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A FRAMEWORK TO HELP CONSTRUCTING DISTANCE LEARNING ACTIVITIES ON CONCEPT MAPPING FOR EDUCATION

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Abstract. This work presents the first results on developing a distance learning intervention methodology designed to potentialize a collective learning environment set up by an educational portal addressed to the use of concept maps on a piagetian constructivist approach. The results consist on a set of orientations in order to construct the activities for distance learning courses as well as suggestions on teaching procedures (interventions) on those courses. **Keywords:** distance learning, concept maps, continued learning and intervention methodology.

1 Presentation

The investigation on psychological and epistemological foundations for the use of concept maps in educational activities is one of the main focuses of the Laboratory of Distance Learning Studies (Le@d.CAp), a UFRGS research group. The researches produced results such as the elaboration of analysis models and methods of concept maps supported by Jean Piaget's Genetic Epistemology and Jean-Blaise Grize's Natural Logic (Dutra, Fagundes & Cañas, 2004). Such concept map approach, innovative in relation to the classic theories which support this type of knowledge representation, resulted in the production of a set of analysis criteria of conceptualization processes using a temporal sequence of Concept Maps from the same individual, on the same subject (Dutra, 2006).

To make it well known and to improve its scientific production, the Le@dCAp research group, through Concept Map in Education portal (MCE site) has been offering experiences in working with webs since 2003, built according to models that privilege more deepened education practice discussions, focusing on concept learning. Professionals and students, who are interested in using the concept maps for learning development and evaluation, find in the MCE portal a space for discussion and sharing of ideas which privilege the interaction among the participants as a way to provide learning.

Consequently, the distance courses, offered to the communities of the MCE portal participants, become a unique space to test and to obtain data, which will verify the efficiency in different contexts of the models produced in the Le@dCAp. For this reason, we consider extremely important the analyses of the results obtained in such courses in order to identify and to systematize, in method, the set of factors which were capable of producing efficient interventions using the interaction elements in each case. The support offered by virtual interaction tools like chats, forums, e-mail lists and blogs, provides the record of activities performed and the interactions promoted, therefore, allowing their analysis and classification.

Following, we will present a brief contextualization of the theoretical tool and the actions conducted through the MCE portal to show the results and considerations obtained from the analysis of materials and orientations available for each course, as well as the students' and teachers' participation records.

2 The concept maps, MCE portal and the courses analyzed

The MCE portal has a series of functions which allow its participants to contribute, to learn and to interact autonomously through co- authored activities. As soon as each participant is registered in the portal, his/her electronic address is automatically included in the attached Discussion list through the e-mail address mapasconceituais@grupos.ufrgs.br , a fast and reliable way to raise and to raise discussions is available for them, as well as to report work, events and other actions related to the use of Concept Maps.

It is also possible for the participants to have access to the required resources to register an activity through an Environment for Activity Creation and Edition (AÇAI), therefore to form a community which can include other listed participants. This file creates a virtual space similar to a blog where objectives, aims, strategies and evaluation criteria can be seen, and also the motivation of the people in charge. Moreover, the responsible ones can write in a Daily Record where the activities can be described, the files annexed, digital images sent, and related links listed. Other participants (listed or not in the portal) can interact with the activity, sending comments to the diaries or to the whole community.

In addition to these ways of interaction among the portal participants in the Forums, it is possible to create some discussions on specific questions asked by the community. Every participant can create a discussion forum as well as to be involved in the discussions proposed by the colleagues. The Forum messages are organized hierarchically with information about the one who wrote it and when it was posted. Search tools allow highlighting the messages according to the postage date criteria and keywords.

In the space denominated Productions, materials produced by the community which uses the Concept Map in Education can be found. Any registered participant can send materials according to the categories indicated. With a search tool, the user can specify the material he is looking for including articles, texts, presentations, even concept maps.

3 Method

The courses offered by MCE Portal and analyzed for this study were developed according to the following strategies:

- Short duration courses (around 3 to 4 weeks with 60 maximum working hours); in all of them, there was a discussion list support of the portal to send orientations and to solve any doubts related to the elements used for the activities;
- Two of the courses analyzed were completely performed with the available blog in the portal: the orientations were posted as a daily record in addition to the students' productions (the image files generated by the concept maps were annexed to each diary), and the interactions and interventions were carried out through the diary Comments;
- The other two courses used the software CmapTools (Cañas et al, 1994, 2004) and a concept map server (CmapServer) which allow sharing via internet the maps as well as the possibilities to provide a Discussion Thread (online discussion forums which can be annexed to the concepts or links of a map produced in the CmapTools and saved in the map server);
- In one of them, a videoconference was made through the Macromedia Breeze available in the UFRGS server: in addition to the audio and video broadcasts (bidirectional), it was possible to share documents (PowerPoint presentations, pictures, etc.) and to interact via chat.

The method involved the activity analyses and the orientations for its use, as well as the interventions made by the teachers in contrast with the participants' course productions to obtain the leading principles of the activity production and the interventions made (not only by the teachers but also by the participants' interaction). For this reason, intervention means, for this study context, each proposal activity and the interactions in which teacher ↔ student or for those that involve student ↔ student.

4 Results

The work method for the development of the course activities consists of allowing exchanges supported by the available texts and materials in this environment among the participants. Consequently, the records produced for these interactions become the main learning evidence of each one of them. Considering this, frequency and participation evaluation are linked to the participation quantity and quality which are effectively registered in the environment, that is, the postage of messages requested in each activity, the participation in the synchronous interactions and to the sending of material (in general, concept maps transformed in figures).

The initial design of each course offered by the MCE portal follows a set of principles which were systematized in the concept map of Figure 1 as the following:

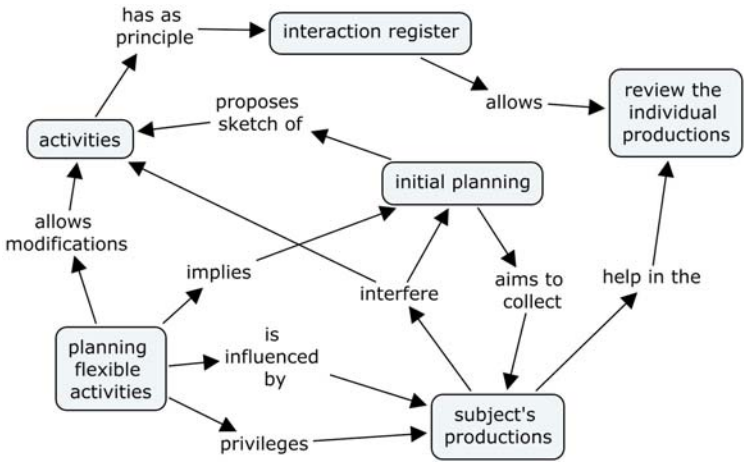

Figure 1. Principles which rule the planning of the course activities in the MCE Portal

Let's consider as an example, the following sequence of activities produced for the Constructivist Approach Course of Concept Maps (2007):

- The first activity consisted in the elaboration of a concept map (using the CmapTools software) that would represent each one's understanding in respect to the differences among the approaches proposed by the meaningful learning and the genetic epistemology. To do so, two texts were offered: concept maps and meaning learning and concept maps and genetic epistemology. In addition, the elaboration of a text was requested to explain the map built, clarifying and discussing their propositions. The text and the figure of the concept map were posted on the blog individually.
- In the second activity, we asked each participant to interview two classmates from their group regarding the maps and texts produced by both. This interview was performed in the comment section of each Diary to obtain the classmates' point of view about their productions.
- Finally, after the round of messages and the videoconference, each participant had to produce a second version of the concept map built in the first activity as well as of the explicative text related to it. An evaluation related to the learning (self-evaluation) as well as the methodology applied in the course including suggestions of possible themes for new courses.

In this activity description, some highlighted aspects in the concept map in figure 1 are presented The first activity , although simple, aimed at obtaining records from the participants in the form of concept maps, which could explicit not only their comprehension of the theoretic aspects involved in the texts but also their ability to construct a concept map. The complement regarding this first action by the students, that is, a request for the explanatory text resulted in observing the previous activities in which the intervention by the teachers as well as the course participants in general did not involve the totality of the concept maps and the relationship systems represented in each map.

The second activity can be considered the main focus of the sequence shown. The questions and answers obtained in each interview turn could be contrasted by each diary board. That is, sometimes, the explanation that each participant asked his classmates was already present in the diary containing the map. At times, the participant himself would realize that his explanation or his map could be complemented or was not clear enough, considering the question or suggestion given by his classmate. As everything was registered and could be reviewed as many times as necessary, so the exchange sequence allowed the review proposition of the first production of each student (the concept map) in the third activity.

Thus, in relation to the activity propositions as an intervention method, the principles described previously (in the concept map, figure 2) regulate the production systematic of the course material in order to establish, once the course contents were defined, the performance strategies of teachers and participants. Therefore, we can state that a flexible activity plan that privileges the production analyses of the course participants will help in the intervention (by the teachers and the students).

In the second example, there is a sequence of Concept Maps extracts produced by a course participant "Concept Maps in Learning Evaluation" (2005) and among them, the interventions made by the teacher and other participants in order to modify (improve) such production.

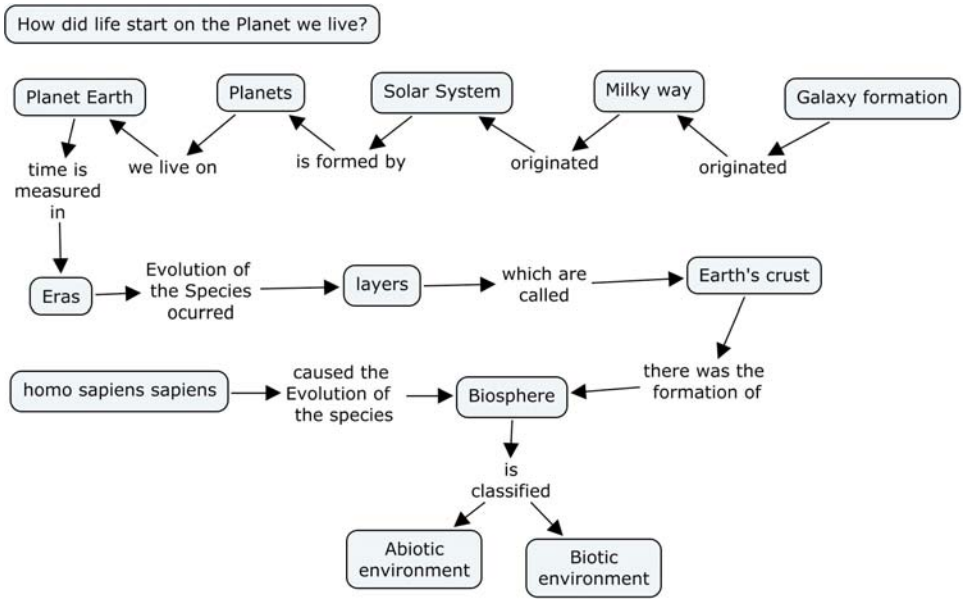

Figure 2. Concept Map produced on 10/11/2005

Figure 2 shows the first version of the concept map built by a course participant on a subject that he liked and, according to him, had some knowledge about. As the course aimed at the use of maps for the evaluation, the following interventions are evidently trying to reflect upon such objective. The first intervention regarding this production observed here was done by the course teacher.

Discussion Thread 10/18/2005 Hello, Participant Student I agree with Participant Student 2 in a particular aspect: what a work!! Navigation through your map offers information which is related to the question you have chosen as the map focus. Besides, structurally, your concept map is well built: all the relations are expressed using verbs in linking phrases. As a contribution, I'd like to get an example of your map and ask you some questions: Galaxy formation- originated- Milky Way - originated- Solar System- is formed by-Planets-If that is the reading sequence , do you think we could say that: Milky Way is a galaxy? Each galaxy has a solar system? All set of planets are solar systems? These are questions which could certainly explore a little the information expressed in the map and would also lead to better definitions for the concepts of Galaxy, system, and planets. What do you think? My regards, Teacher

The underlined text above reveals the teacher's choice which considers a determined sector (relationship set) of the concept map in Figure 3. This relationship system, which seems more like a text than a concept map, is approached by the teacher in a way to explore the relationship possibilities (logically plausible) between the concept pairs. It means that each set concept-linking phrase-concept can be tested separately in case the proposition is denied (Solar System – is formed by – Planets → are all the set of planets solar systems?), of the exchange of one of the concepts, or even, of establishing another link between the concepts which appear there. It is also possible to explore the combinations among the propositions. The following concept map shows some changes made after the intervention. The alternations were mainly made in the linking phrases in order to answer the teacher's questions.

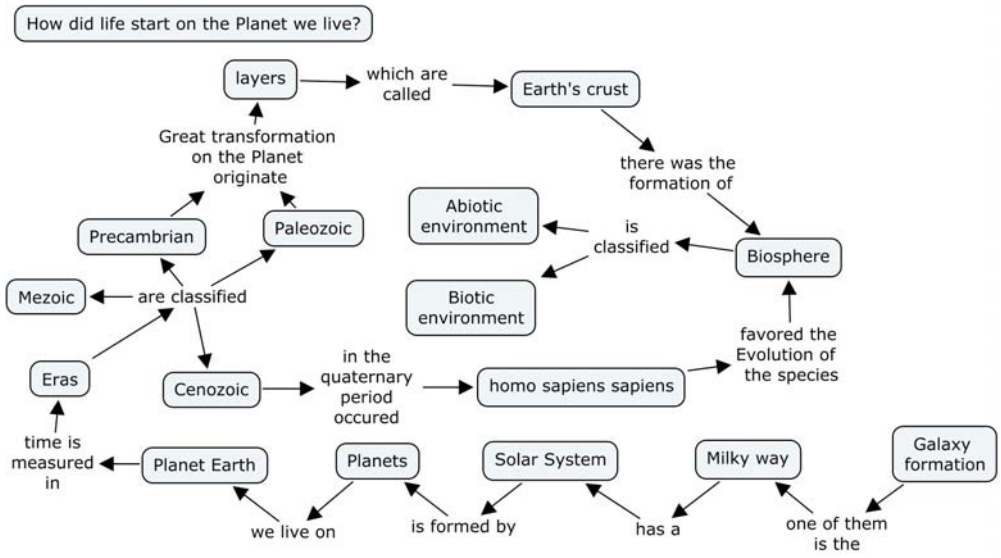

Figure 3. Concept Map produced on 10/19/2005

The following extract, still incipient when referring to the intervention, shows a awareness state from another course participant while analyzing the second version of the concept map in figure 3.

Discussion Thread 10/27/2005 Participant Student This new presentation that you've made, adding some more concepts and other linking phrases , made the map clearer. It is amazing how the construction of a MC never ends…It doesn't matter how good it is, we always look through a new point of view every time we see it. Participant Student 2

We can observe an important attempt by the student to examine an important aspect in the construction of concept maps, which certainly refers to the fact that it is always possible to explore the map relationships in a frequency which, as she notes, "never ends". It is possible to choose arbitrarily some specific points of the concept map where interventions can be made once the focus is on the process, which leads to the concept construction and not to the concept map itself as the final product. Such reflections are important for their professional practice as educators are expected to apply the knowledge constructed effectively during the course.

The analyses of both examples make it clear that the elements (synchronous and asynchronous) allow us to identify the intervention possibilities based on the interaction elements used in each course. It is observed that the interventions occur over the relationship possibilities between the students' concept map. Considering this, the activity planning needs to potencialize this type of intervention, emphasizing that there is no need for technological sophistication (in reference to the elements), focusing the evaluation of its efficiency on the participants' feedbacks.

5 Conclusions

The current literature review in respect to the investigations on the use of concept maps allowed us to analyze the study carried out by Cunha, Fernandes, Omar & Silva (2004) which presents a Cooperative Environment based on the web, which I built for the application of learning evaluation and to test it with the students, establishing an efficient evaluation with concept maps in relation to the objectives proposed by the teacher. The research line suggests that the environment built by the authors is important to help in the meaning learning evaluation. According to them, the environment stimulates the relationship among the concepts and the proposition formation among them, facilitating the construction of knowledge over a specific theme. However, we did not find in the report, criteria capable of establishing a relationship between the experiment performed and the authors' conclusions. Would it be possible for an environment to stimulate the construction of relationships among the concepts? How to consider that the relationships shown really represent the construction of knowledge?

As for Rocha, Jr & Favero (2004), they searched for an automatized analyze system of Concept Maps. They concluded that these automatic analyses can be uncertain due to the ambiguous character that the propositions in the Concept Maps can present. Their work proposes a strategy which aims at minimizing this ambiguity by the analysis of the concept inclusivity nature within the concept map hierarchy. The methodology involves the use of a program called EBNF, which makes use of a set of grammar rules which, according to the study, allows the position of the linking phrases in the concept map propositions. When attributing to such value positions related to a arbitrary grammar (here considered as a typification of possible linking phrases), the concept map processing establishes a semantic comparison measure of the different propositions , putting them together according to the grammar used and establishing their relevance and pertinence levels. In another paper (Rocha, Jr & Favero 2004b), the same authors presented a program which uses a genetic algorithm and computer ontology to compare concept maps referring to common issues (which make up the ontologies) and to offer suggestions for the users of a map digital editor (developed by the authors). As they state in a specific section of the article, this type of approach differs from the one found in the literature to promote comparisons between the set of maps and not only with the one proposed by an expert in the subject. It is a consistent and ingenious work considering the method used to measure and to compare. On the other hand, we ask: Is it enough to suggest propositions for the maps to promote concept constructions? Is it possible to establish if the meanings expressed by the subjects are equivalent only by the criteria withdrawn from the language or the semantics?

As for the actions described in this paper, the interventions presented in the previous section aimed at provoking awareness state (Piaget, 1997, 1978) by the subjects (course participants) in relation to their constructions (concept maps) and, at the same time, in relation to the strategies for the use of maps to follow the students' learning process.

The distance intervention model, which we now present, represents our first results in gathering a systematized set of orientations that lead to the production of activities and the exploration techniques for the relationship possibilities in the Concept Maps built by the course participant students offered by the MCE portal. The examples presented suggest that it is possible to potentialize the actions efficiency implemented after the identification and planning of such interventions in a way that, by the end of the activity cycles, it is possible to infer that in fact there was a change in the subjects' meaning system (Piaget, 1976b; Piaget, 1995).

Considering this, we emphasize the importance of a retroaction in the activity planning in a way that the interaction and intervention analyses allow some flexibility when re-elaborating the proposals, as well as how this planning influences the kind of teachers' intervention during the courses. The methodology presented is, therefore, built from the systematic analyze of the interactions in the courses where the interventions resulting from the activities (from the students and the teachers) help their development. Finally, it is emphasized that the need for each teacher-students to produce and to review their own concept maps, focusing the activities on the interaction over such maps. The analyses and observation results pointed out in this paper can be summarized by the following orientations:

- In respect to the activities, privilege should be given not only to the concept map construction , but mainly to the systematic revision of each map built to make the relationships more explicit among the elements (concepts in construction) involved in such productions;
- Due to the type of construction allowed by the concept maps, the record production in natural language performed by the subjects is fundamental considering the propositions contained in the production resulting from each activity (the concept maps); and
- The systematic exchanges (questions, request for clarification, interviews) related to the concept maps produced in order to obtain the point of view of the subject responsible for them are fundamental for the awareness state in respect to the relationships (or relationship systems) expressed in the maps.

The contrast between the results obtained in our study, considering other researches done, makes us believe that the first results can support the discussions and investigations that occur due to the expansion of distance education in the country, and in special, for the distance degree courses.

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