

CULTIVATING COMMUNITIES OF PRACTICE WITHIN PROJECT WEBLABS

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PROJECT WEBLABS¹

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Abstract

This paper gives a brief account of the way communities of practice are developed and sustained within school based activities using ToonTalk². First, we give general information about the aims and activities of the project WebLabs. Secondly we present a brief rationale on the idea of community of practice according to Wenger (1998) and Wenger, McDermott & Snyder (2002). Thirdly we illustrate how communities are being developed within the project. And finally we discuss the relevance of a framework derived from a situated perspective on learning (Lave & Wenger, 1991) to address the issue of the way technology constitutes the practices of the children within WebLabs.

The project WebLabs

According to the proposal submitted to the EC, Project WebLabs aims to investigate the creation of new ways of representing and expressing mathematical and scientific knowledge in European communities of young learners. The focus of the project is on collaborative construction, description and interpretation of how things work. Our aim is to transform the web into a medium in which students collaboratively construct and critique each others' evolving knowledge and working models.

Sets of Transparent Modules are being developed that are simultaneously reusable and composable for building more complex functionalities, shareable, adaptable to multiple grain sizes according to learner needs, transparent (mechanisms can be easily inspected and modified), and employ multimedia and multimodal functionalities. The project uses ToonTalk, a programming system where computational concepts are represented by concrete animated analogues. One set of TMs will control tangible physical sensors and actuators that afford a two-way connection between computer models and corresponding physical experiments (Project WebLabs, 2001).

Within the project activities, students across European sites create, share and modify multimedia web-based reports of their understandings of selected knowledge domains as they develop during work on carefully designed educationally powerful activities that involve building and debugging models with sets of TMs. The web reports will include working models along with multimedia descriptions, interpretations and reflections that include audio and video clips, textual and graphical explanations and reflective guidance. These will be enhanced by agents that can speak, listen and move around web pages to guide reflection and learning. The project is also developing evaluation methodologies for assessing learning of individuals and communities.

Within the project, e-learning is seen as a natural process that occurs by people interaction at distance (but possibly including real encounters) when people develop activities within some practices where we can identify common enterprises and a shared repertoire (Wenger, 1998). The project Weblabs is mainly concerned with learning in the domains of science and mathematics.

WebLabs is coordinated by a team of researchers in the Institute of Education of the University of London. Different teams were constituted in different countries according to the specific tasks they have within the project. A set of sites were defined to allow the empirical experiments to take place with children. The dimension of the groups of children varies from 4 to 18 according to the context, the space

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² For details about ToonTalk see www.toontalk.com

and the resources. In the United Kingdom, WebLabs' children develop their activities in the South Camden City Learning Centre (CLC). This is not a school, but rather a provider of ICT facilities to learners in the local area. The WebLabs' site in Sofia, Bulgaria, consists of a group of students from 5th grade, coming from a public school located in the neighbourhood of the Faculty of Mathematics and Informatics, University of Sofia. The kids in Plovdiv, Bulgaria, belong to the "Academy 21 Century" - a private educational enterprise that doesn't replace, but supplements regular school activities. The WebLabs groups of 7th grade pupils in Sines, Portugal, belong to the Secondary School Poeta Al Berto. The room where sessions take place is equipped with 4 PC computers and Internet access. The room is shared with groups of students who have special needs support from teachers. The second Portuguese group is based in Corroios Basics School, in the village of Corroios, where a group of 8th graders meet in the school computer lab. The third site in Portugal is located in Alfredo da Silva Secondary School, Barreiro. The school gives students who already dropout the school the opportunity to get a diploma on Basic Education provided that they get a number of special compulsory courses and here the WebLabs' group is formed by 9th graders who are not very motivated for studying (and usually don't like to engage in activities that extend the regular class schedule) that meet in the school computer lab once a week. The Swedish WebLab' group belong to the school Eriksbergsskolan, Stockholm. The school has an educational profile focusing on communication, which means that students are encouraged to make presentations to the whole group, to have open discussions and to engage in performing arts. In Nicosia, WebLabs activities with students come from four different schools take place in the meetings of the club Using computers for the learning of Mathematics and Science in the Mathematics Education Lab, in the University of Cyprus.

In summary, the table 1 shows the situation of the different sites in May 2003:

Table 1: WebLabs sites

<u>Partner</u>	<u>City</u>	<u>Institution</u>	<u>Number of groups</u>	<u>Total of children by group</u>
<i>UK</i>	London	CLC	1	4
<i>Portugal</i>	Sines	EB Poeta Al Berto	2	10
	Corroios	EB Corroios	1	18
	Barreiro	ES Alfredo Silva	1	7
<i>Cyprus</i>	Nicosia	Univ. of Cyprus	3	15
<i>Sweden</i>	Stockolm	Eriksbergsskolan	1	8
<i>Bulgaria</i>	Sofia	Univ. Sofia	1	8
	Plovdiv	Academy 21 Century	3	18

Rationale

The notion of 'community of practice' as it is used within the situated approach to learning is helpful to address the analysis of children activities in a computer environment – and particularly within the project WebLabs - in two aspects: (i) as an analytical tool, in order to better understand how students, as a whole and in each site, evolve along the work within the project; (ii) as a tool for thinking-in-action, a guide for researchers and teachers to organize the principles of action and efforts for implementing and sustaining communities. We will summarize some ideas we consider central to the concept of community of practice. This framework is organized following key ideas coming from Wenger (1998), Lave & Wenger (1991), Wenger, McDermott, & Snyder (2002), and Bliss, Säljö, & Light (1999).

Communities of practice are about content, not about form. However and despite the various forms they can take, Wenger, McDermott & Snyder (2002) consider that there are three key structural elements of a community of practice: the domain, the community and the practice.

Domain. This is what creates a common ground and a sense of the development of a common identity, legitimizing the community through "the affirmation of its purpose and value to members and stakeholders" (Wenger et al., 2002, p.27). It is the main source of inspiration for the members to

contribute and to participate in order that they make sense of the meanings of their actions and initiatives. But the domain is not a fixed set of problems or elements; it's an evolving thing encompassing the evolution of the social world and the community itself.

Community. "The community creates the social fabric of learning" (Wenger et al., 2002, p.28). Assuming that learning is a matter of belonging and participating, community becomes a central element as a group of people that interact, learn together, construct relationships, develop a sense of mutual engagement and belonging. The idea of community does not imply homogeneity. If "long term interaction creates a common history and communal identity, it also encourages differentiation among members [who] take various roles [...] creating their various specialties and styles." (Wenger et al., 2002, p.35). Regarding the dimension of a community, the relevant issue is that we need a critical mass of people to sustain participation but we should be aware that if the community becomes too large that can inhibit interaction: At the same time the community changes its nature as its dimension grows. Issues of leadership and the creation of a learning atmosphere come also to the core of the elements of a 'successful' community.

Practice. Practice is constituted by a set of "frameworks, ideas, tools, information, styles, language, stories, and documents that the community members share. Whereas the domain denotes the topic the community focuses on, the practice is the specific knowledge the community develops, shares and maintains" (Wenger et al., 2002, p.29). Practice evolves as a "collective product" integrated into participants' work organizing knowledge in a way that becomes useful to participants as it reflects their perspective.

The development of communities of practice within WebLabs

Different teams in the various countries started from different previous experiences with the use of ToonTalk and planned for the implementation of sites according to the possibilities and conditions found as more appropriate regarding the aims of the project. The implementation of sites for WebLabs' activities with children started with negotiation with the people in charge of the institutions where the activities would develop and the definition of conditions for working. In all sites described in the previous section, the activities with children started with the introduction and consolidation of the use of ToonTalk. This was meant to create good conditions both to the development of children competence with the software and to set up a common tool within the different sites. As sessions with children take 60 or 90 minutes (depending on the site and the group) many opportunities were created for children to develop oriented activities and to freely explore ToonTalk.

In www.weblabs.eu.com several web-reports show how communication between children and researchers develop denoting engagement both from the part of children and researchers, for example in the discussion of ToonTalk features. In fact, ToonTalk (as the software that comes to be the basis for the development of activities in WebLabs) and its use became the key domain (Wenger, 1998) for the communities in the first sessions denoting the topic they focused on. It worked as a common ground and began to help the development of a common practice.

For example, in Corroios Basic School in Portugal, the children participating in WebLabs belong to regular 8th grade classes of a mathematics teacher. The option for the beginning sessions with ToonTalk activity was to follow carefully step by step the quiz game suggested when children open the software. This allowed the teacher and the whole Portuguese WebLabs team to appreciate the way children were living the new activity. We should note that most of the first comments coming from children deal with the software itself and not with other features of the activity, meaning that they were focused in the specific domain of the software as expected in the first sessions. The teachers wrote down as a web-report their comments on the first sessions and referred for instance that "the explicit intention was not to give much information but to allow children some space for exploration [...] some children understood this option as part of the game and others felt it was a bit stressful". It was clear that the introduction of ToonTalk through the puzzle game generated an effect of enthusiasm as the teacher refers that "pupils got addicted in TT".

In Eriksbergsskolan, Sweden, the first session started by researchers Jacob and Ylva holding an informal lecture, introducing the WebLabs project for the whole class. They showed some ToonTalk examples from the previous Playground project on an big screen and asked the children what they know about computer programming, what they use computers for and what they would like to do on the computer. It was found that most students had computers at home and that they used them a lot for playing games, chatting, sending emails, looking up things on the internet and for typing school-related work into the computer. Although a few students seemed fairly advanced computer users (knowing how to download and install programs, making web pages, etc) none of them were familiar with computer programming. Children had a worksheet to follow which contained roughly the following:

First start ToonTalk, land with the helicopter and enter the house, and sit down. Write your names on to text pads and put them on each other (*Bammer* concatenates the names), write your ages on number pads and put them on each other (*Bammer* adds them together), write "/2" on a number card and put it on top of the age card and see what happens (*Bammer* divides by 2).

Play the game, suck out an object and flip it. What do you think the objects on the back does?

Do we want to make any changes to the game? (the game is really dull so most kids would like to improve it in some way). Do some changes (change speed of objects, add/remove behaviours, change appearance of objects, etc).

[...]

(original in Swedish)

The worksheet makes explicit reference to Bammer, a character of ToonTalk that “put things together” once we drop one over the other and gives some suggestions for children to follow in order to make sense of the way Bammer works. In the second part, children are asked to play a game (a kind of puzzle where they have to travel from one side of the screen to the other without being eaten by the “enemies”. But the game is very easy and thus children are encouraged to make it more complex and inspect the way it is constructed (flipping objects and looking at the robots behind them). Finally children are asked to go and program their own robots to make some arithmetics.

At the introductory sessions in the different sites, ToonTalk was seen as a domain of work both by children and by researchers and teachers. In London, we could talk about ToonTalk in use, in Portugal it was ToonTalk as a game, in Sweden ToonTalk as a high-level computer programming tool and in Bulgaria a mediation tool to implement solutions to problems. However different sites took different approaches according to the background of the people coordinating the sessions, ToonTalk didn't play the role of a fixed set of problems, instead it was seen as an a concrete opportunity for the exploration of a whole field of ideas – in a range going from programming to representation of behaviors by objects on the screen.

In Sofia, Bulgaria, ToonTalk was introduced to children through worksheets that the researchers prepared before and putting it in the context of problems of coding/decoding messages. This is an example of a module plan. The researchers made the following report after one of the sessions:

Session web-report

[...] The researcher introduced the Greek system of representing the numbers. Kids grasped immediately the idea that numbers can be expressed not as usual (by digits) but by other symbols (letters). So the Greek “n” means 50 and the Greek “a” is 1 and their concatenation “na” is 51. One of them said:

“I can add letters to letters and get the decimal numbers corresponding to them.”

Only knowing the key table putting in correspondence the Greek symbols against decimal numbers would reveal the actual meaning of letter strings such as “na”. It was the leading clue to the core of the subject – changing the information so that only those who knew the key would know its actual meaning.

Further the researcher [...] showed how numbers could be added to the first and the last letter of a word written on a text pad. The kids asked then how numbers could be added to the letters in the middle of a word. We encouraged them to think for a solution and they concluded that word had to be broken apart in letters before coding them with a number. After experimenting with sucking/erasing Dusty modes they began to erase boxes relatively handy.

[...] After successfully coding the first short word some kids rushed into coding longer words and even whole phrases. One of the kids asked:

“Is the space between words also a symbol for the computer?”

They were amazed when the result of the coding was a new resonant word. One of them asked his friend:

“Do you have a *gex*?”

]“What, what...?”

“This is *cat* coded with 4.”

After having performed the same operation many times one of them became lazy enough to ask:

“Can we use robots to do this for us?”

Then we made a plan how to train a robot and how to get the result from the coding/decoding back. Kids were curious to see that the robot repeated every single movement of theirs (even the ones done sometimes by mistake).

For those who were teaching the robot for the first time it was not an easy work. The task had to be redone several times before a successful completion. This was partly due to the fact that the robot had to perform many consecutive actions of different kind: breaking and assembling a word, using an intermediate box which had to be erased afterwards, coding and working with a bird. So far kids had trained robots to do one, (at most) two tasks.

[...]

At the end of the lesson one of the kids said:

“I am so glad that I came here!”

(adapted by the authors from a web-report produced by the Bulgarian WebLabs team)

Sustaining activities in the communities

The activities developed quickly in the different sites and soon ideas, successes and difficulties were reported and discussed within the communities through the internet. This happened both at a local level (for example, the whole team meeting on Saturday afternoon at the University of Lisbon to share and discuss issues emerging from the work done with children during the week in the three sites or the chat through instant messaging in the evening after the Weblabs' sessions in the schools) and at a global level (for instance, the Swedish team sharing through a web report posted on the WebLabs home page the problems encountered and having comment and input from other partners). This happened in a variety of topics showing how interaction between all partners – including teachers, researchers and pupils – builds up communities and creates the social fabric of learning.

The reflective reports written by teachers or by researchers (with input from children) are examples of the ways how members of the community (again both at a local and a global level) share frameworks, ideas, tools and information making specific the knowledge the community develops and maintains. Practice within those communities tend to evolve as a “collective product”. For this development several contributions seem to be relevant. First, the interactional facilities provided by the WebLabs setting – both in terms of physical space in the different sites and the possibility of publishing web reports and exchanging emails as a virtual space for communication – bring in opportunities for members of the communities to define joint tasks and take initiatives making them knowledgeable to others and thus creating a sense of mutuality. As children and researchers keep building and maintaining the history of their practice - recording and sharing information about the on going activities and discussing and making representations of the results of the discussion through the web reports - they are producing a reificative memory of the practice (Wenger, 1998). Because the different teams create spaces of interaction that allow people to participate in the negotiation of the ways events are reported within the community and thus creating ways of showing the developments, the communities contribute to maintain a participative memory therefore allowing continuity of the practice. All these contribute to the development of the competence of members creating entry points for the negotiation and development of new enterprises shaping the engagement of people a rather crucial dimension of belonging to the communities (Wenger, 1998) and as a condition for the community to develop in a certain direction.

Inducing consciousness that one belongs to an international WebLabs' community is helping to create possibilities for people to realize their location in the space of the different local communities and at the same time creating possibilities for people to locate themselves in the meanings shared by the members allowing orientation within the community. In WebLabs' communities knowledge and power are being distributed among researchers, teachers and children and this seems to create conditions for people to locate themselves in the project. Although communication between sites in different countries is now starting, we envisage that this is a crucial dimension that can make more concrete and help the development of imagination – as a key dimension of the belonging to the communities (Wenger, 1998). This dimension of the development of the communities is reinforced as the design of the WebLabs project proposal allows and requires space to participate in the definition of the next steps of the project, this enlarges the vision of “what's coming” and allows members to think of possible trajectories of the practice creating hypothetical scenarios and virtually inventing the future.

In different forms, both the voice of children and the questions and voice of researchers focus on the domain of practice of the community as constituted by ToonTalk use. However we see this as a fundamental stage in this first phase of the project the tendency will be to see ToonTalk becoming more and more transparent and children focusing more and more on the topics in science and mathematics.

Topics for reflection

It seems that in different sites children have different ways of working, positioning themselves as members of a group or assuming a more individual role in the sessions. It can be the case that a tendency of some children to work on an individual basis creates difficulties to the development of the community. Although we certainly agree that individual tasks should have a place in all kinds of activities, we also maintain that a collaborative dimension should be part of the work at all levels. Teachers and researchers should be very attentive to the format of the sessions and make the modifications according to their options – not letting it just happen. This is one of the topics that will be focus of analysis and discussion in the different sites and among sites in different countries.

A second topic for reflection emerging from the first phase of work refers to the type and nature of structuring resources that are brought in by participants. On one side we have worksheets including a set of structured instructions and/or ToonTalk objects in a file to be explored and inspected, short experiments with ToonTalk pre-programmed robots, etc, that children use as guidelines for the session with a certain degree of freedom to go and open new avenues in the exploration of the situation given by the teacher/researcher. On the other side, children are using peers and researchers as structuring resources (in different forms and with different orientation) both within a certain local group and also in distance communication. And finally we can see ToonTalk as a basic resource that children are using to represent and express knowledge in new and innovative forms. How these resources are acting as a platform to the development of ways of represent, express and communicate knowledge, within and among communities, is a topic for further analysis.

A third topic of reflection deals with the need to find ways of assessing learning within these communities. It seems to be easy to find symptoms of learning but we need criteria that we can use to describe learning with some kind of evidence. However we see knowledge as distributed among the participants and the resources they are using and we sustain that learning is an integral part of the practice taking place, we feel a need to find ways of describing that practices in order to make more explicit how and what learning is taking place, avoiding methods used in school - like written tests. That is the challenge we face in the next phase of the project.

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