

## Use of Concept Maps as a strategy for Teaching-Learning and Assessment Tool in Geography Lessons

Márcio Aurélio de Moraes<sup>1</sup>, Francisco Willians Hirano<sup>2</sup>, Tatiana de Araujo<sup>3</sup>,  
Gustavo de Nery<sup>4</sup>

<sup>1</sup>Instituto Federal de Educação, Ciência e Tecnologia do Piauí (IFPI)

<sup>2</sup>Instituto Federal de Educação, Ciência e Tecnologia do Tocantins (IFTO)

<sup>3</sup> Instituto Federal de Educação, Ciência e Tecnologia do Piauí (IFPI)

<sup>4</sup> Instituto Federal de Educação, Ciência e Tecnologia do Piauí (IFPI)

marcio@ifpi.edu.br, kikopalmas@gmail.com, t.araujomoura@gmail.com,  
guscane@ifpi.edu.br

**Abstract.** *This article seeks to reflect on the teaching and practice of the use of conceptual modeling that can assist the teaching-learning process of students in the classes of Geography in schools of the educational system of the State of Piauí (Brazil). This research was developed with Geography teachers in a training course for teachers for the use of Geotechnologies and Tools of Web interaction within the Federal Institute of Education, Science and Technology of Piauí (Brazil). As found by the analysis of data collected in this investigation, teachers agree that conceptual modeling contributes to the organization of the geographic knowledge of students. And yet it was evident the use of concept maps as a teaching and learning strategy, as well as an evaluation tool for student performance. Finally, the use of concept maps in teaching Geography brings up the idea of the development and exercise of autonomy by the students, since self-study is one of the essential factors for meaningful learning of spatial content in classroom*

**Keywords:** *conceptual modeling, teaching-learning, learning strategy*

**Resumen.** *Este artículo tiene como objetivo reflexionar sobre la enseñanza y práctica del uso de los conceptos de modelado puede ayudar en el proceso de aprendizaje de los estudiantes en las escuelas públicas de Piauí. Participaron en esta investigación los profesores de geografía que tomaron el curso sobre el uso de herramientas Geotecnología e Interacción Web, el Instituto Federal de Piauí (IFPI). De acuerdo con el análisis de los datos, los maestros favorecieron el uso de los mapas conceptuales como estrategia de enseñanza y aprendizaje y como una herramienta de evaluación del estudiante. Por lo tanto, el uso de*

*mapas conceptuales en la enseñanza de la geografía aporta la idea de desarrollo y autonomía, como el auto-estudio es esencial para el aprendizaje significativo en el aula.*

**Palabras Clave:** *la modelización conceptual, enseñanza-aprendizaje, estrategia de enseñanza y aprendizaje*

## **1. Introduction**

This research was developed with Geography teachers and it provides a reflection on teaching practice and the use of cognitive tools that can assist in the teaching-learning process of students in Geography lessons. Under this perspective it is necessary to mention that during the teaching practice, we constantly seek appropriate learning resources in order to make significant learning to our students, and in this quest, we encounter various strategies and, among them, there is the construction of concept maps. There are several possibilities of using concept maps in teaching Geography. However, this research data pointed to two purposes for the use of this cognitive tool a) as a teaching and learning strategy, and b) as an assessment tool. It is noticed that the concepts and propositions on human cognition are structured as a concept diagram.

## **2. Literature Review**

Moraes (2005) establishes that meaningful learning is characterized by the interaction of information to a relevant aspect of the cognitive structure of the subject, not to any aspect. Information is learned significantly when it relates to other ideas, concepts or relevant or inclusive propositions that are clear and available in the individual's mind and act as anchors.

Two conditions are necessary for meaningful learning to occur: the student must be willing to learn and the material to be presented must be potentially significant. It is interesting that the student is motivated, have an interest in learning. A tired and unwell student can be reflection of unattractive classes. On the other hand, the teacher must also present an exciting material to motivate the student to want to learn.

Concept maps are defined as graphical representations of concepts, like diagrams in a specific domain of knowledge, constructed such that the relationships between the concepts are clear. That is, they represent concepts and their connections (relationships) in the form of a map, where knots are concepts and the links between two knots are relationships between the concepts. These relationships are nominative, i.e., every relationship between two concepts form a proposition (GAVA; Menezes; Cury).

Moreira (2006) warns that the use of concept maps as assessment tool implies a posture that, for many, differs from usual. In the assessment by concept maps, the main idea is to assess what the student knows in terms of concepts, how he/she structures,

ranks, sets, lists, discriminates, integrates concepts of a particular unit of study, topic, subject, etc..

According to Sousa & Boruchovit (2010a), concept maps mobilize the student in planning, monitoring and regulation of his/her thoughts itself and of his/her own actions. In the course of its composition, during his confrontation with other maps, at the time of its reconfiguration, the student is led to reflect critically about his/her achievements and cognitive paths chosen in the production of results. Thus, working with concept maps allows him/her, continuously and gradually, learn to think about his/her thinking and accomplishments, to develop the ability to know himself/herself - cognitively, procedurally and emotionally.

Thus, Souza & Boron (2010) indicate that the concept maps, undertaken as an evaluative tool, do not seek to measure an object, nor only allow passive contemplation of a situation. To the authors, concept maps have the following characteristics: a) promote frequent and high quality feedback that activate cognitive and metacognitive processes of students; b) provide the regulation of education and the consequent promotion of teaching variability; c) locate the error as a stage of the learning process, breaking the dichotomy knowing / not knowing and promoting the building of bridges between what you consider important to teach and what you can learn; d) extend student involvement with the management of his/her learning pathways, improving self-esteem and increasing motivation; e) promote self-regulation of learning generating conditions for students to progressively be in charge of their learning.

## **2. Method**

This section presents the methodological approach of the research, and aims to enable, through detailed interpretation of the paths followed in formulating and developing research in question, in order to provide structuring elements to the reader and allowances for understanding it. In these terms, the methodological procedures are qualitative and the research method used was the exploratory case study. This research was initially developed with forty (40) Geography teachers who teach in the state schools of the State of Piauí (Brazil). Such subjects were students enrolled in the Training Course for Geography Teachers of High School directed to digital Geotechnology and Web Interaction tools at the Federal Institute of Education, Science and Technology of Piauí (Brazil).

It is important to highlight, once again, from the perspective of this research, within the Training Course for Geography Teachers of High School directed to digital Geotechnology and Web interaction tools, we sought to identify the concepts and reflections of the teachers surveyed about the use and possible ownership of geotechnology, interactional and cognitive tools, allowing us to identify elements of approximation of these technologies with the pedagogical practice of teachers.

In one of the practical laboratory classes, the teacher-students had contact with the CMap Tools software with the aim of creating concept maps (Figure 1). CmapTools is a freely distributed tool, available in conjunction with other tools in order to provide collaborative environments and provide students with means to collaborate in knowledge level, allowing users to build their conceptual maps and divide the knowledge expressed

in their maps with other students. Each teacher-student built a conceptual map in the area of Geography, as shown in Figure 2 below:



Figure 1 – Drawing concept maps using the CmapTools software

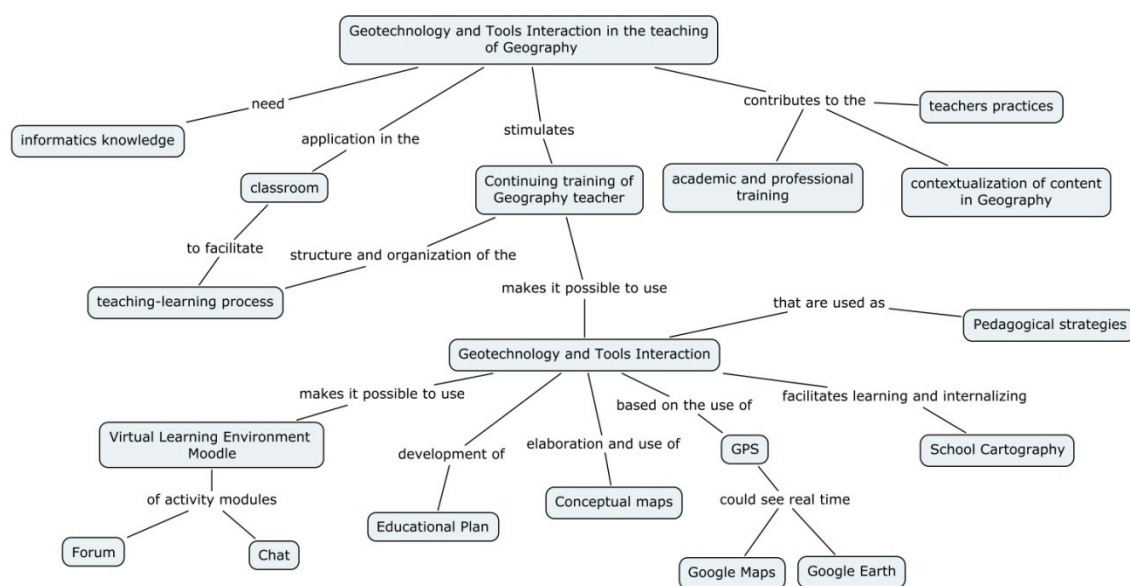


Figure 2 – A concept map drawn by a teacher

### 3. Results and discussion

To understand how Geography teachers see the use of concept maps in teaching practice and what they think about their use as an element that enables meaningful learning, they were offered to speak about the benefits and advantages of using concept maps in their Geography lessons. We started with the speech of some teachers.

"The use of concept maps allows students to express their ideas, explain concepts about specific content of Geography." As a professor of Geography, using concept maps is to enable the student to create an interconnected network between semantic concepts of a particular theme, providing a more concrete learning upon subjects in geography lessons."

"I have had contact with conceptual modeling only in textbooks of Geography, because by the end of each chapter there was a concept map about the content covered, but I never used this feature in my classes, because I did not know how to use it. However, after the classes on conceptual maps of this continuing education course, I discovered in conceptual modeling an interesting tool that can and will be used as a teaching resource for presenting the contents of Geography in my classes from now on, and certainly, the students will like this heuristic tool".

However, these studies highlight the use of concept maps as a metacognitive tool used for the measurement of knowledge from the perspective of meaningful learning. It was noticed, in this sense, that the transcribed testimonies above, the use of concept maps allows students to organize and express their ideas about certain contents, in the case here, about the contents of Geography. To Gava (2013), when we are in a learning process, in different situations and at several different times, we must express our ideas (externalization of knowledge). This expression of ideas can be to summarize an article or text studied, to register a lawsuit, to develop a research project or learn how to produce texts expressing our understanding of a given subject or even to give a speech.

However, it is still necessary to emphasize that during the construction of concept maps by students in the subject of Geography, teacher should take into consideration the proposed content in Geography lessons, as well as the use of these maps as tools for identification of previous ideas that students have in the process of teaching and learning. We agree with Novak (2000) that argues that the concept map is suitable for assessing prior knowledge and diagnosis of alternative conceptions of knowledge, scientific and/or socially accepted; it is an organizer for the conceptual and propositional knowledge of the hierarchy of nature, and promote meaningful learning, evoking prior knowledge and its progressive differentiation.

On the other hand, it is appropriate to emphasize that when students express their ideas about specific content of Geography, they should organize them, and for this it is necessary that the concepts learned in class are related, and hierarchically ordered, because according to Pozo (1996), this organization is based, in turn, establishing internal

relations between the elements of learning materials. In this respect also Boruchovitch (1999) notes that concept maps provide the students with the ability to understand the meaning of the contents, link them to their previous knowledge in a self-regulated and orderly manner, and promote meaningful learning.

Along with that, based on Boruchovitch & Sousa (2010) for the occurrence of significant learning, so it is essential to determine what the student already knows, to subsequently introduce new concepts in accordance with the acquired baggage of their daily lives, in line with their prior knowledge. The result, full of meaning, emerges when the student establishes relationships of this new knowledge to relevant concepts already possessed.

Castelar (2007) states that to achieve real learning, it is necessary, first, that the student actually wants it; then realize that he/she is capable; and, finally, reflect on the relevance of school to their lives. Therefore, in Geography lessons and by using concept maps one should seek to work awareness of learning in order to lead students to reflect on the topics learned in the classroom, making connections with the daily life because, according to the author, the success of the educational act occurs more easily if such act involves learning, and consequently the development of a teaching practice that may constitute an effective means of preparing students for a better understanding and participation in society he/she lives, and this is a challenge for the Geography teacher.

Continuing to the testimony of teachers of this investigation, another aspect evidenced in the use of concept maps as a metacognitive tool was beyond being used with a teaching strategy, as noted above, the possibility of its use as an assessment tool, the prospect of a formative evaluation as reported below.

"The use of concept maps allows teacher and presents the content of Geography. It can also assist you in assessing student learning, because this feature allows the student to relate the concepts covered in the Geography lessons, expressing the knowledge assimilated and learned."

"Before attending this training course for the use of technology in teaching Geography, I used to assess my students just by doing a conventional assessment with writing and multiple choice questions. Now I can assess my students through the construction of conceptual maps, and the interesting point is that we can, together, me and my students, build on each end of class a concept map from the perspective of a formative evaluation."

About this reality, Boruchovitch & Sousa (2010) address that formative assessment is committed to learning because it engages with the progress of students in the field of knowledge and procedures for its appropriation.

Geography teachers can use conceptual maps as strategies of qualitative assessment with their students in the classroom, in order to identify whether there was learning of geographical concepts by the students, and this is possible by the analysis of maps produced by the students; thus, allowing them to make inferences about the ability to relate concepts. Further in this direction, Moreira (2006) points out that the analysis of maps is essentially qualitative. The teacher, instead of bothering to assign a score to the map drawn by the student, should seek to interpret the information given by the student

on the map in order to obtain evidence of meaningful learning. It is pertinent to note that the assessment must also be understood as a critical learning activity because it allows the teacher and the students to learn collaboratively (Álvarez Méndez, 2002).

By highlighting these aspects on the perception of Geography teachers about the possibilities and benefits of using concept maps as a teaching and learning strategy and as an evaluative instrument in the course of this investigation, we sought to describe indicators that point to the importance of conceptual maps in the teaching-learning process of Geography.

A questionnaire with open questions was used with Likert scale, which comprised selected statements so as to provide valid inferences that might corroborate the impressions and perceptions of Geography teachers about the use of concept maps in teaching Geography. In these terms, the validation of the attitudes and expressions of teachers was made by accepting the answers on a 5-point scale, in which the number 1 corresponds to the statement "strongly disagree" and the number 5 to the statement "totally agree".

The indicators were described using four (4) statements, according to Table 1.

**Table 1: Indicators of the importance of concept maps in teaching-learning process in Geography**

Items	Likert scale				
	1	2	3	4	5
Conceptual maps contribute to the organization of geographical knowledge of students in Geography.				45 %	55 %
Besides Geography, other subjects could use concept maps as a learning and knowledge assessment tool.				32 %	68 %
The content of Geography is easier to be understood through concept maps than through texts.				45 %	55 %
The development of concept maps in group facilitates student learning related to the contents of Geography.				14 %	86 %

Given the above, descriptive statistics was used to analyze the data collected. It can be observed that teachers agree that conceptual modeling contributes to the organization of the geographic knowledge of students. Regarding the possibility of using concept maps as a teaching and learning strategy and performance evaluation tool, teachers agree that conceptual modeling can contribute to the good performance of students in other classes.

For teachers, the use of concept maps for it is a heuristic tool, and therefore, makes use of graphic elements and can make it easier to assimilate the contents of Geography by students. Finally, teachers believe that the development of concept maps in groups facilitates student learning in relation to the contents of Geography.

## 4. Conclusions

There is no doubt that the concept maps can collaborate with the expression of ideas and concepts in an organized way in the cognitive structure of the learner who wants to learn. In light of the foregoing, exposed through the analysis of the data collected in this investigation, teachers agree that conceptual modeling contributes to the organization of the geographic knowledge of students. And yet it was evident the use of concept maps as a teaching and learning strategy, as well as an evaluation tool for student performance. Finally, the use of concept maps in teaching Geography brings up the idea of the development and the exercise of students' autonomy, since self-learning is one of the essential factors to make meaningful learning of spatial content classroom occur.

## References

- ÁLVAREZ MÉNDEZ, J. M. (2002). "Avaliar para conhecer: examinar para excluir". Porto Alegre: Artmed.
- BORUCHOVITCH, E. (1999). "Estratégias de aprendizagem e desempenho escolar: considerações para a prática educacional". *Psicologia: reflexão e crítica*, Porto Alegre. v. 12, n. 2, [http://www.scielo.br/scielo.php?pid=S0102-79721999000200008&script=sci\\_arttext&lng=pt](http://www.scielo.br/scielo.php?pid=S0102-79721999000200008&script=sci_arttext&lng=pt)>. Dezembro.
- CASTELLAR, S. (2007). "Mudanças na prática docente a aprendizagem em espaços não formais". In: REGO, N.; CASTROGIOVANNI, A. C.; KAERCHER, N. A. *Geografia: práticas pedagógicas para o ensino médio*. Porto Alegre: Artmed.
- GAVA, T. B. S.; MENEZES, C. S. de; CURY, D. (200-). "Aplicações de mapas conceituais na educação como ferramenta metacognitiva". Vitória, <http://www.nte-jgs.rct-sc.br/mapas.htm>, Novembro.
- POZO, J. I. (1996). "Estratégias de Aprendizagem". In: COLL, C; PALÁCIOS, J.; MARCHESI, A. (Orgs.). *Desenvolvimento psicológico e educação: psicologia da educação*. Porto Alegre: Artmed.
- MOREIRA, M. A.; BUCHWEITZ, B. (1993). "Novas estratégias de ensino e aprendizagem: os mapas conceituais e o Vê epistemológico". Lisboa: Plátano.
- MOREIRA, M. A. (2006). "A teoria da aprendizagem significativa e sua implementação em sala de aula". Brasília: Universidade de Brasília.
- MOREIRA, M. A. "Mapas conceituais e aprendizagem significativa". Porto Alegre. (199-). <http://www.if.ufrgs.br/~moreira/mapasport.pdf>, Fevereiro.
- NOVAK Joseph D. ( 2000). "A Aprender, criar e utilizar o conhecimento". Lisboa: Plátano Ed. Técnicas.
- SOUZA, Nadia Aparecida de. BORUCHOVITCH, Evely. (2010). "Mapas conceituais: estratégia de ensino/aprendizagem e ferramenta avaliativa". *Educ. rev.* [online]. vol.26, n.3, pp. 195-217. ISSN 0102-4698.
- \_\_\_\_\_.(2010). Mapas conceituais e avaliação formativa: tecendo aproximações. *Educ. Pesqui.* [online]., vol.36, n.3, pp. 795-810. ISSN 1517-9702.