

Affordances of ICT Tools for Learning

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Introduction

The term of affordance has been popularly used nowadays although it does not exist in dictionaries. Gibson (1979) originally defined affordances as actionable properties that existed between an object and an actor. For instance, a big tree with leaves in the sun can afford people shade to sit in to keep cool. No matter how people perceive it, the tree has the ecological property to afford shade. In Gibson's definition, the properties are associated with real or actual affordances, which are primarily independent of the actor's culture or experience. Norman (1999) distinguished perceived affordances from real ones. He argued that the same object could be perceived differently by various people. It is the perceived affordances not the real ones that determine how the object could possibly be used. The perceived affordances are deeply dependent on the actor's experience and knowledge. For instance, the tree may be perceived as a decoration by the tree owner; or perceived as a road sign by a car driver. Furthermore, affordances can also be seen as a set of cognitive constructs that are deeply subjective in nature. They are the internal representations of the objects that a person possesses, and heavily dependent on the person's experiences. For instance, the tree may be perceived as a potential material for making a piece of sculpture by an artist.

These interpretations of affordances (real, perceived, and cognitive constructs) are more associated with naturally existing objects like a tree. For manmade artefacts like a mobile phone or an ICT tool, the meaning of affordances is slightly different. They can be differentiated into actual (or designed) affordances and perceived affordances. The actual affordances are the full set of designed features or functions that the artefact can provide for its users to perform certain tasks. For instance, the designed actual affordances of a mobile phone include enabling people to talk, take photos, listen to radios, or access web sites.

Comparatively, the perceived affordances often refer to those features that are known to or often used by the user.

Some issues are important for understanding the concept of affordance. First, the actual affordance of a designed artefact must be consistent with the perceived affordance as the latter determines how the artefact could be possibly operated by its users. For instance, the perceived affordance of a mobile phone is to enable people in a distance to talk. It is not acceptable that a mobile phone does not support this primary function even though it has other powerful features. In addition, as perceived affordances are heavily dependent on the users' personal experiences and knowledge, it is crucial for designers to know the profiles of the intended target users so that the designed tools are usable.

Second, context is closely related to affordance. It determines the extent to which the affordance can be realized. Obviously some designed affordances can be accomplished in a context but may not be in a different context. For instance, a big hammer affords hitting a nail. But if the nail is in a small hole where the hammer cannot reach, the hammer certainly cannot function. In this case a smaller hammer or a screw driver is more proper. Another example would be an online communication tool (such as MSN or Skype) may work excellently in a place where the Internet access speed is fast enough, while it may not work well in other places where the access speed is slow.

Third, the affordance of an artefact has the possibility to be misused or underused. A knife is mainly designed for cutting things, but it can also be used to kill people. The primary affordance of a mobile phone is to enable people to talk. However, if it is used for making photos or recording voice only, the effect would be less ideal as a camera or voice recorder is more appropriate for that purpose.

In summary, the actual or designed affordances are crucial for an artefact as they determine the primary function. But the perceived affordances are more critical as they imply how the artefact would be possibly used by users. In this chapter, Norman's definition is adopted. The affordance refers to the perceived and actual fundamental properties of technologies that determine the usefulness and the way they could possibly be used.

Affordances of ICT tools

The development of emerging technologies has resulted in a rapid increase of ICT tools. Many of these tools have great potential for teaching and learning although they may not be initially developed for educational purposes. This section analyses the affordances of ICT tools from pedagogical, social and technological perspectives.

Pedagogical affordances

In an educational context, pedagogy often refers to the teaching strategies, techniques, or approaches that teachers use to deliver instruction or facilitate learning. Pedagogical affordances are defined as those characteristics of an ICT tool that determine if and how a particular learning activity could possibly be implemented within a given educational context (Kirschner, Strijbos, Kreijns, & Beers, 2004).

ICT tools have great potential to support the implementation of various pedagogical approaches. For instance, a set of student-centred pedagogical approaches (such as case-based learning or knowledge building) is listed on the MOE web site:

http://www3.moe.edu.sg/edumall/tl/it_integration/engaging_it_practices/libpedagogies.htm.

Every approach can be supported by the use of various ICT tools. For instance in the knowledge building approach, students can use the knowledge forum or a discussion board to share information, negotiate ideas, and hence construct knowledge. Students can also use mind mapping tools such as Cmap to build knowledge through connecting concepts. In the problem-based learning approach, teachers can use videos or flash movies to present authentic problems; students can use the Internet to search for information, and use chatting tools to discuss ideas.

In a more conventionally teacher-centred learning environment, the use of ICT tools can help to support the Gagné's nine events of instruction: gain attention, inform learners of objectives, stimulate recall of prior knowledge, present the material, provide learning guidance, elicit performance, provide feedback, assess performance, and enhance retention and transfer to the job. These events are important activities or strategies that a teacher often uses in a lesson. To make a lesson more interesting and engaging, the teacher can use ICT tools to support every event. For instance, the teacher may use a Youtube video or a computer game to attract students' attention at the beginning of a lesson, and use PPT to inform student the learning objectives. Later on, the teacher can use an online quiz to assess students and provide feedback, and use an concept mapping tool to summarize the main learning points, and ask

students to use an online discussion forum or weblog to reflect on what they have learn and apply the knowledge learned into a different setting.

Social affordances

In real life, people naturally live and work in various communities, in which they turn to others for help when they encounter problems. However, in an online learning environment, participants often lack social opportunities to communicate with others. Providing sufficient social affordances of a learning environment become crucial. The development of computer mediated communication (CMC) has made social communication and interaction through the Internet more convenient and flexible.

The social affordance is defined as the perceived and actual properties of an ICT tool that promote users' social interaction. It aims to establish and maintain the social presence of the teacher and students. Here the social presence refers to the degree to which the participants of a community project themselves socially and emotionally as "real" people through the medium of communication being used (Garrison, Anderson, & Archer, 2000). The overall goal of creating social presence is to build high immediacy and a level of comfort in which people feel at ease to communicate with others. The social affordance of ICT tools must provide a comfortable learning environment, where students are willing and feeling safe to interact with the teachers and their peers.

The social affordance of an ICT tool also must support various types of interaction such as student-student and student-teacher interaction. The student-student interaction can happen within small groups, the whole class, or the entire school. Students can share information, work on group projects, ask questions, and construct knowledge together. Teachers play an important role in learning processes. They can scaffold or moderate the learning process, and provide feedback on students' work.

The social affordance of an ICT tool must enable both synchronous and asynchronous communication. The real time synchronous communication takes various forms such as text chat, voice conversation, or video conferencing. It enables students to share ideas and get responses immediately. The asynchronous communication is most likely to be presented in a form of threaded group discussions, personal messages, or a question-and-answer facility. It

has potential to promote learners' knowledge construction and improve students' rapport as they can remove aggressive sentences to avoid unhappiness before publishing the messages.

Technological affordances

The technological affordance becomes more prominent in a technology enhanced learning environment, for many learning activities are conducted through the support of a computer. The technological affordance refers to the usability of an ICT tool. It is concerned with whether the tool allows for the accomplishment of a set of tasks in an efficient and effective way that satisfies users. Neglecting technological affordances would put an ICT tool at risk of being useless (Wang, 2008).

The technological affordance of an ICT tool primarily focuses on ease of learning, ease of use, and aesthetics. Among them, ease of learning is particularly critical for beginner users while ease of use will become more important when users gain more experience over time. Certainly the interface should be attractive in order to motivate and engage learners.

For an online or web-based ICT tool, the technological affordance should also support availability and easy access. Certainly the tool must be available all the time and the access to it must be convenient and fast. Otherwise, very few people would like to use it.

In addition, it is preferable that the technological affordance of an ICT tool allows its users to customize its interface design. Such customization includes adjusting the positions or colors of screen components, or adding or removing certain elements.

The pedagogical and social affordances of an ICT tool determine the educational values of an ICT tool while the technological affordances determine the extent to which the educational values can be realized. Without sufficient support of technology, undoubtedly many pedagogical and social affordances are hard to implement. Nevertheless, the primary factor that influences the effectiveness of learning is not the availability of technology, but the pedagogical and social affordances.

An example: Affordances of the Weblog

We take the weblog as a sample to illustrate its affordances from pedagogical, social and technological perspectives.

Pedagogical affordances

A weblog is a private cyberspace in which individual students create their own online diaries. The weblog has the potential to support various pedagogical approaches such as case-based learning, problem-based learning, or knowledge construction. Teachers can use a weblog to present the details of a case or a problem by using text, videos, pictures and links. Students can propose solutions by using the commenting feature. Also, they can share ideas, collect comments, and revise their understanding through the weblog. Critical thinking and knowledge construction are promoted.

Related to the Gagné's nine events of instruction, a teacher can use an embedded video in the weblog to attract student's attention, use the weblog to present the learning objectives and materials. Also, the teacher can use a weblog to assess and track students' cognitive development, as posts in a weblog are organized in a reverse chronological order. By tracking the blog postings helps to facilitate the awareness of how one constructs meanings over time.

In addition, as the weblog is more of a private space, student bloggers take ownership of their own blogs and hence may find personal values, feel in control, and take responsibilities.

Social affordances

The weblog provides an avenue for students to publish their thoughts and obtain feedback from the others. It provides a safe and comfortable environment in which the posts are completely under the student bloggers' control. They can decide what to publish. After publishing a post, they can modify or delete it. They can also decide who can make comments on their published posts. On the other hand, students must establish positive cyber wellness to determine what can be published or what information is proper for publication.

It has great potential to promote social interaction. A weblog has a higher chance to be viewed by a larger number of people. It can be accessed by anyone who knows the weblog address. The public nature of a weblog puts the student blogger on a centre stage where the quality of their blogs is constantly subject to public appraisal or criticism.

It supports asynchronous communication. Student bloggers have sufficient time to think before they publish their thoughts. Similarly, viewers do not need to post a comment or reply

immediately after they have read the post. The asynchronous feature of the weblog promotes students critical thinking.

It also supports student-student and student-teacher interaction. The teacher can use a weblog to publish course information and supporting resources or links, or use a weblog to collect students' feedback. On the other hand, students can also use a weblog to write online reflections, or showing project proposals to their peers or the teacher. In either way the interaction between students and peers and between students and the teacher is fostered.

Technological affordances

The weblog is easy to learn and to use (Wang & Woo, 2008). It takes a few simple steps to create a new account. For new users, it does not require any high technical skills to setup the account. The toolbar at the top of the text editing box is similar to that of Microsoft Word. The users who have experience of using Microsoft Word would be able to use it easily. Also, the weblog is easy to use. Posts can be published by using the text box on the web site directly, or by email. Additionally, the interface design of a weblog is attractive and customizable. It provides a number of templates for users to choose. The layout of a template can also be further modified if necessary.

In addition, the weblog is accessible all the time and the access speed is reasonable. The embedding function makes a weblog open and extendable. Third-party web components (such as a Youtube video, a CBox, or a concept map created at <http://bubble.us>) can be easily embedded into a weblog. Other technological affordances of a weblog include allowing bloggers to edit html codes, add new gadgets, or subscribe to other blogs.

Conclusion

Effective ICT integration into teaching and learning is an essential competency for teachers. Simply placing hardware and software together will not make integration naturally follow (Earle, 2002). Teachers need to plan thoughtfully before they start ICT integration into the curriculum. However, with the rapid development of emerging technologies, there are an increasing number of ICT tools available. It is therefore a challenge for teachers to choose proper tools for specific learning needs.

An educational system is a unique combination of pedagogical, social, and technological components and their affordances. Sound design of these components will ensure effective ICT integration to a certain extent. Before integrating specific ICT tools into an educational setting, teachers must decide what pedagogical, social and technological affordances are required and what affordances are available. It would be ideal if the available affordances match with the required affordances (Bower, 2008).

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