

## Argumentative Knowledge Construction in Online Learning Environments in and across Different Cultures: a collaboration script perspective

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**ABSTRACT** In recent years, information and communication technology has established new opportunities to participate in online learning environments around the globe. These opportunities include the dissemination of specific online learning environments as well as opportunities for learners to connect to online learning environments in distant locations. These dissemination and distance learning scenarios create potential challenges, however, in terms of the cultural differences in the internal scripts that learners of different cultures bring to these environments. This article considers these issues and challenges specifically for online environments focusing on argumentative knowledge construction. It discusses the importance of cross-cultural research in this area and proposes that a collaboration script perspective may prove extremely valuable for this research.

### **Intercultural Challenges of Dissemination and Distance Learning Scenarios**

*Dissemination scenarios* involve disseminating and installing specific online learning environments on servers throughout the world in cultures different from the culture in which they were developed (e.g. the Web-Based Inquiry Science Environment, WISE, was developed in the USA, but is now also used in China, Germany, Japan and Scandinavia). These online learning environments often focus on engaging students in *argumentative knowledge construction* (AKC). AKC involves constructing and exchanging arguments and counter-arguments in online discussions in order to learn how to argue within a domain and enhance the acquisition of domain knowledge (Weinberger et al, 2006). Learners from various cultures, however, differ with respect to procedural knowledge of how to argue and learn together.

Procedural knowledge can be thought of in terms of the *internal scripts* that guide learners' actions (Schank & Abelson, 1977; Kollar et al, 2005). A learner's internal scripts may affect the benefit the learner derives from a learning environment (Kagan et al, 1985). Kagan and colleagues (1985) found differences between learners of different cultures in terms of traditional classroom education and collaborative learning. A reasonable explanation for these results suggests that learning environments impose *external scripts* onto the learners to some degree, which may either complement or disrupt learners' internal scripts (Kollar et al, 2005).

In *distance learning scenarios*, learners from all over the world connect to online learning environments maintained in distant locations (e.g. Kim & Bonk, 2002). In this scenario, students with different cultural backgrounds engage together in online AKC. Culturally heterogeneous groups can potentially benefit from the opportunity to share diverse perspectives, but heterogeneous groups also often suffer from process losses in terms of misunderstandings and coordination difficulties when working on tasks together (Cox et al, 1991; Anderson & Hiltz, 2001). Essentially, some degree of shared focus and coordination seems prerequisite for effective collaborative learning in online settings (Fischer & Mandl, 2005), and process losses due to coordination difficulties have been identified as a major issue for online learners (Strijbos et al, 2004).

All of these factors therefore combine to pose specific challenges for the learners as well as for educators and instructional designers (Kagan et al, 1985; Hatano & Inagaki, 1998; Phuong-Mai et al, 2006). In terms of AKC, it is likely that learners from different cultural backgrounds may follow different internal scripts in terms of different perspectives of how to act and interact (see Flechsig, 1996; see Schank & Abelson, 1977). Educators and instructional designers therefore face challenges in equitably supporting learners with different cultural backgrounds within these online learning environments (Phuong-Mai et al, 2006).

Learners in these scenarios need to learn not only about the communication technology, such as email or video conferencing, but also to interact and argue with learning partners from all over the world in online learning environments (e.g. Anderson & Hiltz, 2001). A specific challenge of online learning is that learners need to continuously build and maintain a common cognitive basis without social context cues (i.e. facial expressions and other non-verbal cues). It can be assumed that this is particularly problematic when learners from different cultural backgrounds come together in online environments.

Unfortunately, there is comparatively little scientific knowledge about the extent to which online learning approaches developed and empirically tested in one culture, such as AKC, can be transferred and applied in other cultures. Studies on this question have not yet systematically compared learners' interaction patterns using the same online learning environment in different cultures. Instead, the few studies that have been conducted involve (1) learners that differ in age, (2) learners that differ in acquaintance with their learning partners, and (3) learners who were provided with different learning materials, tasks, and online learning environments (e.g. Veermans & Cesareni, 2005).

In order to accumulate scientific knowledge on the dissemination scenario, we suggest investigating interaction patterns of culturally homogeneous groups in one specific online learning environment under controlled conditions with participants from different cultures who are demographically comparable. In outlining a framework for this research, we first introduce the approach of argumentative knowledge construction, which requires learners to share their knowledge, engage in resolving socio-cognitive conflicts, and come to joint conclusions. Next we discuss the extent to which the activities suggested by the AKC approach might play out differently in various cultures. We conclude by discussing the promise of the ideas of internal and external collaboration scripts as lenses for analysing and facilitating AKC in online discussions across different cultures.

### **Cultural Differences in Argumentative Knowledge Construction**

This section provides a theoretical background about AKC and discusses possible differences between cultures with regard to AKC.

#### *Argumentative Knowledge Construction*

Argumentative knowledge construction means that learners construct domain-specific as well as domain-general knowledge through collaborative argumentation (Andriessen et al, 2003; Weinberger et al, 2006; Weinberger & Fischer, 2006). The AKC approach is appropriate for any learning task that is complex and open enough for learners to contribute and argue about multiple conceptualisations and perspectives. For instance, learners may be asked to take opposing views on

a topic or learners may be assigned to discuss their conceptualisations with learning partners of differing views (Plötzner et al, 1999). AKC may also occur when learners discuss complex problems and come to joint solutions (De Grave et al, 2001; Stegmann et al, 2006). In these scenarios, learners may, for example, suggest their individual solutions to a problem, mutually criticise and challenge the initial proposals, and eventually come to more adequate conceptualisations of the problem when carefully balancing arguments and counter-arguments (Leitão, 2000; Schwarz et al, 2000).

### *Cultural Differences*

Cross-cultural psychology seeks to investigate similarities and differences in individual psychological functioning across various cultures. Although some psychological processes appear relatively universal across cultures (McCrae & Terracciano, 2005), members of various cultures differ in the way basic psychological processes manifest in observable behaviour. Beyond different symbolic systems, cultural artefacts, or traditional rites, cultural differences also explain some patterns of preferences, perception, thought, and interaction. Based on this perspective, the variance across different cultures must be investigated in order to generalise studies of human behaviour (Heron & Kröger, 1981).

Some research has examined the culturally diverse organisational structures of educational institutions. These examinations have investigated, for example, the use of technology in the classroom (Kozma, 2003) and organisational conditions for collaborative learning environments (Huber, 1995; Shwalb & Shwalb, 1995). Apart from practical differences such as organisational structures, differences in cultural values and individuals' behaviour have also been investigated (Hofstede, 1991; Horii et al, 2005).

In a series of large-scale studies, several critical value differences between cultures have been identified (Hofstede, 1980; Triandis, 1989). The factor regarded as the single most important distinguishing characteristic of cultures is *individualism* (vs. *collectivism*). Individualism indicates the degree of self-determination and the preference for relatively loose social networks. Collectivism, in contrast, is defined as the importance of the social group and the preference for tightly knit social networks (Cox et al, 1991; Triandis, 1995; Oetzel, 1999). Individualism may influence the extent to which collaborative learners refer to each other and share knowledge in discourse, which has been shown to positively correlate to individual learning gains (Teasley, 1997). Members of collectivistic cultures tend to display more cooperative behaviour when learning together, such as sharing knowledge, whereas members of individualistic cultures tend to display more competitive behaviour focused on individual achievement in collaborative learning environments (Diaz-Guerrero, 1984; Kagan, 1984; Leung, 1988; Cox et al, 1991). For instance, (collectivistic) Japanese groups exhibit fewer conflicts, employ more cooperative conflict tactics (i.e. they tend to resolve conflicts by sharing knowledge and coming to joint conclusions), and employ fewer competitive conflict tactics (i.e. they tend not to resolve conflicts by favouring one solution over another) than (individualistic) European and American groups, who in contrast display more competitive behaviour (Oetzel, 1999).

The individualism–collectivism continuum may moderate processes of collaborative learning with respect to how much knowledge gets shared within small groups and with respect to the degree of conflict-oriented behaviour displayed. Collaborative learners from collectivistic cultures, which are widely spread in Asia, Africa and Latin America, could be hypothesised to share more knowledge when learning together in contrast to learners from individualistic cultures (most of Europe and North America), who might be more likely to engage in conflict-oriented behaviour (Chang et al, 2002). Furthermore, it has been argued that individualistic learners may tend to have opinions independent of their group, whereas collectivistic learners' opinions tend to be consistent with their peers (Chang et al, 2002). Finally, learners with a collectivistic orientation prefer working in groups and perform better in groups, which is why cooperative learning strategies have been recommended for collectivistic learners (Chan & Watkins, 1994; Salili, 1996; Phuong-Mai et al, 2006). There is also research indicating that Western models of online learning such as AKC, which focuses on conflict-oriented behaviour between equal learners, may not be appropriate for collectivistic cultures (Phuong-Mai et al, 2005, 2006).

There is yet little knowledge on the question of how learners from different cultures engage in and ultimately benefit from AKC. Various cultural factors might both inhibit and encourage AKC because AKC involves both conflict-oriented behaviour and knowledge sharing as important components of what Leitão (2000) calls knowledge building cycles, in which learners discuss diverging perspectives upon a problem. Furthermore, cultural differences may interact with specific requirements of online learning environments. For example, online learning based on asynchronous communication might be particularly useful due to reflection time in some cultures (e.g. Finnish culture), whereas it may pose particular barriers due to a lack of immediacy in other cultures.

These hypotheses about the impact of cultural differences in AKC in online learning environments require further systematic research. Cross-cultural research thus far has focused on cultural differences in individual preferences, value orientations, and cognition of the individual. Relatively little research has focused on the interaction patterns of collaborative learners in AKC within various cultures.

General cultural factors, such as individualism/collectivism, however, provide only a starting point for this research. First of all, individualism and collectivism may represent independent cultural characteristics rather than opposing ends of one continuum (Triandis, 1995). Furthermore, although value differences are assumed to affect individual behaviour, cultures that are similar with respect to value orientations may still differ with respect to how these value orientations shape behaviour. Beyond more general value orientations, members of different cultures may vary with respect to how general cultural characteristics are represented in discussion style (Cox, 1994). For instance, Finnish and German culture seem to be similar with respect to individualism/collectivism and other cultural factors (Hofstede, 1980), but may still differ strongly with respect to, for instance, turn-taking rhythms, modesty in presenting ideas, and transactivity of talk (Bartlett, 2001; Kim & Bonk, 2002).

General approaches to distinguishing cultures therefore only provide initial insights into potential differences rather than definitive rubrics for concluding and predicting how learners of different cultures will interact. Identifying and predicting behaviour of learning groups of different cultures is therefore not only a question of distinguishing cultures on the general level of value orientations (Hofstede, 1980; ; Hampden-Turner & Trompenaars, 1994; Schwartz, 1994); it is also a question of identifying differences in argumentative knowledge and of the culture-typical interaction patterns of collaborative learners within these cultures.

### **Collaboration Scripts**

Collaboration scripts have been conceptualised as procedural knowledge that specifies and sequences roles and activities in a collaboration scenario (Kobbe et al, in press). The term 'script' has also been used to denote external, process-oriented instructional support for collaborative learning provided by a teacher or instructional designer within a learning environment to help learners engage in specific interaction patterns (Kollar et al, 2005).

#### *Internal Collaboration Scripts*

Schank & Abelson (1977) defined the term 'scripts' to refer to culturally shared procedural knowledge about everyday situations. Flechsig (1996) argues that the 'script' perspective (a) facilitates analysis of how general cultural factors are concretised in everyday situations, (b) provides background context for how behaviour should be interpreted, and (c) facilitates cross-cultural learning by providing culture-specific procedural knowledge.

Slight script deviations may cause friction in cross-cultural encounters even when internal scripts overlap significantly between those cultures. For instance, when American soldiers stationed in England during World War II dated English women, both the American men and the English women mutually accused each other of being 'easy' and sexually aggressive (Watzlawick, 1976). Both the American and the English mating scripts involved roughly 30 steps, but the script sequences differed between the two cultures. Whereas the script activity 'kissing' is the fifth step in a typical American mating script, it comes very late in the English script (roughly the twenty-fifth

step). When the American assumed that it was time for a goodnight kiss, it was received as reckless and impertinent behaviour at this early stage of mating by the English woman, who was not only being 'cheated' of major parts of her mating script, but who also had to decide whether she was to break off the relationship or to continue with steps 26 to 30 including the act of sex. In this latter case, the American soldier could only reciprocally regard the behaviour of the English woman as inappropriate for this early stage of the relationship from the perspective of the American script.

Conflicts resulting from differences in internal scripts have been investigated in relation to participation, interaction patterns, and team performance – particularly in the context of culturally heterogeneous virtual teams collaborating in computer-mediated communication (Webber, 1974; Cox et al, 1991; Ravlin & Meglino, 1993; Oetzel, 1999; Thomas, 1999; Anderson & Hiltz, 2001; Chang et al, 2002; Agerup & Büsser, 2004). With the expansion of participation in online learning environments across cultures, researchers have begun to investigate how culturally diverse learners participate in these online environments (Kim & Bonk, 2002; Reeder et al, 2004; Veermans & Cesareni, 2005; Wresch et al, 2005). This research has thus far focused on general cultural factors rather than investigating and comparing the actual internal scripts involved.

Learners' internal scripts guide their actions in collaborative learning situations. In AKC, for example, a learner's internal script affects what that learner counts as an argument or counter-argument. Similarly, internal scripts help determine the acceptable timing for suggesting counter-arguments. Online learning environments may therefore require adaptation for the different internal scripts of various cultures. Online environments may also require adaptation to support learners from different cultures (with their different internal scripts) learning together effectively in the same environment.

We argue that the script perspective encompasses interdependent roles and activities of learners within a group and thus provides an adequate focus for analysing typical interaction patterns of culturally homogeneous groups and the typical misunderstandings of culturally heterogeneous groups. The influence of internal scripts on collaborative learning can be investigated with respect to the extent to which the prevailing collaborative learning scripts within any one culture are similar to scripts that are believed to effectively promote learning, such as Leitão's (2000) knowledge building cycles. There is, however, little knowledge regarding which internal scripts are shared between cultures (and to what extent). By identifying specific internal scripts, teachers and instructional designers will better understand the extent to which members of culturally homogeneous groups need additional facilitation in order to participate productively in AKC.

#### *External Collaboration Scripts*

Interaction of collaborative learners can be guided by scripts that are at least temporally represented externally in the learning environment, such as a teacher who models specific interaction patterns (O'Donnell & Dansereau, 1992). As an instructional approach, collaboration scripts can tell the participants what to do with respect to the learning task, the roles they should play, and the sequence in which to engage in the activities. This instructional approach has been transferred to online learning environments (Fischer et al, 2007), where scripts are typically embedded within the interface of online learning environments to facilitate AKC (e.g. when learners in online discussions are about to reply to a message of their learning partners, scripts may hint or prompt them to warrant claims or formulate counter-arguments).

Because external scripts support specific interaction patterns, research on external scripts may help us better understand the types of interaction patterns that best facilitate collaborative learning. Stegmann and colleagues (2006), for example, developed and evaluated a script for the construction of argumentation sequences based on Leitão's (2000) approach. Within an asynchronous discussion board, learners were guided to engage in knowledge building cycles. As part of this approach, the subject of each message was pre-defined based on its position in the discussion sequence. The first message of a discussion thread was labelled 'Argumentation'. The answer to an argument was automatically labelled as 'Counter argumentation'. A reply to a counter-argument was labelled 'Integration'. The next message was again labelled 'Counter argumentation', then 'Integration', and so on. Results of the study show that this external script for the construction of argumentation

sequences facilitated learners' engagement in interaction patterns following Leitão's model. Furthermore, learners in the script condition acquired more knowledge about argumentation than learners in the control group without such an external collaboration script without impeding the acquisition of domain-specific knowledge (Stegmann et al, 2006).

Another external script under investigation – the so called *social script* – directs students to rotate the roles of 'case analyst' and 'constructive critic' (Weinberger et al, 2005). Each student becomes a case analyst for one case study and simultaneously acts as a constructive critic for the case studies of his or her learning partners. After several rounds of critiques and replies to critiques, the learners compose final case analyses based on the preceding discussion. To further support learners in acting out these two roles, students' messages were pre-structured with role-specific prompts, such as 'These aspects are not clear to me yet,' 'My proposal for an adjustment of the analysis is ...,' or 'We have not reached consensus concerning these aspects.' Several studies show that this external social script facilitates the transactivity of learners' online discussions as well as individuals' acquisition of domain-specific knowledge (Weinberger et al, 2005).

There are indications that instructional supports for collaborative learners require further adaptation to the individual needs of the participants (Cohen, 1994). Computer-supported scripts, for example, can interact with learners' argumentative knowledge. Kollar et al (2005) provided learners with an external argumentative script that guided learners to complete Leitão's knowledge building cycles consisting of argument, counter-argument, and integrative argument and to provide support for the claims that were being put forward in the arguments. Learners holding well-elaborated internal argumentative scripts were identified and distinguished from those who did not. Learners with elaborated internal scripts on how to argue do not seem to require additional support by external argumentative scripts to acquire domain-specific knowledge in AKC (Kollar et al, 2005). The results show that the external argumentative script successfully facilitated the acquisition of argumentative knowledge of all learners. Learners' internal scripts, however, seemed to influence the acquisition of domain-specific knowledge. Learners with more elaborated internal scripts than others benefited more regarding the acquisition of domain-specific knowledge.

Scripts also seem to interact with the levels of prior knowledge of the individual participants of the group. Dyads receive significant support from a script that assigns the roles of explainer and listener to the two learners when both learners exhibit similarly low levels of prior knowledge, whereas the knowledge acquisition of heterogeneous dyads (in terms of prior knowledge) seems to be impeded by the same script (Fischer, 2001). The script appears to interfere with the spontaneously emerging interaction patterns of the heterogeneous learners by assigning the roles of explainer and listener without considering the individuals' learning needs or the distribution of needs and resources within the group.

Current research investigates scripts for argumentative knowledge independent of the culture. Building on these findings, cross-cultural research on collaborative learning in online discussions needs to identify the prevalent argumentative knowledge and resulting interaction patterns of learners from different cultures. The construction of counter-arguments, for example, might need different supports in Japan than in the USA. There are indications that the school practices of the two cultures foster specific, but different, aspects of argumentative knowledge (Inagaki et al, 1999). Research needs to investigate the interaction effects of the qualitatively different argumentative knowledge resident in various cultures in terms of computer-supported collaboration scripts. Based on these investigations, external scripts could be developed to more effectively support cross-cultural AKC in online discussions.

## **Conclusions**

Although the importance of intercultural differences is currently acknowledged in many societal areas, cross-cultural research has not yet notably influenced the design of online learning environments. Research thus far (e.g. Cox et al, 1991) confirms that cross-cultural interaction poses both challenges (in terms of coordinating different internal scripts) as well as potential benefits (in terms of sharing culturally divergent knowledge). Without additional facilitation, participants may not overcome the challenges to achieve the potential rewards of collaboration. To investigate and facilitate cross-cultural interaction, more systematic studies will need to investigate cultural

differences in interaction patterns, cross-cultural interaction, and ways to facilitate cross-cultural interaction and cross-cultural competence. There have been few large-scale studies, such as Hofstede's (1980), and these few studies have typically focused on general cultural factors investigated through self-reports.

Educational practice is currently shifting towards both the *dissemination scenario* (in which specific online learning environments are being disseminated throughout the world) and the *distance learning scenario* (in which learners participate in online learning in culturally heterogeneous groups). Studying typical interaction patterns of different culturally homogeneous groups within one specific online learning environment would allow us to construct more insightful hypotheses about the interaction of culturally heterogeneous groups in similar environments. Research on culturally heterogeneous distance learning groups has primarily focused on single case studies without comparison to culturally homogeneous groups (Wallace & Chou, 2001; Wresch et al, 2005). Few studies compare processes and outcomes of culturally homogeneous and heterogeneous groups, and these studies typically focus neither on scripts nor AKC (Anderson & Hiltz, 2001; Kim & Bonk, 2002). We suggest investigating and comparing interaction patterns of culturally heterogeneous groups and culturally homogeneous groups within a single specified environment to allow us to control for environmental parameters in the analysis.

The script perspective may prove very productive for conducting this research. The script perspective provides a narrow focus on relatively stable procedural knowledge that moderates interaction patterns. Furthermore, significant research has already focused on the role of scripts in AKC for culturally homogenous groups. In addition to investigating the internal scripts that guide learners' spontaneous interaction, we also suggest further research on the effects of external scripts on the interaction of culturally homogeneous and heterogeneous groups. External scripts may provide a feasible approach to facilitate the participation of diverse learners who might not otherwise benefit from AKC in online learning environments.

### **Possible Limitations**

One limitation of the script perspective is that scripts may differ in the degree to which they are shared within a single culture. Schank & Abelson (1977) explain that internal scripts are culturally shared knowledge for well-known situations, such as 'going to a restaurant'. Scripts on AKC, however, may represent personal knowledge rather than culturally shared understandings (Kollar et al, 2005). A challenging research question, therefore, is to what extent variance of interaction patterns may result largely from inter-individual rather than inter-cultural differences. For instance, some learners may apply conflict tactics untypical for their culture. Thus, a variety of internal scripts may be used within any one culture.

Furthermore, internal scripts may prove difficult to investigate. Learners may not act according to their script in novel situations. Especially in cross-cultural encounters, learners may create new, possibly trans-cultural, ad hoc scripts (Welsch, 1995). The observable interaction patterns may therefore not represent prevalent internal scripts. Observations of interaction patterns may thus need to be accompanied by self-reports on how AKC is supposed to proceed, which in turn may be culturally biased. Therefore, researchers from the different cultures under investigation need to collaborate and analyse learners' interaction patterns within one CSCL environment. This research might analyse self-reports from multiple perspectives including multiple back and forth translations of the verbal data in addition to applying multiple methods (Wallace & Chou, 2001).

Finally, scripts may be subject to rapid cultural change. Some internal scripts (e.g. the American restaurant script) are being disseminated across cultures and may coexist with multiple other internal scripts in many individuals. Similarly, new scripts may be invented along cross-cultural encounters in online discussions, which are either guided by general rules of 'netiquette' or by particular forms of interaction within special interest groups with members from all over the world (Van Alstyne & Brynjolfsson, 1997). Against this background, Welsch (1995) has introduced the concept of trans-culturality, indicating that even though cultures are not homogeneous and can be conceived as disconnected from other cultures, cultures are subject to mutual influence. This

mutual influence may lead to an integration of value orientations and scripts across different cultures.

### Final Thoughts

The spontaneous emergence of cross-cultural interaction patterns and the creation of new scripts do not reduce the importance of script research. On the contrary, at a time when new scripts are being created, script research may nourish ways to facilitate effective cross-cultural AKC and facilitate the synthesis of effective new cross-cultural scripts.

The various effects of specific external scripts in different cultures will provide insight into specific internal scripts. For example, scripts may be most effective when they complement the knowledge of learners (i.e. when they suggest interaction patterns that the learners would not spontaneously engage in themselves). Learners with a less elaborated internal script for conflict-oriented behaviour in AKC may thus be particularly well supported by scripts that productively induce and help resolve conflict. Learners with less elaborated internal scripts for conflict-oriented behaviour may, however, also have the most difficulties achieving the external scripts' goals. Investigation of the interplay of internal and external computer-supported scripts may thus help us understand how AKC can be supported across cultures.

Ultimately, research on external computer-supported scripts may provide benefits beyond the facilitation of AKC (Weinberger et al, 2005; Stegmann et al, 2006). Scripting can potentially enable learners to adapt to different cross-cultural scenarios by making them aware of different internal scripts and by creating flexible and trans-cultural scripts. By providing different scripts to learners from different cultures, we could facilitate participation in AKC that might better prepare learners for the rapidly changing world characterised by the collapse and creation of nations, political networking (e.g. the European Union), transnational mass media, migration, and the coexistence of multiple cultures living within one society. Online discussions could be regarded as a test bed in which cross-cultural competence could be developed as an important part of a media literacy that exceeds mere technical skills (Fabos & Young, 1999).

Simply confronting learners from different cultures with one another does not seem to lead to positive and beneficial experiences of AKC (Lin & Kinzer, 2003). Script research can help facilitate and investigate AKC in and across different cultures by identifying typical internal scripts and how learners with these internal scripts can be supported in AKC. Based on this research, trans-cultural scripts could be developed to facilitate cross-cultural AKC and media literacy for cross-cultural online learning.

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