Interaction Analysis in Asynchronous Discussions: Lessons learned on the learners' perspective, using the DIAS system

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Abstract: DIAS is an Asynchronous Discussion Forum Software, developed in order to offer extended monitoring and interaction analysis support, by providing a wide range of Interaction Analysis (IA) indicators jointly used in various situations, to all possible users (individual students, groups, teachers/moderators, researchers/observers), appropriate for their various roles in different activities. In this paper we present a brief overview of the research and results regarding the students as IA tool users, deriving from four conducted studies, in educational contexts.

Introduction

Asynchronous discussion forae are nowadays widely used in formal or informal educational contexts, applying principles of constructivism, emphasizing in social interaction during learning activities. Research is focusing towards finding methods for supporting critical thinking through interactions, occurring within asynchronous discussions, in order to achieve high quality learning. Such a goal requires tools, frameworks and methods for the facilitation of monitoring and/or self-reflection and therefore selfregulation that could be supported by the automated analysis of the complex interactions that occur. D.I.A.S. is a forum platform with integrated Interaction Analysis (IA) tools. In the current paper, we present a general overview of the research questions and results, focusing on one of the perspectives: this of adult learners (students) as IA indicators' users.

Theoretical Background

Critical Thinking is an intellectual process allowing learners to construct new knowledge through problem solving and collaboration. While implementing discourse activities by means of discussion forae, higher levels of interaction are needed to encourage learners to think critically, as indicated throughout the literature (Henri, 1992; Gunawardena et al, 1997; Garisson et al, 2001), along with internal reflection. It is often necessary for the learner to externalize his/her thoughts in order to achieve proper reflection, thus promoting message writing in discussion forae as an ideal reflective process. Intensive discussion and social interaction may lead to multiple knowledge construction phases (Schellens & Valcke, 2005). Our main research axis is peer support in asynchronous discussion learning activities, in order to trigger metacognition, which leads to selfregulation, as well as to facilitate the moderator's tasks. Our intention is to build tools by applying Interaction Analysis techniques in discussions' activity data, visualizing and providing quantitative information directly to technology-based activities' participants, in order to self assess their activity (Dimitracopoulou et al, 2005; Dimitracopoulou & Bruillard, in press). The IA results are presented in an appropriate format (graphical, numerical, literal), interpretable by the users, providing an insight of 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, in order to analyse the complex cognitive and social phenomena that may occur. The expected outcome is the optimization of the activity through: a) better activity design, regulation, coordination and evaluation by the forum moderator, and b) refined participation and learning outcome for the students through reflection, self-assessment and self-regulation.

The Discussion Interaction Analysis System (DIAS)

While examining Forum and Forum Type software, we found several drawbacks in participants' support. These include minimum analysis information provision, information provided only to a portion of the participants (e.g. the teachers), closed and/or complex, non-transparent analysis systems or even lack of empirical research (Bratitsis & Dimitracopoulou, 2006). This led us to the development of the DIAS system, a fully functional discussion forum platform. We took into account that users involved in a 'learning activity' form various cognitive systems, as individuals (students and teachers in various roles) or members of groups or even communities, thus expressing different needs for support. Different indicators' sets are addressed to students, teachers, moderators (the latter having increased information needs while monitoring, assessing, evaluating), or researchers along with the corresponding *Interpretation Schema* for various discussion strategies or usage scenarios. An *Interpretation Schema*

explains how to combine different indicators, in order to extract additional, more qualitative information. All the indicators are produced by measuring quantitative activity data. The implemented charts vary from having low (presenting very simple and understandable information) to high interpretative value (providing several aspects of information, which can be different, depending on the type of user who is reading the indicator). Finally, customizability, flexibility and interoperability are considered to be crucial characteristics for independent analysis tools, such as DIAS. More related information can be found in Bratitsis & Dimitracopoulou (2006; in press).

Research Results' Overview

Four case studies implementing a different educational activity approach have been designed *in situ*, constituting the core teaching method for the corresponding semester courses. Similar data collection and analysis methods were used, including questionnaires, experimental (allowed to review IA indicators) and control groups (not reviewing indicators) monitoring and semi-structured interviews with every participant. Some of the questions asked aimed at: (a) *Detecting the most/least popular indicators and the latent reasons*, (b) *Detecting and explain user behavior alterations due to the indicators' presence*, (c) *Measure the frequency of reviewing the indicators*, and (d) *Distinguishing users' information preference* (individual or group data, personal or related to others' actions?). During interviews, *all the system's indicators* were reviewed and discussed upon, in order to examine their transparency. Additionally we intended to record utilization ideas and initial reactions to the indicators' information – "*What do you understand by observing this diagram*?", "*Would this affect you and in what way*?", "*Do you think this information is important and why*?". The most powerful indicators in matters of explanatory value were correlated with the discussions' actual content, in order to examine possible relations.

Examining the "*influence of IA indicators on the users*", we came to the concrete conclusion that they operate as a very powerful motive for participation. Users being positively surprised by the dynamics of the presented information were very enthusiastic and eager to use the IA indicators during the discussion activity (94 out of 98 agree). Regarding "*how often did the users review the indicators*", almost 60% did so every time they connected and 80% at least 2-3 times per week. Researching the "*kind of information users were interested in*", 70% of them preferred comparative information, in order to assess their actions in regard to those of their collaborators. Individual indicators were less preferred (50% of the users), mostly for confirming their impression of their personal activity. Another important issue for the IA field is "*how users decode visualizations*". Apparently, that most of the indicators were adequately transparent. Using simple diagrams, such as bar-charts, XY-charts and scattered charts facilitates understanding, since everybody is familiar with them. A careful choice of colors may be an additional facility. For example, a gradient transition from blue to red color in the background of the *Classification Indicator* (Bratitsis & Dimitracopoulou, 2006) indicates the desired area for a user to be placed upon. Additionally, through the interviews, we decided that instructions are necessary in order to better utilize the IA indicators. In some cases, users understood the main concept of a diagram, but were unable to "read between the lines", detecting more refined information. Furthermore, combinations of different indicators, in the form of an *Interpretative Schemas*, should also be provided, as it is difficult for a simple user to think of all the possibilities, regardless of his/her role.

Another, equally significant issue is "*how the indicators affect the users and the learning process at extension*. *Do they help users develop their selfregulation processes? Do they help monitor and assess dialogic activities?*" Apart from functioning as a strong participation motive, which one could ascribe to the users' sensation of being monitored by the teacher, results of further analysis of users' actions were very encouraging. For example, postgraduate students who understood SNA diagrams were tighter connected with their collaborators, than just reading and writing more messages (in some cases at the expense of content quality). They tried to truly interact with more collaborators, which resulted in more profitable conversations. Another example is the effect of the Tree Structure indicator (Bratitsis & Dimitracopoulou, in press), which shows the number of threads within a discussion forum that an individual user has participated in. Students reviewing this indicator participated in more threads than those who didn't. These simple examples lead to the conclusion that IA indicators *do affect users and the learning process at extension*. Their effort to improve their interaction status within the discussion activity consequently increased the prerequisites for high order thinking and learning. Higher interaction facilitates critical thinking and sustains effective discussions (Palloff & Pratt, 1999; Garisson et al, 2001; Schellens & Valcke, 2005). In matters of "*facilitating understanding and assessment of discussions activities' goals*", the indicators helped students to evaluate their participation and see if they respected the discussion and the collaborative process. For example, in a multiple phase activity, some students admitted that various group activity indicators assisted them in better noticing increased activity periods, thus distinguishing the emerged course phases. In that manner, they assisted them in understanding the effective activity planning and indicated how and when they should act. More ideas generated by

students (while using the indicators on their behalf) clearly showed that specific indicators improve monitoring of the process and better assessment of the current situation.

Discussion – Future Work

Our main conclusion is that the use of IA indicators in asynchronous discussions is an engaging and efficient approach. The overall impression was very positive and we were able to observe shifting in users' behavior, as they appeared more active and productive. Some indicators were more preferred than others, regardless of the teaching settings, whereas some of them are better utilized under specific context and activity settings. For example *SNA diagrams* seem more appropriate when heavy interaction among smaller groups is pursued, whereas *Activity Indicators* (Bratitsis & Dimitracopoulou, 2006; in press) seem more appropriate in cases of open ended discussions with a large number of participants. We consider that a large number of case studies are necessary in order to extract concrete results for that matter. The complexity of the IA process evaluation and the variety of the produced diagrams, indicate that this method is useful for medium and large-sized groups of students, as it is easier to review the actual messages for groups of less than 5 or 6 people. Having produced several *Interpretative Schemas*, which were positively evaluated by the participants (Bratitsis & Dimitracopoulou, 2006; in press), we were very surprised to see that users came up with new ideas for utilizing indicators. New indicators were built in the process, as new needs were expressed. This seems to be a perpetual process, which may lead to the creation of an "Idea Repository". Detailed instructions are required, if we wish users to exploit the indicators. Otherwise, the produced diagrams would seem like an additional workload, with no clear meaning. Consequently, users would avoid taking them into account

Future plans include conducting additional case studies, in order to explore further aspects of the IA perspective. Results found under specific learning settings, should be tested for validity under different settings (for example using a different collaborative learning strategy). Furthermore, new questions arose. Does age influence the users' perception and decoding of visualized information? Do indicators presenting similar information with different visualizations affect users in a different way? If yes, when should each approach be used? For example, some indicators present comparative activity information using absolute values and others use percentages. Thus, the gaps within the charts appear larger in the first case. Could this be a reluctant factor for a less active user, assuming that bigger effort is needed in order to improve his/her position? On the other hand, could this affect likewise more active users, leading them to reduce contributions? Would using smaller gaps affect user motivation? The variety of new questions is quite big, but all of them relate to research refinement of the indicators' effect on the users individually, as a group or a community and the learning process. The overall conclusion that applying IA methods for building tools to support the participants of an asynchronous discussion activity is one step at the right direction, should be the main lesson learned from this approach.

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