

25. Revisiting Affordances for Learning in Mobile Technology Based Environments

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Abstract. The term “affordance” has been used in Information Communications Technology (ICT) based environment to explore the opportunities the educational technologies provide for students. Gibson (1979/1986) defines affordances as the possibilities that the environment offers for the perceiver. The perceiver and the environment make an inseparable pair. In the case of learning, affordances are those relationships that provide a “match” between something in the environment and the learner (Van Lier, 2004) as a whole. The learning environment is a complex system consists of different components and layers. By becoming integrated components of the environment, different learning entities, whether social or individual, constitute affordances for each other. Through interactions, these affordances are integrated, and transform into effectivities (Visser, 2001). Besides, according to Gibson, affordances are invariant. However, they can be increased when the intensity of stimulation changes. They can also form higher order affordances when primary affordances are always found in particular combinations. Finally, Gibson (1979/1986) argues that affordances are not neutral. A focus on affordances for learning in mobile technology-based environment helps us identify how the environment as an integrated whole provides support for students’ learning, what and how components of the environment interact to provide various affordances.

Keywords: affordances, m-learning environments, mobile technology

1. Introduction

The paper looks into the issue of affordances for students’ learning in a mobile technology based environment based on Gibson’s ecological approach to perception and action (Gibson, 1977; 1979/1986), and presents educational implications from such an investigation.

Mobile technology generally refers to technologies that are portable and personal (Naismith, Lonsdale, Vavoula, & Sharples, 2004). According to some research reports on mobile technology applications, it appears that the most widely used forms of mobile technologies in education are mobile phones and PDAs (Personal Digital Assistants) (e.g., Naismith et al., 2004; Sharples & Beale, 2003), though laptop computers (e.g., Nicol & MacLeod, 2005) and tablet PCs (Personal Computers) (e.g., Corlett & Sharples, 2004) have been also trialed in educational contexts.

The term “affordance” is not a new term. It was first coined by the perceptual psychologist Gibson. Gibson (1977) defines affordances as the possibilities that the

environment offers for the perceiver. The perceiver and the environment make an inseparable pair. In the case of learning, affordances are those relationships that provide a “match” between something in the environment and the learner (van Lier, 2004). Therefore, learning cannot be seen in isolation from what happens in a learning environment as a whole. Affordance was used in the field of human computer interaction (HCI) (e.g., Elliott & Hearst, 2002, Gaver, 1991, Kafai & Ching, 2001) to investigate the issue of affordances in computer software/interface design, and more recently has been used in the area of ICT applications in education (e.g., Klopfer, Yoon, & Perry, 2005; Kong & Kwok, 2003) to explore the opportunities the educational technologies provide for students in ICT based learning environments. At the turn of the century, what affordances are provided in mobile technology based environment has been attempted in a few research projects (e.g., Hutchby & Barnett, 2005; Liang, Liu, Wang, Chang, Deng, Yang, Chouz, Ko, Yang, & Chan, 2005). However, research in this area is still scant.

According to Gibson’s theory of affordances (Gibson, 1979/1986), the same environment perceived by different observers may produce different affordances. Affordances are independent of an observer. No matter whether the observer can perceive the affordances or not, they are there to be perceived. For Gibson (1979/1986), constant perception does not change the invariant affordances, but changes in the intensity of stimulation, which may increase the affordances. Besides, if primary affordances are always found in particular combinations, then those combinations can themselves constitute higher order affordances. In addition, Gibson (1979/1986) assumes that the environment is embedded with unlimited possibilities or affordances which make our life possible. There may be many affordances that have not been taken advantage of by the actors. Finally, Gibson (1979/1986) argues that affordances are not neutral. Some affordances of the environment are positive, and some are negative. In the case of mobile technology educational applications, we need to explore not only perceived affordances, but also other affordances like increased affordances, higher order affordances in order to maximize affordances in mobile technology based environments; in the meantime to reduce the possibilities of picking up negative affordances in the environment.

The rest of the paper discusses the relationship between affordances and the mobile technology based environment first; then examines various affordances associated with mobile technology educational practices; finally presents the educational implications of the study.

2. Affordances and the Mobile Technology Based Environment

“Affordances exist only within the context of an animal - environment system” (Gibson, 1979/1986, p. 2). Chemero (2003, p. 185) echoes Gibson’s perception by arguing that “affordances are features of whole situations”, in which, animals play a crucial role. Thus, “perceiving something about the whole situation cannot always be just perceiving something about the environment, divorced from the animal”. Therefore, learning cannot be seen in isolation from what happens in a learning environment as a whole. Take the mobile



Figure 1: The mobile learning environment (Laouris & Eteokleous, 2005, p. 7)

technology based learning environment for instance. In the environment, there may be various components like learners, tutors, mobile technologies, other technologies, and other learners or factors. By becoming integrated components of the learning environment, different learning entities, whether social or individual, constitute affordances for each other (See Figure 1). Through interactions, these affordances are integrated, and transform into effectivities (Visser, 2001), or in Chemero's (2003, p. 184) word, "abilities". Effectivities can be considered as the means by which an affordance may be seized (Bongers, Smitsman, & Michaels, 2004).

3. Various Affordances in Mobile Technology Based Environment

3.1 Invariant Affordances

Gibson (1979, pp. 138-139) states that affordances are independent of the observer, "The affordance of something does not change as the need of the observer changes. The observer may or may not perceive or attend to the affordances, according to his needs, but the affordance, being invariant, is always there to be perceived". Whereas, the abilities or aptitudes to perceive the affordances may be dependent on the available information and the disposition of the observers (Visser, 2001; Webb, 2005). Gibson (1979; 1986, p. 128) suggests that "a niche is a set of affordances" for a particular animal. Different animals, with different abilities, may have "nonoverlapping niches" (Chemero, 2003, p. 191) or sets of affordances. Affordances in the same environment perceived by different observers may produce different results, which is not due to unstable features of affordances, but due to the capabilities of the observer.

For example, SMS (Short Message Service) - one feature of the mobile device, was used for raising students' awareness in collaborative learning (Liu, Tao, Nee, Liu, Chen, Hsu, & Hong, 2005). While, in TAMALLE (Fallahkhair, Pemberton, & Griffiths, 2005) - a television and mobile phone assisted language learning environment, SMS was also used by learners with cultural or language item problems when they were watching a TV programme in order to receive just-in-time scaffolding on his/her mobile phone from the service provider. Therefore, the affordances of SMS were perceived differently by different researchers, hence resulted in different educational applications. For another instance, Thornton and Houser (Thornton & Houser, 2005) experimented to use video-enabled mobile phones for helping the university EFL (English as a foreign language) Japanese students capture idiomatic meaning of English idioms, while video was used for making ePortfolios and creating life stories in another project reported by Hartnell-Young & Vetere

(2005).

3.2 Increased or newly perceived affordances

Gibson (1979) assumes that “the environment as a whole with its unlimited possibilities existed prior to animals”, and these conditions and affordances are “what make animal life possible” (p. 128). By this, it means that there may be many affordances in our environment that have not been taken advantage of. For Gibson (1986, p. 3), constant perception is possible because certain variables “remain invariant with movements of the observer and with changes in the intensity of stimulation”. It may contribute to increased affordances, or newly perceived affordances by different perceivers. However, the degree of an affordance exists relative to a particular user depending on two factors of the degree of perceptual information and the degree of affordance (McGrenere & Ho, 2000) as shown in Figure 2.

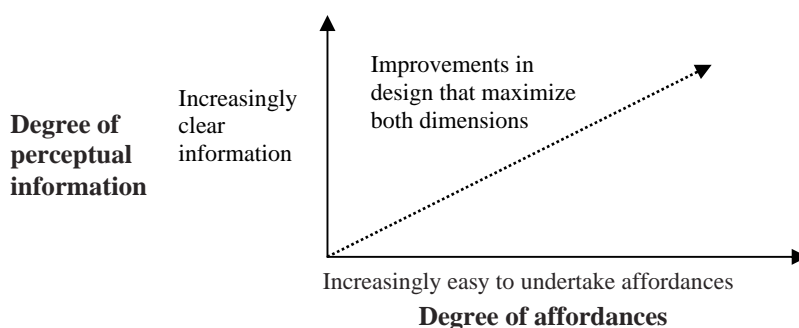


Figure 2: Representing the affordance and the information that specifies the affordance (McGrenere & Ho, 2000, p.7)

Kadyte (2004, p. 74) posits that “probably the oldest and most widely used push technology is e-mail”. Indeed, it is an interesting phenomenon that no matter how advanced/complicated a learning system has been developed, it seems that the most frequently used and highly rated features of mobile devices are such as SMS, emails, camera/video, media players instead of those costly platforms developed for strictly defined purposes (Tretiakov & Kinshuk, 2005). The learners used these features for various purposes due to the ease of use that increases affordances of these features, or new affordances perceived by them. For example, SMS was originally developed for sending messages between mobile holders. Later it was used for commercial purposes to make advertisements, and more recently has been increasingly used for educational purposes because more and more affordances have been perceived by learners and educators (Fallahkhair et al., 2005; Liu et al., 2005). The features of emails (e.g., Corlett & Sharples, 2004; Thornton & Houser, 2005), and camera/video (e.g., Joseph, Binsted, & Suthers, 2005; Mitchell & Race, 2005), and Media Players (e.g., Corlett, Sharples, Bull, & Chan, 2005) of mobile devices have undergone similar processes.

3.3 Higher order affordances

If primary affordances are always found in particular combinations, then those combinations can themselves constitute higher order affordances (Gibson, 1979/1986). “The affordance fuels perception and activity, and brings about meanings – further affordances and signs, and further higher-level activity as well as more differentiated perception” (van Lier, 2004, p. 96).

Colley & Stead (2004, p. 45) posit that none of the features of SMS, MMS, VoiceXML, mini Browser, etc. on mobile devices “is particularly rich by itself, but we suggest that combined appropriately they can provide an engaging and beneficial experience for even the most resistant learner”. Several programmes used SMS together with other technologies to support language learning. One example was reported by BBC (2003). BBC, cooperating with Sina provided English language teaching via mobile phones and web-based instruction in China. Similarly, Song and Fox (2005) conducted a research on improving adult learners English vocabulary by integrating SMS via mobile phones into web-based learning. Both of the examples show that the combination of the affordances of SMS and web-based instruction in mobile technology environment could help augment learning. In another project of one prototype of multimedia learning applications on PDAs for mobile local history tour, the combination of audio and visual information was appreciated by the learners for supporting informal learning (Bradley, Haynes, & Boyle, 2005).

3.4 Non-neutral affordances

At various levels of affordances, “we can now observe that some offerings of the environment are beneficial and some are injurious ... all these benefits and injuries, these safeties and dangers, these positive and negative affordances are properties of things taken with reference to an observer but not properties of the experiences of the observer” (Gibson, 1979, p. 137). Though the integration of mobile technology into educational practices benefited the learners, teachers and administrators in many aspects, there have been a host of issues vis-à-vis the limitations of the mobile technology confronting the researchers.

The screen size of the mobile devices has constantly been regarded as one of the main issues limiting its applications (e.g., Chen & Kinshuk, 2005; Corlett et al., 2005; Ketamo, 2003). Because of the limitations of the screen size, resources with longer texts, for instance, e-books, long paragraphs, was considered inappropriate to view on the mobile devices. The content intended for mobile use had to be formatted to mobile use. Therefore, processing texts in short paragraphs on mobile devices was proposed (e.g., Ketamo, 2003). In addition, the video quality (1 megapixel) of the mobile devices was considered inadequate for presentation purposes (e.g., Hartnell-Young & Vetere, 2005). Also, limited storage of mobile devices was a big issue (Bradley et al., 2005). Next, the writing input of the mobile device was considered troublesome by the users (e.g., Corlett et al., 2005). Moreover, wireless connectivity was limited to certain contexts using wireless LAN, which was a barrier for anytime, anywhere learning purposes (McGreal, Cheung, Tin, & Schafer, 2005; Smordal & Gregory, 2003). There were other limitations such as inconvenience in mobile printing, lack of common platform (McGreal et al., 2005). Security and cost of using mobile devices were also challenged (Bradley et al., 2005).

However, with the development of the mobile technology, more and more inadequacies of mobile devices have been complemented in terms of connectivity, video/picture resolution, storage, platform, etc. In the meantime, more and more resources have been developed for mobile technology applications.

4. Implications

Being aware of affordances for learning in mobile technology based environment will render rich implications for both learners and educators.

First, as affordances exist in a whole situation composed of animals and other

components, the concept of mobile learning, “e-learning through mobile computational devices” (Quinn, 2001), is no longer adequate to describe the kind of learning. “Mobility is about increasing a learner’s capability to physically move their own learning environment as they move” (Barbosa and Geyer, 2005 cited in Laouris & Eteokleous, 2005, p. 8). Therefore, when an investigation into mobile technology applications in teaching and learning is conducted, a number of components, such as learners, teachers/tutors, other learners, mobile technology, other technologies, curriculum and the like must be taken into consideration as a whole. Examining how and what components in the environment as a whole interact with each other and contribute affordances to each other is crucial for successful applications of the technologies in education.

Second, generally speaking, affordances are invariant, whereas the ability to perceive the affordances is varied from one perceiver to another, hence, affordances for learning in mobile technology based environments may be perceived differently by different perceivers. In addition, affordances can be increased, or seized by constant perceiving, or getting information from others. This prompts us to exert unfailing effort on observing, trying out possibilities of new things, and learning from others so that we can get increasingly clear picture of how to integrate mobile technology into learning effectively, and making this process increasingly easy.

Thirdly, as noted previously that it is possible to form higher order affordances which may contribute to higher-level activities and differentiated perception if a unique combination of invariant affordances is always found together, educators or learners should attempt different possibilities that a mobile technology based environment offers, and take advantage of various affordance combinations for teaching and learning in the environment.

Last but not least, Gibson (1979/1986) gives an example of the affordance of a knife with a sharp edge when talking about positive and negative affordances. A knife affords cutting if manipulated in one manner, but it affords being cut if manipulated in another manner. In the case of affordances for communication in mobile technology based environment, on the one hand, mobile technologies allow anytime, anywhere communication for the learners, on the other hand, the learners may become overloaded, or spammed by such means of communication. In order to avoid being trapped by the negative affordances for learning in the mobile technology based environment, both educators and learners have to weigh both positive and negative affordances in the environment, and make decisions on how best the opportunities that the environment can offer for students’ learning support.

All in all, this paper intends to inform educators and learners of the affordances for learning in the mobile technology based environment so that affordances in the environment can be maximised to a point where enhanced opportunities for learning are beyond those affordances directly created by the introduction of the technology.

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