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On becoming digitally literate: the production of computer-mediated materials by language teachers

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ABSTRACT: The purpose of this paper is to explain how different groups of teachers learned to use computers to produce teaching materials for their classes. The experience is described from the perspective of complexity and chaos sciences, which presume that in a given situation all aspects are related to each other. The data were collected from courses taught to in-service language teachers, both in a traditional classroom environment and through the Internet. The results show that although teachers faced many difficulties in the process of acquiring the necessary skills to use a new tool in their classes, by moving from textual production to hypertext and simulated interaction, they were also able to identify and use some of the facilities provided by the virtual environment. The possibility of previewing the final objective and ironing out individual differences through network collaboration was a facilitating factor. The final question posed by the study is whether a tool should be seen as a mediating artifact between teacher and student or as an extension of the teacher.

ORGANIZED CHAOS

Most studies on teacher education have a tendency to describe how teachers teach. This paper goes in the opposite direction; its main purpose is not to describe how teachers teach, but how teachers learn. It has both a very specific topic and a very broad one. It is specific because I am concerned with how teachers learn to use computers to prepare materials for their classes. But it is also very broad because I am not only concerned with teachers; I am concerned with people. And also, I am not only concerned with computers; I use them to illustrate a much broader concept, which we can refer to as

cultural artifacts. Putting it all together, I am interested in describing how people acquire the tools they need to do their jobs. I am using teachers and computers in my paper because these are the data I have. I hope they can be transferred to other contexts, those contexts in which learners are struggling to get acquainted with tools.

The data I am using here were collected from different courses I have taught to language teachers on how to prepare computer-mediated materials. These courses were both conducted in the classroom and through the Internet. Teaching these teachers on how to use computers has taught me a lot; and what I would like to do here is to share with you some of the things I have learned from these courses.

It may look like a report of a personal experience, but I think it is more than that. Although I do not have the time to explain it here, there is a theoretical background behind it, including the Complex Thinking Theory by Edgar Morin (1990, 1999), Chaos Theory (Larsen-Freeman, 1997), and Activity Theory as proposed by Leontiev (1978) and developed by Engestrom (1999).

What all this theory leads to is that everything is connected to everything else. We should never approach a problem ignoring the context where it is situated and we should be prepared to find connections where they are least expected. The most popular representation of these theories is the butterfly effect, that is, the way a butterfly flaps its wings in China may cause a storm in the Amazon region. In Chaos Theory this is usually described as extreme sensibility to initial conditions. The following traditional poem illustrates this point:

> "For want of a nail, the shoe was lost;
> For want of a shoe, the horse was lost;
> For want of a horse, the rider was lost;
> For want of a rider, a message was lost;
> For want of a message the battle was lost;
> For want of a battle, the kingdom was lost!"

One small event that seems to be responsible for the evolution of mankind, triggering humanity itself, is the fleeting moment when our primeval ape discovered the use of a tool. It is usually accepted now that the only tribe of apes that survived, and evolved into human beings, was the one the discovered the first tool (Figure 1). According to Francis Bacon, we are transformed by the tools we create and learn to use: "Neither hand or mind alone suffice; the tools and devices they employ finally shape them". It may

be more that: it is possible that the missing link between humanity and apes can be attributed to the first time a tool was used.

Figure 1 – The famous scene from Kubrick´s movie *2001, a space odyssey*

CHALLENGES

Acquiring proficiency in the use of a new tool is a crucial point not only in the history of mankind but also in the personal history of every human being. Let's consider books, for example, which is a typical cultural artifact: it takes years for a student to develop the necessary skills to be able to open and read a book for a given purpose; information or pleasure. Learning to use a new instrument is sometimes so difficult that many people tend to reject it, especially in the early phases when its use is not widespread, and there is still hope that the situation can be reverted. This happened when printed books were introduced in the XV Century and in the 80's and 90's when computers were brought into schools.

Overcoming teacher's rejection of the new technology is usually the first challenge in a computer literacy course. There is a strong feeling against the use of computers in education. Examples collected from the Internet:

> When I put a child in front of a computer, what am I subtexting to the child? Please go hide. . . . I have something more important to do. I have something more important than you! (Clifford Stoll, astronomer,

> writer, leading authority on computer security, lecture, Buffalo Arts Center, 1996)
> Most schools would probably be better off
> if they threw their computers into the Dumpster
> (Michael Fellows, a computer scientist, University of Victoria, British Columbia,1997).
> When using software
> , children may be required to relinquish their voices for the voice of the software
> 's author, assume the software
> 's social
> construction, give up all options that come with making a choice, and relate to the software
> that is choosing on their behalf (Brenda Matthis: Museums and the Web: An International Conference Los Angeles, 1997).

Examples colleted from our teachers in our courses, which also show a level of rejection against the use of computers:

> I am illiterate in computers (Sergio, C3).
> In my home, the one who deals with the computer is my husband (Genoveva, C1).

There is also a well-orchestrated belief, subliminally constructed, that teachers should not prepare materials for their own classes. Textbooks have been carefully prepared for them by professional designers, with a level of quality control that teachers cannot match, all arranged to make teacher's life as easy as possible, including answers for the exercises.

Another challenge is the active nature of a materials production course. In academic life we are all used to courses where we go to a classroom, sit down, listen to somebody, and then go home with some reading assignments, come back to class, sit down again, discuss the texts, listen to somebody, and restart the whole cycle. A course in materials production is totally different; the student has to produce something new. It involves hands-on experience, and may look like a course in porcelain painting or embroidery, but it is more than that because it also involves a good knowledge of the theoretical approaches that support the practical activity.

There is also the belief that learning is a smooth continuous process that occurs more or less automatically as the result of certain activities. We tend to

believe, for example, that we learn as we read a text, listen to a dialogue, or do any kind of exercise, as if there were a close relationship between doing something and learning. Unfortunately, for us to learn something we have to do more than that; there is no learning without conscious struggle. We must have a clear objective, know where we want to go, and then put an effort in what we do to reach that objective. There is no guarantee that any action will incidentally result in learning.

Another serious problem is the idea that people are born with a gift to learn something; some are born teachers, others are born writers, and so on. This is what we can refer to as the gift ideology: if you are born with a gift for languages, you will learn it easily; if not, you will never learn it. For some reason, many teachers in our courses believed that using computers demanded a special aptitude, a gift you are born with; something that cannot be taught, something that cannot be learned. Part of our job in the course, then, was trying to convince some teachers that this kind of reasoning was just an easy way to justify failure.

The problem with some teachers was not only lack of basic computer skills, but also lack of basic knowledge about classroom language learning activities in general. The following exercise, for example, was submitted by a teacher as an instance of cloze. It can be easily seen that the purpose of a cloze activity, which is to use clues from the text to infer the words that should fill in the gaps, is totally defeated:

> The___, the __ and the __
> I´d like to be the ____
> To shine on your ____

FROM TEXT TO EVENT

One of the most serious challenges we have to face when we intend to empower teachers to use such a sophisticated tool as a computer is that the result of the activity produced by the new tool may be completely different from any cultural artifact we are used to deal with in our classrooms. This seems to be our case here. Although a computer produces text, as we know it, it can also produce more sophisticated artifacts such as hypertext and event, which are extremely more difficult to prepare, but necessary if we want to use the machine to a reasonable level of its potential.

First, let's see some basic differences between text, hypertext and event, offering some operational definitions for each one, and making it clear that

these definitions are made in the context of this presentation, with the purpose of highlighting the differences between them.

Text is seen here as merely a group of words, put together in a sequential way, according to their preferences and restrictions, by a writer interested in reaching a given objective. Text is usually displayed in a bidimensional format. The words used in a text have syntactic, semantic and even discourse restrictions. A text usually has an objective which may be to please, inform or convince the reader.

Hypertext is operationally defined here as a group of texts randomly encountered by the reader according to links from previous texts made by the reader interested in reaching a given objective. A hypertext, therefore, has no previous existence; it is constructed by the reader on the fly. The itinerary followed by the reader is totally unpredictable.

I am emphasizing here, not the process, but the final product of both writing and reading. This is admittedly controversial, especially when we describe hypertext as a product of reading, but it has some operational advantages, and also highlights the differences between them, that is, we cannot read a hypertext: we *read* a text and *construct* a hypertext. We move from a receptive position to a more productive one.

Finally, event, which can be basically defined as something that happens; it can be real, involving real people in real, authentic situations, or virtual, basically simulated in a computer. Hypertext, and mainly text, cannot provide real interaction. We can argue that when we read we interact with either the text or the author of the text; we may change with our reading, but text and author will not be affected by our reading – which is a serious problem, as far as there is no such thing as one-sided interaction. Shakespeare will not move in his tomb no matter how deeply we may be moved by reading Romeo and Juliet.

A computer, however, can simulate an event, in a way that we can really interact with it. In other words, although everything is virtual in a computer, the interaction is real. The machine can analyze what we write, provide feedback and help us with what we are doing. This real interactive capability of the computer is seen here as an example of event. Figure 2 shows a screen of an event where the student is trying to answer a question posed by the system.

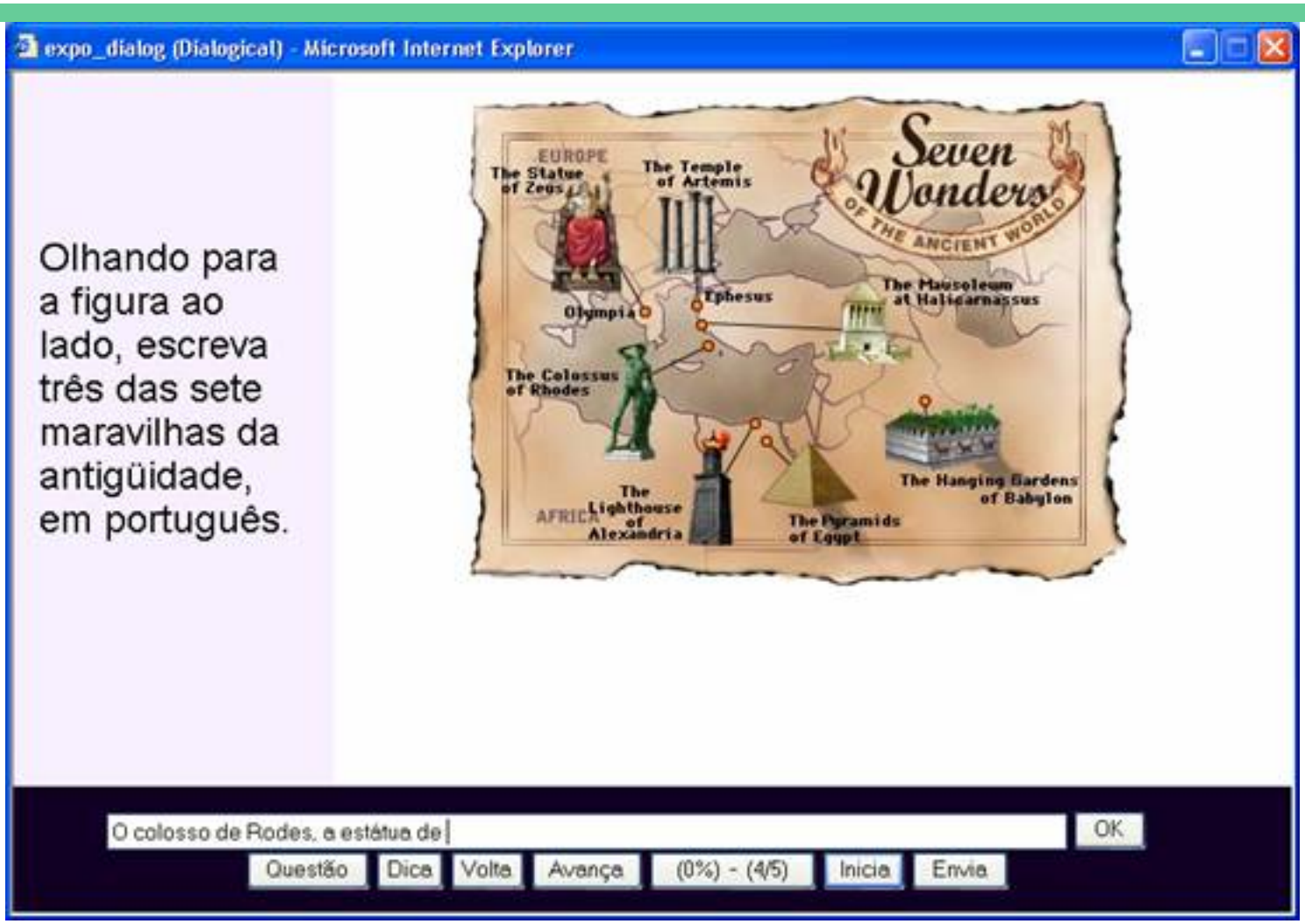

Figure 2 – Example of an event

METHODOLOGY AND ANALYSIS

The subjects were language teachers, including Spanish and English, as foreign languages and Portuguese, as both mother tongue and foreign language. Out of this larger group of teachers, 30 were English teachers in a in-service traditional classroom course (Especialização), and a small group of 5 teachers in Graduate Program in Applied Linguistics. The others were teachers in two web-based courses offered to teachers from different parts of Brazil.

The data-collecting instruments were questionnaires in the classroom courses and postings from the forum, produced by the teacher in the Web-based courses.

The basic procedure in the courses was characterized by moving from the end to the beginning. It was felt that teachers should first have a clear idea of the objective they should be trying to reach. There were two reasons for this

backward movement. The first was that most teachers had no clear idea of the kind of activities they would be producing; they not only lacked experience in producing computer events but were not familiar with the events themselves. Another reason was that most teachers were unable to associate an action in what we called the teacher's environment, where the event was prepared, with the student's environment, where the event was used.

The analysis is summarized here considering two moments: (1) from the course introduction, when teachers saw demonstrations of the final product they should be producing, and (2) during the process of acquiring the tool, that is, the authoring system they would be using to produce the event.

Apparently the demonstrations at the beginning of the courses were able to raise expectations. Some of the testimonials:

> Needless to say that I am beginning, and, so far, fascinated. (Mirna, C4)
> I am already making plans to use my knowledge in my classes
> to enrich the way I teach. (Karen, C3)
> I am looking forward to what lies ahead! (Dinorá, C4)

As soon as they started working on the courses, preparing activities with the authoring system, two different aspects seemed to prevail. One was individual differences in dealing with the technological demands imposed by the use of computers; the other aspect was how these differences were smoothed through collective collaboration. The following comments reflect the differences between those who were more capable of acquiring the necessary skills to use the authoring system and those who had to struggle harder to learn it:

> When I started the assignments for this week I found out I would not have the slightest difficulty in getting them done. (Josefina, C4)
> As for the activities for this week I had ALL the difficulties I could have. (Gislene, C4)
> I had a lot of trouble doing the assignments, but I loved every step. (Cristina, C4)

On the other hand, the feeling that they belonged to a network where some of the difficulties could be solved by mutual collaboration was also noticed:

> The good thing about this forum is to see that you are not alone. (Liliane, C4)
> I decided to review the activity according to the feedback I got from the others to improve it. Graça, C4)

CONCLUSION

Acquiring competence in the use of a tool, seen here as cultural artifact, is a complex process which demands commitment by the members of a given community. It involves so much work, that it can only be done if the objective and benefits are clear to the learner.

People are not isolated beings but live in a community, where they can form a network, change experiences and help each other. A community is made not only by people but also by the social artifacts that they produce. The elements in the community, including people and tools, are all related to each other. Any problem with any of the elements affects the whole community. This is demonstrated by the complexity theories, which can be used to explain and inform any kind of social practice, including learning.

I would like to end this presentation by raising some points concerning the role of tools in our practices. Is a tool something that is separated from the subject? If you wear contact lenses, for example, are they separated from your eyes or are they part of them? What if you have a piece of metal implanted in one of your bones? Is it part of your body? In other words: are we all becoming cyborgs?

Some researches (Schaumburg, 2001; Reeves & Nass, 1996) have found out that people tend to anthropomorphize computers, treating them as if they were people. Hubard (1996, p. 21) argues that any piece of courseware [...] carries with it a 'teacher in the machine'). Is a tool a mediation between the subject and the object or is a tool an extension of the subject?

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