The implementation of a Web-based Learning Environment concerning teachers' collaboration in the area of Fluids.

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Abstract

In our work we developed and implemented a web-based distance learning course, addressed to in service primary teachers in Greece. The course aims at enhancing participants' understanding of fluids as well as their collaboration towards producing teaching learning materials for their pupils. We implemented a specific strategy, in order to promote asynchronous collaboration among participants and evaluated results by using Murphy`s quantitative content analysis model for computer based collaborative identification. Results showed that participants moved from simple interaction to the production of shared artefacts, identified as enhance collaboration.

Keywords

Collaboration, Web based learning Environment, Quantitative Content analysis.

Theoretical background

During recent years, in the area of higher education, a great number of applications have used Web-based learning environments, in order to support distance learning courses and computer supported collaborative approaches, in learning and problem solving, in several areas, (Scardamalia, & Bereiter, 1994), (Avouris, N., Dimitrakopoulou, A., Komis, V., 2003). Computer-mediated communication can facilitate collaborative learning strategies and approaches, (Hiltz, 1990), thus providing opportunities for virtual communities of learners to collaborate in ways that lead to shared understanding, (Murphy, Laferriere, 2005).

For many years, theories of collaborative learning tented to focus on how individuals function in a group, but more recently the focus has shifted so that the group itself has became the unit of analysis, (Dillenbourg et al, 1996). The pedagogic advantages offered by collaboration and web based distance learning activities, are in the centre of research. Research suggests, that online asynchronous discussions facilitate many-to-many learner(s)-to learner(s) interaction, that potentially may promotes collaboration, though not guarantee it, since collaboration is more than interaction. Collaboration represents a "purpose relationship", the intent to "produce something, to solve a problem, create, or discover something", (Schrage, 1995), and to work together to achieved shared goals, (Kaye, 1992; Roschelle & Teasley, 1995). It also requires coordinated synchronous activity that is the result of continued attempt to construct and maintain a shared conception of a problem.

Evaluating on-line collaborative learning interactions is a complex task due to the variety of elements and factors that take place and intervene, in the way a group of participants comes together to collaborate, in order to achieve a learning goal, (Daradoumis et al, 2006). The development of shared goals and understandings is seen as an ideal for those wanting learners to benefit from online written discourse, (Harasim et al, 1995). However it appears that developing shared goals as well as shared artefacts is not

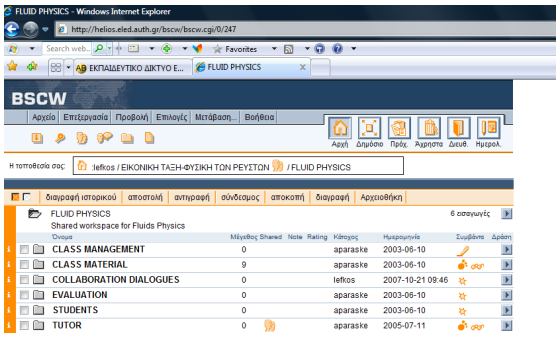
an easy task to be achieved via web based environments and worth further investigation (Murphy, 2004). In the area of primary education, in Greece, literature suggests that in service primary teachers, who are the focus of this study, express their willingness to collaborate, but they feel unprepared to implement collaborative learning in teaching scientific topics, (Piliouras, et.al, 2000). Moreover, they would like to take part in collaborative programs before they will implement collaborative activities for their pupils and they are willing to take part in service programs in which they have opportunities to participate in collaborative activities, (Piliouras, et.al, 2000). Besides our pilot studies concerning teacher' collaboration in web based environments show that in service primary teachers in Greece are hesitant to collaborate with their colleagues in difficult topics because they feel that collaboration will reveal their possible knowledge deficit. Fluids is a topic which is taught in Greece as well as in many other countries. Research suggests that primary teachers hold alternative conceptions in this area and in particular with regard to pressure and buoyancy.

In this context, we developed web based materials and a teaching strategy aiming at enhancing participants' understanding on pressure and buoyancy, as well as their asynchronous distance collaboration towards producing teaching learning materials for their pupils. In the present study, we report on the strategy and the collaborative identification of participating teachers.

Design of the study

I) The web based environment

The sample of our study consisted of twenty four, (24), experienced primary teachers, who attended a two years in service program at the Department of Primary Education, University of Thessaloniki. In developing the course, first software for the Web based learning environment implementation was chosen and the open source software B.S.C.W. (Basic Support for Collaborative Work), has been chosen, because it is free for academic use,(http://bscw.gmd.de/). Then a web-based learning environment, (W.B.L.E.), was set up on the Internet on http://helios.eled.auth.gr/bscw address, **(picture 1).** The learning environment included six, (6), separated, and shared spaces concern: class management, class material, collaboration dialogues, evaluation, students, and tutor. Details of the environment have been published elsewhere, (Paraskevas, Stamatis, Psillos, Molochides, 2003).



Picture 1: Screen shot of shared spaces of Web based learning environment

Specially developed materials in the area of fluids were digitized and uploaded to the environment. A kit containing simple equipment for performing experiments described in the supplemented these materials as presented elsewhere (Paraskevas, Stamatis, Psillos, Molochides, 2003), (Molochides, Psillos, 2000), **(picture 2).**

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Picture 2: Kit with simple equipment

II) The teaching strategy

Based on data from two pilot studies, we designed a special mixed strategy in order to enhance teacher's collaboration. The structure of the strategy included four subsequent phases as following:

- Teachers were initially familiarized with the environment.
- They studied the web based material and implemented experimental activities concerning pressure and buoyancy individually.
- They participated in a face to face workshop and were instructed how to collaborate in asynchronous environments.
- They engaged in asynchronous collaborative dialogues aiming at producing teaching learning material for their future pupils in primary schools.

Analytically, the teachers were initially familiarised with the Web based Learning environment, at the University laboratory. They were supported with written instruction, involved in familiarised activities about using W.B.L.E. , and concluded with the registration procedure to the Web based learning environment which was based on e-mail. They also carried out written tasks, in order to measure their prior content knowledge for fluids. Then the administrator of Web based learning environment uploaded the learning material for pressure and buoyancy and hand it out a kit with simple equipments to the teachers. In the second phase the teachers were informed that they had to carry out activities about pressure and buoyancy at any time they would like to within a two weeks period. Teachers downloaded the learning material and carried out the experiments and the planned tasks from a distance. Then they uploaded all the planned tasks and carry out written tasks at the laboratory. In the third phase the teachers presented and discussed their own previous collaborative experiences in an open general meeting, face to face. One of the authors presented to them theoretical issues concerning collaborative learning and provided participants with specific instructions on how to engage in implementing collaborative discussion at distance. In the final phase they were engaged in collaborative activities, in dyads, using web based written asynchronous dialogues, in order to plan and produce teaching learning materials for their future pupils.

iii) Instrumentation

In order to identify collaboration possibilities, among teachers, we carried out quantitative content analysis of their written computer based dialogues, using the widely applied model of Murphy (Murphy, 2004). For that purpose we downloaded and printed the written dialogues from the web based environment and used as a unit of analysis, the message. Certain clarifications on the exchange and meanings of messages were deduced from end of the course interviews. Murphy's model includes a series of processes or stages that move from interaction to collaboration. The earlier processes are prerequisites for the later ones. According to Murphy's model, recognition of collaboration in the context of asynchronous discussions, involves identifying instances and manifestations of a range of a process along this continuum ranging, from social presence to the production of a shared artefact. It also involves identification of individual indicators of these processes ranging from sharing personal information to sharing goals and purposes. Promoting collaboration will necessary involve an appreciation for the context or learning material in which participants interact in virtual environments. The processes include:

social presence, articulating individual perspectives, accommodating the perspectives of others, co-constructing shared perspectives and meanings, building shared goals and purposes and producing shared artefacts, and are showed below, **(figure 1).**

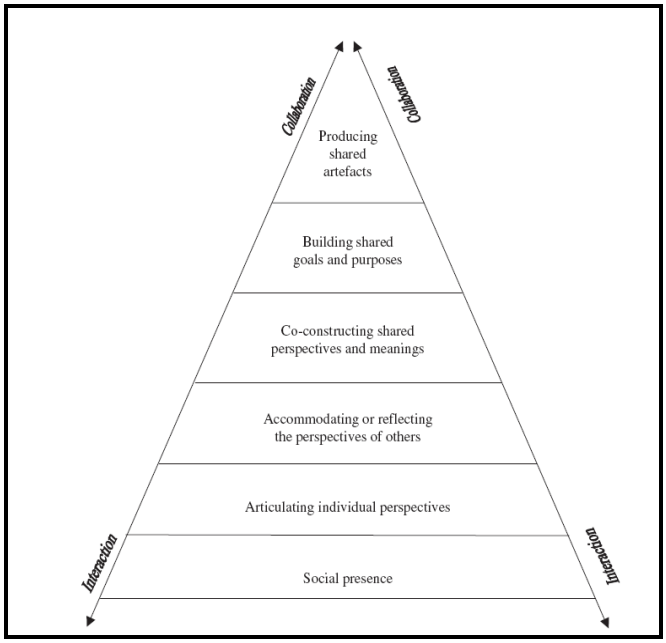

Figure 1: Murphy's collaboration model

For each process we derived specific indicators and coded each message with a specific code. The indicators were derived by first identifying the types of statements participants made in their dialogues, for example, posting a question, sharing information about oneself or disagreeing with another participant. When the entire transcript had been read and all the statements had been categorised, the resulting list of indicators was compared with the six major processes. Classification of statements were cross examined by a second researcher and discussed so that agreement was reached. The individual indicators were then associated with the processes the supported. Letter codes were assigned to each of the processes and indicators.

Results

From the implementation of the specific model in our data it emerges the number of messages, in which each of the indicators of collaboration occurred. Overall two hundred fifteen five, (215), messages were exchanged in all the twelve dyads, ranging from social presence up to shared artefacts. Twenty eight messages, (28), showed evidence of interaction in the phase "social interaction", eight messages, (8), coded as articulating individual perspectives, ten messages, (10), were coded as accommodating or reflecting the perspectives of others. Thereafter eighty two messages, (82), found as co-constructing shared perspectives and meanings and seventy five messages, (75), coded as building shared goals and purposes. Last all dyads produced the required shared artefacts which were learning activities for pupils, concern buoyancy and pressure. These results are shown in table 1.

Table 1: collaboration results according Murphy`s model

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Participants-(dyads)	Social presence	Articulating individual perspectives	Accommodating the perspectives of others	Co-constructing shared perspectives and meanings	Building shared goals and purposes	Producing shared artefacts
24 - (12)	28	8	10	82	75	12

Analytically participants' messages were classified as following:

In the phase of Social presence:

According to the model, collaboration begins with interaction, participants show awareness of each other's presence and begin to relate as a group. Social presence creates group cohesion, which enriches interaction and when a sense of community is formed through communicating on a social rather than an informational level, interaction can move to a higher level and become collaborative, (Henri, 1992; Garrison et al, 2000).

In the results one message, (1), characterised as sharing personal information, twenty one, (21), coded as recognising group presence and six messages, (6), coded as expressing feelings and emotions.

In the phase of articulating individual perspectives:

At this phase, participants are aware of the presence of others, but do not explicitly reference their perspectives or solid feedback from them. Data showed, seven messages, (7), coded as statements of personal opinion or beliefs, making no reference to perspectives of others and one message, (1), coded as summarising or reporting on content without reference to the perspective of others.

In the phase of accommodating the perspectives of others:

This phase is a prerequisite towards building knowledge and constructing new meanings. At this phase participants not only share perspectives, but also challenge and refine those perspectives. When participants articulate and externalise their thoughts, disagreements or conflicts become explicit, (Murphy, 2004).

Data showed that, one message, (1), coded as directly disagreeing with/challenging statements made by another participant, four messages, (4), coded as indirectly disagreeing with/challenging statements made by another participant, two messages, (2), coded as introducing new perspectives, one message, (1), coded as coordinating perspectives and last two messages, (2), coded as sharing information and resources.

In the phase of co-constructing shared perspectives and meanings:

When participant's perspectives are challenged, both by disagreements or criticism, usually they restructure their thinking, (Steeples et al, 1994, Brown and Palincsar, 1989) and in order to produce common and shared meanings, they must work together (O'Malley, 1995).

Data showed that participants worked together and posted, thirty one messages, (31), coded as asking for clarification/ elaboration, four messages, (4), coded as posting rhetorical questions, eleven, (11), coded as soliciting feedback, six messages, (6), coded as provoking thought and discussion, twenty nine, (29), coded as responding to questions and last one message, (1), as sharing advice.

In the phase of building shared goals and purposes:

While participants develop social presence, articulate, accommodate and co-construct shared perspectives, they also work together to achieve shared goals, (Roschelle & Teasley, 1995). Data showed that, forty four messages, (44), coded as proposing a shared goal or purpose and thirty one messages, (31), coded as working together towards a shared goal.

In the phase of producing shared artefacts:

Sharing goals can lead to the production of shared artefact, and until the production of them is accomplished, collaboration is not completed. Data showed that all participants managed to produce written learning material, concern buoyancy and pressure, taking under consideration, content knowledge, student's alternative views and colleague's perspectives through asynchronous dialogues.

Summary and conclusions

In this paper we developed and implemented a specially developed web-based distance learning course, addressed to in service primary teachers in Greece. The course aims at enhancing participants' understanding of fluids as well as their collaboration towards producing teaching learning materials for their pupils.

Concerning collaborative identifications participants' postings were distributed across all six categories of Murphy`s model and this suggests that the teachers did not restrain to simple interactions but moved towards collaborative activities.

The fact that one participant, shared personal information concerning social presence, seems to have an explanation, as all participants studied together, knew each other and thought that it would be worthless to share personal information. The messages that coded as recognizing group presence, were the introductory messages, including greetings such "Hello my name is", or Hi Kostas, how are you". Few messages express feelings and emotions, concerning personal progress and express their stress, in order to complete the dialogues. Those feelings and emotions characterize adult's education and can be found in any stage of their progress, (Rogers, 1999).

The small number of postings, concerning accommodating the perspectives of others, seems to point out that participants were actively engaged with the learning material, shared understanding of this content, and felt unnecessary to exchange a higher number of postings for that purpose. It is characteristic that one hundred fifty seven messages (157), found in the phases "co-construct shared perspectives" and "building shared goals", constitute the two thirds of the total messages. This number seems to point out that participants, despite the high complexity of the scientific topic, successfully managed to co-construct shared perspectives and building shared goals, taking under consideration content knowledge.

It is possible that enhancement of their understandings of pressure and buoyancy supplied before the collaborative phase of the strategy facilitated participants to reach the higher levels in Murphy's' model. As a matter of fact achieving such levels in web based collaborative activities may not be taken for granted, (Murphy, 2004). In other words we consider that if content knowledge was insufficient, we might found postings only from the first two phases of Murphy`s model, (social interaction & articulating individual perspectives), perhaps as monologues.

The production of twelve shared artefacts from all participants, considered as identification and completion of collaboration. That is also a key element therefore all participants reached that phase, without any withdraws. We consider that participants were helped to achieve such goal by being specifically guided on how to collaborate instead of being left to proceed without instruction in a learning

situation for which they had little prior experience.

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