would be an example of modification. Puentedura describes the upper two levels of the model (augmentation and re-definition) as *transformation*. At the highest level of re-definition, the use of digital technology would realise new learning outcomes that would have been previously inconceivable to facilitators of outdoor experiential learning. The SMAR ladder is one way for facilitators to consider the impacts of their use of digital technologies. In the DTOEL framework shown, the order of the steps were inverted without changing their sequence because it was more user-friendly in that configuration.

C7. Unintended consequences. A limitation of the SMAR model is it assumes any application of digital technology is neutral or positive, and it fails to consider the potentially negative impacts of using digital technology. Based on the literature reviewed earlier, an additional step has been added to the SMAR ladder in the DTOEL framework. The added step, called *distraction*, refers to situations where the use of digital technology has a negative impact on the learning outcomes or overall experience. Thomas and Munge (2017) encouraged facilitators of outdoor experiential learning to ask questions about the unintended consequences of either using or not using digital technologies, and this prompted the addition of this step. For example, Smith et al. (2016) found that even when using digital technology for learning-orientated purposes, the tools can distract the learner from the intended task. However, it may also be possible that a decision to not use technology has some unintended consequences for the learners or facilitators that may not always be positive either. For example, a decision to adopt a low or no-technology focus could limit or negate opportunities for learners to record their experiences, reflect on them, and learn from them. Regarding safety, the decision to ignore the positive affordances offered by digital technologies such as satellite phones could have negative, unintended consequences on emergency response capabilities.

C6. Feedback. One final component of the DTOEL framework in the consequences of decisions section is the need to plan for, or draw on, the feedback regarding the success of decisions to use or not use digital technology in outdoor experiential learning (Da Silva, 2014). The feedback part of the framework links it into a loop or a learning cycle and allows for multiple applications in any given time frame. Greenaway (1998) highlights the importance of feedback to ensure that facilitators recognise and learn from their outdoor experiential learning sessions. In the current framework, it is important that whatever the consequences of decisions, the results are fed into the future pedagogical considerations and decisions on affordances of digital technology to build upon the experience of the facilitator. Having outlined the key components of the DTOEL framework, its application will now be explored in two outdoor experiential learning examples.

Applications to outdoor experiential learning practice

Overall, the DTOEL framework is arranged with the use of digital technology on the right and it not being used (or removed) on the left. The framework starts by considering the pedagogical considerations at the top, weighing up the affordances of digital technology in the middle, and concluding with the consequences of decisions at the bottom. Prospective use enables facilitators to decide upon digital technology use (or non-use) in outdoor experiential learning, and retrospective use enables a review of decisions made about technology use. Two hypothetical applications of this model will now be outlined.

Example 1: prospective use of the framework—mobile phones and digital apps

In the first example, shown in Figure 3, a facilitator called Pippa had read many articles on the use of species identification digital apps in outdoor experiential learning. Her learners were very keen to use their phones outdoors, so Pippa considered this for her next session. Using the DTOEL Framework, she consulted the pedagogical considerations. First, she establishes that she is using outdoor experiential learning as a pedagogy on a school trip and that the learners would be in the experience stage of their learning cycle (overall context, point A1 in Figure 3). The session aimed to connect with the environment (aims of the session, A2), and the learners would be using the digital app (user of digital

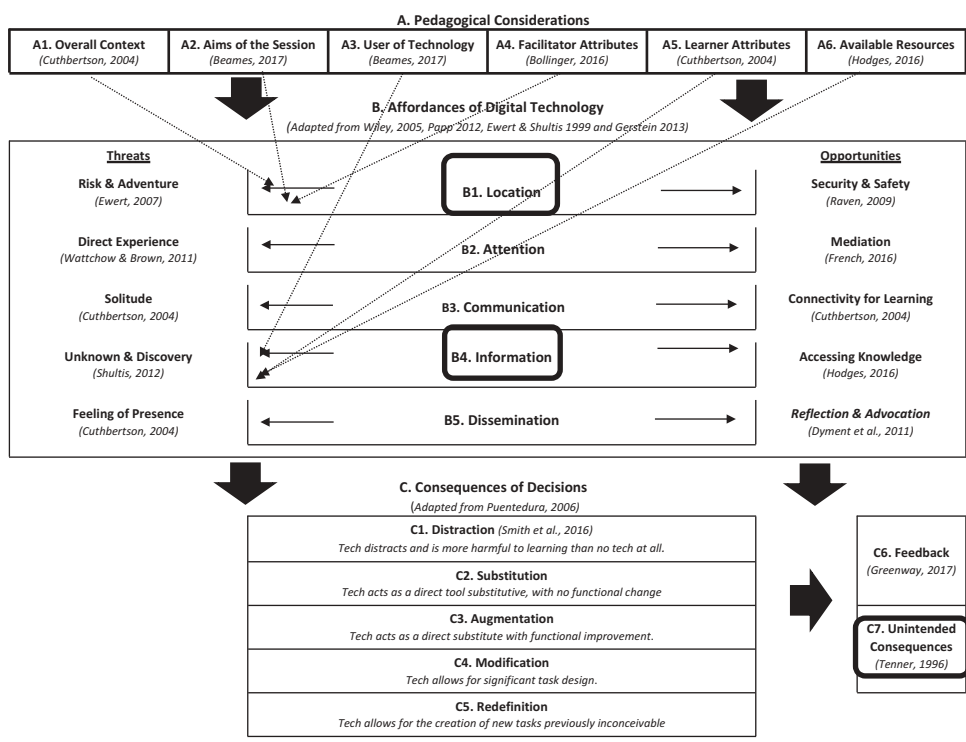


Figure 3. An example of prospective use of the framework: Mobile phones and digital apps.

technology, A3). She had never used this app or any other outdoor experiential learning apps before as she did not have a smartphone (facilitator attributes, point A4). The school did not have any phones or tablets that could be used if the learners did not have their device and many of the learner's phones had unreliable batteries (available resources, A6).

The affordances of 'location' (B1) and 'information' (B4) were identified as the most relevant to consider the opportunities and threats of her decision about technology use. She was excited about the potential of empowering the students to guide their learning and identify plants on their own (accessing knowledge, B4) but was worried that using the digital app would potentially threaten the sense of exploration that she valued in outdoor experiential learning (unknown and discovery, B4). However, all the pedagogical considerations evident to Pippa, indicated that the use of the digital technology might be a threat or encumbrance to the aims of her outdoor experiential learning session. Consequently, she chose not to use the digital technology and asked her learners to leave their mobile phones at home. Reflecting afterwards, she reported that some of her learners were engaged on the field trip in ways she had not seen at school when they had access to their phones (redefinition, C5). However, she did report some unintended consequences (C7) of this decision. Following the field trip, the learners were not able to sit down and review their learning by looking at the pictures from the field trip, as they usually would have done following an excursion (unintended consequences, C7). Reflecting on the experience, she resolved that in future trips she would designate a specific time for taking pictures with her camera, separate from the rest of the session and consider allowing learners to take cameras with them in future (feedback, C6).

Example 2: retrospective use of the framework—drones and cameras

In our second example (see Figure 4), Theo is privately reflecting on a recent kayaking session he facilitated with his students. Theo believed that his learners had realised the lesson objectives (aims of

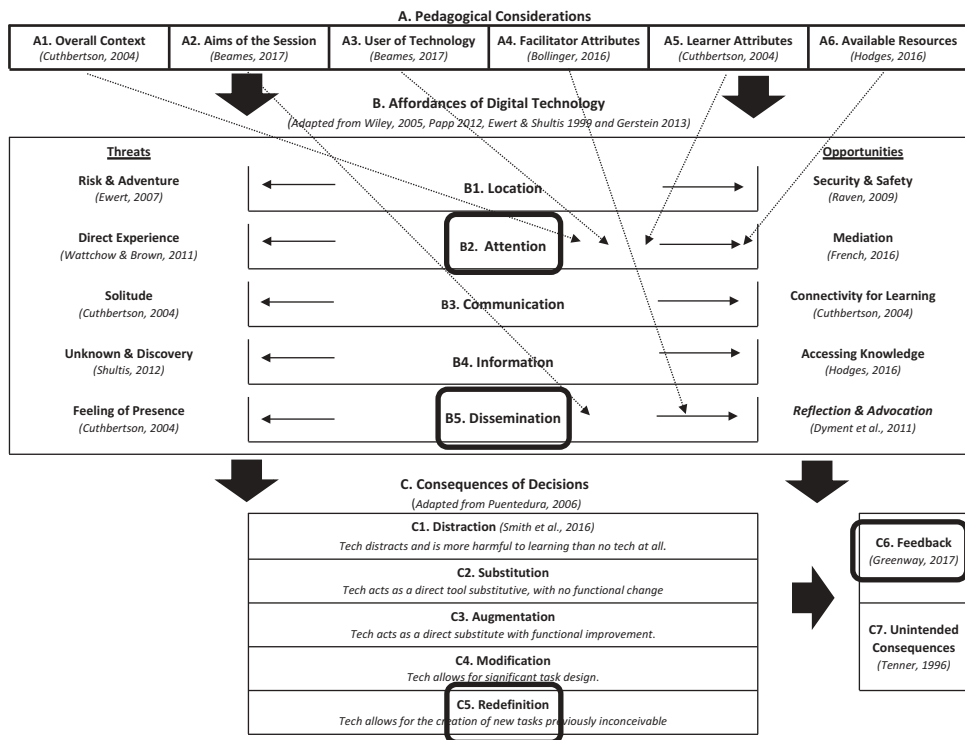


Figure 4. An example of retrospective use of the framework: Drones and cameras.

the session, point A2), which were to learn the kayaking skill of forward paddling. Theo used cameras and drones to provide his students with video feedback, and he believed that this use of digital technology increased their skills, engagement and learning opportunities. However, Theo had some concerns that the use of the cameras and drones had negatively affected the overall, outdoor learning experience. Consulting the pedagogical considerations identified in the framework, Theo established that he was using outdoor experiential learning as a subject (overall context, A1) to develop skills in the discipline of kayaking (aims of the session, A2). Theo operated the drones and cameras himself (user of the technology, A3), he had completed a drone and camera training course (facilitator attributes, A4), and the learners had the skills to edit and review the media themselves (learner attributes, A5). The school that Theo worked for was well funded with the hardware and software to film and display the video footage in the field (available resources, A6). Regarding the affordances component of the framework, Theo considered the attention and dissemination dimensions to be most relevant. Focusing upon these affordances, he considered the threats of digital technology in disrupting the flow of the learner's performance (feeling of presence, B5) and the connection with the water and the river that inspired his students to perform (direct experience, B2). Referring to the consequences of decisions part of the framework, he identified that his use of digital technologies had achieved things that would otherwise not have otherwise been possible, because the video footage allowed them the students to view their performance in the field and further analyse their skills afterwards (redefinition, C5, Puentedura, 2006).

Theo felt that the pedagogical considerations, and the corresponding affordances, justified his use of digital technology in outdoor experiential learning and confirmed his achievement of redefinition in the framework due to the learning opportunities that the digital technology provided. However, Theo did report that the noise of the drone meant that at times, the learners could not hear all of his instructions (unintended consequences, C7). Consequently, on the next occasion, he flew the drone

higher with a bigger zoom so that it could not be seen or heard by the students (feedback, C6). The process of operating the equipment also diminished the degree to which Theo was present with the students during the experience, which meant he had to rely on his co-staff to monitor student safety on the water.

Limitations of the digital technology in outdoor experiential learning framework

While the DTOEL framework provides a unique insight into a complex problem, some limitations need to be highlighted. Firstly, many of the papers reviewed did not distinguish digital technology from technology and often may be talking about technology in general, as opposed to digital technology. Furthermore, the framework is a synthesis of relevant research and the concepts in the framework have not yet been empirically tested in any formal setting. The SMAR ladder (Puentedura, 2006) itself has been the focus of some critique, and some have argued passionately against the validity of its application (for example, see Anderson, 2015; Guhlin, 2015). Guhlin (2015) argued that the SAMR ladder focused too much upon the task without looking at the instruction that goes behind it. He contended that it is an outdated model fitting an old style of teaching and does not reflect more contemporary, learner-focused pedagogies. It is also worth highlighting again that the SMAR ladder was designed for technology education teaching in a classroom setting, not an outdoor experiential learning context. Another weakness in the framework is that the facilitator using the framework may be subject to bias or prejudice when interpreting data and making decisions about the effectiveness of digital technologies in outdoor experiential learning. For example, a facilitator may think that their use of digital technology is at the redefinition level of the SMAR ladder, when in fact the evidence suggests they are operating at the augmentation level, at best. This applies equally to the pedagogical considerations and affordances component of the framework that the facilitator will consider. There will always be uncertainty and ambiguity around the judgements being made by facilitators, and such judgements should be based on evidence when possible. Facilitators are also encouraged to consult with colleagues when using the framework to improve the efficacy of their judgements and decisions, to temper any potential biases and increase the quality of decisions made using the framework.

Conclusions and future directions (2)

Digital technology can distract from an outdoor experiential learning experience, but it also provides opportunities to enhance learning too. There will always be a stream of new technological devices and people wanting to sell them. In this paper, the DTOEL framework has been offered as a tool that can be used by facilitators of outdoor experiential learning to make informed decisions about the use (or non-use) of digital technology in their programmes. The framework may assist facilitators to make a more critical and fulsome assessment of the strengths and weaknesses of using (or not using) digital technologies, before the experience. Equally, the framework can be used retrospectively to help facilitators to reflect on the merit of any digital technology use (or non-use) after an experience.

Our future research will focus on the processes that facilitators of outdoor experiential learning use to make decisions about their use of digital technologies. Data collection and analysis will aim to assess whether the DTOEL framework captures the considerations that facilitators account for in practice. Furthermore, there is little in the literature about the unintended consequences of intentionally removing digital technology in outdoor experiential learning. It is uncertain if the avoidance of digital technology always leads to the intended positive outcomes. Finally, in the future, new innovative technologies (such as augmented and virtual reality) may be used in educational settings negating the need to take learners outdoors into the field at all. This use of technology falls outside the scope of the recognised affordances in the current framework and may be a genuine threat to outdoor experiential learning.

This paper has attempted to present a balanced consideration of the strengths and weaknesses of using digital technologies in outdoor experiential learning. The DTOEL framework, synthesised from the available literature allows for a more critical evaluation of the pedagogical considerations, the affordances and consequences of decisions for any given experience or program. The framework can be a useful tool to help facilitators of outdoor experiential learning to make informed and considered choices about their facilitation in a modern digital world.

Disclosure statement

No potential conflict of interest was reported by the authors.

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