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# The Role of the Learning Platform in Student-Centered E-Learning

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## Abstract

*It is often a case that technologically-oriented research on e-learning stresses the tools and individual features used in e-learning platforms rather than the pedagogical model and the underlying course structures. This study compares the outcomes from a similar course in a similar setting using very different learning platforms designed by the same research group. The tool used in the first course, EDUCO, offers awareness of other learners by real-time social navigation features. The tool used in the second course, EDUCOSM, relies on easy-to-make joint asynchronous annotations on documents. The pedagogical model for the courses was the same: student-centered learning in self-organizing and self-evolving groups using peer support to tackle open-ended large problems. The results suggest that the learning outcomes can vary, especially in a case where the environment is open and transparent in a sense that it enables learners to easily rely on and help each other in peer-to-peer fashion.*

## 1. Introduction

Internet and related technologies have already had a significant impact on ways to organize learning and studying. On the other hand, emerging trends in higher education include a shift from teacher-oriented lecturing towards student-centered learning. Student-centered learning [8] is supported theoretically by various overlapping pedagogical concepts such as self-directed learning [1], student-centered instruction or learning [3], active learning [11], vicarious learning [9] and cooperative learning [3].

Organizing learning in student-centered way includes substituting active learning experiences for lectures, holding students responsible for material that has not been explicitly discussed in class, assigning open-ended problems which require both critical and creative thinking, and using self-paced cooperative learning.

Typical off-the-shelf learning management systems can be used in student-centered learning. However, current technologies are able to offer more versatile ways to support collaboration between the peers.

Awareness of others, joint building of knowledge and matching unknown actors or resources are examples of contemporary ways to support collaborative learning [5].

This paper examines the impact of two different learning platforms with different collaboration features, when the platforms were used in a similar course in a similar context. The first system relies on real-time *social navigation* [2] and offers a strong sense of other learners (learning community) by showing in real-time where other people are and where they move in the learning space, and an easy way to engage into chat with any participant. The second system relies on *joint annotation*: the system offers an easy-to-use and straightforward way to highlight or comment documents that are brought into the common pool of documents by the learners themselves, so that the annotations are immediately visible to other learners. The second system provides thus a highly transparent learning environment, where every learner can easily help other learners by highlighting important points in documents, or commenting on each others draft documents, for example. Both platforms offer a space for students or groups of students to publish their own work.

Although the features in these two learning platforms vary, the learning culture they impose is much the same. They both rely on the idea of learner-centered collaborative learning with peer-support in self-organizing and self-directing groups. In addition, the learners are expected to take responsibility for their own learning so that the role of the teacher is more of a guide than a teacher.

## 2. Tools

### 2.1. EDUCO

From the users' point-of-view, the key issues in EDUCO [7] are navigation towards useful information using social navigation, synchronous and asynchronous communication, group forming and publishing group works.

EDUCO environment consists of three frames: the EDUCO *tool frame*, a view to a document from the pool of documents, and possible comments to that document.

The EDUCO tool frame consists of different views of which only one is visible at a time. The most important views are map, chat, search and alarm (Fig. 1).

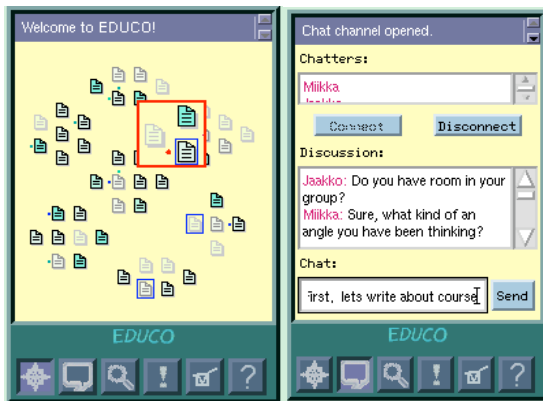


Figure 1: Two different views of EDUCO: Map/Chat.

The *map* view presents documents currently available in the learning environment and provides a way to navigate to them directly. By double-clicking any document a learner can open it in a large frame in the browser window. A user is represented as a colored dot around the document he or she is currently viewing. Other users are visible to every user in real-time, so that their navigation is visible to everyone present in the environment.

The documents change their brightness level and color on the map depending on how much they have been viewed relative to the other documents, as seen in Fig. 1. In other words, map view provides the users of EDUCO two social navigation features. Coloring the documents according to how much they have been viewed is asynchronous social navigation. Presenting users as moving dots next to the documents they are currently viewing is a form of real-time social navigation. Both of these features can help the users to follow the footsteps of the others. The real-time social navigation also adds to the sense of not being alone in a web-course [6].

EDUCO has a built-in *chat* functionality integrated to the map view to enable synchronous communication between the users of the environment. The chatters can be picked up from the map view by clicking the dots representing users. The number of participants in the discussion is unlimited, but one person may use only one chat channel simultaneously. Figure 1 shows an example of the use of chat. In addition to synchronous discussions, EDUCO uses two types of document-specific asynchronous communications: areas for general comments and hierarchical newsgroup-type discussions for meaningful knowledge building.

The *search* function of EDUCO can be used in finding persons or documents. The *alarm* offers each user a possibility to set “triggers” into the documents,

groups and the overall system. In other words, a user can set EDUCO to alarm when certain conditions occur. This feature is useful in a case where a user searches for a learning companion showing interest to a certain document or topic, or wants to contact a particular person when he or she enters the system. The alarm function also enables making combinations of triggering events.

Alarms, chat and navigational patterns can be used when screening for potential members for group work. Every user can form a group by clicking a button “Add a new group”. Other people can join an already existing group, or they can start a new group. After producing a joint work, it can be published in EDUCO for newsgroup-type of hierarchical comments.

The group-forming feature of EDUCO is designed for Web-courses where the learning process involves writing reports in groups. Document icons in the map view of EDUCO can each represent a collection of student reports.

It should be noted that the documents (and corresponding document icons in the map view) in EDUCO are brought into the system by the teacher; learners are not allowed to add new documents to the system.

## 2.2. EDUCOSM

The EDUCOSM system [10] consists of a set of tools (i.e., Search, Newsgroups and Filters) for asynchronous collaborative knowledge construction. The system appears to the user as a button bar at the top of the browser window and a custom popup menu that is available on any page being accessed through the system (with a right-mouse click). The button bar is used for navigating between the views, including desktop, search and filter creation views, which are described below. Functions for handling individual documents are located in the popup menu. Popup menu functions allow the students to add new material to the system and create annotations and newsgroups.

The use of the EDUCOSM tool is described from a learner’s point-of-view. Suppose that the learner becomes interested in a certain topic, and wants to find more information about it. From the search view, he can send queries to Google and search the entire Web. The popup menu is available on all pages, allowing the student to add new material to the system. The right mouse button makes the menu visible, and an option labeled “Add to EDUCOSM” is applied to include the open document to the environment. In addition, the learner is asked to assign the document to one of the topics of the course. When a document is added to the system, it becomes visible on index pages and internal search, it can be annotated, and the system can recommend it to other potentially interested users on the

desktop. In other words, it becomes available for the entire community to collaborate on.

The primary means of collaboration are joint annotations, hierarchical newsgroup discussions and publication of the learners' own reports. Two different types of annotations are supported: highlights and comments. Highlights can be applied to marking important parts of the text, analogously to the way people highlight lines of text on paper. In practice, to make a highlight involves selecting the text with the mouse, right-clicking the mouse to make the popup menu visible, and choosing the appropriate option from the menu. Comments work the same way, except that they include the learners' own reflections appearing as a tooltip when the mouse pointer is placed on top of the commented text fragment (Fig. 2). More space for longer discussions is available in document-specific newsgroups, which can be attached to every document as needed (using the same hierarchical newsgroup-type discussion board as in EDUCO). The students can publish their own work along with other resources, and all of the same collaboration tools are available for discussion and feedback concerning the student reports.

The extent to which collaboration actually takes place around the newly added document depends largely on its relevance to the interests of the course participants. Some documents are studied, annotated and discussed comprehensively, whereas others may not have much overall impact on the community.

Although collaboration is a crucial part of studying in EDUCOSM, it may occasionally happen that the learner does not want to see all of the annotations in a document simultaneously. This need can be addressed with filters that define the group of learners and the time period from which annotations are shown. For example, the learner may choose to see only the latest annotations of his own work group, or hide all annotations completely. Filters are created on a special page, where the learner can simply select the people from a list and optionally limit the time period to the last day, week or month.

Additional features include personalized desktop and internal bookmarks. The desktop serves as the entry point to the system, and contains links to announcements, assignments, articles and newsgroup messages. The announcements and assignments are posted by the instructor.

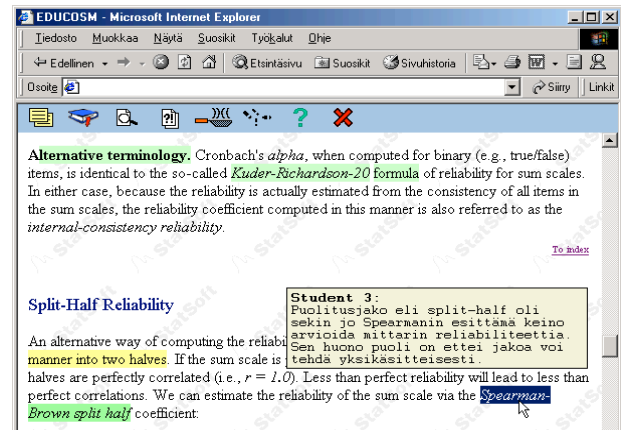


Figure 2. EDUCOSM user interface showing a tooltip comment.

### 3. Study Setting

The data sets were collected during the Spring 2002 and Spring 2003 semesters from a course entitled "Computer Uses in Education" with a subtitle of "Web-based learning". The courses were given at the Department of Computer Science, University of Helsinki, Finland. The responsible teacher for both the courses was the same. The courses were web-based courses without face-to-face meetings except orientation to the course and to the tool in the beginning. It was mandatory to use the tool provided (EDUCO in the first and EDUCOSM in the second course). Forty-three students completed the course in Spring 2002 and thirty-one in Spring 2003. Some of the students were adult learners with varying backgrounds and degrees but most of them were Computer Science majors in both of the courses.

The format for the course was unique compared to the other courses at the Department. The students had to produce weekly or bi-weekly reports from given topics. Apart from some special assignments, it was not allowed to produce the report alone. At least a working pair was required, and a group of three was recommended. Moreover, the groups were not allowed to stay the same during the whole course.

In addition to the different learning platform, there were minor organizational differences in the courses. In 2002, there were nine weekly assignments; in 2003, there were five. The topics were the same, but in 2003 the students were able to choose more freely which assignment to start to work on. In 2003, the groups had also more time to work on some of their reports.

In 2002, the documents in EDUCO map discussed the issues covered during the first eight weeks. The documents were organized to eight different clusters under a common theme. The themes were close to the weekly topics but not completely the same. The document cluster sizes varied from two to ten, giving a

total of ca. 40 documents. The exact amount of documents varied during the course, since new resources were added or removed occasionally.

In 2003, the teacher brought in some meaningful resources into the joint document pool to start with. During the course, the students brought in hundreds of additional documents into the joint pool of documents; some of which naturally more helpful than others.

#### 4. Results

The questions are, if the amount of activity shown by the students is different in 2002 and 2003, and did it lead to different learning outcomes. These questions are discussed in the light of the logged statistics from the tools used, the points awarded to the student reports (primary learning outcome), and subjective differences between the courses as seen by the responsible teacher for both the courses. The logged statistics include only those students who stayed to the end of the course.

**Visible activity.** It should be noted that with EDUCO, the learners had somewhat more limited ways to show activity, such as: time in system; writing general comments; writing postings to discussion boards; chatting with others. When using EDUCOSM, there were more ways for activity: time in system; writing postings to discussion boards; and more importantly, bringing documents into a joint pool of documents; highlighting them; commenting them with tooltip comments; filtering annotations.

Time in system and number of sessions do not provide us with accurate data, since students had different ways of using the system. For example, some people left the session open intentionally to generate an illusion of activity; some printed out the documents to study without the system. Therefore, only written input and annotations from the students were taken into consideration when examining the activity (Table 1).

Table 1. Differences in activity in 2002 and 2003.

<u>2002, n=43</u>	Total	Avg
General comments	172	4,00
Newsgroup postings	481	11,2
<b>Total</b>	<b>653</b>	<b>15,2</b>
<u>2003, n=31</u>	Total	Avg
Tooltip comments	1328	42,8
Newsgroup postings	111	3,58
Highlights	1846	59,5
<b>Total</b>	<b>3285</b>	<b>106</b>

The statistics show clearly more peer-helping activity in 2003. The tools offered made it easier to engage into

activities. In 2002, there were three students who did not post any general comment or newsgroup postings. In 2003, everyone showed some activity, although one student did not write any tooltip comments or newsgroup postings but highlighted existing documents.

**Learning outcomes.** Both in 2002 and 2003, the grading for the course consisted of several different parts. There were points awarded for overall activity in the sense of helping the “joint knowledge construction process”, but the most points were awarded from the reports produced in small groups. The grading was done by the teacher and the teaching assistant separately, and if their grades for individual reports varied, an average was calculated. In 2002, seven best reports (out of nine) for each student were included in the final grade. In 2003, all five reports were included in the final grade. The topics were the same in 2002 and 2003, but in 2003, the topics were bundled so that there was flexibility to choose the topic that was the most interesting.

The first assignment was an orientation to the topic of the course. The last assignment was to gather the best and the most important ideas from all the produced reports. Since the first and the last assignment were fairly different in nature compared to the other assignments, we will examine the assignments in between the first and the last assignment. The second row in Table 2 shows the average points awarded from those assignments in 2002, varying from 7,54 to 8,06. In 2003, the assignments were bundled so that the second assignment included 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup>, and third assignment included 5<sup>th</sup> and 6<sup>th</sup>, and the fourth assignment included 7<sup>th</sup> and 8<sup>th</sup> (as seen in Table 2). Average points awarded from those assignments in 2003 vary from 8,31 to 8,43, as seen in the fourth row in Table 2. When the points awarded in 2002 are bundled in the same way than in 2003 (middle row in Table 2), we can see that the points awarded are significantly higher in 2003 (varying from 8,31 to 8,43) than in 2002 (varying from 7,61 to 7,80), suggesting that the learning outcomes are better in 2003.

Table 2. Points awarded from student reports in 2002 and 2003. Maximum points per report is ten.

	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>	9 <sup>th</sup>
2002	7,46	7,98	7,76	7,61	7,54	7,68	7,54	8,06	9,21
	<b>7,46</b>	<b>7,78</b>			<b>7,61</b>		<b>7,80</b>		<b>9,21</b>
2003	<b>7,90</b>	<b>8,43</b>			<b>8,31</b>		<b>8,39</b>		<b>8,31</b>
	1 <sup>st</sup>	2 <sup>nd</sup>			3 <sup>rd</sup>		4 <sup>th</sup>		5 <sup>th</sup>

From a pedagogical viewpoint, there are several open questions – and as such, limitations of the study – considering the observed differences in 2002 and 2003.

It is not clear what is the effect of a longer time to work on an assignment (as it was the case in 2003); according to common knowledge, longer time to study should lead to better learning results. In addition, when the students were able to choose their topics more freely in 2003, it should have an effect on their motivation and thus the learning outcome (see e.g. [12]). Moreover, there is some effect caused by the teacher's experience gained after one successful course, probably compensated by the fact the teacher is not so enthusiastic the year after the first course. Some minor effect can be caused by the fact that it was not mandatory to switch teams *every* time for group work in 2002 but was in 2003.

**Perceived (subjective) differences.** There is only one significant difference between the courses: the sense of community was stronger in 2002 (for more details, see [6]). The feeling of being a part of a community was seen in more positive attitude towards the course in the end. The teacher of the course was mentally more involved in 2002 compared to 2003. One difference from the teacher's viewpoint is that it was significantly easier to give feedback in 2003, since the tool (EDUCOSM) allows to pin comments very tightly to a certain part of the text, so that small but accurate comments are possible.

## 6. Concluding remarks

Student-centered learning can be successfully transformed into e-learning environment. Interactions between the students and the teacher, as well as among the students, can be supported by various technologies or tools or features. Successful structuring of the activities and meaningful tools can lead to positive interdependence within the learning community as well as engagement, autonomy and independence [4].

This study suggests that there can be difference in learning outcomes based on the tools used. One conclusion is that if the pedagogical model and the course structures benefit from transparency and peer support in learning, it is beneficial to have tools that allow easy and straightforward way to interact and provide input to support other community members, in peer-to-peer fashion.

However, it is clear that the results presented here are only an initial step towards evaluating the impact of individual features in e-learning platforms; the results are difficult to generalize, so the gradual accumulation of the evidence is necessary in the future.

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## References

- [1] P. Candy, *Self-direction for Lifelong Learning*, Jossey-Bass, San Francisco, CA, 1991.
- [2] A. Dieberger, "Social Navigation in Populated Information Spaces". In A. Munro, K. Höök & D. Benyon (Eds.), *Social Navigation of Information Space*, Springer-Verlag, 1999, pp. 35-54.
- [3] R. Felder and R. Brent, "Effective Strategies for Cooperative Learning", *Journal of Cooperation & Collaboration in College Teaching*, 10(2), 2001, pp. 69-75.
- [4] B. Hudson, D. Owen and K. van Veen, "Working on educational research methods with Masters students in an international online learning community". Paper to the EERA Network 6 Open Learning Contexts, Cultural Diversity, Democracy (OPENet), European Conference on Educational Research, Univ. of Hamburg, 2003.
- [5] J. Kurhila, "Tools to Support Learning Communities On-Line". In Proceedings of ICALT 2003, IEEE Computer Society Press, 2003, pp. 518-519.
- [6] J. Kurhila, M. Miettinen, P. Nokelainen, H. Tirri: "Enhancing the Sense of Other Learners in Student-Centered Web-Based Education". In Proc. Int'l Conference on Computers in Education (ICCE 2002), IEEE Computer Society Press, pp. 318-322, 2002.
- [7] J. Kurhila, M. Miettinen, P. Nokelainen and H. Tirri "EDUCO - A Collaborative Learning Environment using Social Navigation". In P. de Bra et al. (Eds.) Proc. Adaptive Hypermedia and Adaptive Web-Based Systems (AH 2002), Springer-Verlag 2002, pp. 242-252.
- [8] S. Land and M. Hannafin, "Student-centered Learning Environments". In: D. Jonassen and S. Land (Eds.), *Theoretical Foundations of Learning Environments*, Lawrence Erlbaum Associates, Mahwah, NJ, 2001, pp. 1-23.
- [9] J. Lee and J. McKendree, "Learning vicariously in a distributed environment", *Journal of Active Learning*, 10, 1999, pp. 4-10.
- [10] M. Miettinen, J. Kurhila, P. Nokelainen, P. Floreen, H. Tirri: "EDUCOSM - Personalised Writable Web for Learning Communities". In Proc. ITCC 2003, IEEE Computer Society Press, pp. 37-42.
- [11] P. Ramsden, *Learning to Teach in Higher Education*, Routledge, London, 1992.
- [12] C. Sansome and J. Smith, "Interest and self-regulation: the relation between having to and wanting to". In C. Sansome & J.M. Harackiewicz (eds.), *Intrinsic and extrinsic motivation. The search for optimal motivation and performance*. Academic Press, 2000, pp. 341-372.

