Interaction Analysis as a multi-support approach of social computing for learning, in the "Collaborative Era": Lessons learned by using the DIAS system

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Abstract

Apparently computer technology is shifting its focus, with individual users not being the main target any more. The evolution of Web 2.0 technologies is promoting the development of services, suitable for the collaborative construction of electronic content. The web seems to be gradually transforming into a multi-user platform, through which learning approaches, aligned with Computer Supported Collaborative Learning (CSCL), can be promoted into a new dimension. Under this scope, Interaction Analysis (IA) tools can be used to support different functionalities (e.g. awareness, regulation and evaluation of the collaborative processes by the participants themselves), based on the understanding of the social processes and the possibilities of intervention, in order to support and improve collaboration. In this paper we present our findings from using an asynchronous discussion platform with integrated IA tools for implementing learning activities, while trying to link those results with the new trends of the "Collaborative Era".

1. Introduction

The Internet, as we know it, has reached a nodal point. After several years of development and implementation of services and standards, the time has come to put them into profound practice [1], through Web 2.0 services. Web, as we know it, is mainly a way of sharing content in a static manner (although non-static presentation methods are also used) and establishing communication among people. The term *Web 2.0* is used rather vaguely to describe a collection of technologies, applications, ideas, concepts and realizations in the Internet [2]. It is about jointly generated content, data sharing and collaboration, along with the use of various *social software* modules. The passive web is being transformed into an actively engaged collaborator who constructs, uses and reuses content. Under this scope, the terms *Social Web*, *Social Software* and *Interactive Social Software* [3] are often used, to describe Web 2.0. The key issue is collaboration, interaction and dynamic content construction .

On the other hand, technology based educational approaches that fall under contemporary learning theories, such as sociocultrural theory and constuctivism, emphasize on social interaction. According to these approaches, intense interaction is a prerequisite for the development of *Critical Thinking*, which promotes learning significantly.

The interception of *Web 2.0* and *Technology Based Learning* seems obvious. Both focus significantly on social interaction among collaborating actors. Interaction Analysis (IA) is a field of research which studies these phenomena and allows the construction of multi-purpose supporting tools, appropriate for such users. In this paper, we describe our findings when applying IA techniques in asynchronous discussion learning activities. The paper is structured as follows: The importance of (social) interaction among learners is highlighted. Then the IA field is briefly described and the findings of our research, using the DIAS system are presented, before the concluding discussion.

2. Interaction Analysis

For the contemporary learning approaches, such as the *sociocultural theory* and the *constructivistic* approach, *social interaction* is a key issue for learning, by facilitating a circular process of internalizing external stimulants and externalizing internal knowledge structures. Through interaction, a person's awareness of his/her environment is increased, thus increasing the ability of creating communication channels with others, in the settings of a Community of Practice or a Learning Community. According to Palloff & Pratt [4], the needs of a learner in this context are clear: communication, feedback, interaction, orientation and encouragement. Interaction is a constituent of all these parameters.

The IA process consists in recording, filtering and processing data regarding system usage and user activity variables. The produced analysis indicators (presented usually in a visualized form) may concern: a) the mode, the process or the 'quality' of the considered 'cognitive system', within the learning activity; b) the features or the quality of the interaction product; or c) the mode, the process or the quality of the collaboration, when acting in

the frame of a social context forming via the technology based learning environment [5]. The automated, computer based IA results are presented to the technology based activities' participants in a format (graphical, numerical, literal), interpretable by them, providing an insight on their own current or previous activity allowing them to reflect on a cognitive or metacognitive level, and thus act in order to self-regulate their activities. Additionally, IA provides information to the activity observers-moderators, in order to analyze the complex cognitive and social phenomena that may occur.

This approach can produce flexible IA tools, which support directly technology-based activities' participants. IA tools can support different functionalities, based on the understanding of the social processes and the possibilities of intervention, in order to improve collaboration and enhance learning. Such functionalities are awareness, regulation and evaluation of the collaborative processes. They are oriented to different types of users; e.g. *evaluation* to teachers and *regulation* to students.

3. Interaction Analysis in asynchronous discussions: The DIAS system

The DIAS system [6] has been developed by the LTEE laboratory of the University of the Aegean. It is a fully functional discussion forum platform, with several functionalities for facilitating user participation and the moderators' alternative discussion strategy planning. About 80 visualized indicators (including all possible variations) are produced, varying from simple statistical awareness information to complex cognitive and metacognitive indicators. Our main goal is to offer direct assistance to students, supporting them in the level of awareness of their actions, as well as those of their collaborators, in order to activate their metacognitive processes, thus allowing them to self-regulate their activities. In parallel, we aim in supporting the discussion moderators (eg teachers) in order to 'identify' problematic situations that require regulative interventions [6].

3.1. Research Methodology

Using a methodological triangulation approach, four case studies implementing a different educational activity approach were designed *in situ*, constituting the core teaching method for the corresponding semester courses [6]. Similar data collection and analysis methods were used, including a 30 minute semi-structured interview with every participant, questionnaires and activity observation, using the actual IA indicators and raw data. Statistical processing of questionnaires, qualitative analysis of the open ended questions and evaluation of user participation were used to cross examine and validate results.

3.2. Results

Our studies lead us to the concrete conclusion *that the IA indicators affect the users*, operating as a very powerful motive for increasing activity. In all the conducted studies. messages' production was significantly higher in the experimental condition. Almost all the users admitted being very much interested in and affected by the indicators and were very enthusiastic about using them during the discussion activity (94 out of 98 agree).

Regarding *indicators' usage frequency*, we found that the majority of the students reviewed indicators very often (more than 80% acted so 2 or 3 times per week in all studies. Researching the "*kind of information they were interested in*", 70% of the users wanted to see comparative information, in order to assess their actions in regard to those of their collaborators. Individual indicators were less reviewed (50% of the users), mostly to confirm their impression about their individual activity. The latter percentages were similar to all the studies.

A very significant issue of the IA research field is "*how users decode visualized information?*". It appears that most of the indicators were transparent. Using simple, common diagram formats, such as bar, XY and scattered charts facilitates understanding, since everybody is familiar with them through school. A careful choice of colors may be an additional facility. By discussing with the participants (in all 4 studies), we decided that detailed instructions are necessary in order to better utilize the IA indicators, regardless of the complexity of the diagrams. Refined information seems to lack many users' attention when reviewing an indicator for the first time and should be underlined in advance in order to better utilize it, as discussed in [6]. Furthermore, the combinations of information from different indicators, in the form of an Interpretative Schema, is better to be also provided in advance, as it is difficult for a single user to think of all the possibilities, regardless of his/her role [6].

Another, equally significant issue of research is "*how the indicators affect the users and the learning process at extension. Do they help users to develop their own regulation process? Do they help to monitor and assess such activities?*" As aforementioned, they function as a very strong motive for increasing participation, but *is that enough? If students understand that the teacher is observing their actions in that detail, it is only reasonable for them to increase their activity.* For better answering this question, we had to further analyze users' actions. The results were very encouraging. For example, all the postgraduate students, in all the studies, who knew how to read SNA diagrams seemed to be tighter connected with their collaborators, than just increasing the number of messages they read and wrote (in some cases at the expense of content quality). They tried to interact with more collaborators, which resulted in more profitable

conversations. Many of the undergraduate (almost 90%) students in study No 4 agreed that they would have acted likewise if they were provided with SNA diagrams and knew how to decode them. This simple example, along with other similar cases, described in [6], lead us to the conclusion that IA indicators *do affect users and the learning process at extension*. The users' effort to improve their interaction status within the discussion activity consequently increased the prerequisites for high order thinking and learning, as described earlier in the current document. Higher interaction facilitates critical thinking and sustains effective discussions [4], [6].

In matters of "*facilitating understanding and assessment of discussions activities' goals*", the indicators helped students to evaluate their participation and see if *they respect the discussion* and the collaborative process. For example, in multiple phase activities (studies No 3 & 4), some students admitted that various group indicators, assisted them in better noticing increased activity periods, designating the beginning or ending of the distinct phases. Thus these indicators assisted them in better understanding the activity planning, indicating how and when they should act. Also, during coordination and discussion summarizing phases, ,some users preferred to review a diagram showing the number of users answering to their messages or the *Tree Structure indicator* [6], counting the answers to a coordinating message. Thus they could decide if the number of answers was adequate in order to review them and proceed to the next step or if they had to wait some more. These are some examples of ideas generated by students (while using the indicators on their behalf) clearly showing that specific indicators improve monitoring of the process and better assessment of the current situation.

Although our research was mainly focused on the student's perspective, we noticed that for moderators' and researchers', more complex indicators and interpretative schemas are needed, as described thoroughly in [6]. Teachers participating in our case studies expressed very positive attitudes towards the proposed utilization ideas. Some of them were generated through interviews with the teachers, while trying to record their specific needs. This seems to be a perpetual process, as our experience revealed that interpretation and utilization ideas may be produced at any time. The User Performance Indicator presented in [6], for example, was generated when a teacher expressed the need to have a clear picture of the messages' sizes too, apart from their number, in order to evaluate user participation. Likewise, the User Time Reads indicator's concept was generated after noticing users attempting to increase their status within the indicators, towards the end of the activity, thus attempting to "trick" the system..

4. Discussion

In this paper, we tried to demonstrate how the use of IA indicators can facilitate learning, by enhancing interaction among learners and promoting selfregulation ability. Moreover, the teachers as moderators can be assisted in their monitoring and evaluation tasks. Our main conclusion is that the use of IA indicators in asynchronous discussions is an encouraging and efficient approach. We were able to observe shifting in users' behavior,, through activity data, who appeared more active and productive. Thus this approach can support the participants of technology based learning activities in multiple ways, according to their designated needs.

In our research we implemented a discourse activity (asynchronous) which is a collaborative learning activity, falling under the corresponding theoretical approaches. Taking into account the "transformation" of the web into a collaborative platform with major social extensions and studying the ongoing discussion about how these technologies can be integrated into learning, we think that IA should be more carefully considered. Web 2.0 services and technologies are all about collaboration and joint construction of content; learning content and eventually knowledge, in the case of learning activities.

By demonstrating how IA tools facilitate and improve collaboration, we formulate the argument that the use of such tools should be intensively researched within the Web 2.0 context. User actions are identifiable and individual activity is to be considered in collation with the group activity, as they are tightly interconnected. IA techniques can be applied, following an approach such as the one described in this paper, in order to support learning, through social, collaborative activities. It is only very important to do so in the early stages, while initially designing such learning activities. The field is just starting to evolve and the research challenges are quite big.

5. References

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