Introducing planning in socio-constructionist activities in Environmental Education, Maths and Physics

Authors: N. Yiannoutsou[1], M. Daskolia[2], Z. Smyrnaiou[1], F. Moustaki[1], C. Kynigos[1]

Affiliation: 1: Educational Technology Lab, University of Athens,
2:Environmental Education Lab, University of Athens
Email: nyiannoutsou, fotmous, mdaskol, Kynigos@ppp.uoa.gr

Abstract

We describe here a research that focuses on the study of planning in constructionist learning environments that involve concepts related to environmental education, mathematics, and physics. We focus on constructionist activities because we consider them a different case for planning from those presented in the literature. Constructionist activities integrate self regulation and what we call emergent planning. We conducted a study with eleven secondary teachers to observe them as learners that plan their constructions and discuss the role of planning with them as reflective practitioners. Our findings show that planning took place during the enactment of the activity and not before and had a mainly reflective and not an "organizing" role for the task.

Summary

Planning has been addressed as an element, among others , of self-regulated learning (SRL) or as one of the three phases of cognitive regulation (along with monitoring and evaluation) and it has been described as a general domain metacogitive skill (Schraw 2007). In many studies planning is part of a broader research on self regulated learning and no special emphasis has been placed on it. We identify five main trends in research in self regulated learning a) on factors that influence self regulated learning such as personal epistemologies, motivation, characteristics of the task, discipline (VanderStoep 1996), b)on research and evaluation of self regulated learning and c) on tools that can support self regulated learning with special emphasis on technology based support (for a review see Schraw ibid) and d) on the role of self regulated learning in domain specific learning such as maths, (Labuhn et al 2010) reading comprehension etc, and in computer based learning which is the focus of our study also. The emphasis in computer based learning is documented upon the argument that the personal learning styles and the independence in learning require more than ever self-regulatory skills (see for example Strømsø & Bråten 2009 with emphasis on internet based learning) Most of the studies that focus in SRL in computer based environments involve cscl environments, internet based learning, hypertext or hypermedia environments but we found no reference to constructionist environments (i.e. microworlds).

Constructionism, which could be considered as a branch of constructivism (Ackermann 2001) as it shares the view of building knowledge structures through progressive internalization of action adds that learning can take place more felicitously if learners are engaged in constructing a public entity (be it a computer model or a sand castle) with personal meaning (Papert 1991). What makes constructionist activities an important aspect of study is the role

of planning during this construction. As Papert claims (1993) learning in computer based constructionist environments (microworld) does not require a detailed planning but the learners can start with a vague idea of what they are going to do. In this case planning is an emergent process which evolves along with the construction informed by the task related feedback offered from the microworld. This seems to be a quite different learning situation from those described with the tools mentioned before. Taking into account that planning in in this case is emergent and sometimes it is difficult to be made beforehand because the process of construction is dynamic, it is changing and evolves through the interaction with the microworld we formulated a Research Question that focused on how planning could be used in constructionist activities and apart from the emergent step by step plans that seem to formulate during construction is there place for a more general plan that includes them all?.

Method and research process

To make planning a specific task for the participants of our study we introduced a planning vocabulary consisting of twenty two concepts such as hypothesis forming and testing, discussion, observation, experimentation etc and by 2 types of concept relationships: dependent relationships, alternate relationships. The participants were informed that they could create their own concepts or relationships if those available were not sufficient for their planning. We report here on a study with 11 secondary teachers specialized in mathematics (4), physics (2) and environmental education (5). We used teachers in this phase of our study because we wanted not only to observe learners during the planning process but also to record their point of view about planning as experts. Participants formed 4 groups of two and one group of 3. Two groups worked with a microworld in 3d mathematics, one group worked with a microworld in 3d physics and two groups worked with a microworld in environmental education (focusing on issues of sustainability). All participants were familiar with constructionist environments and constructionist learning. In each group there was at least one person who was familiar with the task at hand and had the role to explain it to the other member(s) of the group. The data collected include: observational notes of group discussions and assemply discussions, the concept maps of the planning process created by the participants and the responses to the questionnaires distributed.

Findings- Final Remarks:

All plans contained task free information. Two out of the six plans were linear, the rest contained alternatives and loop relationships. The most concepts that were more frequently used were "discussion" "experimentation" "observation" and "Reflection". Planning took place during the enactment of the activity and not before. The planning vocabulary was used as a reflection tool and not as a driving force on how to organize the work on the task. Teachers in one group said that the planning vocabulary helped them to think more deeply on the teaching process because it allowed them to focus on the details of the task and on the functionalities of the microworld. These findings suggest that the role of planning in the self regulation process of learning can take a different form according to the characteristics of the learning environment.

Acknowledgements:

The research is funded by the EU Funded project "Metafora: Learning to learn together: A visual language for social orchestration of educational activities" Grant agreement 257872.

References

Ackermann, E. (2001). "Piaget's Constructivism, Papert's Constructionism: What's the difference?", In *Constructivism: uses and perspectives in education*. (Volumes 1 & 2). Conference Proceedings, Geneva: Research Center in Education, pp 85-94.

Labuhn, A. S., Zimmerman, B. J., Hasselhorn, M., (2010).Enhancing students' self-regulation and mathematics performance: the influence of feedback and self-evaluative standards. In *Metacognition and Learning* 5 (2), 173-194

Papert, S. (1991). Situating Constructionism. In I. Harel & S. Papert (eds) *Constructionism.* (pp 1-12). New Jersey: Ablex Publisshing Corporation.

Papert, S. (1993) *The children's machine. Rethinking School in the Age of the Computer*. BasicBooks, A Division of HarperCollins Publishers, Inc. New York

Schraw G.,(2007). The use of computer-based environments for understanding and improving self-regulation. In *Metacognition and Learning* ,2 (2-3), 169 – 176

Strømsø H.I., Bråten I., (2010) The role of personal epistemology in the self-regulation of internet-based learning. In *Metacognition and Learning*, 5: 91 -11

VanderStoep, S., Pintrich, P. R., and Fagerlin, A. (1996). Disciplinary differences in selfregulated learning in college students. In *Contemporary Educational. Psychology*. 21: 345–362.