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## Logics of Online Collaboration: Scripts, Polychronicity and Improvisation

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### Abstract

*This paper evolves around the challenge of ensuring sufficiently guided learning on one side and self-directed, learner-centred learning on the other side. An online course using collaborative case-based learning is taken as an example to discuss tradeoffs between designing collaborative processes upfront and the need to allow for emergent, unspecified forms of collaboration. To do so, collaborative learning is conceptualised as being influenced by three different kinds of logic: formal, informal and practical. Examples for scripted, polychronic and improvised interactions are to illustrate the interplay between the three kinds of logic.*

### Keywords

Collaboration technology, computer-mediated communication, virtual groups, improvisation

### INTRODUCTION

In today's society, learning is one of the most indispensable activities required to succeed in an environment characterised by continuous change. Globalisation, increased competition and the revolutionising development of information technology are only a few signs of rapidly changing social and economic conditions creating a need for continuous learning (Zhang and Nunamaker 2003).

This paper evolves around the challenge of ensuring sufficiently guided learning on one side and self-directed, learner-centred learning on the other side. Naturally, guided and self-directed learning activities are not mutually exclusive, however, they imply different approaches to online teaching. Whereas the former favours an upfront design of collaboration processes, the latter requires a sufficiently flexible course design that allows for collaboration processes to emerge.

From a theoretical point of view, collaboration is conceptualised as being influenced by three different kinds of logic: formal, informal and practical. The need to differentiate between different kinds of collaboration logic is motivated by Ciborra's (2002) general critique of methods and models in IS being too removed from the actual reality in which IS is applied. To identify different types of collaboration logic, the paper applies two concepts, already known from research on information systems usage: *polychronicity* (Lee 1999) and *improvisation* (Ciborra 2002).

The author starts with introducing some expectations towards (online) education from employers' perspective, i.e. what is expected from students, and from the students' perspective, i.e. what do they expect from a university. Next, online group work, though being an adequate means to promote the desired learning outcomes identified in the first part of the paper, is also problematic in that it can be perceived as very time consuming or time ill spent. To address this issue, the concept of learning scripts is introduced (Dillenbourg 2002). The case study at the end of this paper, however, suggests that scripted interaction makes only for a small part of students' interactions and that polychronic or improvised interactions are important complements to scripts. Finally, it is argued that a broader understanding of online collaboration will enable e-educators to better evaluate the diversity of collaboration processes, which in turn is necessary to coach online groups according to their needs.

The purpose of this paper is twofold. First, it is to extend the conceptualisation of online interaction, striving for a better alignment between instructional models and the messiness of 'real world' online learning, and second, it is to discuss the limitations of scripts if used in isolation.

## EXPECTATIONS OF ONLINE EDUCATION

### Industry's perspective

'Availability of suitably qualified employees' was the number one concern for Australian businesses in the last two investor confidence reports issued by the Australian Chamber of Commerce and Industry (ACCI 2007). Beside technical and applied capabilities, businesses ask for 'knowledge-workers' that communicate effectively, are able to work in teams and possess other 'soft' skills, which are crucial to innovative businesses (BCA 2006, p.15). Moreover, lifelong learning and entrepreneurship are often seen as an important competitive advantage in an increasingly dynamic market where the only constant is change. Other skills highly regarded by employers are creativity, flair, enthusiasm and the capacity for independent and critical thinking (ACNielsen Research Services 2000, p.16).

### Students' perspective

Burns *et al.* (2001) investigated a variety of factors that influence a student's decision to study online. Some of the positive factors included the possibility to better manage work commitments, spending time with friends and relatives, reduced study costs if students lived in remote areas and could avoid extensive travelling (*ibid*). As a downside, the authors mentioned motivational problems, diminished social relationships with fellow students and problems that might come with a lack of time discipline. These problems can be exacerbated if faculty is ill-equipped to provide adequate support to distance students (Sheehy *et al.* 2006). Depending on others is often perceived by students as running counter to the benefits of studying externally, i.e. studying independent of place, time and possibly peers (Crebert *et al.* 2004). Hence, introducing group work into an online course is not necessarily a popular step with students who feel that they were better off working individually.

### University's perspective

The challenge for universities is then to take into account industries' expectations, ensuring their students' employability, while keeping courses attractive and suitable to the needs for flexibility of external students. To develop the desirable communication and argumentation skills this study investigates online group work, which is frequently cited as an effective means to promote the before mentioned skills (Burdett 2007).

Interestingly, asked what contributed most to the development of their generic skills, graduates mentioned collaboration and interactive group work first (Crebert *et al.* 2004). Students acknowledged that in order to fit into their work teams they needed to communicate effectively with colleagues and analyse new situations quickly; something group work allowed them to practice in a safe environment (*ibid*). However, realising the benefits of group work in an online environment raises some difficulties as discussed in the next two section.

### Applying collaborative, case-based learning in an undergraduate online course

The present research is based on the author's experience with coordinating and teaching a second year, undergraduate course 'Introduction to e-Business'. Between 2004 – 2006 this course has been offered as a summer school course, run purely online. On average, these summer courses drew an enrolment of 55 students. In order to engage external students more actively, learning activities were organised around the preparation and discussion of four teaching cases.

Students had access to conventional communication channels such as email, online forums and text chat as well as to the more powerful virtual meeting room 'Centra ®' (Estes 2004). Centra enables users to hold audio discussions while simultaneously looking at another source of information (for example a shared document or a shared web-page) thus allowing for the convergence of two media. Students use headphones with attached microphones to communicate with one another and manipulate the data in the shared application via mouse and keyboard.

Historically, case-based learning (CBL) in higher education goes back to 1879 when the Harvard Law School aimed to foster the general understanding of principles through the discussion of particular cases (Merseeth 1991). Many of the benefits of CBL seem to respond directly to the skills called for by future employers. For example, CBL has been found to improve critical thinking and problem analysis (Stewart and Winn 1996). Also, using cases to teach information systems, Hackney (2003) reported substantial motivational gains through the discussion of problems that were relevant to real companies.

### Problem statement

Much of the past research in computer supported collaborative learning (CSCL) or computer mediated communication (CMC) has concentrated on developing or testing theories that could offer 'best fit rules', attempting to match particular activity categories with specific communication media (Garrison *et al.* 2001).

Jonassen *et al.* (1994), however, caution that people learn from thinking and not from technology. Technology has no causal impact on learning, in the sense that the 'right' technology could make someone learn. The same argument can be brought forward regarding teaching and learning methods. Using CBL is not a panacea and educators will still have to worry about how technology and instructional method can facilitate, or impede learning activities.

Focusing on learners' collaborative efforts, initially, the author attempted to answer the question 'How to support online collaboration effectively?', intending to support collaboration through scripts, which will be discussed in the following section. Very soon, however, it became apparent that collaboration scripts were only intermittently used and frequently adapted to better suit a group's particular needs (Voigt to appear). Moreover, content analysis of several online meetings showed that groups were managing multiple group functions at once (cf. Poole *et al.* 2004). As a consequence, the research had to aim to answer another question first: 'What happens during online meetings that brings about such a great variety in the way groups approach collaboration?'. As McConnell (2006) asserts, "We know little of what actually takes place in an online learning community and what members of communities do in those settings" (*ibid.*, p.4).

## LOGICS OF ONLINE COLLABORATION

Since Aristotle, 'logic' has developed into a variety of directions resulting in different meanings associated with the term. Formal, propositional logic establishes that "an argument is sound if the truth of the premises guarantees the truth of the conclusion" (Hannan *et al.* 2007, p.5).

However, we speak of informal logics if we want to assess the soundness of an argument based on what is said or omitted, or based on the interlocutors' presuppositions (Eemeren *et al.* 1996, p. 12). Whereas formal logic implies causality, informal logic relies on the judgement of informed, rational actors (*ibid.*). Positions are discussed according to a logic of pros and cons, advancing grounds that are acceptable to the participants.

A third kind of logic, the logic of practice (Bourdieu 1992), refers to the unconscious, tacitly held beliefs resulting from a history of doing things in a certain, unreflected way. Behaviours are 'reasonable' or 'logical' if they correspond to generally held expectations (*ibid.*). Logic in Bourdieu's sense, is not the result of symbol manipulation (formal logic) or rational argumentation (informal logic) but is constructed through practice during which actors develop an understanding of their everyday world that is economical, i.e. convenient to use because of its simplicity (Bourdieu 1992, p.86). In applying practical logic, actors are less concerned for the requirements of a theoretical framework such as coherence, completeness or generalisability, than the chance to succeed in their chosen endeavour. Sterne (2003) underlines this point declaring "If we do not distinguish between academic logic and practical logic (or rather, if we do not recognize academic logic as only one kind of practical logic), we wind up writing as if the people we study are running around making use of concepts we devised in the process of studying them!" (*ibid.*, p.375).

In this paper it is suggested that online collaboration is guided and subject to all three kinds of logic simultaneously. Scripts restricted to formal (or causal) logic are therefore of limited help if in a given moment a group operates according to a 'practical logic'.

### Scripts as idealised learning processes

Online education uses instructional scripts in order to elicit certain actions that are conducive to successful learning (O'Donnell 1999, p.180). Put differently, scripts are meant to increase the occurrence of pedagogically desirable activities and to decrease the amount of 'unproductive' interactions (*ibid.*). They usually contain specifications of an ideal process of collaboration, prescribing what should be done, in what order and by whom, using what resources (Kobbe *et al.* 2007). Means by which scripts can be implemented are varied and take more or less flexible forms. Flexible scripts aim to enhance learners awareness of their collaboration processes and suggests steps for doing things, whereas 'hard-coded' scripts may require a demonstration of a certain level of understanding before the next step can be done (Suthers 2007).

Though the usefulness of scripts has been demonstrated in numerous studies (Stegmann *et al.* 2007; Weinberger *et al.* 2007), scripts necessarily simplify complex interaction processes to remain instructionally feasible, i.e. they emphasise a single perspective such as task fulfilment – 'How to elaborate the content of an answer' – or task coordination – 'How to organise the exchange of interim results during group work' (cf. Clark *et al.* 2003).

In this study, two scripts provided students with a quick-to-grasp shorthand for the essential steps of e-CBL. On a more general process level, students were asked to (1) post their individual case preparations, (2) discuss their differences and similarities in their case analysis during an online meeting, and (3) produce a coherent case report which is then (4) evaluated by peer groups (Mauffette-Leenders *et al.* 1999). On a meeting level, groups should: (a) determine a meeting facilitator, (b) start the meeting by reviewing the case issues, (c) analyse the

case issues, (d) formulate a coherent set of solutions, and (e) coordinate remaining tasks (Mauffette-Leenders et al. 1999, p.67).

From a logics point of view, the ideal status of a script depends on many premises ranging from students' technology skills to their level of relevant background knowledge (Clark et al. 2003). Overcoming the dilemma of a script's multiple dependencies requires further exploration and conceptualisation of the multiple dimensions of collaboration logics, which is attempted in the next two sections.

### **The polychronicity of 'real world' online learning**

As stated in Lee and Whitley (2002) virtuality implies, by definition, being and acting in multiple places at once. With this claim the authors refer to the socially constructed nature of time and space (as opposed to clock time and physical space). In an off-line environment, persons often have space-time combinations associated with specific activities. For example, in order to discuss a personal matter one might suggest a time during the evening in a less formal place, whereas work-related matters would be scheduled during morning hours in a place that has the required facilities (projector, whiteboard, Internet access etc.).

Information and communication technologies (ICT) blurs the boundaries between private and public space as well as between leisure and work time (Castells 2000). Distance students perceive these blurred boundaries both, positively and negatively, as a liberation from rigid timetables or as a threat to family and privacy (Burns et al. 2001). It is beyond the scope of this article to follow up on the various advantages and disadvantages technology brings to online learners. Instead, the paper will focus on polychronicity online and what this implies for the management of online collaboration.

First introduced in Hall's (1983) studies of how different cultures understand and manage time, the concept of polychronicity is defined as "the number of related and unrelated tasks, activities, and stimuli an individual attends to, participates in, and is involved with literally at one time or within relatively brief spans of time" (Persing 1999, p.360). Hence, even when a learner is virtually attending a synchronous online meeting, he or she can attend to another conversation in parallel using an instant messenger (engaging in multiple unrelated task) or looking up some information to support an ongoing discussion on the Internet (engaging in multiple related task).

Polychronicity implies that activities which scripts represent as a sequence of steps (e.g. read case study, identify issues, formulate a set of possible solutions etc.) could well be executed quasi-simultaneously. The latter means that students can start these steps at the same time and, by keeping the evolving thread of each activity in mind, switch among them freely. A solution that is suggested before the issue has been properly identified can still be of value if this guides the ensuing analysis. Besides, post-hoc rationalisations of decisions are a known strategy in situations where goals are fuzzy and members try to minimise their efforts (Cohen et al. 1972).

Logically, polychronicity raises the question 'Should instructional design impose a certain sequence of learning activities?'. This paper argues that polychronic behaviour is more akin to the informal logic of argumentation (Eemeren et al. 1996), where issues are followed up or put on hold according to what is perceived as important at the time. Rather than attempting to prescribe an optimal path (in the form of a script based on reported research), polychronicity entrusts the group itself with managing the temporality of its collaborative effort. However, the author is aware that this hinges on the group's willingness to actively monitor and discuss their collaboration processes.

### **Learning through improvisation**

Whereas polychronicity has relativised the need to sequence learning activities in a certain order, the concept of improvisation will highlight the importance of unscripted learning processes. It has already been mentioned that the successful application of a script depends on a number of conditions, such as coming prepared to a meeting or having the skills to use the virtual meeting room to its full benefit. This section then discusses how learning can happen if fundamental conditions are not fulfilled or break away, e.g. the learning platform is down, a group member is unable to log on, or the majority of a group is unprepared. These difficulties can provoke anger, frustration or simply a feeling of 'why should I care' among students, in which case the call for top down intervention is quickly made (Jacques 2000, p.69).

Similarly, Ciborra (1998) highlights the frequency with which implementation or usage of Information Systems fail and calls for less reliance on procedures derived from abstract models and more room for experimentation and improvisation. Ciborra's (2002, p.170) main argument evolves around the fact that process recommendations are decontextualised, i.e. they do not consider the manifold social aspects, such as the moods and affections of users which impregnate the reality of IS. The belief that everyday usage will conform or align to abstract models is partly the reason for why IS projects fail despite the application of a rigorous methodology (ibid).

In order to avoid the dilemma between idealised models and messy real world, Ciborra (2002) suggests rupturing the spell of method and allowing for intuitive interventions (improvisations) in the running of IS. Ciborra (1999) defines improvisation as “situated performance where thinking and action emerge simultaneously and on the spur of the moment. It is purposeful human behavior which seems to be ruled at the same time by intuition, competence, design and chance. While improvising, the agent is able to frame and recombine features of her situation, so that they become resources for intervention.” (ibid., p.78).

The author argues that improvisation is beneficial to collaborative learning too. If students understand the idiosyncrasies of their situation, including the moods and affections of their peers, they may be able to adapt the script or create new forms of collaboration (Voigt to appear). Hence, if the preliminary requirements for a script are not given, rather than calling off the meeting, students could improvise, putting alternative topics on the agenda (if the majority of a group is unprepared) or using alternative communication channels (in the case of a technological breakdown).

Continuing the mapping between different kinds of logic and certain types of interactions, improvisation makes use of practical logic (Bourdieu 1992), as developed and exercised during students’ daily social interactions. Using practical logic, students can decide whether to address a group issue with a formal complaint or a group internal email. Likewise, the individual’s practical logic will influence whether a technical breakdown is taken as a reason to break off an online meeting or whether an effort is made to improvise, reconfiguring technology in order to continue the meeting.

## ANALYSING ONLINE INTERACTIONS

Working from an interpretivist perspective, this research “does not predefine dependent and independent variables, but focuses on the complexity of human sense making as the situation emerges” (Klein 2001, p.219). The method applied is ethnographically informed case studies (Stake 2000). Ethnography means “writing about cultures” (Sarantakos 1998, p.195). Opposed to positivistic interpretations from the outside, ethnography emphasises “*local meanings*” or the “*actor’s point of view*” from the inside (Erickson 1984, p.2). Typical for ethnographic studies is prolonged and intense interaction with the field which allows a researcher to test and refine their understanding of a given phenomena over time (ibid).

The objective of this empirical section is to describe instances of scripted, polychronic and improvised interactions which are to show (a) how ‘real world’ collaboration operates with different kinds of logic, and (b) that deviating from the ‘scripted’ logic is sometimes necessary to get collaboration started or keep collaboration going.

### Student cohort

Forty-two students participated in the online discussion of four teaching cases over a period of eleven weeks (Dec 05 - Feb 06). Each case was dedicated to a different theme: business models, the usability of online shops, online security and ethics in a globalised business environment (Laudon and Traver 2004). When the course began, students got access to the various communication technologies and were encouraged to explore their features. Then, during the first two weeks, each group was given an introduction to the available online communication tools and learning scripts in order to create confidence in the technology and the feasibility of online group work. These measures seemed particularly important, given that for the large majority of students (82%) this was their first online course, less than two thirds (62%) had used synchronous online communication such as Instant Messengers and about one third (29%) indicated previously unpleasant experiences with group work.

### Data collection and presentation

The empirical data used for this analysis are taken from a larger study concerning the feasibility and effectiveness of e-CBL, with preliminary results being published in Voigt and Swatman (2006). The data consist of vignettes, summarising the interactions of nine groups over a period of eleven weeks plus the recordings of group meetings as far as they were released by the groups themselves. Additionally, the interpretation of a group’s collaboration efforts is supported by interviews the researcher had with members from all groups except for B, D and I.

Textual interactions (chat and forum postings) were available as transcripts. Posting per members ranged from seven to 24 and groups had between three and five chat sessions and two thirds of the groups changed from the text chat to Centra (Table 1). The accumulated time groups spent in online meetings varied considerably, ranging from 2.7 hrs to 5.5 hrs for chat room usage and from 3.1 hrs to 10.1 hrs for the virtual meeting room (Table 1). A subset of the recorded Centra sessions was then transcribed using ELAN 3.3; a tool that allows for transcribing and coding multimedia corpora by linking annotations to the audio and video stream (Berez 2007).

Table 1: Online activities (n=9 groups)

Group	Members	Postings per Member	Chat Sessions	Chat [min]	Centra Sessions	Centra [min]	Total [min]
A	4	22	3	166	4	186	352
B	5	7	5	285	1	77	362
C	6	11	5	185	8	610	795
D	4	24	4	331	3	264	595
E	5	12	4	206	3	135	341
F	5	10	4	162	1	90	252
G	5	10	5	169	4	271	440
H	4	23	5	258	4	337	595
I	4	8	4	135	1	64	199

Finally, each group’s activities (to the extent they were recorded electronically) are visualised in a diagram, an example is shown in Figure 1. The timeline from weeks 2 to 10 is shown on the category axis, the number of postings is indicated on the left value axis, and the duration of meetings is shown on the right value axis. The four vertical, dashed lines indicate the dates on which the group submitted a case report. The different interaction media are symbolised by bars for postings, rectangular shapes for chat sessions and round shapes for Centra sessions.

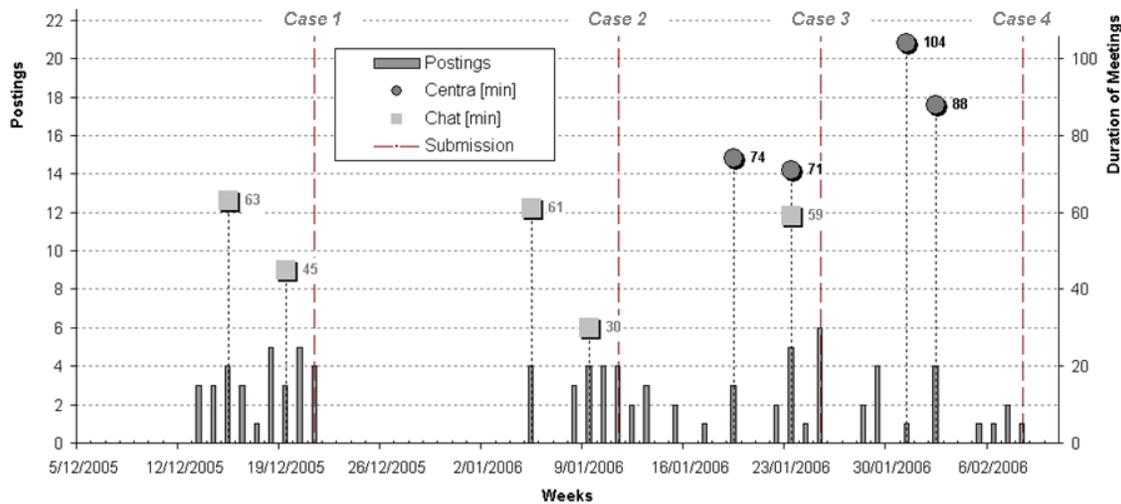


Figure 1: Group interactions across various communication channels

**Instances of scripted interactions**

Whether or not a group followed the overall script of posting their preparations, discussing the case synchronously and following up remaining issues through postings could partly be inferred from a simple glance at the visualisations of a group’s synchronous and asynchronous activities. Taking the example of Figure 1, it can be seen that the group settled for a pattern of two meetings per case report and, with the exception of the second case which was due shortly after new year, synchronous meetings were preceded by a number of postings. Of course, to what extent an online meeting or a posting did actually contribute to the advancement of the case report can not be inferred from a purely quantitative analysis of group interactions.

### **Instances of polychronic interactions**

As suggested by Lee (1999), information technology brings multiple threads of action together. For the most part, evidence for polychronic behaviour was found during the analysis of online meetings. Polychronic behaviour had been defined as engaging in multiple related or unrelated tasks. Unrelated tasks could result from the fact that students attended online meetings from their home, looking after their children while participating in the meeting. Examples for multiple related tasks are instances when the group discussed an issue while simultaneously searching for references to back up their argument. While some groups opted to keep the discussion process separate from the writing process, other groups preferred to write out their ideas in full, intermingling the discussion of the case with discussions about how to best convey the flow of their argument.

Another dimension of polychronic behaviour is a natural consequence of using richer communication media. While on the surface a discussion elaborates on a case issue, group members develop the group's social climate and engage frequently in coordinating future tasks (Garrison and Anderson 2003). The following example shows how coordination, content and the student's social presence are addressed in a single utterance made during an online discussion: "If I can collect my thoughts maybe I post something ... they [textbook] talk about the television campaigns generating extra sales and the cost per purchase is seventeen dollars as opposed to eleven dollars for online sales, but it's all a bit mushy in my own thought so I don't think I am explaining it very well" (*Group C*).

### **Instances of improvised interactions**

An example of improvisation happened shortly before the submission of the third case (Figure 1). During a meeting when *Group H* was supposed to discuss their final draft of the case report, a technical problem interrupted the Centra session, which was then continued using the text chat, copying and pasting sections of the report into the chat session which were commented upon afterwards. Chat was also a useful resource when *Group C* found that even though application sharing allowed for multiple editors, sharing the document in read-only mode and sending text snippets via chat was considerably faster than typing directly into the shared application.

Both examples may seem trivial but the fact that other groups encountered similar issues but did not improvise makes it a valuable lesson. Just as much as improvisation helped groups to improve their collaboration processes, interviews and case vignettes revealed several situations where the researcher felt that a more flexible or entrepreneurial approach would have been beneficial.

*Group B* and *I* never adopted Centra due to technological constraints, i.e. either their computers or firewall configurations prohibited them accessing the Centra application. These groups also showed the lowest number of postings per member (Table 1). It could be argued that using less rich communication affected their appreciation of group internal communication in general, thereby missing out on group building experiences which are important for developing a feeling of group belonging or group cohesion (Garrison and Anderson 2003).

## **OUTLOOK: COACHING GROUP'S USE OF SCRIPTS**

The paper illustrated how collaboration is impacted by different kinds of logic. Discussing observed instances of polychronic and improvised interactions has pointed towards the limitations of instructional scripts in e-learning. In order to create room for improvisation, Dillenbourg and Tchounikine (2007) suggest to make scripts more flexible by differentiating between essential and therefore unchangeable elements of a script and adaptable elements. The former could become mandatory steps in a technology-led process whereas the latter are steps students need to reflect upon and implement accordingly. However, in this case the question remains what criteria would serve to separate the essence of a script from its spurious, less important parts.

Alternatively, the author's experience with online group work suggests that online collaboration can require intensive coaching which is made easier if instructional materials (e.g. online tutorials on how to use the virtual meeting room or readings about the method and rationale of CBL) are ready to hand. However, since the mere availability of ICT and online resources does not guarantee that they are used as intended or that they are used at all, it will still be the task of the online tutor to monitor a group's needs and point to the relevant resources (Nelson and Bueno 1999).

Additionally, coaching groups in a technologically mediated environment has the important role to draw students' attention to the very limitations of technologically mediated collaboration (McConnell 2006). An online tutor can then develop the necessary understanding of a group situation in order to decide which logic is at work. It may then turn out that the problem is unrelated to a rational understanding of online collaboration or collaborative technologies and that the issues is rooted in the student's practical logic, questioning the validity of the collaborative approach in general (Motschnig-Pitrik 2006).

In conclusion it can be said that managing the different logics of online collaboration means to make students aware of how important their participation is in creating the group's own practical logic, which can only be supported, but not replaced by the formal logic of a course design. More work is needed to identify viable forms of distinguishing and measuring the suggested types of logics on a larger scale in order to improve the efficiency of online coaching.

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