

Children learning as participation in web-based communities of practice

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Abstract

Assuming learning as participation in communities of practice, and taking a situated perspective on learning, we studied children's practice within WebLabs activities. The data collected was video recordings of groups of children in selected sessions and material they published in their WebReports. Data analysis enabled us to describe children's practice in the project and find evidence of learning in the following categories:

(i) The emergence of a shared repertoire, including:

- vocabulary instantiated in their ways of approaching problems, questions, demands, challenges (using technology, programming and modelling), representing and sharing ideas (describing their work, ideas and thinking, commenting on other peoples' work and ideas, building on others' ideas to further their own, e.g. constructing the Randomness WebLabspedia)

- an emerging valuing of crossing boundaries (both cultural as well as in specific knowledge domains, e.g. on Numbers);

(ii) The co-definition of mutual engagement. This is visible through:

- an emerging acceptance of the partiality of knowledge as a positive contribution to the knowledge of the community as a whole group and not as a sign of 'not knowing' things (e.g. the exchange of modes of proving that a certain ToonTalk robot produces a certain sequence in the Guess My Robot activity);

- an emerging sense of responsibility for the overall achievement, i.e. the joint enterprise where children feel that they have a voice (e.g. by contributing to the improvement of the software, children experience a strong sense of belonging to a project team);

- an emerging sense of ability and pleasure in going deeper into their ideas and products (a kind of localized depth) by way of a set of conditions, namely: interaction with powerful computational tools, interaction with teachers and researchers who help sustain collaboration (acting as peers in the exchanges within their specific tasks) and possibilities for innovative representations.

Summary

In the environment we designed, students investigate mathematical ideas through exploratory programming in ToonTalk. They share and refine their ideas in group discussions in class and on-line discussions using the WebReports system. These activities are guided and monitored by teachers and researchers. All the actors – students across different sites, teachers and researchers, form the WebLabs community of practice (Wenger, 1998).

In this paper, we will focus on an activity called Guess my Robot, which is aimed at advancing students' understanding of number sequences. The activity is a game in which students invent a rule for a number sequence and model it as a ToonTalk robot (procedure) that generates that sequence. They then collect the first few terms of the sequence and publish them in a web report. Their peers explore these in their own ToonTalk environment. They use a variety of tools to uncover the rule of the sequence: ToonTalk programming, Excel and (even!) paper and pencil. Once they succeed, they respond to the challenge by posting a comment on the report, which includes a robot they created for generating the same sequence. This activity was implemented in 4 countries, by 5 groups of 4-10 students.

We will use this activity as a case study to examine the WebLabs project under the community of practice lens. In this activity we induce children to operate in a mathematical domain through the proposal itself, the tools available, the guidance provided by the teachers and the dialogue with peers and researchers. We are trying to cultivate and sustain communities of practice – both physically and virtually – where it is natural to make conjectures, test hypotheses, offer counter-examples and so on.

Our data includes the analysis of session videos, as well the products of students' work. Our presentation will discuss the co-definition of mutual engagement, learning as participating in the development of a practice and the emergence of a shared repertoire. In this summary we illustrate with two examples.

One of the themes that emerges from students' reflections on using ToonTalk to explore sequences is their growing ability to cope with complexity. As one student claimed: "it is very interesting that using simple robots we could create complex number sequences" children claim. This should not be seen as a sign that all is straightforward: "actually we do not like the fact that most of our predictions did not come true". We see here an emerging acceptance of the partiality of knowledge (e.g. the notion that one's prediction in science may not really be true), interpreted as a positive contribution to the knowledge of the community as a whole group and not as sign of simply 'not knowing' things. Evidence of this is given by the fact that when children were exchanging modes of "proving" that two "different" ToonTalk robots can produce the same number sequence, they went through sequential stages of approaching the idea of proving in mathematics, and the sense that it is the audience that gives (or does not give) credibility and legitimates the results.

We strive to understand the ways in which students learn by analysing (or tracing) trajectories of: the way they talk and refine meanings when they express their thought; the way they produce and adopt tools and artefacts; the forms they use to create representations, records and recall events; how they appropriate and invent terms and redefine old ones. This is the children's shared repertoire within their WebLabs practice. We see their vocabulary being instantiated in their ways of approaching problems, questions, demands and challenges.

The ways some children changed their forms of representation of programs to produce sequences is evidence of the changing and dynamic improvement of their repertoire. This is applicable both to the tools involved in Weblabs and to the mathematical concepts and processes. For example, children use several terms deeply connected to

ToonTalk. Depending on the knowledge domain they are working on, they also share some other terms particular to the domain or to the key actions involved in that domain. For example in activities based round ecology, which we named 'Ecomodelling', children talk about "changing behaviours" referring to the modelling processes involved. In activities based around the idea of randomness, expressions such as predictable and unpredictable, "enough information", "choices", "extractions" are used by children and are part of their regular vocabulary both in the sessions and in the webreporting. In Numbers activities, terms such as "generating intelligent and challenging number sequences", "prediction", "complex sequences" are part of their daily discussions and reports. Similarly we identified ways of representing ideas that become part of childrens' repertoire, such as including a box with "instructions" (e.g. "Read Me") in the set of boxes with robots and inputs in order to make easier for their imagined audience to use (peers in other schools and countries).

References

Wenger, E. (1998). *Communities of practice – learning, meaning and identity*. Cambridge: Cambridge University Press.