Workshop

"INTERACTION ANALYSIS SUPPORTING PARTICIPANTS DURING TECHNOLOGY-BASED COLLABORATIVE ACTIVITIES"

Workshop Chairs

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ABSTRACT: It is started to be acknowledged that the design of technology based learning environments must not be limited to the initial means of action and communication, but needs to be extended by the means of analysing the very complex interactions that occur, thereby supporting collaborative activities participants (students & teachers). The research and development related research field of collaborative interaction analysis support focuses on some central dimensions: (a) Interaction analysis methods, (b) Design of systems, (c) Evaluation approaches of the provided support. The field has already progresses on the first and second dimension, while has not yet explored sufficiently the impact of the provided support to participants themselves. Similarly, most of the actual works concerns, mostly students than teachers. The participants of the present workshop, have therefore focused on 'how tailoring collaboration analysis indicators for different types of users'. They reached to contribute with some more refined concepts and approaches related to (a) interaction analysis tools users profiles and needs and (b) approaches to take them into account in a flexible and powerful way.

KEYWORDS: technology-based learning environments, collaboration, interaction analysis, self-regulation, assessment, guidance, students, teachers

1. INTRODUCTION

Up to the present, CSCL community has focused on the design, the implementation and the evaluation of collaborative learning environments, as well as on the understanding of collaborative learning processes. Actually, it is started to be acknowledged that the design of technology based learning environments must not be limited to the initial means of action and communication, but needs to be extended by the means of analysing the very complex interactions that occur, thereby supporting collaborative activities participants (students & teachers).

The need to support participants' awareness and metacognition, diagnosis or even assessment is pushed by the intensive interest to use collaborative systems in every day educational practice, where there is a need to (self) evaluate in an operational way, both the learning processes/ outcomes and the quality of collaboration.

When students work individually with technology based learning environments a variety of interactions between students and systems take place. Moreover, during collaborative learning activities complex interactions occur, between two or more individuals collaborating in a group, as well as among students and optionally a coach.

Most of the existing learning systems still have limitations when used by young or older students in real school settings. Some of the limitations are attributed to the fact that students have difficulties to develop metacognition on their own actions and processes, or to self-estimate the appropriateness of their participation in a collaborative group or a wider learning community. Students seem to need information (in a literal or visual form) on their own actions, that could support awareness, metacognition and thereby self-regulation of their learning activity.

Similarly, teachers who are in charge of several groups of students, fail to interpret and account for the enormous number of complex interactions that can take place simultaneously. This leads to scenarios in which teachers are not able to detect collaboration breakdowns, which can lead to frustrating experiences and even to abandon these new learning experiences in favour of more traditional methods. They need some appropriate, structured information on what happens, that could allow them to have more appropriate synchronous or aposteriori interventions, related to the quality of the activity outcome (content) and/or the quality of the collaboration itself. Additionally, teachers also need support to perform formative evaluation of their own educational practice, in other terms, to self-regulate their own teaching strategies.

Acknowledging these limitations, researchers have started to work on addressing these problems. Up to the present, usually work related to Interaction Analysis was carried out by:

(a) researchers that collect data and analyse interactions afterwards in order to understand collaborative process.
(b) systems applying Artificial Intelligence inspired methods that compare interaction analysis results with an ideal desired case, and produce messages that guide directly students during the learning activity.

During the last few years, after the achieved progress on understanding collaborative learning processes, researchers are interested in how to manage interactions' data, in an automatic way, in order to support directly the participants. Indication of this recent interest constitute the organization of related international workshops (Jermann, et al., 2002; Soller et al. 2004).

2. Interaction Analysis Process

Let us present briefly the main 'phases' involved in the 'interaction analysis process' (Figure 1). Students interact with technology-based learning environments, in collaborative mode. In different moments of the learning activity, they can interact with the environment individually, or by group (s), forming various cognitive systems. Additionally, a teacher may intervene or just supervise the whole collaborative activity.

In order to analyse participants' interactions:

⇨ Data are selected (*data selection or data filtering*) by an automatic mode, from the available data sources.

. During interaction, two types of interaction data could be collected:
(a) the collaborative interaction *product* (its final form and eventually intermediary instances of this product, during the interaction)
(b) student(s) actions registered into the environment logfile, capturing the whole interaction *process*

⇨The selected data are aggregated by different *data processing methods*

⇨ The application of 'data processing methods' produces usually one or more *'indicators'* that indicate 'something' related to the 'quality' of individual activity (e.g. variables that he/she change, order of significant actions, etc.), the mode or the quality of the collaboration (e.g. division of labor, participation rates, categories of specific contributions), the process or the quality of the collaborative product. These variables have to be interpreted, taking into account, the learning activity, the profile of the participants and the context of interaction etc.

The analysis may produce one or more basic indicators (usually low level indicators), as well as one or more composite ones (high level indicators).

These indicators constitute variables that describe 'something' related to:

- the mode, the process or the 'quality' of the considered 'cognitive system' activity
- the features or the quality of the interaction product,
- the mode or the quality of the collaboration, when acting in the frame of a social context formed via the technology based learning environment.

There are two general categories of indicators: (a) time dependent indicators, describing aspects that evolve during the process of the interaction, (b) time independent indicators, usually describing global aspects of the final product or of the whole process, that are processed at the end of the interaction session.

⇨ Concerning the presentation of the indicators' values to the users of interaction analysis:

(a) The values of these indicators could be announced directly to students or teachers, via a specific *interface*. The *presentation of the values* usually takes an appropriate form: textual, numerical, or diagrammatic visualized one. The diagrammatic visualized form, often concerns the variation of the values of the indicator in relation to an independent variable (e.g. time), or the values of another indicator.

(b) In some cases, the systems incorporate an assessment of the values of indicators ('calibration'), that is done into the specific context of interaction (e.g. presenting a range of 'positive" and 'negative values")

(c) In other cases, systems interpret the meaning of the indicators values, comparing them with an internal suitable or even ideal model, and therefore proceeds to the production of explicit messages advising students what to do. In the latter case, a guiding system is produced, (addressed usually to students).

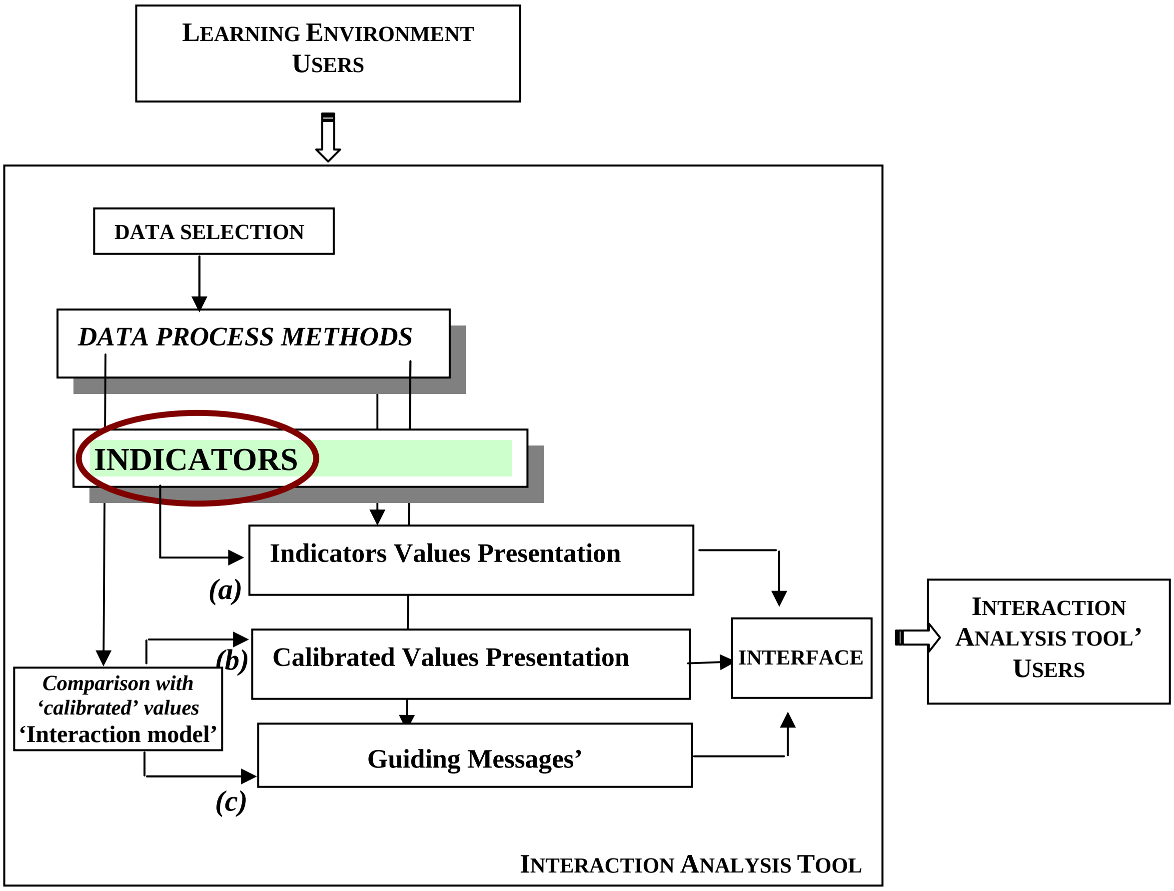

Figure 1. Interaction analysis Process

The whole 'system' that selects the needed data and aggregate them via data processing methods, producing indicators, and even developing appropriate forms of messages could constitute a distinct *interaction analysis tool*, or to be a piece of interaction analysis software/code, internal to the Learning environment.

It should be useful to distinguish every time, to *what the interaction data referred*. They may referred to (a) the actions or the product of individuals students, (b) the actions or the products of a specific group of students, (c) the actions or the product of a number of students' group, (d) the actions of a teacher, and so on.

The *users of interaction analysis indicators or tools* could be: the student, the teacher, the system it-self, or the researcher. In this workshop, we focus on how interaction analysis could support the participants of the learning process, thus: the student(s) and the teacher(s), and the various cognitive systems that may form.

Taking into account the interaction analysis process, we could argue that Interaction Analysis tools that offer only the direct "indicators values presentation' (see (a) in Figure 1), could be considered as **"awareness tools'**, supporting participants on a level of awareness, related to their own actions, or the actions of their collaborators. Tools that offer in all the cases 'calibrated indicators values' (see (b) in Figure 1), give elements to assess the collaborative activity, and thus could be considered as '**assessment tools'**. In both previous cases, the information presented to the user-student, can support him/her in a metacognitive level. Finally, tools that in all the cases, produce messages guiding participants (mainly students) in their activity, could be considered as '**guiding tools'** (see (c) in Figure 1)**.** However, an interaction analysis tool could combine all of the three above functions, if it is considered appropriate for the intended users.

It is to be noted that in the ideal case, for each interaction session, *a number of complementary low or high level indicators*[*]* is produced. These indicators could form an implicit or explicit *"model of the interaction"*. This model is a surrogate 'construct', a conceptual understanding of the process that takes place or has taken place. This model would have three components:

(a) A set of names of the *agents* that interact and the *means* that they use.
(b) A set of descriptive indicators (variables) representing "aspects' of the interaction
(c) An interpretation, relating all the available descriptive indicators

[*] This distinction between high and low level indicators, refers mainly to their significance and their interpretative values: (a) High level indicators: these that have an inherent interpretative value, and usually have been inferred by complex process from the raw data. (b) Low level indicators, those that have not an autonomous interpretative value and are usually inferred directly from the raw data

This distinction does not mean that high level indicators are better or more significant that the low level ones. The significance of these indicators cannot be estimated a priori: it can only be pointed out by researches studying the effect of these indicators in a specific context of use (e.g. eventually the "awareness related indicators" based on low level indicators on their participants actions, could be more effective –in terms of how students take them into account in order to self regulate their activity- , than the indicators assessing directly the quality of their final product, or of their applied strategy).

Concluding, the significance of the produced indicators has to be directly related to their effectiveness on supporting interaction participants.

4. RESEARCH DIMENSIONS

The actual research focuses on some central dimensions, trying to explore a number of underlying questions:

- *Interaction analysis methods:* What raw data to take into account? How to represent them? How to inter-relate collaboration features with collaborative activity content and process? How to go beyond simple quantitative indicators (e.g. participation rates) to more sophisticated ones? How to produce not only quantitative indicators but also qualitative ones? How to coordinate the analysis of actions and dialogues? How to provide a rich variety of analysis output to really assist participants ? etc.
- *Design of systems:* What form could the information that will be provided to participants take (messages, quantitative info, visualized info)? How to produce significant visualization tools that students (of different ages' level) are able to decode? How to produce tools that assist teachers (of different profiles) in order to intervenes on-line or off-line? When must this information be presented to them? etc.
- *Research approaches on the evaluation of the provided support*: What is the effect of the interaction analysis support? How we can evaluate it? What are the appropriate approaches and conditions to identify users' requirements, in order to improve the analysis tools designed with the intention to support them? etc.

5. WORKSHOP TOPICS

The objective of the present workshop was to discuss and clarify concepts and approaches, referring to interaction analysis supporting participants. Relevant topics mentioned in the workshop call were the following:

(A) *Analysis Methods:*

- Interaction Analysis methods (source data, intermediary or high level indicators, derivation process, etc)
- Representations of interaction analysis methods
- Identification of appropriate interaction analysis indicators (high or low level)

(B) *Design Issues:*

- Form of information derived from interactions' analysis (quantitative information, visualisations, messages, etc) that could be appropriate for specific participants' profiles
- Design principles that derive from empirical results analysis related to participants' interactions
- Design of interaction analysis tools (for different participants' profiles)

(C) *Research Methods & Results:*

- Methods of how to study students and teachers needs and requirements related to the tools and functions intended to support them *appropriate methods* of how to identify students' and teachers' needs and requirements, in order to achieve a better design of tools and functions supporting them
- Empirical results on how collaborative participants use and profit from available tools or messages

The above concerns: (i) every kind of collaborative learning system such as collaborative problem solving systems (based mainly on synchronous collaboration), wide community systems (based mainly on asynchronous collaboration), or even specific tools of communication (e.g. forum), (ii) every kind of participants, students (of different ages) as well as teachers and tutors.

The members that expressed their intention to participate wished to contribute on 'Interaction Analysis methods' and 'Design Issues'. They exchanged ideas and after discussions, a particular "question" was specified that has the potential to push the research towards more appropriate approaches.

Subsequently, a more specific topic of discussion was specified; *"Tailoring Collaboration Analysis Indicators for Different Types of Users".*

6. A SPECIFIC TOPIC: "TAILORING COLLABORATION ANALYSIS INDICATORS FOR DIFFERENT TYPES OF USERS"

Why this question is significant to be posed nowadays? Most of the actual interaction analysis tools, are actually addressed to the individual student, or only to the teacher. However, a more complete vision is needed, in order to (a) cover the needs as well as the cognitive possibilities of the various cognitive systems that are formed during collaborative interactions, as well as (b) explore more flexible and eventually powerful possibilities related to the functions of participants' support. The two following considerations may help in this direction:

I. *Considering all users and cognitive systems involved in collaborative learning settings:* The agents that seem to be considered in some collaborative environments are often seen in a one-dimensional point of view. From one hand, during collaboration the main actor is neither only the *individual-member* of a collaborative team, nor only the *team as a whole*. Both of these 'aspects' are important, and equally so is the case of *the whole community* formed of individuals and groups collaborating in various modes. On the other hand, a learning process, (at least in the frame of primary and secondary education), involves both learners and *teachers* (independently of their immediate role significance). Learner-centred design approach, being dominant during the last decade, although it has influenced positively the designers, it has presented the following drawback in collaborative technology-based learning environments: By focusing in principle on the individual learner, it takes out of the cycle the other agents involved (Dimitracopoulou, 2001). These agents may form *one or more cognitive systems*, in the sense of distributed cognition theory (Salomon, 1995; Dillenbourg, 1996). Consequently, nowadays, all agents involved in the process are important, and may need to have specific tools in their disposal. Thus, we need to consider: (a) the individual, (b) each distinguished group, (c) the classes of groups that are formed, (d) the teacher(s) involved, (e) the whole learners' community that is formed.

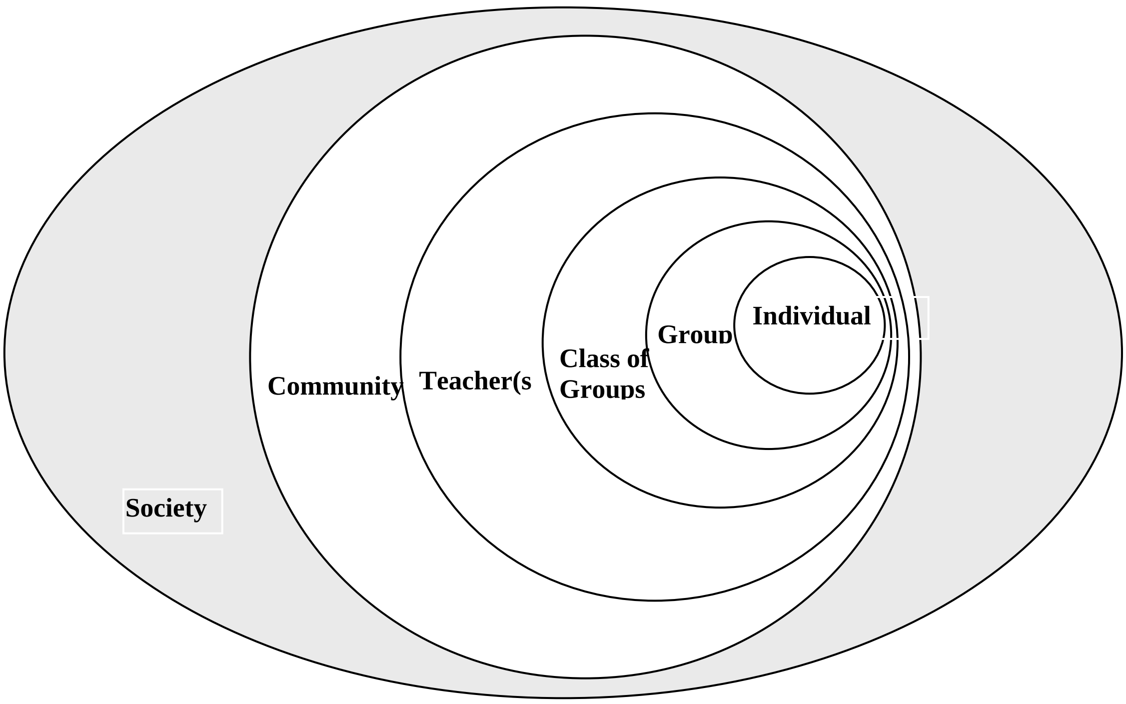

Figure 2. Various cognitive systems are formed during collaborative learning activities

II. *Considering the control of collaborative process as distributed to all the agent (humans and artificial ones)*: In our point of view, it would be fruitful to work on the direction of *expanding the management of the collaborative activity* to all the agents: 'individual', 'collaborators', 'teacher', 'system'. This expanded management of collaboration would be possible, according to an approach based on a number of general *principles*, that would allow determining the need for an agent (human or artificial) to intervene, as well as the specific sub-role that this agent shall undertake. The current dominant approach is based on a well-defined desired state (a reference model of 'appropriate collaboration'), according to which a system advises the collaborators. This approach does not seem to be the most appropriate, given that it is valid only in very specific cases of activities, problems, conditions and students' profile. Generally, knowledge construction activities are open and flexible, while such a model is quite restrictive. Through similar considerations, researchers point out the necessity to take into account the humans agents and artificial tools [Soller et al, 2004] in a continuity.

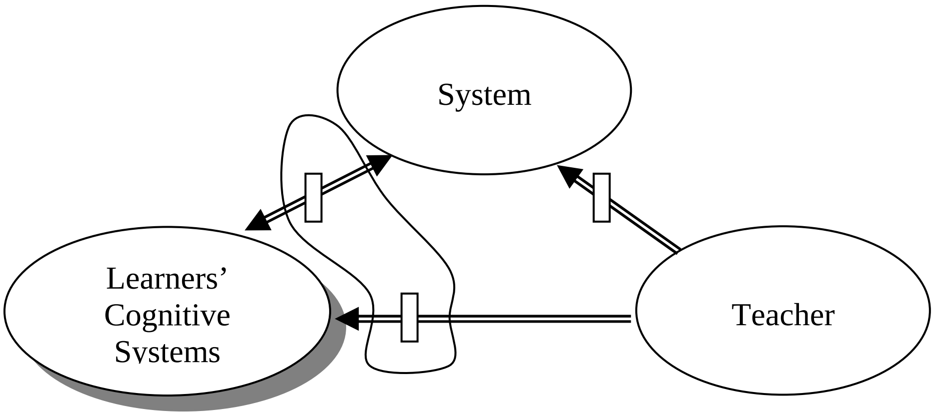

Figure 3. Control of collaborative process as distributed to all the agents (humans and artificial ones)

Actually very few interaction analysis applications are addressed to more than one agent. Position papers included in the present workshop express the effort to cope with this problem. These papers contribute on three dimensions:

(A) Identification of different types and profiles of users, in different contexts/conditions of learning environments' use. Authors work contributes by:

- *(a)* Analysing and categorizing the different roles identified in the literature concerning students and teachers *[Martinez, et al]*
- (b) Identifying and representing various possible social structures, in order to apply appropriate policies *[Barros, et al.]*
- *(c)* Pointing out the potential of focusing the analysis, in a combination of cognitive systems [*Kollias, et al.]*
- (d) Presenting a rough taxonomy of interaction analysis users' types, concerning the learning environments applied in primary and secondary education, that presents different cognitive abilities or even motivation to use interaction analysis outputs *[Fessakis et. Al.]*

(B) How to 'adapt' the interaction analysis output to these profiles: Authors work contributes by:

- *(e)* Discussing on the cognitive possibilities of each cognitive system, through an analysis of metacognitive needs and self regulation possibilities, and proposing the incorporation of the possibility to shift the control progressively from '*external regulation'* (guidance) to '*internal one'* (self-regulation *[Jermann]*

(f) Proposing customizable agents, in the frame of a vision of 'social empowerment' *[Morch et al.]*

(g) Proposing customizable visualizations of indicators [Harrer et al.], and more generally, optional interaction analysis tools *[Fesakis et al.]*

C) Contributions on more appropriate basic indicators and analysis produced: Authors work contributes by:

(a) Distinguishing individual actions from collaborative interactions (*Mühlenbrock)*

(b) Proposing an evaluation framework able to derive a set of four high level indicators *(Daradoumis et al.)*

In the following paragraphs, a brief summary of the position papers is presented, according to the three main dimensions.

(A) Identification of different types and profiles of users, in different contexts and conditions of learning environments use:

(A.1) J.A. Marcos, A. Martínez, & Y. Dimitriadis. In their position paper entitled: **« *Towards the integration of evaluation and regulation with a role-based approach*",** starts with the intention to integrate the according to authors 'evaluation support' (for teachers), and 'regulation support' (for students). They try to cope with the problem by identifying the roles that take part in the collaborative activity and their corresponding requirements.

Their literature review, revels a consensus with respect to the generic roles identified in a learning scenario, such as the teacher, the student, the evaluator, etc. On the contrary, teachers' and students' more specific roles depend very much on the classification approach and on the context and there is no such consensus between the different authors. The authors propose a **classification of roles** depending on two dimensions that classify roles in static or dynamic and in predefined or emergent. Authors, consequently propose that there is the need to define more specific indicators and the values that identify the transitions between the different roles. To conclude, authors assume a two way relationship between roles and analysis of interactions. First, analysis of interactions helps to identify roles, and then these roles will be supported by interactions analysis functions.

(A.2) B. Barros and F. Ferdejo, propose **"Mechanisms for the *auto-organization* of virtual learning communities and mechanisms for their observation and regulation".**
Their approach on dealing with different profiles and roles, resides on a global vision of the social structure. They propose a social framework, grounded in activity theory that defines explicitly the social aspects of a particular community. Furthermore, they produce **a social representation** (based on a metamodel) in order to describe the social structure as well as the organisation of partial societies (models). In terms of functionality, they define the interaction workspace (resources, tools, etc), while the behaviour is defined via policies (rule based) that define the norms for regulating the society.

The proposed framework is intended to offer a variety of possibilities for observing, analysing and mediating social behaviour in virtual communities. The underlying scope is to capture behaviour in context (project, activity, task, interaction mode, resources) at a variety of granularity levels, from individual, small groups, to more complex collective organizations such as larger communities (groups or groups) and societies (several communities). Finally, the challenge of this vision is to propose and **apply dynamically different policies** to improve the intercommunication and the collaboration processes.

(A.3) **V. Kollias, S. Vosniadou, A. Koukoutsakis, N. Mamalougos & M. Vlassa,** point out the "**The potential created by joint assessment of collaborative and cognitive measures of intragroup and intergroup interactions**".

The paper gives an example of the potential of an analysis, that considers **two cognitive systems**: the one that corresponds to the individuals into a group (intragroup interactions), and the other that corresponds to the community of the different groups (intergroup interactions).

Moreover, they put emphasis on how collaboration analysis indicators become more potent by combining them with cognitive indicators, and speculate on ways in which they could support users with various expertise as learners in a classroom.

The purpose of this analysis is exposed via a brief presentation of experimental data, processed by researchers.

(A.4) **George Fessakis, Argyro Petrou, & Angelique Dimitracopoulou,** present a position paper entitled "**Taking into account a taxonomy of user types, of primary/secondary education level, in an optional and customisable interaction analysis environment".**
The paper firstly presents a general **taxonomy** of the types of interaction analysis users of technology based learning activities, that we met in primary and secondary education. The taxonomy is produced according to a rough analysis, of users' cognitive/metacognitive abilities and needs. As an example, the taxonomy is applied in the case of interaction analysis indicators and tools that are connected to a collaborative modelling environment (ModellingSpace). The usefulness of the application of this general taxonomy, is presented by the association of a combined approach of: (a) selection of appropriate indicators and/or indicators visualisations, (b) in an **optional and customisable** interaction analysis environment. Concluding they argue, on the need to take into account different types of users, when we work for primary/secondary education level, given the **variability of their needs**, motivation, as well as their cognitive and metacognitive abilities, over time, and current conditions.

(B) How to 'adapt' the interaction analysis output to these user types and profiles:

(B.1) **P. Jermann** discusses on "**Tailoring interaction analysis for different types of users according to their (self-) regulation competence".** Firstly, the author argues that the type of analysis and support offered by a computer to a group of learners and/or to teachers should be adapted to their (self-) regulation competences. Reflecting thoroughly on the concept of 'self-regulation', conclude that the construct of self regulated learning brings together research on learning styles, on metacognition and on motivation as well as on goal directed behaviour. He discusses a three-layered model of self-regulated learning that refers to three meanings of metacognition.

Moreover, the author discuss on the distinction between 'self'regulation' and 'guiding'. He considers that, when students are able to choose their learning goals and appropriate problem-solving strategies by themselves, they are **internally regulating** the learning process. When the students need external help to get started or to complete a task, they are externally regulated. Mixed forms of regulation exist where the responsibility for regulation is shared between learners and teachers. Given that our goal in using computational interaction analysis is to provide support in these external and mixed forms of regulation, the author proposes that the distribution of the executive function does not have to be frozen in a fixed configuration. It proposes that, rather, **the control progressively must shifts from the teacher to the learner** as he or she gets more proficient in controlling activity. Consequently, a CSCL environment would; (a) begin to support regulation by using a guiding systems approach, (b) as learners get more autonomous, a metacognitive tools approach would be proposed (presentation of *calibrated indicators values*). (c) finally, when learners or teachers get proficient at interpreting the feedback they get from the system, a simple mirroring tool might suffice to support interaction regulation (*awareness, simple indicators values' presentation*).

(B. 2). **A.I. Mørch and J, E. Nævdal** present concrete examples on how **"Helping Users Customize their Pedagogical Agents".** The authors, emphasizing the social dimension of human-agent interaction, propose an interactive way to adapt the interaction analysis output to different types of users.

They, introduce from social sciences the concept of "***social empowerment***" in the virtual societies, and discuss the implications of customizing interface agents in multi-user environments, which includes the means for users to exercise a new form of control over their environment ("social empowerment") that may extend as far as redefining social relations within a community of users.

More conceretely, they propose **customizable (end-user modifiable) agents** (via a customizer (RuleEditor), allowing end users to modify the presentation ("what to say") and intervention ("when to say") attributes of the pedagogical agent. Pedagogical agents are user interface agents embedded in interactive learning environments to provide awareness of social interaction and knowledge building.

This approach allows to specify how users can influence who they want to interact with, redefining and expanding social relations, and improving awareness of collaboration patterns of their peers (insofar as this is relevant to the shared task). According to authors, instructible agents that help users gain control over their computer applications and end-user modifiable critics, empower users to enrich a problem domain with new design units and rules.

(B.3). **Andreas Harrer & Lars Bollen,** discuss on "**User-Adaptable Indicators for Graph-based Modelling Environments".**

Their position paper discusses the transition from collaboration and interaction indicators with fixed functionality to more flexible **indicators that are adaptable** by the users according to their specific needs. The authors argue that analysis methods for collaboration and interaction indicators usually embed a specific focus of interpretation for the analysis. This focus may be a given pedagogical theory (talking and tuning), a conversational approach (e.g. the rainbow method) or an established set of properties to be computed automatically (SNA properties). This methodological focus gives detailed information if the indicator is used exactly as foreseen, but lacks the flexibility for the user (be it learner, teacher or researcher) to use it with a different perspective, that was not embedded before. The authors, in their position paper sketch their approach for extension of some indicators for their collaborative modelling environments 'Cool Modes' and 'FreeStyler' to individual user's focus of interest, thus providing more flexibility in what these indicators may express.

C) Contributions on basic indicators needs and analysis produced

Additionally, two papers, try to pose more basic questions contributing on the interaction analysis processes in two different levels; (a) data filtering, (b) elaboration of high level indicators. One of them discuss on the distinction between "individual actions" (self-addressed actions) and 'collaborative actions' during a collaborative session, while the other present a number of high level indicators, that assess students interactions, related to their collaboration quality.

[C.1.] ***Martin Mühlenbrock***, presents "***An Adaptive Model of Collaborative Action in Shared Workspaces".*** The author focuses his interest on how, in the frame of a collaborative session, to distinguish the 'real' **"collaborative (inter-)actions", from the 'individual actions'** (see also, B. Barros, 2000). He argues that actions in shared workspace differ according to their degrees of interaction, and define formal indicators for the automatic evaluation which are based on 13 dimensions of interactivity. The interactivity among the human agents that work in a 'collaborative session' is directly related and measured with the 'collaborative action' instead of individual action. Furthermore, he defines **an evaluator of shared workspace activity** that can distinguish interactions from actions. It is specified as a hybrid approach based on plan recognition, i.e. action-based collaboration analysis, and Bayesian classifiers.

[C.2.] Thanasis Daradoumis, Fatos Xhafa and Ángel Alejandro Juan Pérez, propose a **"A Framework for Assessing Self, Peer and Group Performance in e-Learning" .**
Authors' interaction analysis approach focuses on 'Assessment and Evaluation' purposes, and it is mainly addressed to teachers /tutors. The framework is applied in the context of the evaluation of performance of online learning groups, especially in the case of real, complex and long-term collaborative learning experiences. The proposed **framework** allows them to derive four important

levels of collaborative learning analysis: *task performance*, *group functioning* (or participation/ interaction behaviour), *social support*, and *help supply* (or task/process scaffolding).
All these **four high-level indicators** are related to the qualification mark assigned to the learning outcomes achieved by the group and the individual members.

7. CONCLUSIONS

The present workshop, related to interaction analysis supporting learning activities participants, was organized with the intention to contribute on :

(a) the clarification of concepts and methods used,

(b) the reflection on adaptation of interaction analysis outputs to different types and profiles of interaction analysis tools users.

Working in this latter direction, workshop participants, introduced new concepts and considerations related to users' types/profiles and their corresponding needs as well as approaches to take them into account, that will be thoroughly discussed during the workshop:

(a) Users' profiles and needs:

social representations of communities in various granularity levels [from individual, small groups, to larger communities and societies*], high and low level analysis of students and teachers' profiles, differences among various users' types/profiles, variability of users' profiles and their needs*

(b) Approaches to take them into account and underlying concepts:

means for users to exercise a new form of control over their environment ("social empowerment"), application of policies of collaboration processes, internal/external regulation and dynamic shift of control among student/ teacher/system, customisable pedagogical agents, customisable or adaptable interaction analysis tools, relations among various kind of awareness support and metacognition, relations between evaluation and regulation, categories of interaction analysis tools

8. ACKNOWLEDGMENTS

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9. RELATED LITERATURE

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