Conception and implementation of rich pedagogical scenarios through collaborative portal sites: clear focus and fuzzy edges

Daniel K. Schneider,
with Paraskevi Synteta, Catherine Frété, Fabien Girardin, Stéphane Morand
TECFA, Faculté de Psychologie et des sciences de l'éducation,
Université de Genève

Working paper prepared for an invited keynote address and workshops at

ICOOL
International Conference on Open and Online Learning
December 7-13, 2003
University of Mauritius

URL: http://tecfa.unige.ch/proj/seed/catalog/docs/icool03-schneider.pdf

Abstract

Recent interest for rich activity-based pedagogies that originate in various socio-constructivist schools of thought is tied to the goal of creating deeper, more integrated and more applicable knowledge. We also want students become better general problem solvers and better group workers. Finally there is a pressure to make learning more interesting and even more fun. However, experiments made with learner-centered "new pedagogies" have shown that automatic results are not guaranteed. Good pedagogical design is crucial to their success. The efforts to make "new pedagogies" effective requires the use of structured scenarios where the teacher has to fulfill a triple role of **facilitator**, **manager** and "**orchestrator**". In addition, learning should happen within a social space that provides intellectual and emotional support. Therefore, supporting technology, i.e. virtual learning environments, should be designed both as "**scenario engine**" and as **true virtual space** where participants have "presence". Such systems can be implemented with Community, Content and Collaboration Management Systems (C3MS) that have been developed for collaborative portal sites. According to our experience, they allow us to create learning environments that provide a **"clear focus"** (learning activity support, management and scenario orchestration) but also necessary **"fuzzy edges"** (community support).

Contents

The challenge

Today exists an increasing interest for so-called “active” and “rich” pedagogies that originate in various socio-constructivist schools of thought, e.g. project-based, problem-based, enquiry-based or case-based learning. There are multiple reasons. So called “traditional” pedagogies are very efficient for “knowledge transmission”, but often lead to isolated and superficial knowledge which is difficult to integrate and to apply. In the modern changing world there is an increasing need that students become better general problem solvers and better group workers. Finally there is a pressure to make learning more fun in order to spark both student’s individual interest.

However, experiments made with learner-centered “new pedagogies” have shown two things: (1) “Old teaching” by content transmission plus exercising remains more efficient for teaching ***basic*** vocabulary, concepts and even skills. We will not come back very much on this matter here, but do insist that modern approaches to learning should be “blended” and use the right approach for a given pedagogical goal. (2) “New pedagogies” including project-based and collaborative learning do not guarantee automatic results. Framing and support by teachers is crucial to their success. Both learners and teachers are frequently “lost” and it therefore is important that teachers do not just propose “projects to do” and provide “help whenever needed”. In other words, effectiveness is not guaranteed by adapting vague pedagogical strategies. The efforts to make it effective require the use of somewhat **structured scenarios**. The modern teacher has to fulfill a triple role of **facilitator**, **manager** and “**orchestrator**” of pedagogical scenarios which we will elaborate in much more detail through this chapter.

We define a pedagogical scenario as a **sequence of phases** within which students have **tasks to do** and specific roles to play. In other terms we advocate creative but flexible and open “story-boarding”. While teachers can regulate and orchestrate complex scenarios with very little technology the effort can soon become cumbersome. In addition, more advanced functionalities like visualizations of student activities can simply not be done without the help of technology. This implies that modern and active pedagogics are more successful if the teacher can profit creatively from information and communication technology (ICT) according to his and his student’s needs.

While the pedagogies and the technology advocated here could be applied (with modifications) to any educational level, we will focus in this paper on scenarios that are appropriate to higher secondary and university education at graduate or undergraduate level.

1 PEDAGOGICAL DESIGN

In the heart of a rich, active and open pedagogical scenario are student activities mediated through products. In more simple terms: in order to learn, students have to create. In analogy to research projects we seek knowledge gain through the medium of artefacts like written text (memos, publications, etc.). “The reason that Dewey, Papert, and others have advocated learning from projects rather than from isolated problems is, in part, so that students can face the task of formulating their own problems, guided on the one hand by the general goals they set, and on the other hand by the 'interesting' phenomena and difficulties they discover through their interaction with the environment” (Collins et al 1989: 487). Powerful learning environments that aim at the development of general problem skills, deeper conceptual understanding and more applicable knowledge include according to Merriënboer and Pass (2003) the following characteristics: “(1) the use of complex, realistic and challenging problems that elicit in learners active and constructive processes of knowledge and skill acquisition; (2) the inclusion of small group, collaborative work and ample opportunities for interaction, communication and co-operation; and (3) the encouragement of learners to set their own goals and provision of guidance for students in taking more responsibility for their own learning activities an processes." We shall expand some of these ideas.

Pedagogies adhering to such principles believe in socio-constructivist learning theories in a very broad sense. First of all as an understanding of learning that stresses the importance of knowledge construction based on previous knowledge and interaction with the social environment, e.g. theories that have grown out of constructivism (Piaget) and socio-culturalism (Vygotsky). Second as a set of pedagogies that use strategies like project, problem, case-based learning and/or working within authentic contexts. We can therefore call these new pedagogies "**construction-based**" teaching, since both internal meaning and artefacts are to be constructed. We can also call them "**activity-based**", since the teacher has to design student activities.

Interaction among subjects has an important place within these new approaches. As stated in Dillenbourg (1999:6) "Collaborative learning is not one single mechanism: if one talks about 'learning from collaboration', one should also talk about 'learning from being alone'. Individual cognitive systems do not learn because they are individual, but because they perform some activities (reading, building, predicting,...) which trigger some learning mechanisms (induction, deduction, compilation,...). Similarly, peers do not learn because they are two, but because they perform some activities which trigger specific learning mechanisms. This includes the activities/mechanisms performed individually, since individual cognition is not suppressed in peer interaction. But, in addition, the interaction among subjects generates extra activities (explanation, disagreement, mutual regulation,...) which trigger extra cognitive mechanisms (knowledge elicitation, internalization, reduced cognitive load,...)". We can distinguish three different degrees and qualities of interaction among members of a learning community:

1. In "Collaborative work" partners work together on the same task, either synchronously or in frequent asynchronous interaction.
2. In "Cooperative work" partners split the work, solve sub-tasks individually and then assemble the partial results into the final output.
3. In "Collective work" each works alone on his task, but shares results and problems with the others, and therefore shares inspiration, exchanges help and so forth.

True collaborative pedagogies are generally the most difficult to implement, since there must be some degree of symmetry and actors must have a high capacity for negotiation. In other words, situations are difficult to achieve where peers are more or less at the same level, can perform the same actions, have a common goal and work together (Dillenbourg 1999). Cooperative designs are easier, but the benefit is only interesting if the global task - i.e. building a common artefact like a encyclopedia about certain topic or physical object like a solar vehicle - stimulates individual work. "Collective work" can be added on top of each other strategy in order to boost individual (cooperative) or group (collaborative) performance. Collaborative and cooperative designs can be mixed, e.g. collaborative work in small groups can be combined with a cooperative scenario at the class level. Interaction among subjects can take many forms and each kind may provide different types of benefits.

But, as we said before, effectiveness is not guaranteed if the teacher simply asks students to do projects and to learn together or at least to profit from each other. They risk is high that students can't start, get lost or are otherwise unproductive. We therefore suggest to create semi-structured pedagogical ***scenarios*** that define an orchestrated sequence of learning activities. Such a scenario is often called a "script" in the literature and in particular in the field of Computer-supported collaborative learning (CSCL): E.g. Dillenbourg (2002) defines a script as a story or scenario that the students and tutors have to play as actors play a movie script. Such pedagogical scripts can be become very sophisticated: for each phase the script specifies tasks students have to perform, the composition of the group, the way that the task is distributed within and among groups, the mode of interaction and the timing of phase. Phases are ordered and connected, i.e. outputs of one phase become inputs of the next phase. Pedagogical scripts are mostly sequential, at least from the students perspective. However, this does not mean, that these are merely instructions that the learners have to follow. Tasks can and often should be defined as mere goals, e.g. at some point the teacher can ask students to hunt down and formulate definitions of the objects they will have to study. The way they do it is left open.

When designing and executing a pedagogical scenarios the teacher has to respect a harmonic equilibrium between the freedom which is necessary for intellectual development and motivation on one hand and certain guiding principles on the other. Engagement in a project and open confrontation of ideas must be guided by structured activities and a certain amount of monitoring, but the teacher should not overscript and overregulate since it will have negative effects on crucial factors like development of general problem-solving, metacognition capacities, motivation, etc. that we have defined above as majors pedagogical goals.

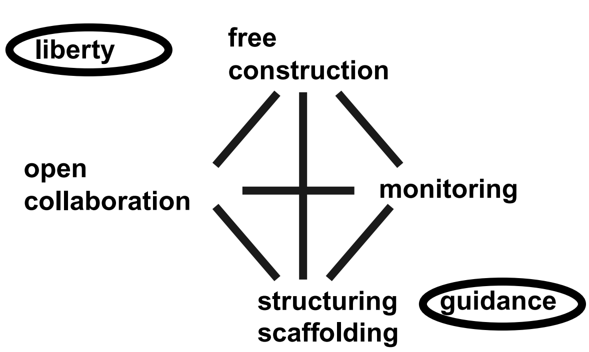

Figure 1: A careful equilibrium between liberty and guidance is needed.

Activity-based, collaborative, and construction-based pedagogies can be implemented at three levels: (1) the micro-level, i.e. smaller pedagogical scenarios or projects which can be components for larger projects, (2) long term projects, i.e. project-based classes and (3) the general study environment favoring student initiative and community building on which we will come back later. While micro activities (lasting only over a single or a few lessons) can not reach the same goals as true project-based teaching, they nicely can complement traditional instruction and are often the only realistic alternative in today's organization of the school and university system. We now will examine particular instructional design issues, first at the level of smaller scenarios and then for larger project-oriented classes.

Pedagogical scenarios / small projects

A key feature of structured socio-constructivist teaching involves sequencing scenarios and therefore breaking the "problem" into parts so that students are challenged to master as much of a task as they are ready to handle.

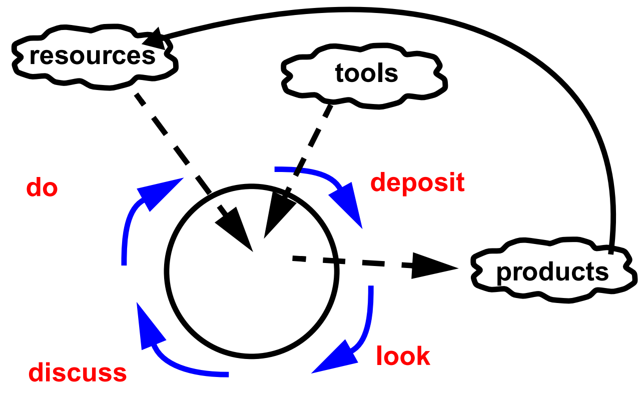

Figure 2: The basic do-deposit-look-discuss loop.

From a more abstract perspective, scenarios evolve in cycles, e.g. a typical teaching/learning phase has more or less the following ingredients (in whatever order):

1.Do
2.Deposit
3.Look
4.Discuss

As figure 2 shows, resources, tools and products play an important role. Each time a student does something, there should be a product (even as small as a little message) that is deposited somewhere and that can be looked at and discussed. Below is an alternative but very similar loop showing that there are variants of the same principle: Things are looked at, things are produced and discussion happens. It is the principle of information seeking, production and interaction that counts.

1. Look (discovery)
2. Discuss (interaction)
3. Do (production)
4. Deposit (sharing)
5. Feedback (discussion of results)

The teacher's ***manager*** role is to make sure that such loops are productive, e.g. that the students produce something, that it is task related, that they engage themselves in meta-reflection (look critically at their own work) and that they discuss and share with others. The teacher's ***facilitator*** role is to help students with their tasks, e.g. help them to select resources and tools, explain difficult concepts and procedures, "debug" when they are stuck etc. The teacher's ***orchestrator*** role is to implement (or most frequently also to create) the scenarios or scripts as they are also called. This means basically to define a scenario as a sequence of clearly identifiable phases in a way that learners focus on a smaller amount of tasks at the same time and that these tasks are not too difficult to be solved at some point.

Let's have a look at a simple example. Imagine that for a given purpose, students need references for a project. We can turn this into a pedagogical activity with a scenario that includes the following steps:

1. The teacher introduces the theme, gives clues and asks students to consider the different aspects of the subject (Discuss).
2. Students search the web with various search engines and bookmark the links they find interesting (Look, Deposit).
3. Students then try to work out a certain amount of categories and sub-categories for this theme (Look, Do, Deposit).
4. The results are put in common and a hierarchy is worked out (Look, Do, Discuss).

5. The approved categories are entered in a common space (e.g. the classroom wall, a sheet of paper or an electronic links management system) (Deposit).
6. Students classify, enter and describe their links (Do, Deposit).
7. Teacher provides an evaluation (Discuss).

As this example clearly shows, most activity-based, constructive and collaborative pedagogies do not necessarily need any special tools, but work can be made more efficient (after some adaptation period) and certainly more powerful by adopting some support technology. Walls in a classroom run out of space, paper is lost and collaboration within the classroom is under heavy time constraints and "home work" lacks the sort of support that classroom activities have. Content needs to managed, knowledge exchange must be organized, discussion tools must favor exchange of arguments, projects must run, and generated knowledge must be managed. We will examine facilitating technology in the section on "TOOLS" [p. 12].

As we said before, scenarios should not be "over-scripted", the student should in general be its own master of the tasks and tasks should have some flavor of authenticity. Along similar lines, the teacher should not directly interfere with student's products, but only give feedback and evaluation and let the student fix things himself. Defining a scenario therefore is a ***workflow*** design problem, but with the idea that pedagogical workflows are different from the ones in industry. In industry the goal is the product, in education the goal is apprenticeship, i.e. what the student has learnt from performing a set of activities.

What kinds of activities typically happen in such a workflow approach?

(1) Gathering and distribution of information:

- Teachers and learners share resources and the activities are designed to help them gather information and make it available to all.

(2) Creation of collaborative documents:

- Here the students can write definitions, analyze cases, solve problems, write documents and create illustrated documents together around specific themes.

(3) Discussion and commentaries around productions:

- Learners identify together facts, principles and concepts and clarify complex ideas. They formulate hypothesis and plan solutions, make links between ideas, compare different points of view, argue, evaluate... …

(4) Project management related activities:

- Learners can decide work plans, share tasks and form groups, decide a schedule…
- Teachers can distribute and regulate tasks

Let's now address the issue on how we combine simpler scenarios into larger ones.

Project-based courses

Project Based Learning is a teaching and learning model (curriculum development and instructional approach) that emphasizes student-centered instruction by assigning projects. It allows students to work more autonomously to construct their own learning, and culminates in realistic, student-generated products. More specifically, project-based learning can be defined as (Synteta 2001:13) :

- Engaging learning experiences that involve students in complex, real-world **projects** through which they develop and apply skills and knowledge
- Learning that requires students to draw from many information sources and disciplines in order to solve problems
- Learning in which curricular outcomes can be identified up-front, but in which the outcomes of the student's learning process are neither predetermined nor fully predictable
- Experiences through which students learn to manage and allocate resources such as time and materials.

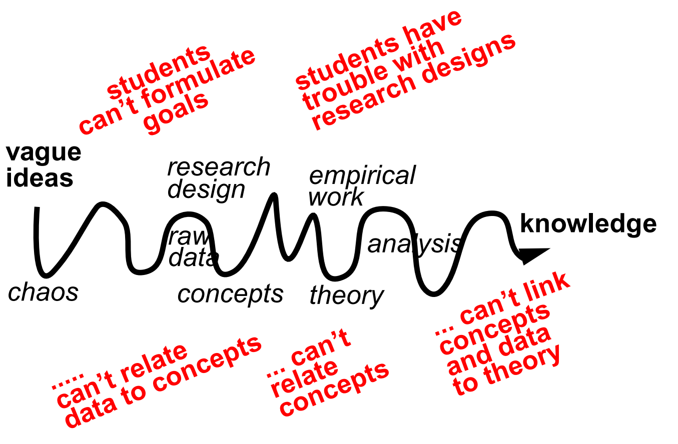

Figure 3: From chaos to knowledge - some difficulties with projects

Projects are complex endeavours involving many different activities. In particular students have trouble for (a) initiating inquiry, formulate coherent research questions; (b) define a research project; (c) direct investigations; find resources, (d) manage time; keep deadlines, estimate time needed to do a task, (e) collaborate and give feedback; articulate work of others and give regular feedback, (f) follow-up the project; revise products, (Synteta & Schneider 2002). In addition to the difficulty of setting clear goals for various phases, students have trouble relating data, concept and theory.

Figure 3 shows a picture of inductiveness that does not necessarily exist for all kinds of project "story-boards". This one depicts some typical exploratory student research that has been conducted in one of the author's own courses but it also has been observed in enquiry-based designs. The figure puts emphasis on the "being lost" and "can't cope with all the information" syndrome that is typical for a lot of student projects. While it is the role of the teacher to orchestrate (define both boundaries and steps for student activities), a certain amount of fuzziness is absolutely desired for several reasons. First all students must be trained early on to cope with these sort of situations, because they are current in "real life", i.e. fuzziness is part of authenticity. Second, only when students are put in situations where they have to re-construct knowledge (not just to reproduce it) are they able to constitute deep, grounded, connected and applicable know-how. While such learning is harder than reproductive learning it does create more powerful knowledge structures if done right.

However, since the student is not just to supposed to ask questions whenever he is stuck and to limit his production to whatever he feels be able to do, we do need both constraints and scaffolding. A teacher should **orchestrate a project into several more or less sequential scenarios** who in turn can be broken down to smaller phases (we will discuss an example on page 27). This will insure that learners will focus on smaller sub-problems, will do things in the right order (e.g define research goals in the beginning of the project and not in the middle).

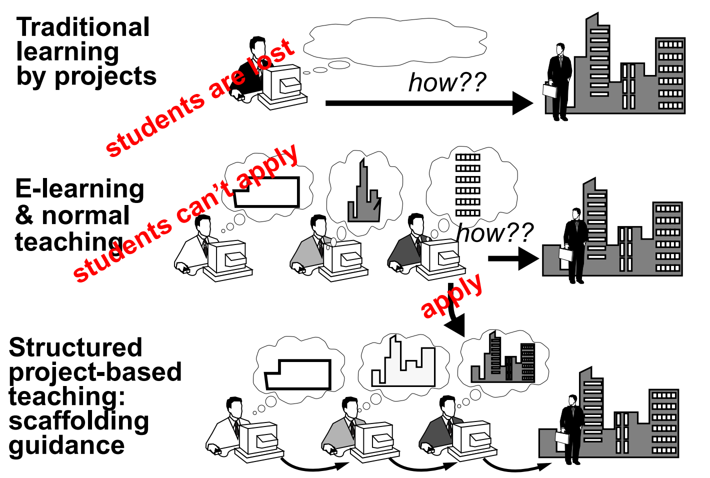

Figure 4: The complementarity of traditional and structured project-based teachings

A project-based learning design (even one of the structured kind that we advocated here) can be **supplemented** by traditional reproductive learning, since it is often not efficient to teach basic "know-that" and basic "know-how" knowledge by the means of a project. Various pedagogical designs are often complimentary. E.g. grammars for languages must be taught by "drill and practise", but then they also must be applied at some point in order to make language skills efficient. The same can be said for many domains like engineering, law or economics.

2 THE COMMUNITY AND MOTIVATION FACTOR

The general study environment

The community factor is particularly important in open and distance learning situations. As formulated by e-learning practitioner Gilroy (2001) "E-learning should be first and foremost about creating a social space that must be managed for the teaching and learning needs of the particular group of people inhabiting that space". Going one step further, on can claim that: "In order for individuals to learn how to construct knowledge, it is necessary that the process be modeled and supported in the surrounding community. This is what occurs in a learning community" (Bielaczyc & Collins 1999: 272). While a large part of our knowledge comes indeed from formally planned learning scenarios, people **learn a lot from informal exchange** with fellow learners, with professors, experts, i.e. from exchange within tightly or loosely defined communities. We can define communities as networks, made up of individuals as well as public and private institutions. They share a certain amount of **practices**, common **goals** and common language. They do have a social organization including formal or informal hierarchies and some idea of "**social service**" (members helping each other).

Beyond this abstract definition, "community" is quite an ambiguous concept that encompasses, for example, communities of practice (e.g. teachers from the same school or teaching similar things), local communities (people living in the same area) and virtual communities (people sharing some information over the internet). In our case, the core of a learning community is the **class** and such communities can quite easily be enhanced to with the help of collaboration and information systems because social interactions can be mirrored and reified (there are traces left that can be inspected) and students also can meet synchronously or asynchronously when they are not in class. In addition to support the class-as-community, we suggest to open portals to the outside world and to let profit other classes from the resources and work produce, to show other teacher's how "you did it".

It is also possible and highly beneficial to have either formally or informally outsiders (like domain experts) participate. E.g. the portal used to teach some academic matter could also be promoted as a resource site (web links, Frequently asked questions (FAQs), support forums, articles about new developments) for the whole world. Attracted Internet users may at some point start to participate and there enhance the teacher's and student's own information and collaboration web. It is even conceivable to plan the other way round. A teacher in academics could also start by building up a community site for a given topic and then include students activities inside to make it more "lively". Figure 5 shows the general idea which can be configured in many variants.

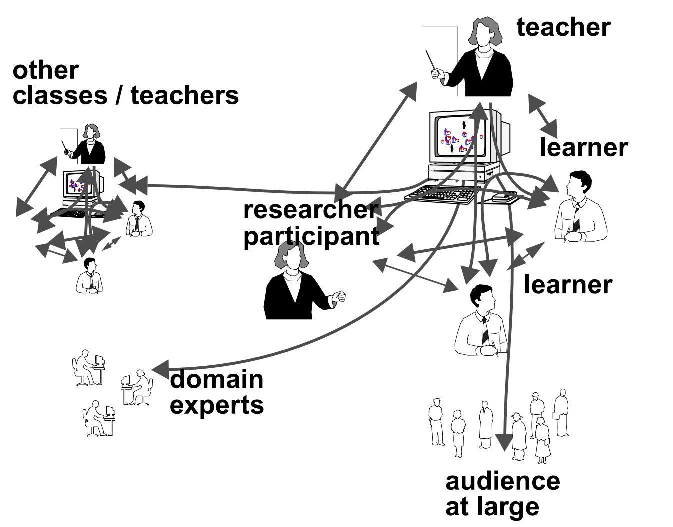

Figure 5: Webs of cooperation and the "open classroom"

Intensive pedagogics, flow and creativity

It is very important to us that t**eaching generates enthusiasm, enhances concentration and favours creativity**, which are very distinct but somehow interconnected phenomena.

Lloyd P. Rieber (1998) convincingly argues that learning process itself - and not just the result - should be interesting, if one seeks higher motivation among learners. "Serious play" or "**hard fun**" are intense learning situations where learners engage large amounts of "energy" and time and that do provide equally intensive pleasure at certain moments and which have been identified as "flow" or "**optimal experience**" by Mihaly Csikszentmihalyi in 1990. Flow situations have been mainly noticed and studied in play or artistic creation and are defined as states of happiness and satisfaction that arise when "carried" by an automatic and spontaneous activity. It is interesting for teachers to know that "flow states" go along with the impression of discovery and creation and boost performance in conjunction with important cognitive efforts. "Flow states" are therefore highly desirable, both for the individual student and the teacher. Conditions in which flow happens are characterized in the literature by an optimized level of challenge, a feeling of control adapted to the learner, a touch of fantasy, and feedback of the system. Details are shown in table 1l.

Table 1: Constituent elements of the flow experience

Element	*Details*
challenge & curiosity	• an activity should trigger curiosity and allow the learner at the same time to formulate goals, while preserving some element of surprise regarding the outcome.
control	• levels to play (in gaming), technical difficulties in project, some liberty to select goals strategies & tactics
fantasy	• imagination and freedom (make believe + voluntary activity)
feedback	• clear and immediate feedback should be provided if the goal or not has been reached.
self-esteem	• tasks should be adapted (see above) and encouragement to learn & augment results should be provided.

There are multiple lessons that we could draw for the design of learning environments. An open, active and project-based learning is favorable to trigger challenge, curiosity, leave some control to the student. However, "flow" theory contains principles known from more "behaviorist" instructional designs, like optimizing the level of difficulty and providing fast and appropriate feedback or otherwise appropriate positive reinforcements. While we don't argue, that open and active learning should be "programmed" like an e-learning environment, the teacher has to make sure that at least some tasks are very affordable and lead to quick results and more importantly that quick and informative **feedback** is provided by the system, co-learners or the teacher (whatever appropriate).

Creativity is a far more complex issue and its relation to flow is not obvious. "Optimal experience" has been described by gamers or programmers and enhances without doubt productivity, but does not necessarily entail creativity. According to Feldman (1994), creativity should be studied and therefore facilitated by the teacher at three different levels: (1) the social field, (2) the domain (symbol systems of knowledge) and (3) the individual. Table 2 lists some important variables that could be beneficial for creativity.

Table 2: Creativity variables

Level of analysis		*Some important variables that correlate with creativity*
Individual	***Intellectual traits***	• existence of ideas • complexity of thought • complexity of conceptual structures • augmented reflexivity
	Personal traits	• sensitivity for the environment • preference for complexity • intrinsic motivation for getting a job done • capacity to produce sustained efforts and control over the process • capacity to transformer subconscious material • capacity to find a balance between the desire to transform and the desire to preserve important elements
	Cognitive structures	• domain expertise • existence of "networks of enterprise" (goals, projects, etc.), i.e. some sort of general "purposefulness"

Table 2: Creativity variables

Level of analysis	*Some important variables that correlate with creativity*
Symbolic environment (domain	• presence of a symbol system that authorizes and generates new possibilities
Social environment ("field")	• a network of people who provide support, instruction, evaluation, recognition, etc. • cognitive and affective support system • "faustian deals"

It is clear that education can not influence on all these variables. But it certainly can have a positive influence on individual dispositions that already exist. It can act upon conditions, i.e. on educational tasks and the general learning environment like the "class spirit" with the help of specially designed technology that we will introduce below. By exposing students to open-ended, challenging, authentic and partly self-defined projects on one hand and by providing scaffolding and support on the other, the teacher does create situations where individual traits shown in table 2 can be exposed and developed. We will come back to the community and motivation factor on page 29.

3 TOOLS

Introduction

ICT have support potential for most of the functions provided by an educational system. Several pedagogical-technical models are currently available and sometimes in competition. Examples are "open-resource-based learning" (using simple web technology), neo-instructionalism (e-learning platforms), collaborative learning (using computer-supported collaborative learning systems or groupware systems), tele-teaching (using increasingly sophisticated conferencing systems).

The history of the pedagogical use of Internet in the traditional institutions (schools and regular universities) shows a confrontation of two schools of thought, one that favors open and active teaching and the other that favors rationalization or sometimes improvement of traditional knowledge transmission. Pedagogical use of Web technology started out in 1993 with early adopters using the web for innovative project-based "teaching and learning". On the

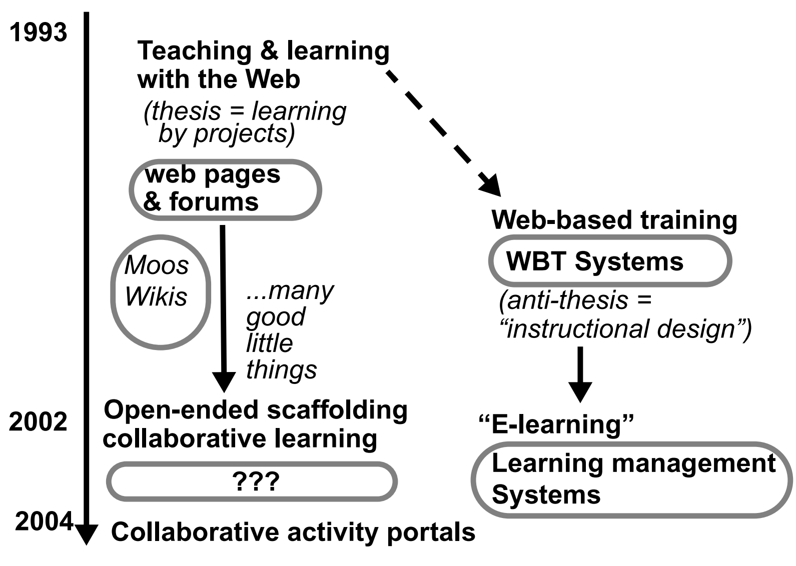

Figure 6: Pedagogical use of the Internet - two schools of thought in competition

other hand, web-based training systems inspired by traditional CBT software started appearing on the market and form the core of today's so-called "Learning Management" or "E-learning" systems. While these systems anchored in the behaviorist tradition are making interesting progress as far as modularity of contents and standardization are concerned, they do not fundamentally seek to improve pedagogies by supporting rich socio-constructivist scenarios. As Gilroy (2001) has pointed out: "The emphasis of most e-learning programs to date has been on the accumulation, organization, and delivery of content. This is manifested in all aspects of how the new sector has been organized: in the business and operating models of the service and technology providers; in the design and organization of the content and learning management systems that are now widely used; and in the investments venture capitalists, publishers, universities, and corporations have made."

Open-ended, creative and active pedagogies can get support from almost any Internet technology, as long as students can also be producers (not just readers and exercise button pushers). Besides traditional tools like HTML pages and forums, there exist quite a number of interesting tools nowadays like participatory content management systems, collaborative hypertexts in various forms, e.g. Wikis. However, there is a lack of a "rich" platform to cover the needs outlined in the previous sections. In other words, we do have educational software to deliver course-ware but we don't need it really. We need tools that support students engaged in more complex and open-ended tasks. While there is an interesting number of non-behaviorist research software and while constructivist (e.g. project or problem-based) scenarios are quite popular (Wilson & Lowry, 2001), they are not supported by the same amount of technology as the scenarios inspired by more traditional instructional design (Reigeluth 1983) are. Our current work aims to provide affordable support for innovative scenarios described by various socio-constructivist schools of thought and to test, enhance and enrich them. We will outline a partial, but operational solution that is available now.

ICT as thinking tools and the role of documents

We claim that basic technical requirements for active and rich pedagogics are not extremely high. Interesting results can already be achieved by providing the following sort of functionalities:

- Access to rich information sources (not just stream-lined e-learning blocks) by various means, e.g. browsing, searching by categories or popularity, searching by keywords.
- Affordable interaction with various types of information contents (including annotation).
- Rich interactions between actors.
- Integration.

Activity-based pedagogies assign a different role to ICT, and in particular to the status of documents. Classical teaching methods (which include main-stream e-learning) require that teaching materials are well prepared in advance (by either a teacher or a content expert) and that it is used "as is". Learners usually are supposed to digest this material (repetitively if needed) in a rather isolated way. The same contents are used over many classes, unless something needs to "fixed" of course.

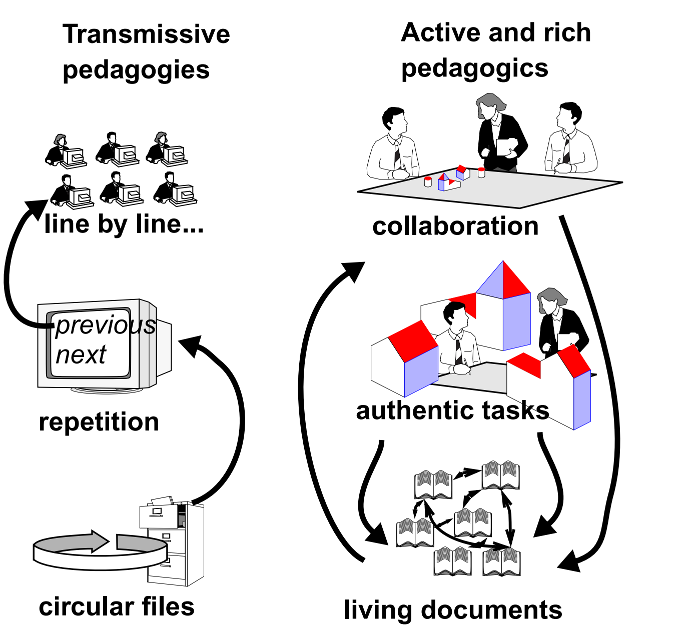

Figure 7: The status of documents - static in transmissive pedagogics and living in active pedagogics

Activity-based pedagogies assign a more diverse role to the document. Learners generally select the documents they need by themselves from a larger choice (which includes the whole Internet). More importantly, they actively participate in the production of documents, some of which can be reused later on. Ideally, they also should be allowed to annotate documents, i.e. enrich them by their own experience. A "socio-constructivist" web server therefore constantly changing and therefore also requires awareness tools that put forward what has changed, what is new, what is popular, what is exciting, etc.

In more general terms, we claims that the computer should be mainly a **facilitating structure, a thinking, working & communication tool** and not a content transmission device. Accordingly, most student and teacher activities should be supported by computational tools and lead to new "contents". Within this perspective we can see that activities and roles are defined in an collaborative information processing framework. We do not ask ourselves how to convey contents and how to control reading and exercising, but how we can support various knowledge production related tasks. Table 3 gives a rough idea how roles of participants can be mapped over different information processing activities.

Table 3: The role ICT for active and rich pedagogies

Information processing activities	***teacher (manager)***	***learner (worker)***	***computer (tool)***	***designer (resource)***
Goal setting	helps or defines	defines or refines	provides tools	provides ideas & half-baked models
planning	suggests & controls	does	provides tools	
monitoring	audits & helps on demand	self-observation, diaries	provides tools	observes
contents	suggests, produces	uses & produces (!)	storage, search & awareness tools...	*can* provide contents and/or develop tools
tools	configures, helps	selects, learns, uses	runs	
exchange	suggests does	does	provides tools	suggests

Community, Collaboration and Content Management Systems

Simple Internet technologies (web pages, forums and e-mail) have been successful in education because they answered basic needs for information exchange, communication and collaboration needed for constructivist scenarios. In addition to being simple, yet powerful, the "standard" Internet lets the user (teachers) ***have control***. While simple web technology does enable creative scenarios it has 4 drawbacks: (1) Maintaining static web-sites (including the student's pages) is time-consuming, (2) simple discussion systems like forums or mailing-lists do not do very good knowledge management. (3) More sophisticated scenarios (like co-authoring or work-flow) are badly supported and (4) there is no glue for putting all these together.

Community web-sites actually face quite similar problems and seem to have found at least a partial answer. Within the last two years an impressive number of what the authors coin C3MS (Community, Content and Collaboration Management Systems) have sprung into existence. Inspired by personal weblogs (also called blogs, which are increasingly popular journaling systems), slashdot-like weblog/news systems, simple content management systems and various popular groupware applications, they offer a modular system for configuring interactive community web-sites. In addition, most of these systems provide documented extension mechanisms allowing third party persons to contribute modules with additional functionalities. C3MS systems are a form of Web portals.

A portal gathers a variety of useful information and communication resources into a single, 'one-stop' web page (Looney and Lyman, 2000). A portal therefore is a **collection of objects** (information bricks) and **services** (operation on these bricks) that can be accessed from the portal (web) page. When the user works with a specific resource, e.g. a collaborative hypertext, only a part of the interface changes. A portal therefore is a kind of "**cockpit**" where the central views changes, but the other instruments stay in reach.

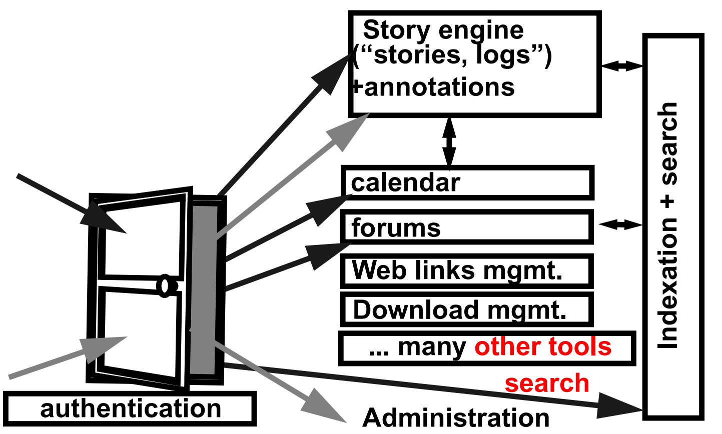

Figure 8: Basic functionalities of the collaborative portal (C3MS system)

Portals can be adapted for specific communities and sometimes users can tailor them to their needs. More sophisticated systems like PostNuke offer a good set of core portal functionalities, such as a good user administration system, a news/journal system, web links sharing, search, FAQs, Polls and more. In addition, an impressive amount of extra modules (many from autonomous developers) like collaborative hypertexts (wikis), pictures galleries, simple content management systems, event calendars, chats, project managers, file-upload, glossary management are available. Many web-applications popular in education that existed beforehand as stand-alone applications (e.g. Forums and Wikis) are adapted (or being adapted) for integration into portal systems like PostNuke. In addition, specific pedagogical applications based on the needs of teachers exist and others are being developed., e.g. by our research team.

Table 4 shows a non-exhaustive list of standard tools available in a typical portal system and how they can provide support for various functions that a pedagogical information and communication system should provide for activity-based teaching:

Table 4: Functions and tools of the portal

Function	*C3MS modules (tools of the portal)*
Content management	News engine (including a organization by topics and an annotation mechanism) Content Management Systems (CMS) Collaborative hypertexts (Wikis) Image albums (photos, drawings, etc.) Glossary tool or similar Individual weblogs (diaries)
Knowledge exchange	News syndication (headlines from other portals) File sharing (all CMS tools above)
Exchange of arguments	Forums and/or new engine Chats
Project support	Project management modules, Calendars
Knowledge management	FAQ manager Links Manager (“Yahoo-like”) Search by keywords for all contents “top 10” box, rating systems for comments “What’s new” (forum messages, downloads, etc.)
Community management	Presence, profile and identification of members Shoutbox (mini-chat integrated into the portal page) Reputation system Activity tracing for members Event calendar News engine

Selection of C3MS bricks

We use the term “C3MS brick” for a component that takes care of a specific task, can be easily separated from others, can be configured and administered, can be combined and orchestrated with others and all this through the main portal environment.

In order to present the “world” of C3MS portals to the teacher community, the teacher’s catalog available on our support site (Synteta, Schneider & Frété 2002) contains an list of modules that teachers can combine into educational scenarios. This catalog has been strongly inspired by Guzdial's and al. (2000) work with the Swiki (a very nice and ergonomic stand-alone wiki). Our first field experiments are encouraging and we hope to observe and report interesting experiments within the next 2 years and plan to include a facility for cooperative updates of the catalogue and comments.

Let's present an example of a C3MS brick from this catalog:

Table 5: Functional description of the news engine

Generic name(s)	News/Articles/Topics/Sections
Software names (Postnuke centric)	News, Submit_News, Story Submission Module, Topics Newsletter, NewsPortal, PN Submit News
Functional Description	Submit news, display the news on the index page, post new articles or stories or topics on the site. Functions: Submit, comment, edit, delete, rate, search, browse, moderate
Structural Description	This is a core module of most portals but there exist also some 3rd party ones with special features
Pedagogical interest	Interact by providing new information (to start a story, a project, an activity), comment information of others, asynchronous debate, present an expert's view on a theme
Construction process	Exists by default in the main menu
Other Notice	Can be commented
Support for activities	Brainstorm, IntroWork, SendFeedBack, SubmitStory, SubmitComment (see table for explanations)

The architecture of typical C3MS bricks

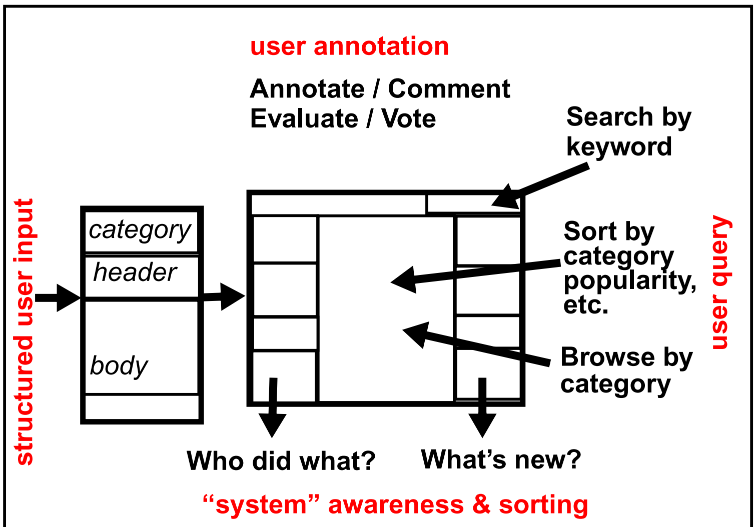

Figure 9: The insert - categorize - annotate - evaluate - sort - search functionality of the typical C3MS brick

Portalware like PostNuke is sometimes called a "Content Management System" (CMS). As we shall explain below they are CMSs of a special kind. Instead of providing functionalities for defining complex document and workflow templates as in industry tools, we deal here rather with a container that can provide a lot of little, but powerful tools to manage smaller bits of information and that allow the community to contribute with comments and sometimes votes. In addition, various applications provide self-ordering and awareness mechanism to the users, e.g. what is new, what is popular, etc. Therefore such portals are particularly useful to manage informally generated knowledge, e.g. the result of educational activities. Portals usually have incorporated search engines, some have functionalities for rating information, so that good information "floats" to the top. For more structured information, e.g. web links, hypertexts etc. there exist special applications that allow users to make quick updates (instead of going through the process of editing

HTML files and uploading them). A simple C3MS brick usually offers i**nsert - categorize - annotate - evaluate - sort - search** functionality as figure 9 shows. Such features define the core of a "**living documents**" and **knowledge management** system and are essential to support student activities engaged in complex pedagogical scenarios.

A C3MS platform is not limited to the kind of simple tools we describe above, there are just predominant and relatively easy to develop. Other applications like complex forum systems or educational special purpose tools like computer-supported collaborative learning applications do also exist. E.g. our team developed "ArgueGraph" (Chakroun 2003), a Computer-supported collaborative learning (CSCL) discussion tool according to a model developed by Dillenbourg. The major advantage of embedding such applications into a portal is to have a central access point for scenarios and to profit from existing libraries (e.g. for user and permission management) and from all the other C3MS bricks.

Various learner activities need to be **integrated**. Since C3MS currently do not provide any integrated workflow capabilities, the teacher must select one or two special tools in order to "drive" a scenario or a larger project. The easiest solution for scenario management (i.e. setting tasks, describing resources and providing feedback) is to use the News Engine, a Forum or a Wiki page. Our team developed two additional tools: **ePBL** is a "Project-Based e-Learning" module and it provides the following functions: (1) Scaffold students during their projects by "forcing" them to fill in their project specification (through an XML grammar); (2) help students write their final article and (3) help teachers monitor easily several projects in parallel and give them feedback on time. We will describe an example course using ePBL on page 27. **pScenario** is a tool that allows teachers to define complete and rich scenarios for various pedagogical formats (face-to-face, at distance or mixed) and to associate student activities with other tools. It is up to teacher to clearly identify needed tools and to combine pScenario with other PostNuke tools (e.g. Wiki, Links Manager, News Engine or special educational tool) into a teaching portal. pScenario also could be used to administer a typical American graduate course that features readings, short exercises and a term paper. Finally, the CRAFT laboratory at EPFL developed a project management tool that allows a teacher to run larger project-based courses.

We shall not further elaborate on these tools here, since the point of this chapter is to demonstrate that creative and interesting pedagogical activities can be implemented with the help of off-the-shell community portals plus their huge module libraries.

A note on e-learning, pedagogical documentation sites and standards

Since managing structured pedagogical contents (so called "learning objects") or other teacher or student produced information sites is an issue for some teachers, we shortly shall address some issues here. First of all we do not recommend C3MS systems like PostNuke or Zope as a platform for so-called "eContents". You can either adopt a commercial e-learning system like WebCT or one of the numerous open-source solutions like Claroline or Ganesha. Our C3MS solution applies to situations where you want to orchestrate and manage learning **activities**.

If the goal was to replace an HTML-based information web site then we also could recommend open-source Content Management Systems (CMS) like SPIP which also have been successfully deployed in education. On the other hand, there are now several interesting initiatives to provide at least basic CMS templating support for C3MS portals, i.e.

for PostNuke we could recommend the “Steel KB” or the “Content Express” modules. Finally, we suggest to evaluate wikis who have very poor layout capacities and who do not offer tools for structured input, but have been used very successfully for building larger encyclopedias. At the time of this writing, wikis are the success story in the world of socio-constructivist pedagogies since they can be rapidly deployed and students are very quickly operational (e.g. see Notari 2003). If you plan to put teaching materials on the web, a documentation server might be appropriate. In any case, it is appropriate to help teachers to put their materials on the web, but we must insist that this has nothing to do with pedagogics. Putting materials in the Internet is just a way to share teaching materials and to make its distribution more rational. MIT’s often cited “open course-ware initiative” exactly does this. They do not share “teaching”, just their materials. This is a wonderful service to the world, but people using MIT materials don’t get an MIT education.

C3MS systems do not follow any sort of standards with the exception of low level elements like HTTP, SQL, HTML, CSS, RSS). Since it is always a very good idea to adopt open and published standards, lets briefly examine the situation. The currently dominant e-learning framework of IMS/ADL/SCORM describes learning contents and associated information as XML data. Current e-learning platforms mainly implement meta-data, simple pedagogical sequencing (presentations of materials) and quizzing. They do not follow any explicit pedagogical standards despite the fact that their theoretical foundations stem from the very serious instructional design (e.g. Gagné). Most of what can be seen on the market is simple “shovel ware” that often lacks the sort of interactivity that we had with CBT back in the ’70s. It therefore does not even live up to the standards of serious behaviorist instructional theory which provides its foundations. Progress achieved in the last few years rather concern modular management of so-called “reusable learning objects” (RLO) and ease of delivery via the web of course. However, it is not very clear what an RLO is and even how big a typical one should be and it has yet to be determined how easily decontexualised materials can be reused in an other content. While RLOs probably make sense in the context of simple industry training the issues are much more open regarding upper high school and university level.

Interestingly enough IMS adopted in 2003 a new pedagogical markup language and standard which is called “learning design” (LD) (Koper 2003) and has been developed under the name of “educational markup language” by at team from the Dutch Open University (Koper 2001). It does have the potential to describe very rich and diverse pedagogical situations. However, it is yet unknown if industry or an academic consortium will provide a full implementation. Software that enables creative teaching does not have as much a viable business model as the ones that allow to sell contents do. Anyhow LD is an interesting formalism and has to be watched. Alternatively it may be possible to adopt emerging workflow standards from industry to education.

So far we have only discussed learning materials and learning scenarios as data. We also need systems to interpret and to run them. The situation here is much worse. So far, no architectural standards for pedagogical platforms exist. Commercial system usually don’t even publish stable application programmer interfaces (APIs) that would allow to expand the functionality. Regarding industry portals (the heavier and more complex equivalent of C3MS systems) the situation is under improvement. Systems based on standards like SOAP (Simple Object Access Protocol), UDDI (Universal Description, Discovery and Integration), WSDL (Web Services Description Language), WSIF (Web Services Invocation Framework), WSFL (Web Services Flow Language), ebXML Messaging Service Specification, WSIL (Web Services Inspection Language), WSRP (Web Services for Remote Portals), Portlets, etc. may improve future interoperability. However, currently there is a heavy price to pay. Besides the considerable resources needed to formalize and express pedagogical scenario interpreters such systems must be programmed either in Java or dotNet. On the positive side however, one could imagine future portals as glues that could tie together various interesting and decentralized applications (like document servers, quiz engines, forums, links managers, project tools).

In conclusion, given the current state of affairs outlined above, we strongly recommend to invest into "street standards", i.e. systems that are not developed by research groups or industry, but ones that are open, that are understandable by "hobby programmers", installable by low-skilled system administrators and that are used by thousands of websites. PostNuke is such a system. It does have its deficiencies, but it is sustained by a large user community and since it does have a stable API, its strength lies in its modules economy which allows dozens of part-time developers to program interesting modules within a reasonable time frame (from 1 week to several month according to the level of complexity). In addition, since PostNuke is based on a LAMP (Linux-Apache-MySQL-Php) architecture, interesting stand-alone applications like PhPWiki and PhBB (one of Internet's most popular forums) have been successfully integrated. What will happen if PostNuke dies? Well, it already happened twice that the whole core programming group left for other projects. Others took it up. And if others don't next time ? Since PostNuke is open source and free, there will upwards compatible forks. One of dissenting core programmers group now works on eNvolution, a system which is capable to run about 98% of all API compliant PostNuke modules. These are the strong arguments in favor of popular open source systems. Let's now examine in more detail how we can "implement" pedagogical scenarios with the help of a C3MS.

4 INSTRUCTIONAL IMPLEMENTATION

Scenario Planning

Pedagogical story-boarding with a C3MS follows a simple principle. The teacher creates a pedagogical scenario (**activity**) by defining different ***phases*** of the work process. Each phase contains at least an ***elementary activity*** which in turn should be supported by a tool (portal brick). Larger projects can contain several smaller scenarios. The scenario building bricks, i.e. elementary activites are something like "search on the Internet", "insert a link", "make a comment", "coedit a text", "vote for something", "enter an item to a glossary". It is needless to say that portals can not provide all the tools than can be imagined, e.g. on-line drawing programs are hard to find. Anyhow, it should be planned that at least the products of some

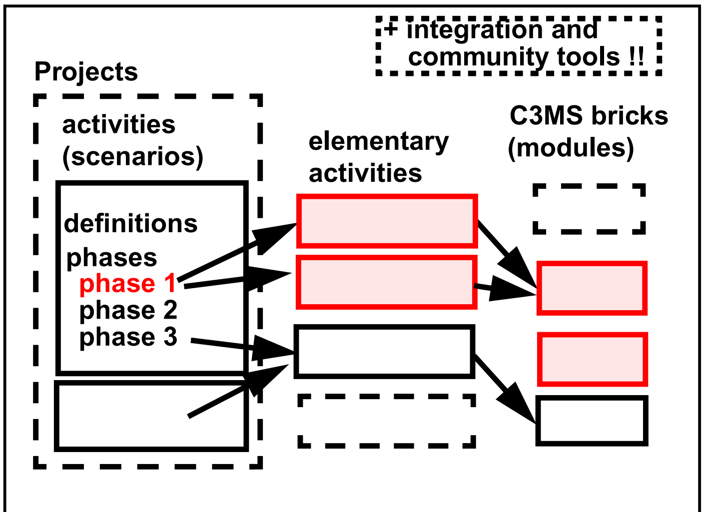

Figure 10: Scenario planning and C3MS brick selection

activity should be posted to the portal, in order to discuss, annotate and reuse them. In our teacher's catalog we classify the scenarios according to the following categories:

1. Gathering and distribution of information: Teachers and students share resources and the activities are designed to create a "critical mass of input", i.e. help them gather information and make it available to all.
2. Creation of collaborative documents: Here the students can write definitions, analyse cases, solve problems, write documents and create illustrated documents together around specific themes.
3. Discussion and commentaries around productions: Students identify together facts, principles and concepts and clarify complex ideas. They formulate hypothesis and plan solutions, make links between ideas, compare different points of view, argue, evaluate, etc.

Table 6 shows an example of the scenario called "references list" that we introduced before in section "PEDAGOGICAL DESIGN" [p. 3].

Table 6: The technical-structural definition of the "reference list" scenario

Title	References list
Goals	Web search, classifying, conceptualization, synthesis...
Public	11 years old students and more
Description	The students have to work on a theme they don't master for a project. They have to create together a list of web sites that will help them work in a later phase. These sites will have to be described and classified.
Duration	From several days to several weeks
Steps	• The teacher introduces the theme, gives clues and asks students to consider the different aspects of the subject. ("IntroWork" or "BrainStorm") • Students search the web with various search engines and bookmark the links they find interesting ("SearchWeb" or "KeepReference) • Students then try to work out a certain amount of categories and sub-categories for this theme. ("CreateCategories") • The results are put in common and a hierarchy is worked out ("CoEdit") • The approved categories are entered in the portal ("CreateLinkSpace") • Students classify, enter and describe their links ("SubmitLinks" or "CommentLinks")

Each scenario described in the catalogue is composed of a certain amount of **steps** that can be described in terms of **generic elementary educational activities**, which we labeled with a tag. like "BrainStrom" or "SubmitComment". Technical "C3MS bricks" can in their turn, support most of these labeled generic activities**.** A teacher can therefore plan educational scenarios with the help of a more abstract vocabulary that will help him to choose from a set of supporting technology. Here is an example elementary activity entry from the catalogue:

CoEdit: Creation and modification of collaborative documents. Available C3MS Bricks:

- "Wiki": Creation of collaborative documents that can be edited by all members. The identity of "actors" doesn't appear on the screen if they don't wish

- ContentExpress: In this case, the text will directly appear on the portal, it will be possible for others to modify it but this will be less adapted to collaborative work.

Table 7 shows a partial list of generic educational activities that are typical components of pedagogical scenarios and that can be implemented with C3MS portals. Practise will without require strong modifications of our catalog entries but we still would like to show some here, since in any case teachers have to come up with their own personal definitions. They are the ones who orchestrate scenarios, we only can make suggestions

Table 7: Some elementary generic activities

Label	*Short description*
BrainStorm	Everyone says/writes what he knows or imagine on a subject. Before starting an activity students try to figure out all they already know so that they can integrate knew knowledge better.
CoEdit	Creation of collaborative documents. They all can modify a unique document.
CommentLinks	Insertion of commentaries under the links entered in the portal. Useful to give hints on web sites content. See “CreateLinkSpace”
CreateCategories	Determining categories for a theme, entering categories in an interaction space.
EditGallery	Use of the gallery module to display images, photographs and commentaries.
EditGlossary	Configuration and use of the glossary to display words, expressions and their definition. The teacher can enter the words to be defined and the students can enter the definitions of the words or expressions whose meaning they had to find out.
EditStory	Modification of an already displayed text
EditSummary:	Creation of a specific displaying space on the portal
EditVote:	Creation of a quiz, poll, survey…
Interact	Discussions on forums or in the news engine (add comments to stories)
RateLinks:	Giving one’s opinion on the value and interest of the displayed links by voting. The links are then classified.
SendFeedBack	Evaluation and commentaries upon productions by the teacher or experts (during and/or after the activities). The feed back can be individual or collective.
ShowBest	Displaying of the best productions according to chosen criteria, which can be quite motivating.
SubmitComment	Commentaries, reactions, complements to a text or any presented material. Can be done an unlimited amount of times
SubmitLinks	Insertion of a link in the link space, which will have been configured - see “CreateLinkSpace” and “CreateCategories”
SubmitQuestion	Insertion of a question to be answered or a word or expression to be defined

Table 7: Some elementary generic activities

Label	*Short description*
SubmitStory	Insertion of a text to be commented or to which a following or commentaries will be associated, exposition of cases...
VoteFor	Vote for a project, an idea, etc.

A complex scenario template at high-school level

Let’s examine now a larger, but not too complex scenario template that illustrates the basic principles of scenario planning that could happen in a specialized biology class a high school level. Imagine a class where students have to study wild-life of the area. One could imagine that each student can select an animal for study (including more “exotic” genres like insects and fish) and that for each animal a certain amount of options remain open, e.g. study of habitat, behavior with humans, reproduction, etc.

Each project should be defined individually, but the very general approach could remain similar for all participants as expressed in figure 11. There also could be a certain amount of collective activities, like the construction of a glossary that defines essential terms. If the teacher considers glossary making important for reasons like “students will better understand terms if they search and write and discuss them” or “students really should put some effort into understanding the vocabulary of a domain before they work within”, then he can look at our template and fit it to his own needs which are driven by constraints such as education level, time constraints and available technology.

	PROJECT “study wild life”
	Main activities (scenarios)
1	Learn how to use a portal
2	Make a common glossary (including links to resources)
3	Define research subjects
4	Make research plans (including research goals)
5	Field work
6	......

Figure 11: Scenario planning and C3MS brick selection

The template for the glossary activity can be found in figure 12. It is important to state again that we only make suggestions regarding the different phases and that we do not even suggest a single mapping to elementary activities nor a single mapping of elementary activities to a technical module. In other words, the teacher must be in control throughout the whole design process. Educational technologist should only offer “half-baked” solutions. Ideally, teachers have to adapt a pedagogical-technical implementation to their conceptual and technical skills and to what they have available. There is also a technical compromise to made between selecting the best tools for each task and not to overwhelm the students with too many tools to be used within a scenario.

GLOSSARY activity (scenario)		
	Phases	**Generic activities**
1	participants identify interesting "words"	IntroWork, BrainStorm
2	agree on a provisional list	EditGlossary or EditPage
3	search for information and share links	SearchWeb, EditLink
4	synthesis and editing	CoEdit
5	teacher feedback	CheckWork
6	editing of final definitions	CoEdit

Generic activities	description	Available C3MS bricks
CoEdit	creation of collaborative documents	Wiki, ContentExpress GlossaryTool
BrainStorm	generate ideas	Wiki, News Engine, forums, Bulletin Boards
...	...	...

Figure 12: Glossary scenario, possible generic activities and available bricks

Figure 12 nicely show some of the "open decision space" teachers may have. After examining the situation he may for instance come with the following solution (table 8). As one can see, our hypothetical teacher winds up with 3 tools (Wiki, Links Manager and the News Engine):

Table 8: An instantiated glossary activity

	Phase	Tools	Instructions to students
1	participants identify interesting "words"	Wiki	After discussion in the classroom, each student has to select three terms and enter them to the wiki as homework (first come, first goes)
2	agree on a provisional list	Wiki	In the classroom, the list is discussed and cleaned up and each student will receive 3 items to work on.
3	search for information and share links	Google, Links manager	Each student has to produce 4 links (day 1) and comment 2 other links (day 2 of homework)
4	synthesis and editing	Wiki	Each students receives 2 links and has to edit them. Students are encourages to link to other items and external links.
5	teacher feedback	News engine	Teacher writes a feedback article which is also discussed in class.
6	editing of final definitions	Wiki	Students make final modification to their work and will be evaluated on this.

This example illustrates the structure of exploratory scenarios. Generally speaking, a teacher should think about the following setup which reflects the principles of pedagogical workflow introduced in section "PEDAGOGICAL DESIGN" [p. 3]:

- Activities should start with some sort of conditioning that will generate curiosity, interest, motivation and also show the interest of technology in our case. The initial classroom discussion and the perspective of publishing a nice glossary on the Internet should do this. In addition, entering 3 words on a Wiki is not very difficult and will make students familiar with the particularity of this tool
- Activities should give space to discovery by induction and therefore include exploration, search for information, experimentation and formalisation of working hypothesis that can be confronted to the others. Activities in phase 3 partly implement this.
- Learners should be active and creative, even when they are involved in seemingly simple tasks like glossary making. They should discuss and cooperate with their pairs. Our glossary scenario has some "build-in" collaboration requirements.
- Feedback is important for each student activity. Therefore, we also suggest a formal evaluation of the final product (including a score). The teacher may also give bonus points for cooperative behavior, e.g. forum messages or helpful comments for the other's work. More details are discussed below.

Scenario execution and evaluation

Depending on the complexity and the extent of the learning unit (which we call scenario) one or more preparation phases have to be set up. Larger project usually contain different pedagogical goals and according to this, students may encounter several preparation activities throughout the project. Often, they should be choosing their subjects and working strategies themselves and formule ***their*** own goals. It is very difficult and not always desirable to predict the detailed development of scenarios. The teacher should prepare and master a certain number of path breaking inputs and advice according to the needs of the learners. These rather retroactive inputs differ from the more proactive strategy of a more instructional design approach. Teacher's input should sustain learner's activity and should not always be formulated directive but as advice. The tone for all presented tasks should consider that. Students may not carry out the expected actions. In such cases new regulatory inputs must be generated while the unit is running, e.g. the teacher could post an article with advise to the news board. He may even formulate new pedagogical goals and adapt his script accordingly.

A so called regulatory input is described by Dillenbourg (2002) as a part of a 'phase' in a larger scenario. He allocates five attributes to a phase: the task that students have to perform, the composition of the group, the way that the task is distributed within and among groups, the mode of interaction and the timing of the phase. A regulatory input can contain all five elements but can also consist in a single part of it. If learners pass from one presumed activity (or action) to the next teacher input is not mandatory. Regulation is a subtle and individual intervention and needs to be adapted to every single learner if possible. It is one of the most important guiding tools. Such short inputs can range from encouragement to reorientation.

The evaluation part of scripting is not meant to be solely a classical evaluation at the end of the scenario which in our opinion should also happen in order to provide a clear reward. However, it is more important, that the work (i.e. the 'visible products' of activities) produced by the learning community should be evaluated (compared, commented,..) by all participants, learners and teachers. It is crucial to design the way such comments and criticism should take place during the scenario**.** Learning how to give feedbacks to other learners is by the way a pedagogical goal by itself, since it is an ambitious task to implement a good feedback culture within a learning community.

Finally we would like to recall the most important principle: ***Do not overscript***! Students need some space of liberty, do have to formulate goals and finds, do have to make errors. Otherwise they will not develop general problem solving capacities, i.e. meta-cognitive capacities which is a clearly stated goal of active and rich constructivist pedagogy. As a corollary, teachers must expect breakdowns and reasons leading to opportunistic scenario adaptation.

Example of a "light-weight" Internet Activity for children

Our team did and does participate in several Internet activities. The projects we support are mostly run by active teachers or non-governmental agencies and concern extra-curricular activities like "water", "ecology of polar regions" or children's rights. We shall briefly report here on some lessons learnt from an annual two-month activity we run with our "Terre des Homme" partners in 2002. A new version is under preparation. Pedagogical activities in the portal has been open to any class wishing to participate. In the 2002 edition concerning the particular topic of "migration" we mainly worked from classes around Geneva and from Burkina Faso.

The portal was designed to support the following activities from which the teachers could choose or combine:

- A discussion forum to initiate dialog between different nationalities. Different topics were created according various lines of reflection determined by the core group of Terre des Homme volunteers and participating core teachers.
- Article sections contained stories about concrete migration experiences and were open to discussion.
- A quiz section allowed to test knowledge about migration and legal programs. Teacher's could submit their own quiz (including ones produced by their own class)
- Pupils could submit their own experience as stories.
- A poems tool allowed to publish and comment poems.
- A photo album was meant to present classes to each other or to show pictures and drawings of other interest.
- In addition to these interactive tool, the portal contained various structured information.

These types of activities are not particular on the Internet, but some teachers did profit from the occasion to create some longer structured activities and to integrate the "children's rights" theme into a curricular context, e.g. the french class. It is important to mention that most teachers in our area are only used to produce web pages and to use simple "threaded forums" with their classes. Therefore, our own goal was to make teachers familiar with the idea that there exist a variety of little interactive tools appropriate for different tasks, and that different tasks could be integrated into bigger and richer scenarios. It turned out, that most teachers were only able or keen to implement shorter activities and preferably with the forum. But as we said before, some teachers went further and we expect to do even better this year. Teachers encountered many conceptual, organizational and technical difficulties and we will address some of the issues in the section on "INNOVATION AND CHANGE MANAGEMENT" [p. 31]. In the 2003 version which addresses the topic of "access to water" we overhauled the portal to improve the qualitiy of student writing and exchange. By adding a scenario description tool accessible only to teachers we encourage them to define and exchange definitions of longer lasting scenarios.

Example of a project-based course

ICT supported project-based courses can nicely be set up in a "blended situation", where face to face teaching is mixed with distance teaching. The methodology and techniques we report here are developed and studied by P. Synteta as part of her PhD Thesis. We estimate that the methodology is ready for usage, although progress in several areas can and will be made.

The course we will briefly describe here was "on exotic hypertexts" and was given in a mixed format by he author. It lasted 6 weeks, with a few initial half days in classroom and a 2 hours presentation of the projects at the end of the course. The public were 12 graduate students in educational technology of many different backgrounds. The students had a large freedom for choice of subjects within the general theme and basic requirements were to produce a research plan, to respect of task schedules, to participate in mandatory collective work (include diary writing), then to execute the research plan and to produce a draft of a paper presenting results.

There were several pedagogical goals: (1) Learn something about a specific topic related to more exotic hypertextes (Topic Maps, MOO spaces, Wikis, RDF/RSS syndication, etc.); (2) Learn XML; (3) learn how to run exploratory projects.

Table 9 shows the skeleton of the major students activities. Within each activity a certain number of tools had to be used by the students.

Table 9: Major phases of the Staf-18 course on "exotic hypertexts"

	Activity	*Date*	*imposed tools (products)*
1	***Get familiar with the subject***	21-NOV-2002	links, wiki, blog
2	***project ideas, Q&R***	29-NOV-2002	classroom
3	***Students formulate project ideas***	02-DEC-2002	news engine, blog
4	***Start project definition***	05-DEC-2002	ePBL, blog
5	***Finish provisional research plan***	06-DEC-2002	ePBL, blog
6	***Finish research plan***	11-DEC-2002	ePBL, blog
7	***Sharing***	17-DEC-2002	links, blog, annotation
8	***audit***	20-DEC-2002	ePBL, blog
9	***audit***	10-JAN-2003	ePBL, blog
10	***Finish paper and product***	16-JAN-2003	ePBL, blog
11	***Presentation of work***	16-JAN-2003	classroom

The course first starts with a “wake up activity” where students had to enter resources into the links manager, and enter a few definitions in the wiki. Project ideas have first been discussed in the classroom. Classroom activity also include some traditional teaching, i.e. several introductory lectures + questions. In a next step, students had to formulate projects ideas as articles.

Once they starting working on a project students had to use a special purpose project tool named ePBL which stands for “Project-Based e-learning” (Synteta 2003). In particular, they had to define research plans with a specially made XML grammar. Required information concerned overall aim of the project, research goals and questions, work pages etc. Student could upload these files to server by the means of a versioning system. Since students had to work with a validating editor (of their own choice) the XML grammar reinforced conformance of projects to some norms. More importantly, the grammar acts as a scaffolding or thinking tool helping the students to produce and structure ideas. Contents of the uploaded project file are automatically parsed and summary information is made available in a students/teacher cockpit. Students were asked at regular intervals to update the project file (including workpackage completion information). Teachers then use the cockpit to annotate the project with comments and to enter a more formal evaluation. After each such audit the teacher also posted a summary article to the portal. At the end of the course, the students had to write a paper, again by using an XML grammar from which an electronic book containing all the work has been produced.

In addition to the above mentioned main activities, other interactions were carried out. Sometimes articles about a course-related topic were posted (even spontaneously by students). The portal also has support forums (both technical and conceptual). It displays RSS news feeds summarizing news from other interesting sites. Some side blocks contain awareness tools (who is connected, who passed by, new messages in forums, etc.). A shoutbox (mini-chat) was used to reinforce the feeling of being “present” and for short messages from the teacher. Other tools include a calendar and chat rooms. Lastly after each activity students had to make a diary entry (personal weblog) which gave the teacher important information on encountered difficulties. This tool and the wiki also has been used by the students as personal sounding board.

The main tool besides the ePBL project definition and monitoring application tool used by the teacher was the news engine. It was to used to announce activities (at least one / week) and to provide feedback regarding activities or observations (namely major difficulties found in weblogs or forum messages). The news engine therefore is a “heartbeat” tool that gives “pulse” to the whole process, which is very important.

Results of this and the two other experiments with other teachers were very encouraging. We found that all students defined interesting projects (either some exploratory empirical studies or some technical developments) and that they came up with interesting results. The quality of the final paper in this specific course wasn’t very good generally, but then only a draft has been required and we hardly could ask more in 6 weeks. We found that by using this design, students worked harder, respected deadlines much better and met the pedagogical goals outline above. Class spirit was quite extra-ordinary and we shall comment on this in the next section. It also turned out (and this is not surprising) that teacher involvement was a very critical variable. Constant pressure, but also rapid feedback and availability of both the teacher and his teaching assistant was judged to be highly positive in student interviews we carried out. We are therefore quite happy to claim that this quickly outlined design seems to be a good instance of the teacher as facilitator, manager and "orchestrator" paradigm.

There were of course difficulties encountered in our Staf-18 course. In particular, working with an XML grammar at the very beginning of their studies was both a culture shock and a technical difficulty for most students. They never encountered structured text before and had big difficulties to adapt to a knowledge-tree organization of text. They also had initial difficulties to work with several tools at the same time and to participate in collective knowledge sharing and confrontation activities. However, since activities were mandatory and tools were gradually introduced they very quickly (after about 2 weeks) felt even "at home" in the portal, and really appreciated learning together, a subject we will look into now.

Community, flow and creativity boosting with C3MS portals

Let's come back to "collective work" perspective. While as we showed before, C3MS portal provide rich functionalities for pedagogical "story-boarding" they have been designed first of all as community portals and therefore are ideally suited to boost collective learning, creativity and optimal experience discussion in section "THE COMMUNITY AND MOTIVATION FACTOR" [p. 9]. It is very important that the teacher's design includes support for individual activities. Individual experience should always be exposed to the community who in turn can positively influence individual work. Collective support concerns several dimensions, some of which have always been of interest to the designers of virtual environments. It is clear that we can't draw a clear line between activities triggered because they are build into pedagogical tasks and activities that happen more spontaneously. Finally, it is noteworthy to point out that the architecture described below also nicely could supplement "old-school" teaching or main-stream e-learning.

First, the portal should be a rich information space for "***domain support***" and it should encourage students add their own contribution. Such a space also encourages ***exploration***. Typical tools are links managers, wikis, news engines and RSS feed that keep users up-to-date about articles posted to other interesting portals or individual weblogs.

Intellectual support is provided via forums, annotations and articles. Student productions are always accessible to all (including visitors) and therefore provide for ***recognition***. One could ***manage*** activities by using various standard tools like articles, forums and the calendar, but it may be more appropriate to use special tools, e.g. simple project management tools or special purpose

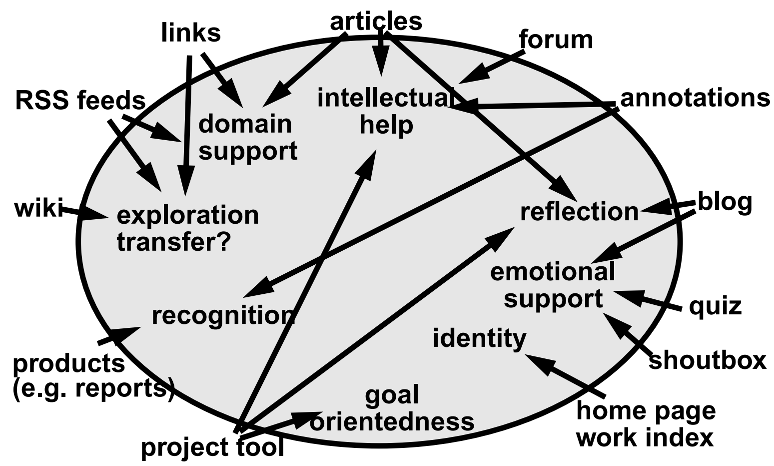

Figure 13: The virtual environment argument: C3MS support for the optimal experience and critical "creativity" variables

ones like the one proposed by Synteta. In our experience, it has been shown that students are more like to contribute to an environment if they own an ***identity***. In the student's partly automatically generated home page on the portal one can see their contributions, read public parts of their personal weblog and conversely each production in the portal is signed with a clickable link to the author. A successful teaching by projects pedagogy needs to provide strong ***emotional support*** and it is therefore important to encourage spontaneous, playful interaction and corner's for humour that will augment quality of on-line life and contribute to class spirit. Tools like the shoutbox or a little quotation box can do wonders. Here is a little conversation extract in french from our students in the middle of the night (:green, :eek correspond to various smilies that are graphically rendered):

```
bourgnon|YOUPI !!!! Posé !!! A demain les amis :)
sangin|belle nuit blanche en perspective.Deja que ai dormi que 3h les 2
dernières        nuit! :frown
rebetez|Mirweis tu ne retombe pas malade s'il te plaît ! :eek
gonzalez|:green  :D FINI !  :D  :green
rebetez|YEAH !! :green  :green  :green  :green  :green
duclaux|Il y en a qui ont de la chance !!!
sangin|conclusion!! go go!!  :red
sangin|un peu baclé mais fini! reste a uploader  :roll
sangin|j'aime pas les deadlines ...grrrrr !!!!  :frown
sangin|arg!oublié les références. C reparti!  :eek
sangin|bon ça suffit! On s'arrete la sinon dodo pendant les cours demain  :red
sangin|arg! encore une nuit blance presque  :frown
duclaux|ouf  :? ya plus ka bloger  :green
```

Lastly, but not least, a personal weblog (diary) can stimulate ***meta-reflection***, in particular if the teacher requires that students write an entry after the completion of each activity.

Our short argument in favor of community, flow and creativity enhancers shows that portals should also be designed in the spirit of true virtual environments that have drawn a lot of attention in the last decade. They never met expectations, mostly because truly interactive pedagogical virtual "worlds" are either very difficult to implement or rather difficult to use in the case of simpler text-based environments such as the MOO. Let's discuss a few features outlined by Dillenbourg et al. 2002): A pedagogical virtual environment (VE) is constructed virtual information space built with the appropriate tools as outlined above. A VE is also a social space, where pedagogical interactions take place. Different spaces become places and the places are populated (Dieberger) and configure social activities. This is not actually true of portals, but it is possible to see at least who is connected, who "passed by lately" and who did what. The same holds true for its geometry, virtual space is not truly represented, but "traces" left by students are step in this direction. Students in a portal are not only active information users and exercise executors as in e-learning, but they do co-construct the environment. The may not add locations like in MOOs or certain online games, but they are least co-architects of the information space. Virtual environments are multi-purpose, they do not just provide a container for specific activities, they can even be used inside the classroom and provide a number of functionalities that support multiple pedagogies, even traditional content transfer and quizzing if needed.

Our short discussion shows that C3MS systems provide a lot of affordances. But experience with interactive collective environments show that technology itself does not necessarily provoke the emergence of rich interactions. In order to turn in "alive" the teacher really has to integrate at least some collective tasks into the pedagogical scenario (like co-construction of dictionaries, sharing of web links, posting of great ideas found during project execution, argumentation about certain concepts, etc.). Furthermore, the teacher has to insist that all communication (except face-to-face) happens inside the portal, e.g. he has to refuse to answer questions by E-mail and insist that students use the forum. According to experience, only about 1/4 of all learners spontaneously use the community features of a portal, but an other half can be quite easily be convinced by designing appropriate scenarios. Once the space starts building up (including their own productions) and once they have been through peer assistance and emotional support (1 hour before the deadline at midnight) they start to develop “a feeling to be at home”. Of course, to make this happen the most important variable is teacher engagement. He has “to be there”. This is the reason, why we do not the use the very popular term of “learner-centered pedagogy” for our approach. The pedagogies we advocate, is very much teacher-centered as well. The teachers role as facilitator, manager and “orchestrator” is far more prominent than the one he has as simple content presenter and exercise monitor in “traditional” pedagogy.

5 INNOVATION AND CHANGE MANAGEMENT

Our survey on educational use of portals came up with few hits, however awareness of their educational potential (and in particular of Weblogs) is growing among various stake holders like software providers (e.g. Gilroy 2001, Fox 2000), teachers , researchers (e.g. Ashley 2002), educational technology support (e.g. Davies 2002). It is also noteworthy to point out that there exist thriving niche markets for specialized applications like Wikis which have and can be easily used for a wide range of rich scenarios (Guzdial 2000). What can be learned from this CoWeb/Swiki CSCL-as-authoring-experience (Guzdial, Rick & Kehoe 2001) is that teachers are open to radical new pedagogies provided that the technology is simple and effective and under their control.

Towards a scenario and modules economy?

Since C3MS systems have a modular and an extensible architecture they can be adapted/combined/ configured to many specific usage scenarios”. Our hope is to create some sort of educational modules economy with the PostNuke platform in order to gain an initial experience in this area and then to help creating an international “street” standard over few years and which later (in 5-10 years?) may lead to more formal standards and tools. Figure 14 shows the model of what we hope may become one or several “scenarios and portal modules” economy.

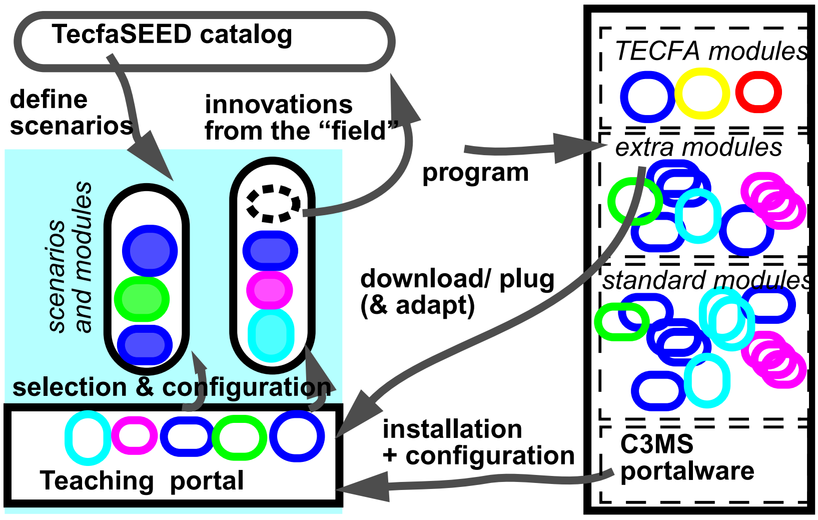

Figure 14: Towards a scenario and modules economy for educational scenarios

Technology and teachers

Technology, in order to be acceptable by the teacher community should appeal to teachers with different levels of technical competence and different levels of "activeness". We discriminate five levels of use with respect to how they appropriate learning technologies: (1) Reusing. Teachers who appreciate ready-to-use material. In our case, this is a scenario that has been instantiated with content. (2) Editing. Teachers who feel the need to modify the content of a scenario they appreciate. (3) Designing. This means in our case to compose completely new scenarios by re-assembling basic components. Teachers can set up the portal from an increasingly large set of "core" or 3rdparty modules and over time, modules specially made for educational purposes will appear from various authoring communities apart from our own. (4) Repurposing. Teachers can adapt modules developed for another purpose. E.g. in one of our teacher portals, the tool used to describe pedagogical scenarios was originally designed to describe food recipes. All we had to do, was to change labels for display. (5) Programming. Some teachers like to program and we can expect them to develop modules. There exist documented APIs for programming plugin modules. The same teacher could borrow objects at levels 1, 2, 3 or 4 at different times according to his availability, his familiarity with the environment, and his involvement in the community.

We believe that teachers ought to be able to work according to their technical skills, to their personal investment, to what is available. Our local strategy is also to train local ICT support persons in the school system; to sponsor Internet events led by specially motivated actors (teachers, NGOs, etc.) where other teachers can "just participate" to whatever degree they wish; and to propagate the use of portals for community purposes (e.g. school web sites). We are aware that this "new language" which involves both new pedagogical behaviors and appropriation of collaborative Internet tools can be only very gradually (over several years!) be introduced to a larger audience. "Best case" examples that are implemented by teacher's themselves without much help from a research laboratory can help a lot, in particular if they have been run by local teachers.

Teacher communities

We also should point out that community portals are becoming popular in other contexts. Increasing familiarity with this tool and perception of its general usefulness for "real life" will help introducing it to education (like the successful use word processors for creative writing). Success stories of new technologies in education are often related to the teachers' ability to insert it into existing knowledge. In other words, it is easier to promote change when teachers can relate to "models" they know, even if they are not necessarily related to teaching. Teachers able to understand the meaning of simple bricks through their own experience might be more willing to use them for pedagogical scenarios, i.e. teachers must have an operational awareness (vonGlasersfeld) in addition to operational control. In addition, there exist sporadic initiatives for building school or campus portals that are actually useful to the community and not just a presentation/information tool designed by some central service as window to the outside world. Such portals could add support to teaching activities by giving each teacher his own C3MS space. We managed to give support to teacher portals without actually being the driving force. Teacher's active in these portals are now aware of this technology and are much more ready to use them with their own students.

Portal technology is also a tool for networking between communities. Groups of individual teachers can run their very own portal according to the precise needs and still be connected to other portals. Automatic syndication (RSS feeds) allows members of one portal to be aware of what happens in an other portal or even individual weblogs. Teacher portals can also feature news summaries from research portals like TecfaSEED or even official ones (provided that their administrators understand about RSS). This way, communication flows are insured and teacher's remain in control over their own virtual presence and are therefore much more motivated.

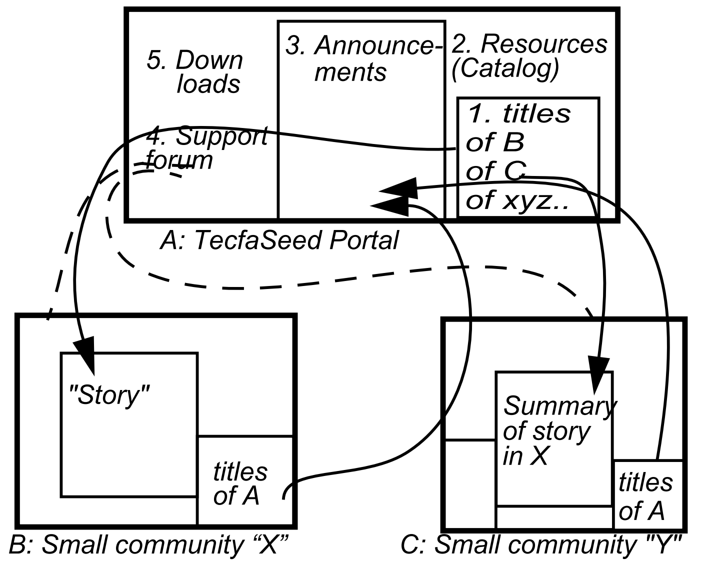

Figure 15: News syndication between portals

Selecting the right software for your institution

In the absence of standards for activity-based pedagogies and given the dominance of so called "e-learning platforms", we suggest to adopt one of the following solutions:

1. A technology-savvy teacher interested by modern server-side technology should try to install and to run his very own C3MS portal. At the time of writing the "PostNuke" is a good compromise. Possibly on a machine that is available in his school, else with a private provider. A variant is to have it installed by someone in the organization or some Internet enthusiast that will do it for little money.
2. Ask around if the school system supports a community portal (for schools) and use this system. You may even think of repurposing the heavy enterprise portal you may have access to (e.g. Lotus/Domino, IBM Websphere etc.). However, this entails negotiation with some central informatics department.
3. As a last resort, re-purpose the functionalities of an e-learning platform.

Currently, we repeat, there is no "off the shelf" platform for the kind of pedagogics we advocate and that covers all your needs. E.g. so far, we do not know yet the full potential of C3MS like PostNuke. One major limitation of using C3MS portals seems to be the lack of provision for integration (and in particular data-flow) between applications which are required for more complex Computer Supported Collaborative Learning (CSLS) scenarios. Another limitation concerns management of contents, activities and people over time: How can we efficiently enough "reset" or move some of it so that fresh activities of the same kind can start with an empty slate while keeping past student production available to new students.? Some of these issues can be dealt with by careful planning of module use and naming, as well as differentiated write access permissions. In other words, handling these issues require the same sort of planning that a traditional user-driven educational site does. But certainly, things could be improved and automatized to some degree. In conclusion we believe that there is an important need for tools that support rich activity-based educational scenarios. C3MS can do “part of the job” and can be used for other interesting purposes such as teacher communities building.

Difficulties

While conducting our field experiments which are run according to collaborative design principles we ran into many difficulties. Some of these are major and we briefly shall discuss the ones encountered at primary to high school level in the official school system. Before going into details, we care to insist here that teachers are not particularly slow. The same kind of difficulties we will describe below are faced by all organizations that try to introduce new behavior patterns and new technology. We therefore feel that it is perfectly normal that ideas expressed in this chapter take about 2 or 3 years to “get across” to willing teachers and probably 10 times as much to the whole system. Let’s now examine the four major issues we identified:

(1) **Few users (teachers and learners) have “portal literacy”**. Spontaneously, most only use a fraction of the offered functionalities. Frequently they do not even have the technical know how, e.g. we were very perplexed to observe that modern and very popular forums like PhBB can lead to near-disasters in Internet activities, since neither teachers nor students are used to a “boxed” forum model. Some of these problems are clearly related to ergonomic issues, but the problem remains even with well defined interfaces. We therefore are facing a literacy problem, i.e. a new digital divide which is not just purely technical but very much conceptual. To put it more bluntly: the modern interactive Internet that makes use of complex “cockpits” is largely unknown to education.

Our first strategy is install portals, even if the task does not require it. This way users get familiar with the typical layout of a portal, even if they only use a single tool like the forum. These portals had others tools configured for activities, like the news engine, a poem editor, a glossary editor or a picture album. Some were just passively consulted, but not actively used in class. However “looking-at” demonstrates what more experienced users can do, and after a year or so teachers are willing to invest into more diverse interactions with the system. As we said before, a related strategy is to help teachers to run teacher community portals and we encourage them to syndicate news among them so that they can see what happens on other portals in other places. In the beginning, “our” teachers wished to work with very minimal configurations, but quite soon they started to experiment with additional tools, e.g. a links manager or a wiki. They also can be quite enthusiastic about “fun tools” like a random quotation engine, a shoutbox, or mini-surveys.

Finally, we offer technical help including hosting and training courses. According to our experience it takes a least an intensive training week to train a teacher to start thinking about pedagogical “story boarding” with ICT and to master the required technology. Even after such an initial training, few are actually doing anything “of scope” immediately after, but after a certain maturation period that can last up to two years they start experimenting and need assistance again. This is a well know pattern from innovation research.

(2) **Pedagogical scenario planning (“story boarding”)** is unusual and very few teachers can “spontaneously do it”. The Tecfa SEED catalog under preparation and other resources that can be found on-line are useful, but they are by no means enough. Either

formal training or open and patient support on a per-needed basis is quite essential. However, teaching ICT and new pedagogies to teachers in a classical way is fairly useless (it has been done not very successfully over the last decade). The right strategy is more about helping teachers to fix themselves innovative pedagogical goals and then to assist them. We do respect the central role of the teacher and let him decide. On the other hand we clearly try to convince them that they should listen to new ideas and not be afraid to experiment and re-experiment. New ICT-supported pedagogies also can be introduced gradually like our “Terre des Hommes” example shows. Not surprisingly, after two or three experiences spaced over time, “things start rolling”. Again, peer-to-peer support is crucial and we therefore support teacher-run teacher-portals and teacher-led initiatives as much as we can.

(3) **The worst negative factor is time**. As we said before, teachers can be sensitized to new approaches rather quickly in less than a two year period (comprising maybe a training course and at least one or two participations in “Internet projects”). But the organization of school life into isolated lessons above primary school level and the absence of project-based teaching in the curricula make it very difficult to organize interesting and longer lasting activities. There is not much we can do about this as a research team, except to make life as easy as possible for teachers on the technical side and to provide some conceptual support and encouragement.

There are a few possibilities to “beat time”. One is to encourage cross-curricular activities, but this is not easy since teachers are used to work alone. An other strategy is to integrate extra-curricular project-based activities into main-stream activities like language teaching and to “smuggle in” the traditional difficult and time-consuming activities like grammar and writing. Finally, after a recent pedagogical reform in upper secondary (high school), teachers can run more intensive specialization courses where they have quite a lot of freedom. The most creative experiments we have observed did happen in biology classes where complex Wiki activities have successfully been conducted (e.g. Notari 2003). The same school reform also requires students to do a “end of school project” of their own choice which would be an ideal area to conduct experiments. The worst situation clearly concerns lower secondary school and we remain quite uncertain about what we could contribute.

(4) Despite all these difficulties, interesting experiments happen at all levels of school. But unfortunately teachers who “can and want” face **administrative resistance** and we do not mean official school policy who in principle does favor creative experiments with ICT. First of all, teachers have to face hostile and frequently incompetent PC managers. For example, Internet ports are censored by lazy and sometimes equally incompetent network administrators. This means that teachers can’t use creative applications like Swiki servers or MOOs. In some areas (Switzerland’s education system is decentralized) there exist very strong forms of censorship. In order to add contents to official school servers, teachers have to pass it through a reviewing committee and this takes a lot of time. Because of pedophilia (which unfortunately happens mostly in the child’s own environment), it is sometimes strictly forbidden to put children’s pictures on the Internet, and that denies them identity and therefore motivation. Finally, it sometimes is very difficult to host teacher-selected portals on official servers and this for multiple reasons, e.g. fear for loss of control, or sometimes again simple laziness and incompetence of systems administrators.

Our solution here is quite simple, we either host these projects or we teach them how to install portals with a private provider. Since Switzerland is a democracy and since teachers have permanent jobs they do not run into trouble with this strategy, provided that they obey official guidelines that require for instance that parents are to be consulted if pictures of children are to be put on the Internet.

We just add a short comment about the university level. We do not face the same issues here, since a professor can pretty much run a course like he pleases. The issues concern simply pedagogical training and resources. Changing a teaching strategy and running high quality project-based courses require a lot of investment that does "not pay" in career terms. While it is sort of required that teaching be "decent", pedagogical excellence and deep involvement to tutoring is not recompensed at all. In addition, recent programs that sponsor ICT in university education with quite substantial grants require that funds are funneled into content production and accreditable distance teaching (main stream e-learning). It turns out, that almost none of the financed projects actually will be sustainable as distance teaching courses. Spontaneously most projects adopted a "blended learning" perspective. Therefore, there might be hope that decision makers in the future will rather invest money to improve the quality of teaching and to sponsor more interesting blended learning formats. Finally, it is important that university teachers can gain intrinsic value from such courses. Allowing teachers to teach at least one project-course on changing subjects where student output could become input for research would be an interesting solution.

6 SUMMARY

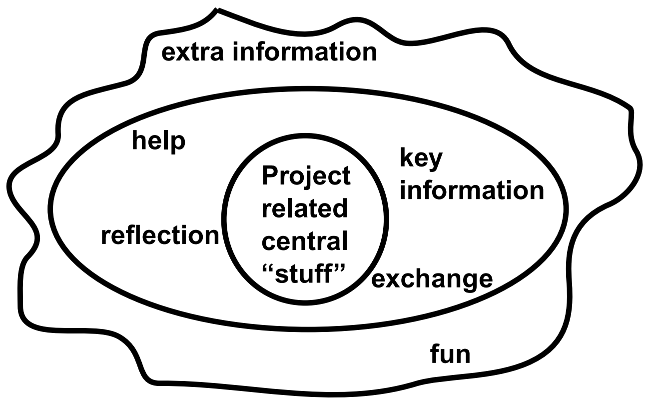

Figure 16: The layer approach to the design of a teaching platform

We do believe that there are new opportunities for socio-constructivist scenarios such as the ones we described in this chapter and that are suggested in our evolving Tecfa SEED catalog (Schneider et al. 2003). Community, Content and Collaboration Management Systems (C3MS) present functionalities that teachers are keen to have, like news/comments, forums, simple CMSs, wikis and others. These tools offer support for the accumulation, organization and display of contents as well as many forms of user interaction. This allows to create rich **pedagogical "workflow" scenarios**. In addition, a well configured C3MS portal is a **community engine** that transforms a pure work tool into a collective and collaborative "place" that boosts class dynamics. In our opinion, a pedagogical portal should have a **"clear focus"** but **"fuzzy edges"** (Rieber 2002). As we design it, a pedagogical portal marries the more rigid "workflow" approach often encountered in modern socio-constructivism with the spirit of open virtual environments that provide a feeling of "place" with identities, social rules, multiple activities, and therefore what is often called "presence".

Often, one associates new rich and open pedagogies are with "**learner-centered**". We believe that being "learner-centered" is not sufficient, since main-stream eContent-centered eLearning also rightly claims to be learner-centered, since students can look at contents and do exercises and tests at their own speed. Good learner-centered pedagogies may also be very **teacher-centered**, since the role of the teacher can become very complex and demanding. Let's recall the three principle roles that we attribute to the teacher-designer of structured, but active, open and rich educational scenarios:

- His role as a **manger** is to ensure productivity, i.e. that learners do things.
- His role as a **facilitator** is the help them in their choices and to suggest resources and tools that will help them to solve problems and get tasks done.
- His role as an **orchestrator** is to create "story-boards", i.e. to break down projects into scenarios, and scenarios into phases. He also may decompose problems into manageable sub-problems or alternatively encourage and help students to do so themselves.

It is very important to respect a principle of "harmony", to find an equilibrium of different pedagogical strategies and tactics and not to be tempted by over-scripting. In our philosophy, a teacher should think of himself primarily as a "land-scaper" who uses ICT to build places where learners can "sculpt" according to some rules and with as much help as appropriate.

Because of their modular architecture, a well trained teacher can configure portals and its "tools" according to his own needs. He can also hunt down new modules. He can re-purpose tools, e.g. he could use quizzes which are normally used for assessment as discussion openers. He can also suggest to the increasing number of technical support people that can be found in the school system to develop new tools. Since this technology is focused on "orchestration" and not content delivery, we believe that it will spread in the nearer future with almost the same ease as web pages did, but it will bring new functionalities. Teachers should have control over their environment and they should share their experience within teacher portals using the same technology. Both statements fit the C3MS philosophy. Finally, C3MS may be a chance to promote the open and sharing "Internet Spirit" to education, which is threatened by the philosophy of the closed so-called "educational platforms", e-learning systems or whatever are called today's main stream systems sold to the educational system. According to our initial experience, and despite many difficulties - like administrative hurdles, the time it takes to accommodate new pedagogical strategies, the disputable ergonomics of some software that we will have to overcome - teachers who engaged themselves "love it" and their students too.

7 PRACTICAL INFORMATION

The TecfaSEED teacher's catalogue and the TecfaSEED community portal

This portal is a bilingual (english, french) center for exchange and collaboration on socio-constructivist teaching & learning with the Internet. You are encouraged to submit News, use the forums, add or consult web links, make use of the wiki or any other application. We also provide a limited form of conceptual and technical support in the forums.

Who can use it?

- All local SEED partners (mostly school networks, their teachers and students)

- Participants of our “Formation continue” (Atelier Webmaster) classes
- Students and teachers of our postgraduate diploma in Educational Technology
- Anyone interested in supporting technology for socio-constructivist scenarios
- People interested by PostNuke technology in education (including educational use of standard modules and developers of special purpose modules)

URL: http://tecfaseed.unige.ch/door/

Downloads and information:

- In the downloads section, you will find interesting PostNuke modules, include the ones developed by our research team.
- The evolving Tecfa SEED catalog, which is a pedagogical and technical cookbook for the pedgagogical desins we advocate in this chapter (expect a first release version in spring 2004)
- Pointers to open Internet activities for schools (like “Terre des Hommes”) and observable project-based learning classes (like STAF-18) we described here.

Other interesting resources

- To find example portals (community and teaching) you can check the server home page (http://tecfaseed.unige.ch/), or look at announcements and side boxes in the TecfaSEED portal.
- Postnuke Home Page. [PostNuke is the C3MS used by the author]: http://www.postnuke.com/
- Portals Pointers @ TECFA. This is a simple list of interesting portalware: http://tecfa.unige.ch/guides/portals/pointers.html
- Martin Ryder, University of Colorado at Denever. [Constructivism Resource List that include fundamental on-line papers]: http://carbon.cudenver.edu/~mryder/itc_data/constructivism.html ,
- Bruce Landon, Centre for Curriculum, Transfer and Technology, Online educational delivery applications, [elearning-centered resource List]: http://www.c2t2.ca/landonline/
- SEED project (points to related but very different work by our European partners) http://ilios.cti.gr/seed

8 BIBLIOGRAPHY

Ashley, C. (2002) Weblogs, part II: A Swiss Army website? *Berkeley Computing & Communications*, Vol. 12, Number 1 (Winter 2002), URL: http://istpub.berkeley.edu:4201/bcc/Winter2002/feat.weblogging2.html

Ausubel, D., Novak, J., & Hanesian, H. (1978). *Educational Psychology: A Cognitive View* (2nd Ed.). New York: Holt, Rinehart & Winston.

Bielaczyc, K, Collins,A.(1999). “Learning Communities in Classrooms: A Reconceptualization of Educational Pratice”, in Reigeluth, C. (ed) *Instructional-Design Theories and Models*, Vol II, London: Erlbaum.

Chakroun, M. (2003), Conception et mise en place d’un module pédagogique pour portails communautaire PostNuke, Insat, Projet de fin d’études. URL: http://tecfaseed.unige.ch/users/mourad/arguegraph/ArgueGraph.pdf

Collins, A., Brown, J. S., & Newman, S. E. (1989). Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics. In L. B. Resnick (Ed.), *Knowing, learning, and instruction: Essays in honor of Robert Glaser* (pp. 453-494). Hillsdale, NJ: Lawrence Erlbaum Associates.

Csikszentmihalyi, M. (1990). Flow: The psychology of optimal experience. Harper and Row, New York

Dieberger, A. (1999) Social connotations of space in the Design for Virtual Communities and Social Navigation. In Munro, A., Höök K. & Benyon D. (Eds), Social Navigation of Information Space, pp. 35-54. Springer: London

Davies, D. (2002) Radio Weblog of March 22 2002 on Virtual Learning Environment (VLE) using Manila http://radio.weblogs.com/0001161/2002/03/22.html#a159

Dillenbourg P. (1999) What do you mean by collaborative learning?. In P. Dillenbourg (Ed) *Collaborative-learning: Cognitive and Computational Approaches*. (pp.1-19). Oxford: Elsevier.

Dillenbourg, P., Baker, M., Blaye, A. & O'Malley, C.(1996) The evolution of research on collaborative learning. In E. Spada & P. Reiman (Eds) *Learning in Humans and Machine: Towards an interdisciplinary learning science*. (Pp. 189-211). Oxford: Elsevier.

Dillenbourg, P., Schneider,D., Synteta,V., (2002) "Virtual Learning Environments", *Proceedings of the 3rd Congress on Information and Communication Technologies in Education,* Rhodes, Kastaniotis Editions, Greece, 3-18.

Dougiamas, M. & Taylor, P.C., Interpretive analysis of an internet-based course constructed using a new courseware tool called Moodle, Curtin University of Technology, URL: http://www.ecu.edu.au/conferences/herdsa/main/papers/nonref/pdf/MartinDougiamas.pdf

Feldman, D.H., Csikszentmihalyi, M. Gardner, H., (1994) Changing the world, A Framework for the Study of Creativity, Westport: Praeger

Fox, G.C. (2000) Portals and Frameworks for Web Based Education and Computational Science?, in Rana.O (ed.), *Proceedings of the Second International Conference on the Practical Application of Java*, Manchester England April 12-14 2000. URL: http://www.new-npac.org/users/fox/documents/pajavaapril00/

Gilroy, K. (2001), Collaborative E-Learning: The Right Approach URL: http://www.arsdigita.com/asj/elearning/ Ars Digita Systems Journal

Greening T. (1998). Scaffolding for success in PBL. *Medical. Education Online*. Vol III, Available from URL http://www.Med-Ed-Online.org.

Guzdial, M. et al. (2000) A Catalog of CoWeb Uses, GVU Tech Report 00-19. URL: http://coweb.cc.gatech.edu/csl/24

Guzdial, M., Rick, J., and Kehoe, C. (2001) Beyond Adoption to Invention: Teacher-Created Collaborative Activities in Higher Education, URL: http://coweb.cc.gatech.edu/csl/24 Journal of the Learning Sciences

Koper, R. (2001) Modeling units of study from a pedagogical perspective, the pedagogical meta-model behind EML. URL: http://eml.ou.nl/introduction/docs/ped-metamodel.pdf

Koper, R., Olivier, B. & Anderson, T. (2003), IMS Learning Desing Information Model. IMS Global Learning Consortium, http://www.imsglobal.org/learningdesign.

Looney, M. and Lyman, P. (2000), "Portals in Higher Education: what are they and what is their potential", EDUCAUSE Review, Vol. 35, No. 4, July/August, pp.28-36. URL: http://www.educause.edu/pub/er/erm00/articles004/looney.pdf

van Merriënboer, J.J.G. and Pass,F. (2003) Powerful Learning and the Many Faces of Instructional Design: Toward a Framework for the Design of Powerful Learning Environments, in De Corte, E. et al. Powerful Learning Environments: Unraveling Basic Components and Dimensions, Amsterdam: Pergamon, 3-20.

MIT News, (2001), "MIT to make nearly all course materials available free on the World Wide Web", April 4 Press release,URL:http://web.mit.edu/newsoffice/nr/2001/ocw.html

Notari, Michele (2003), *Scriping strategies in computer supported collaborative learning envrionments*, unpublished master thesis, TECFA, FPSE, University of Geneva.

Reigeluth, C. M. (Ed.). (1983). *Instructional-design theories and models: An overview of their current status*. Hillsdale, NJ: Erlbaum.

Rieber, Lloyd. P., Smith, L., & Noah, D. (1998). The value of serious play. Educational Technology, 38(6), 29-37, [En ligne] Adresse URL : http://itech1.coe.uga.edu/~lrieber/valueofplay.html

Rieber, L.P. (2001, December). Designing learning environments that excite serious play. Paper presented at the annual meeting of the Australasian Society for Computers in Learning in Tertiary Education, Melbourne, Australia.

Scardamalia, M., Bereiter, C., McLean, R., Swallow, J., & Woodruff, E. (1989). Computer supported intentional learning environments. *Journal of Educational Computing Research*, 5, 51-68

Schneider, D., Frété C., Synteta,V. (2002a) "Community, Content and Collaboration Management Systems: socio-constructivist scenarios for the masses?", Proceedings of Ed Media 2002, Denever, 24-29 juin 2002.

Schneider, D., Synteta,V., Frété C., (2002b) "Community, Content and Collaboration Management Systems in Education: A new chance for socio-constructivist scenarios?". *Proceedings of the 3rd Congress on Information and Communication Technologies in Education*, Rhodes, September 26th-29th 2002

Schneider, D. Dillenbourg, P., Frété, C., Morand, S., Synteta, P. (2003), TECFA Seed Catalog, URL: http://tecfa.unige.ch/proj/seed/catalog/ , Draft version.

Schneider, D. et al. (to appear) "Conception et implémentation de scénarios pédagogiques riches avec des portails communautaires", *Les Communautés Virtuelles Éducatives. Pour quelle Éducation ? Pour quelles cultures ? Second Colloque de Guéret*, 4,-6 juin 2003. [This is a text with a similar aim as this chapter]

Shneiderman B. (1988). Relate-Create-Donate: an educational philosophy for the cyber-generation. *Computers and Education*.

Synteta, P.(2002b). Project-Based e-Learning: The model and the mehod, the practice and the portal. Accepted PhD proposal, University of Geneva, Geneva, Switzerland. URL: http://tecfa.unige.ch/perso/vivian/

Synteta, P. (2003a). Project-Based e-Learning in higher education: The model and the method, the practice and the portal. Studies in Communication, New Media in Education. (pp. 263-269). http://tecfa.unige.ch/perso/vivian/

Synteta, P. (2003b). Project-Based e-Learning system In Wasson, B., Baggetun, R., Hoppe, U., Ludvigsen, S. (Eds). Paper in Doctoral Consortium of International Conference on Computer Support for Collaborative Learning (CSCL 2003), Community events, Communication and Interaction, Bergen, Norway. pp. 219. http://tecfa.unige.ch/perso/vivian/

Thomas J. W., Mergendoller J. R., and Michaelson A. (1999). *Project-based learning: A handbook for middle and high school teachers*. Novato, CA: The Buck Institute for Education.

von Glasersfeld, E. (to appear) "Radical Constructivism and Teaching" Scientific Reasoning Research Institute, University of Massachusetts, URL: http://www.umass.edu/srri/vonGlasersfeld/onlinePapers/html/geneva/

Vygotsky, L.S. (1962) *Thought and Language*. Cambridge, MA: MIT Press.

Wilson, B. & Lowry, M. (2001), Constructivist Learning on the Web, in Burge,L. (Ed.),*Learning Technologies: Reflective and Strategic Thinking*. San Francisco: Jossey-Bass, New Directions for Adult and Continuing Education. URL: http://ceo.cudenver.edu/~brent_wilson/WebLearning.html

Acknowledgements

This chapter reports on collective work done by the Swiss SEED research team at Tecfa, namely: Pierre Dillenbourg (co-project contractor and scientific advisor), Catherine Frété (educational technologist and teacher “interface”), Fabien Girardin (developer and module programmer), Stéphane Morand (developer and portal specialist), Paraskevi Synteta (educational technologist, project-based learning expert and module programmer). We have done this as a team! I also would like to express my thanks to: Barbara Class (PhD student and distance tutoring specialist), François Lombard (educational technologist, teacher and wiki expert), Michele Notari (teacher, STAF student and Swiki expert), Elodie Sierra (teacher and STAF student), Philippe Maigre (teacher and leader of the “Pangea” project), Alan McCluskey (ICT consultant for various national agencies), the whole “Terre des Hommes” team, Laurent Dubois (teacher and leader of the “Educapoles project”) and Charlie Lowe of “Kairosnews.org”. I also would like to mention that confrontation with other SEED projects has been extraordinarily inspiring to all of us. Let’s quote Chronis Kynigos’ “half-baked solutions” or Ulrich Hoppe’s “orchestrations”. Last, but not least, I would like to thank the extra-ordinary open source community that brings us tools like PostNuke. I hope that we can pay it back sometimes by bringing Internet creativity to education.

This research and field work is part of the SEED project (European IST Programme No IST-2000-25214) and sponsored by the Swiss Federal Office for Education and Science (No OFES: 00.0287).