Chapter 111

Affordances in Digital Textbook Use and Development

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ABSTRACT

The affordances of digital textbooks go beyond using textbooks in the four walls of a traditional classroom. With digital textbooks, users can swipe the text to scroll; increase/decrease size of text and images and change brightness options; view and read downloaded information; interact with 3D models and images; make notes, search topics, follow hyperlinks, take quizzes, self-regulate learning and "synthesize" own textbooks and library, etc. However, there are some constraints such as overload of working memory, depending on digital devices' functionality, etc. The correlation between affordances and constraints is analyzed through identification and description of eight didactic systems with platforms maintaining learner-centered environment, interactive feedback, social media, user interface design, and desired results. In this chapter, the concept of "affordances" as a way of strengthening eight possible models explored, called "didactic systems". The used methods are "thematic evaluation" and "comparative analysis". The conclusion and future research is provided at the end.

INTRODUCTION

The term *affordance* was coined by J. Gibson in 1979. This term stresses the role of human-scaled objects, attributes, events and patterns that provide effective perception of object, process or phenomena. W. Gaver (1991) extends the idea of affordance and suggests that affordance "allows us to focus not on technologies or users alone, but on the fundamental interactions between the two" (p. 83). In recent years, term has become increasingly popular for a variety of contexts, including digital textbooks (Hyman, Moser & Segala, 2014; de Oliveira, Camacho & Gisbert, 2014 etc.).

What is the affordance of digital textbooks? First of all, with digital textbooks teachers and students coming from different countries, cultures, and language is able to communicate in digital learning environments. Secondly, as was emphasis by Smith, Brand & Kinash (2013, p. 814), digital textbooks offer many advantages, including portability, instant availability, integrated dictionaries, translators, annotation and bookmarking tools, social sharing functions, text searching capabilities, and lower cost. Mobile devices allow digital readers to consolidate content, not having to carry heavy textbooks.

The ways to understand experiences of using and developing digital textbooks are shaped by expectations about the affordances of the print books and textbooks. While the concept of affordances rely on cognitive psychology, the term could be used to test the subtle relationships between digital textbook, as a learning object, and their users. Thus, from the cognitive perspective, affordances rely on *functional fixedness* (a term used to explain an individual's cognitive bias that limits them to using an object only in the way it is traditionally or habitually used). This means that digital textbooks may be used in the same ways as the printed textbooks, perceiving the functions of formats to be the same or with the additional function that the digital version can be read on digital device.

The digital textbook has to be considered affordable both for teachers and students. However, this statement is true, only in cases when digital textbook affordances correspond to *action*s. The actions should be analysed from philosophical, psychological, pedagogical, and cybernetic and knowledge management points of view. As was noted by Smith, Brand & Kinash (2013, pp. 816-817), affordances refer to "manipulation opportunities", that are directly perceivable and if a user encountered a completely unfamiliar artifact, the affordance would exist simply in terms of what can be done with this artifact. Educational affordances can be seen as a relationship between the learner and the technological intervention, and how learning is enabled through this interaction. From the author's point of view, the lowest level is the opportunity to read digital materials; the next level corresponds to setting exercises around words in textbooks to take advantages of on-board dictionaries and translators; manipulation to curriculum and new ways of planning for a larger purpose, that are coordinated and social. In addition, e-reading devices often afford highlighting, annotations and note-taking of texts.

This chapter aims to categorize educational affordance and constrains in digital textbook use and development through summarizing the processes common for the *teacher ↔ learners'* communication. The hypothesis is: educational affordances of digital textbook mainly depends on message which flows pedagogical communication in learner-centered learning environments and change behavior. From this point of view, digital textbooks affordance correspond to *actions,* if they are perceivable in students' development. Thus, the interactions between author and reader of digital textbook are worthwhile, because digital learning occurs through more complex mechanisms than traditional learning. In the light of these considerations, is there a shift in educational affordances of the textbook? In order to answer this question, let us analyze the affordance of digital textbook in eight didactic systems.

From the design perspective, a didactic system represents a set of systems with digital learning environment in which is used direct or indirect instruction. Students receive messages using one channel or multiple channels. The communication between sender and receiver is based on technology. To this end, the textbook's affordances depends on learning design. Thus, each system can be characterized according to: a) the number of sources for communication: one D_c or many M_c; b) the mode of receiving data stream: one U_i or many M_m and c) management: in an open system O_s or in closed system C_s.

It is expected that educational organization could be analysed as a closed system and as an open system. Educational organization, viewed like a closed system, represents an artificial pedagogical system with the scope of education. The main figure is the teacher, who is the expert in the domain. However, didactical processes are modeled as instructional processes. The main pedagogical function of the teacher is to collect, communicate and manage information from one or more sources and to distribute it to one or more audiences/canals. The main sources are textbooks and/or monographs. An educational system is an open one if the systems continuously interact with its environment or surroundings in the form of information (data, knowledge), energy (skills and core competence), people (teachers, students, and administration), capital or material transfer (repositories, resources, tools).

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