

INSTRUCTION DESIGN PRINCIPLES FOR INTEGRATING TECHNOLOGY IN LANGUAGE TEACHING AND LEARNING

Monique ADRIAEN¹
York University

INTRODUCTION

A survey conducted in 1999 among language faculty (this included linguistics and literature faculty as well) regarding the use of technology in language teaching at York University revealed some interesting observations. Despite the strong support by university administrators, most faculty still had to integrate technology in their pedagogy in a significant way, and of those who had done so, there was ambivalence as to its beneficial effects on students' learning. Many believed that technology had helped their students develop factual knowledge, and basic reading, writing and computer skills, but not critical thinking or problem-solving skills. They did not think that technology had enhanced their students' motivation or helped them become more engaged in their learning. Furthermore, faculty believed that it had little or no effect on their views about teaching and learning. They considered technology as an adjunct to what they do in the classroom with no particular effect on their role as teacher or their course objectives. In the last two years, despite an increase in the number of courses using technology, little has changed in the faculty's perceptions. The use of technology in language teaching and learning still has to deliver on the pedagogical benefits vaunted by its enthusiasts. Technology's full potential has yet to be harnessed.

What we contend in this paper is that to do so, *i.e.* to capitalize on technology's characteristics in order to improve teaching and learning, an important – some might think a *radical* – change in pedagogical practices needs to take place. As David Jonassen *et al.* (1999) say, there needs to be a shift to technology to support *learner* goals rather than *teacher* goals, and, as a corollary a change, to learning *with* technology rather than *from* technology. Many present trends in education, such as learner-centred instruction, learner autonomy, the teaching of higher-order thinking skills, constructivism, can

¹ <http://www.madriaen@yorku.ca/>

help effect this change. We focus here on constructivism and examine how instructional design based on a constructivist approach can lead to a more effective use of technology for learning purposes. We begin by outlining the main characteristics of constructivism and the main features of effective learning according to some of constructivism's main proponents in education. Then we discuss the role of technologies to support this kind of learning and illustrate it in the area of language learning. Finally, we conclude with some of the challenges posed by this new approach.

FEATURES OF CONSTRUCTIVISM

Constructivism – or constructionism as it is also known – is not an instructional model but rather a theoretical framework to understand learning and knowledge. It traces its roots to the works of Piaget, Vygotsky, Bruner, and John Dewey, among others. It is based on two fundamental principles :

- knowledge is constructed by an active learner;
- knowledge is socially constructed.

Let us look at each one briefly.

For the constructivist, knowledge is not transmitted from an expert or teacher to a passive recipient, the learner. It results from a cognitive activity of meaning-construction. The learner is engaged in the construction of mental representations to help him/her make sense of the world. Knowledge is derived from the actions taken by the learner, usually in a problem-solving activity, and reflection on those actions. The learner interacts with objects/ideas/people and strives to make sense of the new, the « discrepant », the « puzzling » data by either synthesizing it into past schemas or by generating new representations to better account for it. As Fosnot (1996) succinctly puts it, « [l]earning is not discovering more, but interpreting through a different scheme or structure ». Meaning-construction and knowledge are thus inherently linked to experience, activity, and interpretation.

They are also linked to social interaction. The social construction of meaning is an important feature of constructivism. Although our understandings are unique and individual, by dialoguing with others, we can consensually agree to shared understandings. In educational settings, the social construction of meaning is translated into collaborative work and social discourse among learners. Learners interact with other learners and other

participants in the learning environment to form and test their constructs in a dialogue. Learning does not occur in isolation but rather within a « learning community » which typically extends beyond the classroom walls.

With this brief background on constructivism, let us now examine how to design a constructivist learning environment. There are many instructional models based on constructivist principles : situated cognition, cognitive apprenticeship, problem-based learning, microworlds, and cognitive flexibility theory, to name just a few. They share some important features including :

a focus on the learner : learners take responsibility for their learning; they become the architect of their learning process; the environment is learner-centered;

a new role for the instructor : the teacher must mediate between learners' current and emergent understandings; he/she becomes a guide, a coach, a facilitator;

an emphasis on higher-order cognitive skills : knowledge-construction is inductive and deductive; critical thinking, evaluation, logic, problem-solving, reasoning, hypothesis formulation and testing, and communication are all developed.

DESIGNING A CONSTRUCTIVIST LEARNING ENVIRONMENT (CLE)

Savery and Duffy (1995) outline 8 instructional features to include in a CLE :

1. anchor all learning activities to a larger task or problem

This ensures that learning will be purposeful, and intentional, and will help students perceive the relevance of the learning activities.

2. support the learner in developing ownership for the problem or task

The students should be involved in determining the learning objectives. Instructors should solicit their input to develop meaningful problems they can readily identify with.

3. design an authentic task

« An authentic learning environment is one in which the cognitive demands, i.e. the thinking required, are consistent with the cognitive demands in the environment for which we are preparing the learner. » (Savery & Duffy, 1995). In other words, instructors should design tasks or problems that are similar to ones encountered in the real world.

4. design the task and LE to reflect the complexity of the environment the learners should be able to function in at the end of the learning

Because understanding and knowledge are linked to the context in which they are embedded, if we want the knowledge to be rich, the environment should not be simplified. The learner should be encouraged and supported to function in a complex environment.

5. give the learner ownership of the process used to develop a solution

Sometimes we give ownership of the problem to the students but then dictate the process to be used to find a solution. To truly engage students in authentic thinking and problem-solving, not all activities should be prespecified. Students should be allowed to determine their learning goals and how to achieve them. We should challenge learners' thinking but not proceduralize it.

6. design the LE to support and challenge learners' thinking

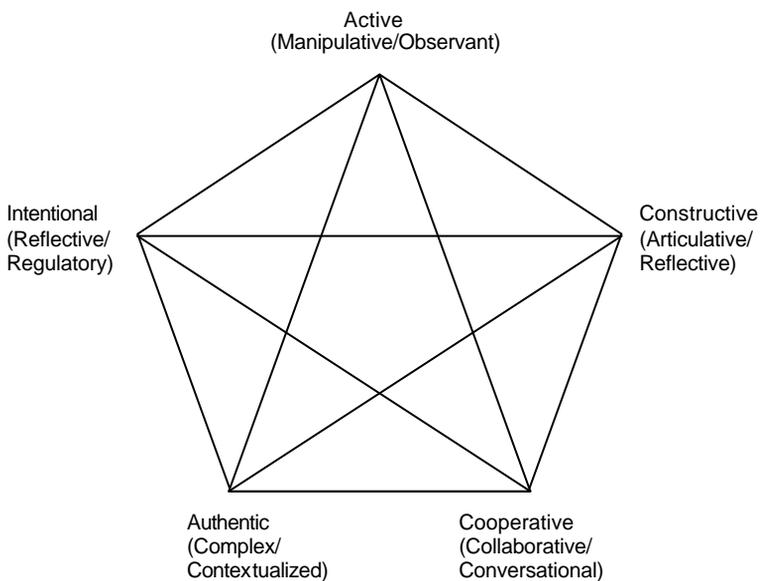
The teacher should not tell learners what to do or think, but value and challenge the learners' thinking by inquiring at the « leading edge » of the learners' thinking and by giving support and guidance.

Because the social negotiation of knowledge is an important characteristic of constructivism, learners must be able to test their own understandings and encounter alternate points of view in a learning community. Collaborative or networked groups can provide such a community.

7. provide opportunity for and support reflection on both the content learned and the learning process

Teachers need to model reflective thinking throughout the learning process. In this way learners may learn the skills of self-regulation and self-learning. Learners also need support in reflecting on what was learned.

Learning environments that implement these guidelines promote meaningful learning. Their main characteristics are well-encapsulated in Jonassen et al.'s (1999 : 8) constellation of attributes of meaningful learning :



Bear these in mind while I now talk about how technology can be used in constructivist learning environments to promote meaningful learning.

How technologies can be used in CLEs to support meaningful learning

If we are to harness technology's full potential to improve teaching and learning, we will have to operate a similar change in perspective with regards to technology as I have just outlined for knowledge acquisition. Just as we need to go from an instructional model where knowledge is transferred from

an expert (the teacher) to a novice (the learner), we need to view technology not so much as a repository for, and a transmitter of, information but as a tool to access and manipulate information, and to communicate with others.

In the current way of thinking, technologies are often used as an adjunct to teaching. They are used to provide additional information, extra practice, and easy access to audio and video data. Much current software consists of preprogrammed lessons, still often of the drill-and-practice variety. They act like teachers and guide the learning (Jonassen *et al.*, 1999 : 153).

But when technologies are viewed as cognitive *tools*, they can begin to serve learners' goals instead of teachers' goals. Computers as « mindtools » (Jonassen *et al.*, 1999 :154-155) allow students to engage in a variety of critical thinking activities :

1. to access and assess information,
2. to compare and analyse data,
3. to formulate and test hypotheses,
4. to identify relationships and classify phenomena,
5. to speculate and predict outcomes
6. to synthesize and organize information
7. to formulate and carry out a plan of action
8. to make and evaluate decisions
9. to represent and share knowledge.

It is in this way that students and technologies can become partners in learning.

When designing technologically-based CLEs, the different technologies available can be incorporated to support active, constructive, cooperative learning. For example, databases, the Internet, and other students, teachers and experts, when interconnected, can function as resource-tools. E-mail, listservs, chat rooms, electronic bulletin boards, videoconferencing and the Internet can serve as communication-tools to share information and knowledge. Finally, multimedia production software, desktop publishing tools, videotaping, simulation programs, microworlds, electronic notebooks, web-page creation programs, electronic organizers, etc., can all be used as manipulation-tools.

Examples

In the examples of CLEs described below, notice how these various tools are made available to the learners as they act within a problem space to solve a problem, as they deal with multiple perspectives and viewpoints, as they act upon the data to test their ideas and their understandings, and as they communicate with others to obtain more information, and share their knowledge.

1. *A la Rencontre de Philippe*: is a classic in its genre. It was developed at MIT by Gilberte Furstenberg and a team in the late 1980's. This is a program for the development of oral French comprehension. Through a narrative, students are asked to help Philippe, a young Parisian, who has been thrown out by his girlfriend, find an apartment in Paris. Students interact with a number of characters of different ages and from various socioeconomic and professional backgrounds, (a real-estate agent, a plumber, Philippe's friends, an old lady, Philippe's snobby aunt and her « safari guide », etc.). They use real-world tools such as a telephone, an answering machine, newspaper ads, a street guide of Paris, and virtually visit apartments around Paris. By the decisions they make (which clips to view, which telephone messages to listen to, which apartments to visit, etc.), they determine their own particular path through the narrative. Various scaffolding tools are embedded in the program to support them: an electronic notebook to take notes, a set of transcriptions of the dialogues, a glossary which allows students to access a word and view all the different linguistic contexts in which it is used. As you can see *A la Rencontre de Philippe* is an engaging program that allows students to construct their own knowledge.
2. *The Cultura Project*: is by the same author and another team and is described in the electronic journal *Language Learning and Technology* (Volume 5, No. 1, January 2001, 55-102; <http://llt.msu.edu/>). This is a web-based program to develop students' understandings of foreign cultural attitudes, concepts, beliefs, and ways of interacting and looking at the world. It is a collaborative project between students at MIT in Boston and students at the Institut National des Télécommunications in Evry, France. The basic theoretical construct of this program is the building of semantic networks. Students produce and analyse their own data and gradually construct a personal approach to the

« other » culture under the guidance of their teachers. How does it work? Students « observe, analyse, and compare similar materials from their respective cultures as they are posted on the Web; [they] exchange viewpoints on these materials in a reciprocal and ever-deepening understanding of the other culture; and [they] study and research an increasing array of materials (films, texts, online news media [such as polling results]) designed to expand their cross-cultural analysis ». (Furstenberg *et al.*, *op.cit.*). They answer questionnaires on word associations (ex. : *work/police/individualism*), on sentence completions (ex. : *un bon voisin est quelqu'un qui ...*), on situation reactions (ex. : *a mother slaps her child in the supermarket* – American reaction : « *I think I should call the police!* »; French reaction : « *Bien fait! Il l'a sans doute mérité!* »). The innovative approach to the teaching of culture used in this program consists of an interactive, iterative process via the electronic exchange of materials by multiple partners (students, teachers, and experts). These multiple voices allow the learners to build gradually a deep and meaningful understanding of two cultures, their own and the other's.

3. Not quite as ambitious but still trying to implement constructivist principles are two projects I have been developing. The first one aims to develop students' reading skills in the context of a short excerpt by the Algerian author, Assia Djebar. The text is about the unveiling of Muslim women and the feelings this evokes in both women and men. Reading is considered an active process of meaning construction, based on the interplay between the linguistic content of the text, the cultural context from which it springs, and the reader's knowledge and past experiences. Therefore an important focus of the program is the development of the learners' awareness of Algeria, and some of its relevant cultural and social issues as these relate to the concepts and themes developed in the text. These include the present and past history of Algeria, French colonialism, the War of Independence, Islam, Delacroix (mentioned in the text, and painter of *Femmes d'Alger dans leur appartement*), and such themes as the dialectic tension between modernism and traditionalism, between past and present, men and women, the interior and the exterior, and the like. The program is an application of cognitive flexibility theory and situated cognition. It consists of a large database of texts, images, sound and video clips indexed according to the themes

and key concepts. A traditional pedagogical approach is used for the linguistic understanding of the text but in the cultural section, I have included a set of activities – most, collaborative – which require the students to search the database, to access sources on the Internet, to exchange information, opinions, viewpoints and data files with other students, their teacher and other eventual participants. Some of these activities include, among others, preparing for a videotaped «television» debate, writing feature articles for different types of newspapers and magazines, creating and publishing web pages. The aim is to encourage students to vary their perspectives from which to explore the database and to reflect on their findings.

4. *An intonation program*: this program, still in early development, is an application of the cognitive apprenticeship model with case-based scenarios. It aims to get the students to discover inductively and deductively the theoretical system of French prosody while practising correct intonation patterns. Intonation is a complex, ill-structured domain with both concept- and case-complexity. Students are put in the role of linguists analysing intonative data, looking for patterns, correlating these with various linguistic features in order to discover the underlying theoretical principles of French intonation. Students are aided in their elaboration of intonation rules by a pitch visualization program and by a coach. The hypotheses they formulate can also be shared via the web with other students and the teacher for feedback and evaluation.

What all these programs share is a constructivist approach that seeks to anchor learning in an authentic task or real-world problem, to provide a rich, complex context to explore, to present multiple perspectives, to provide opportunity for articulating and reflecting upon the content and the learning process, to facilitate collaboration and communication in a shared construction of meaning.

In conclusion it is important to understand that to realize the full potential of recent technological developments, we must fight the tendency to simply introduce technology into our old pedagogy. There is a need now for experimentation with innovative learning structures (Murray 1999). The design of instruction guided by constructivist principles offers, in my view, exciting possibilities.

BIBLIOGRAPHY

- FOSNOT, Catherine Twomey (Ed.). (1996). *Constructivism : Theory, perspectives and Practice*. New York, NY : Teachers College Press.
- FURSTENBERG, G., LEVET, S., ENGLISH, K. & MAILLET, K. (2001). Giving a virtual voice to the silent language of culture : the *Cultura* project. *Language Learning & Technology*, Vol. 5, No. 1, January 2001, 55-102. [retrieved from the Web January 30, 2001 <http://llt/msu/edu/vol5num1/furstenberg/default.html>]
- JONASSEN, David H., PECK, Kyle L., & WILSON, BRENT G. (1999). *Learning with technology : A constructivist perspective*. Upper Saddle River, NJ : Merrill, Prentice-Hall.
- SAVERY, J.R. & DUFFY, T.M. (1995). Problem-based learning : An instructional model and its constructivist framework. In B.G. Wilson (ed.), *Designing constructivist learning environments : Case studies*. Englewood Cliffs, NJ : Educational Technology Publications.