A cross-cultural study of self-regulated learning in a computer-supported collaborative learning environment

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A B S T R A C T

Self-regulated learning (SRL) actions of 30 Canadian and 30 Chinese university students were studied in a face-to-face problem-based learning environment. Participants were randomly assigned to work in dyads consisting of Chinese, Canadian, or mixed Chinese–Canadian pairs to learn Analysis of Variance collaboratively using a computer coach. Dialog segments were coded in terms of types of SRL actions, and whether an action was individually (IND) or socially (SOC) oriented. Canadian pairs produced significantly higher proportions of IND-SRL actions relative to SOC-SRL actions (higher odds ratios) than Chinese pairs, but the odds ratios for mixed pairs were similar to those for Canadian pairs. This effect of cultural composition of dyads for the Canadian and Chinese pairs was replicated in a comparison of Canadian and Chinese participants within the mixed pairs dyads. These results have implications for a socio-cultural account of SRL.

1. Introduction

Over the past few decades, self-regulated learning (SRL) has become a prominent area of research within educational psychology (Zimmerman, 2006). According to Schunk (2001), self-regulated learning can be defined as “learning that results from students’ self-generated thoughts and behaviors that are systematically oriented toward the attainment of their learning goals” (p. 125). Despite the proliferation of research in this area, the relationship between SRL processes and their social context is an issue that is still inadequately understood (Boekaerts, 2002), particularly when viewed from a cross-cultural perspective. Researchers have long assumed that individuals generate self-regulatory actions to accomplish personal learning goals that reflect their needs as individual learners. It has been assumed that while these actions may be supported initially by social factors (e.g., Bandura, 1977), once established they function independently of their social origins and context. However, this is unlikely to be the case when individuals learn through interactions with others in social contexts in which collaboration with other members of a group is important to their individual success and that of the group. Nor is it likely to be the case in “collectivist” cultures in which individuals typically function as members of a group (Triandis, 1995) and are likely to regulate their actions in relation to the goals and needs of the group and its members (Markus & Kitayama, 1991).

Regulating one’s learning to support shared learning goals of a group, or individual goals of its members, involves adopting a social orientation in one’s SRL actions, rather than an individual orientation. In either case, one is “self-regulating” one’s current learning actions, but in ways that reflect the learning goals of others (a social orientation), or one’s personal learning goals (an individual orientation). In most social contexts of learning, to participate effectively as a member of a group one would need to establish a balance between adopting an individual or a social orientation to one’s SRL actions, and this balance is likely to be influenced by one’s previous cultural experiences and expectations.

Such “socially-oriented” self-regulation is largely invisible in current conceptions of SRL which ignore or minimize the importance of socio-cultural contexts (Arvaja, Salovaara, Häkkinen, & Järvelä, 2007; Grau & Whitebread, 2012) and consider only proactive agency by the individual (Martin & McLellan, 2008). An individual’s regulatory actions are assumed to occur only in relation to one’s self (i.e., to the attainment of one’s personal learning goals) and thus they are considered to be individually oriented. Research on SRL in social contexts such as collaborative learning groups (Järvelä & Järvenoja, 2011) and collaborative activities in classrooms (Grau & Whitebread, 2012) can reveal how SRL actions may be socially as well as individually oriented. Cross-cultural research in such contexts can help establish a socio-cultural theory of SRL practices that would clarify how one’s cultural experiences function...
to influence one's adoption of self-regulatory processes adapted to particular social contexts of learning.

This study explored the role social contexts and cultural experience play in framing both individually and socially oriented SRL processes in social contexts of learning. A contextual and socio-cultural theoretical perspective on the nature of SRL actions was adopted to guide the study. Chinese and Canadian students' individually and socially oriented SRL actions were investigated in a collaborative learning environment in which students learned in dyads, working with partners in Chinese, Canadian, or mixed Chinese–Canadian pairs, and the impact of the cultural composition of pairs on their production of individually and socially oriented SRL actions was studied. The results have implications for a socio-cultural account of SRL processes in social contexts of learning.

1.1. Cross-cultural research on SRL

In cross-cultural research, the current conception of SRL as proactive agency by the individual has led researchers to conclude that Asian students have less skill as self-regulated learners compared to Western students (for a review, see McInerney, 2008). However, other research has shown that Asian students are often strong competitors in academic classrooms (for a review, see Bempechat & Drago-Severson, 1999). These apparently conflicting results suggest that the SRL processes of these students are being inadequately evaluated, presumably as a consequence of the conception of SRL as proactive agency by an individual that underlies the design of self-report instruments commonly used to assess SRL as a characteristic of an individual. Rather than relying on self-report instruments, students' SRL actions need to be studied in authentic learning situations (Muis, 2008), and these should include learning contexts in which students from different cultures learn collaboratively through interaction with each other. A theoretical perspective is needed that views SRL as a contextual process and as a socially and culturally situated process to inform methods for the study of individually and socially oriented SRL actions of individuals from different cultures as they occur within collaborative learning situations and social contexts of learning (Järvelä & Järvenoja, 2011; Martin & McLellan, 2008).

1.2. A contextual frame perspective for SRL

From a contextual frame perspective, in social contexts of learning participants interpret situations in relation to contextual frames. Frames are knowledge representations that provide individuals with resources for interpreting, acting and interacting appropriately within situational contexts (e.g., Goffman, 1974). In collaborative learning groups, learning actions occur in the context of the current learning situation and discourse within the group. These actions and accompanying conversational exchanges are framed by the participants' social and content knowledge (Tannen & Wallat, 1987). A participant applies social frames to guide interactions with others members of the group including knowledge of social norms governing how collaborative learning groups are expected to function within a particular cultural context, and applies content frames to organize and perform learning and problem-solving tasks, reason, and explain underlying concepts and meaning (Frederiksen, 1999).

In regulating one's learning, a participant in such a group applies contextual frames locally to interpret the current learning situation, talk, and activity. An individual may choose to interpret a current learning situation as an individual context, framing the context in ways that emphasize personal learning goals. We refer to this kind of self-regulation of one's learning as individually oriented (IND-SRL). Alternatively, an individual may choose to interpret a learning context as a social context, framing the context in ways that emphasize socially shared learning goals and expected social practices students employ as they work collaboratively in a group. This would lead him/her to take others' perspectives into account when performing an action. For example, a member of a learning group may consider advice, opinions, or requests of others, help others to accomplish their personal goals, or contribute to accomplishing goals shared by members of the group. Such collaborative actions take into account the needs or goals expressed by other group members. We refer to this kind of self-regulated learning as socially oriented (SOC-SRL).

However, in a social situation an individual might choose to ignore, refute, or challenge others' actions, or decide to maintain his or her own individual goals when others' opinions or actions are viewed as interfering with his/her own. Such framing of the social situation as an individual context would lead an individual to produce IND-SRL actions. As such, social contexts can encompass a mixture of SOC-SRL and IND-SRL actions, both of which may arise depending on the current focus of one's actions and framing of the situation.

The SOC-SRL concept has not been considered as important in research on SRL. For example, Bandura (1977) viewed SOC-SRL actions as merely isolated responses of individuals to various environmental stimuli, arguing that they are not qualified to be regarded as instances of self-regulation which requires that an individual agent act proactively to reach personal learning goals. However, in collaborative learning situations, an individual has a responsibility to contribute to the collective benefit of the group, refraining from proceeding alone, conforming to others' opinions, and helping others (Johnson & Johnson, 1996a), all of which indicate the importance of SOC-SRL. Moreover, taking into account the perspectives of others may help increase one's own efficiency in learning or performing a task. Therefore, collaborative social contexts should foster SOC-SRL actions, IND-SRL actions, or a combination of both.

Ideally, one would expect that IND-SRL and SOC-SRL actions would complement each other in contributing to the effectiveness of one's learning and knowledge construction in social situations of learning. One would also expect them to be adapted to specific circumstances that might arise in a learning situation. For example, in some situations IND-SRL actions may be effective when contexts allow for self-discovery (Zimmerman, 2006), whereas in other situations SOC-SRL actions may be effective when contexts involve interacting with an expert (Evensen, Salisbury-Glennon, & Glenn, 2001). Moreover, one's personal learning goals might conflict with those of the group in a particular collaborative situation. In this case, IND-SRL may not be effective (Evensen et al., 2001). In addition, an expert might give misleading information or there might be a lack of expertise within a particular collaborative learning group. In such situations, SOC-SRL may not be efficient (Johnson & Johnson, 1996b).

1.3. Cultural contexts and SRL

An individual's preference for IND-SRL or SOC-SRL actions within a specific learning situation may be influenced by his or her previous experience within specific cultural contexts. Triandis (1995) argued that cultural contexts are related to "attributes" of shared cognitive structures and cultural knowledge of groups of people. He theorized that based on patterns of these attributes, two distinct "cultural syndromes" could be identified: collectivism — a pattern characteristic of individuals who are closely linked and give priority to the collective goals of their group, and individualism — a pattern characteristic of individuals who are loosely linked and
give priority to their personal goals over the goals of others in a group. He argues that in some societies, such as in China, collectivism is prevalent, whereas in other societies, such as in Canada, the US, and Europe, individualism is prevalent.

Cultural contexts influence an individual’s perception of what kinds of actions are likely to be effective in a given situation (e.g., Markus & Kitayama, 1991). From a contextual frame perspective, cultural contexts influence individuals’ framing of a learning situation, which in turn influences their perception of what kinds of learning actions may be effective. Individualist cultures stress the importance of the individual self, leading individuals to focus on their own internal states, frame the environment in terms of their own intentions and goals, and consequently produce more IND-SRL actions. Collectivist cultures stress the importance of the social self, leading individuals to frame the environment in terms of shared goals of the group, adapt their personal intentions and goals to those of the group, conform or adapt to expectations of others, and consequently produce more SOC-SRL actions.

In multicultural societies, over time individuals may incorporate cultural values, beliefs, and practices of other cultural groups to form their own bicultural or multicultural identities, which may play an important role in influencing how they frame learning contexts, leading them to produce IND-SRL or SOC-SRL actions (McInerney, 2008). When an individual moves from one culture to a different culture, a process of acculturation occurs in which an individual adapts to the majority culture (Berry, 1997). With increasing experience, a student from a minority culture will adopt values and beliefs of individuals from the majority culture and behave similarly. However, an individual’s values and beliefs associated with the home culture remain and may continue to influence the individual’s behavior (LaFromboise, Coleman, & Gerton, 1993). When students from a minority culture have opportunities to work with other students from the same minority culture, this familiar cultural context may restate the importance and value of their home culture in governing their behavior in that context (Alegria, 2009).

2. Overview of the study

Chinese university students studying in English in Canada were sampled as representative of “collectivists”, and Anglo-Canadian university students were sampled as representative of “individualists”. Participants were randomly assigned to work collaboratively in dyads having one of three compositions: Chinese pairs (dyads consisting of two Chinese students), Canadian pairs (dyads consisting of two Canadian students), and Chinese—Canadian (mixed) pairs (dyads consisting of a Chinese student and a Chinese student). Working in pairs, participants learned Analysis of Variance (ANOVA) using a computer tutor as a guide and resource for their learning and problem solving activity (Mercier & Frederiksen, 2007). Video recordings of dialogue between students in each dyad were transcribed and segmented into dialog units. Units corresponding to SRL actions were identified and coded in terms of (a) types of SRL actions, and (b) whether the action was individually (IND) or socially (SOC) oriented. Our principal research question concerned patterns of orientation of SRL actions within dyads consisting of Canadian pairs, Chinese pairs, and Chinese—Canadian mixed pairs. We examined differences among the three pairs conditions with respect to their proportions of IND-SRL actions relative to SOC-SRL actions (odds ratios).

In line with contextual frame theory, our principal prediction was that Canadian pairs would produce significantly higher proportions of IND-SRL actions relative to SOC-SRL actions (higher odds ratios) than Chinese pairs, since we expected that: (a) in the Canadian pairs both partners in a dyad come from an “individualistic” cultural background and would consequently exhibit a preference for individual learning goals relative to socially shared learning goals, and (b) in the Chinese pairs, both partners in a dyad come from a “collectivist” cultural background and would consequently exhibit a stronger and more balanced preference for socially shared learning goals relative to individual learning goals. (Hypothesis 1)

Second, we expected that dyads in the mixed Chinese—Canadian pairs would produce a proportion of IND-SRL actions relative to SOC-SRL actions (odds ratio) similar to that of the Canadian pairs since we expected that social framing in the mixed pairs learning context would be predominately in terms of dominant Canadian cultural expectations to which the Chinese member of a dyad would conform. (Hypothesis 2). As a consequence of this similarity, we expected the odds ratio for the mixed Chinese—Canadian pairs Group to be larger than that for the Chinese—Chinese pairs group.

We also examined these differences with respect to specific types of SRL actions, to see if predicted effects involving the overall proportion of IND-SRL relative to SOC-SRL actions were associated with specific types of SRL actions. Since the previous hypotheses relate to cultural framing of SRL contexts as a general phenomenon, we expected that the predicted effects of composition of dyads would be quite general. Nevertheless, we wanted to explore whether these effects would be associated with particular types of SRL actions.

Finally, we were curious to know what patterns of orientation of SRL actions would occur for individual Chinese and Canadian participants within the mixed Chinese—Canadian dyads. Consistent with cultural frame theory, we expected that although the participants in a dyad would jointly frame the learning situation in terms of the expectations of the dominant culture (emphasizing an individual orientation to SRL), individual Chinese participants within the mixed Canadian—Chinese dyads also would frame their interactions with their Canadian partner in ways that are significantly influenced by their own culturally based expectations (emphasizing a social orientation to SRL). Thus, we predicted that Canadian participants in a mixed dyad would produce higher proportions of IND-SRL actions relative to SOC-SRL actions than Chinese participants in the same dyad. This pattern would be similar to differences found comparing Canadian and Chinese dyads (Hypothesis 3).

3. Method

3.1. Participants

Sixty male participants (mean age 24 years) were recruited from several disciplines including Engineering (N = 17; 9 Canadians, 8 Chinese), Natural Science (N = 15; 8 Canadians, 7 Chinese), Management (N = 18; 8 Canadians, 10 Chinese), and Arts and Social Science (N = 10; 5 Canadians, 5 Chinese) through posters posted on the campus of a major Canadian university. Only males were selected to avoid the potential confounding effect of gender. All participants had elementary statistics knowledge and were interested in learning ANOVA. Canadian participants were recruited who (a) were born in Canada or the U.S., (b) their father or mother was born in Canada or the U.S., and (c) they spoke English as their principal language at home. Chinese participants were recruited who (a) were born in Mainland China, (b) they had lived in Canada or the U.S. for less than five years, and (c) they spoke Chinese as their principal language at home. All Chinese participants had passed the TOEFL test to be enrolled in an English language Canadian university. In addition, their successful academic performance in a Canadian university was an indicator of their ability to function effectively in English at the university level. Their average stay in Canada was 4 years. Participants were paid $20 for their participation.
3.2. Materials

3.2.1. Computer tutoring environment and learning tasks

The McGill Statistics Tutor is a web-based hypermedia system for learning ANOVA (Frederiksen & Donin, 2005). The tutor functions as a user-controlled coaching and help system which provides a self-contained environment for learning ANOVA. It organizes knowledge of ANOVA into twelve learning topics and tasks, among which Tasks 5 to 9 (ANOVA Score Models, Estimating Parameters of ANOVA Score Models, Constructing an ANOVA Table, Calculating and Using ANOVA Statistics, and Testing Hypotheses in ANOVA respectively) were required to solve a prescribed problem.

3.2.2. Apparatus and materials

All screen activities were recorded and synchronized with video of outside activities (recorded by a camera and an omnidirectional microphone) as a picture-in-picture MP4 file using Camtasia software (TechSmith Corporation).

3.3. Procedure

Participants in the study learned collaboratively, working in pairs (dyads). Dyads consisted of a Canadian and a Chinese participant who were randomly assigned to work together as a pair whose composition corresponded to one of three Pairs Conditions: (a) Canadian Pairs, (b) Chinese Pairs, or (c) Mixed Chinese–Canadian Pairs. A group of ten dyads was formed for each condition (i.e., type of pair). These Groups correspond to the three experimental conditions of this study.

When each dyad arrived at the lab, they were positioned in front of the computer tutor. The experimental session lasted for 2 h. First, participants were given a 30-min training session in which the first author introduced the students to the McGill Statistics Tutor interface. Participants then practiced using the tutor interface for 5 min. They were then provided with the following instructions: (a) the objective of the session was to learn statistics collaboratively; (b) they should begin by reading the problem description to understand the problem-solving task and plan their learning objectives; (c) they should use the tutor for assistance in learning ANOVA and using ANOVA to solve a data analysis problem by completing five required tasks (tutor tasks 5–9); (d) they should complete a joint report on the analysis based on provided ANOVA results (using Microsoft Word). They were informed that the session would be videotaped.

The problem description presented an example of a one-way ANOVA problem. Sample data were provided together with the ANOVA output. The report was required to include: (a) the score model applied to analyze the data (in the form of an algebraic equation); (b) estimates of parameters in the score model; (c) a description and interpretation of the ANOVA table provided in the output; (d) a statement of the null and alternative hypotheses, relevant F statistics, degrees of freedom, and probability values; and (e) a statement of the decision to accept or reject the null hypothesis based on the statistical tests and its justification.

This procedure was consistent for each dyad. The researchers assistance consisted of: (a) preparing the computer environment, (b) presenting task requirements, and (c) familiarizing participants with the tutor.

3.4. Data coding

The video record of dialog between participants in each dyad was transcribed and segmented into dialog units consisting of conversational actions (C-Acts). These units were coded to identify all SRL actions. All SRL actions were coded in terms of: (a) type of SRL action, and (b) orientation of the SRL action as individually oriented (IND) or socially oriented (SOC). To develop coding scheme for types of SRL actions, we used Zimmerman’s (2006) framework, and Azevedo and Cromley’s (2004) coding scheme was consulted since it was developed for use in learning with hypermedia. Definitions and examples of each type of SRL action are presented in the Appendix.

The orientation of each SRL action was coded as either individually oriented or socially oriented (see the Appendix for examples). A dyad unit was coded as individually oriented (IND) if a unit was expressed in terms of (a) ignoring, refuting, or challenging others; or (b) maintaining or realizing one’s own individual goals. It was coded as socially-oriented (SOC) if it was expressed in terms of: (a) meeting the needs of others or the group, (b) shared understanding of relevant knowledge, (c) shared interest, (d) a concern about the performance of the group, (e) a concern about the benefits for others, and (f) a concern about the opinions of others. These SRL codes were applied to all dialog units identified as SRL actions in the corpus of transcripts for the 30 dyads. In coding dialog units, video segments linked to the transcribed dialog units were examined so that the context of the dialog could be taken into account in coding the dialog unit.

3.5. Inter-coder agreement

To evaluate inter-coder agreement, the second author discussed in detail with the first author the definition of each scoring category (type of SRL action, and orientation of SRL action) and provided a list of codes and examples of each code. Then both coded a randomly selected transcript independently. Inter-coder agreement was 85% for orientation of action (243 out of 328 dialog units), kappa = .70. The agreement percentage for all types of SRL actions was 92%. Inconsistencies were resolved through discussion between the authors to ensure full agreement. Then the first author coded the remaining transcripts.

3.6. Data analyses

The dependent (response) variable analyzed in this study was a discourse unit (C-Act) corresponding to an SRL action that was coded as either IND (individually oriented) or SOC (socially oriented). This is a binary response variable since each response can be assigned a value of 1 or 0 (1 if a response unit was coded as IND, and 0 if it was coded as SOC). Effects of independent variables on this response variable were analyzed using the SAS GENMOD procedure (SAS Institute Inc., Cary, NC) to implement a logistic regression analysis (Allison, 1999). In applying logistic regression analysis to these data, the log odds of frequencies of IND responses relative to SOC responses, i.e., the log of the ratio of these response frequencies (or logits), is predicted from a linear model in which the independent variables are the predictors.

Results of a logistic regression analysis are similar to those found in an ANOVA, and are interpreted in the same way, but with a \( \chi^2 \) statistic as the test statistic (rather than an F statistic). In logistic regression analysis, the odds ratio (OR) for an effect is the recognized measure of effect size for tests of hypotheses (Allison, 1999). If OR = 1 there is no effect; the larger the OR, the larger the effect. The odds ratio for each tested effect was computed and will be given in reporting the results.

In the analysis of the dyad data (corresponding to Hypotheses 1 and 2), the Canadian pairs, Chinese pairs, and mixed Canadian–Chinese pairs conditions correspond to the three levels of the independent variable, Group. Two pre-planned contrasts were tested: (a) the contrast between the Canadian pairs group and the Chinese pairs group (corresponding to Hypothesis 1), and (b) the...
contrast between the Canadian pairs group and the mixed Canadian–Chinese pairs group (corresponding to Hypothesis 2). A second independent variable was included in the model as an additional source of variation within groups, the effect of dyads nested within groups, where dyad effects reflect differences among the ten dyads nested within each of the groups.

In the analysis of the response data from individual participants in the mixed Canadian–Chinese Pairs condition (Hypothesis 3), the independent variable was the Cultural Identity of the Participant having two levels: Canadian or Chinese. The coded C-Acts (responses) produced by individuals within a dyad are repeated measures that are likely to be correlated within local sequences of discourse. Consequently the dependent variables need to be treated as repeated measures within these sequences. To conduct a repeated measures analysis of the data, the participants’ sequences of responses were grouped into clusters to estimate the correlations among responses within a cluster. A cluster was defined as a stretch of dialog that focused on a single topic and was delimited by conversational boundary markers (e.g., pauses, intonation, speaker shifts). The local dependence (correlation) structure of responses within clusters was estimated using the REPEATED option of the SAS GENMOD procedure to conduct a repeated measures analysis of the data. Due to the sequential nature of conversational discourse, a C-Act procedure to conduct a repeated measures analysis of the data was estimated using the REPEATED option of the SAS GENMOD program. All markers (e.g., pauses, intonation, speaker shifts). The local dependence (correlation) structure of responses within clusters was estimated using the AR(1) option in the GENMOD program. All analyses reported were repeated measures analyses in which the correlations within clusters were estimated according to this covariance structure (Allison, 1999).

4. Results

4.1. Effects of composition of pairs on orientation of SRL actions by dyads in the three conditions

Total frequencies of IND-SRL and SOC-SRL actions (pooling over types of SRL actions) are presented for each group (the Canadian pairs, Chinese pairs, and mixed Canadian–Chinese pairs conditions) in the last row of Table 1. Results of an overall test of group effects indicated that the main effect of group was significant, $\chi^2 (4, N = 11,018) = 18.45, p < .001$. The effect of dyads nested within groups was also significant, $\chi^2 (27, N = 11,018) = 99.56, p < .001$. Thus, there was significant variation among dyads within groups. This effect was then included to adjust the group effects in this study.

The contrast between the Canadian pairs group and the Chinese pairs group was tested to evaluate the evidence related to Hypothesis 1 in which it was predicted that the Canadian pairs would produce significantly higher proportions of IND-SRL actions relative to SOC-SRL actions (higher odds ratios) than the Chinese pairs. The results of a test of this contrast showed that the difference between the Canadian pairs group and the Chinese pairs group was significant, $\chi^2 (1, N = 7153) = 17.00, p < .001, OR = 1.33, 95\% CI [1.16, 1.53]$, indicating that the odds that dyads in the Canadian pairs group would produce individual (IND) SRL actions relative to social (SOC) SRL actions was 1.33 times higher than the odds in the Chinese pairs group. This result is consistent with the prediction of Hypothesis 1.

Further contrasts tested the evidence related to Hypothesis 2 in which we predicted that dyads in the mixed Canadian–pairs group would produce a proportion of IND-SRL actions relative to SOC-SRL actions (odds ratios) similar to that of the Canadian pairs group and different from that of the Chinese pairs. Results indicated no significant difference between the frequency of production of IND-SRL actions relative to SOC-SRL actions by dyads in the mixed Canadian–Chinese pairs group compared to the Canadian pairs group, $\chi^2 (1, N = 7895) = 0.00, p = .967, OR = 0.997, 95\% CI [.88, 1.12]$. However, there was a significant difference between the mixed pairs group and the Chinese pairs group, $\chi^2 (1, N = 6988) = 16.12, p < .001, OR = 1.33, 95\% CI [1.16, 1.53]$. These results are consistent with the prediction of Hypothesis 2.

4.2. Differences in orientation of specific types of SRL actions by dyads in the Canadian and Chinese pairs

Frequencies of IND and SOC orientation for different Types of SRL action are presented for each group in Table 1. It can be seen that two cells for the summarization type of action were zeros; therefore, this variable was not analyzed. Exploratory analyses of the remaining variables showed that there were significant differences between the Canadian pairs and the Chinese pairs on five variables: clarification, $\chi^2 (1, N = 1366) = 7.72, p = .006, OR = 1.53, 95\% CI [1.13, 2.08]$; elaboration, $\chi^2 (1, N = 864) = 7.55, p = .006, OR = 1.86, 95\% CI [1.19, 2.88]$; environment structuring, $\chi^2 (1, N = 157) = 7.85, p = .005, OR = 3.33, 95\% CI [1.44, 7.73]$; monitoring, $\chi^2 (1, N = 834) = 5.38, p = .020, OR = 1.54, 95\% CI [1.07, 2.20]$; and motivation (i.e. interest, efficacy, and a sense of duty), $\chi^2 (1, N = 135) = 13.83, p < .001, OR = 4.57, 95\% CI [2.05, 10.19]$. All of these variables exhibited a significantly greater preference for individual (IND) over social (SOC) actions by the Canadian pairs.

4.3. Differences in orientation of SRL actions by Canadian and Chinese participants within dyads in the mixed Canadian–Chinese pairs

The difference in orientation of SRL actions produced by Canadian and Chinese participants within dyads in the mixed Canadian–Chinese pairs were tested to evaluate the evidence corresponding to Hypothesis 3 in which it was predicted that, like the Canadian pairs, the Canadian participants in a dyad in the mixed Canadian–Chinese pairs would produce significantly higher proportions of IND-SRL actions relative to SOC-SRL actions (higher odds ratios) than the Chinese participants. Total frequencies of

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<td>2191</td>
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</table>
individually oriented (IND) and socially oriented (SOC) SRL actions (pooling over types of SRL actions) for the Canadian and the Chinese participants in dyads in the mixed Canadian—Chinese pairs are presented in the last row of Table 2. Results of this test showed that the main effect of cultural identity of participant in overall orientation of actions was significant, $\chi^2 (1, N = 3865) = 3.6, p = .05$, OR = 1.20, 95% CI [99, 1.46]. The odds ratio indicates that it was 1.20 times more likely that the Canadian participants produced individually-oriented actions than the Chinese participants. This result is consistent with the prediction of Hypothesis 3.

5. Discussion

5.1. Interpretation of results

Cultural differences in individual and social orientation of SRL processes during collaborative learning in pairs were investigated by studying preferences for IND-SRL over SOC-SRL actions exhibited by Canadian, Chinese, and mixed Canadian—Chinese dyads. We predicted that a higher proportion of IND-SRL actions relative to SOC-SRL actions would be produced by dyads in the Canadian pairs than in the Chinese pairs (Hypothesis 1). The results supported this hypothesis. We found that in a culturally homogeneous context of working with a partner, the Chinese participants were less likely to express individually-oriented actions, such as individual opinions or disagreements, which are inconsistent with shared Chinese cultural norms in which social harmony is viewed as important (Kwan, Bond, & Singelis, 1997; Yang, 1995). These results are also consistent with research on cultural differences in motivation (Iyengar & Lepper, 1999), cognition (Norenzayan, Choi, & Peng, 2007), and metacognition (Hacker & Bol, 2004).

Second, we predicted that the Canadian—Chinese mixed dyads would produce a proportion of IND-SRL actions relative to SOC-SRL actions similar to that of the Canadian pairs, reflecting their adoption of dominant individually-oriented Canadian cultural expectations (Hypothesis 2). Consistent with Hypothesis 2, the proportion of individually oriented (IND) actions relative to socially oriented (SOC) actions for the Canadian—Chinese mixed pairs was similar to that for the Canadian pairs, and larger than that for the Chinese—Chinese pairs.

We also explored whether the predicted effects would be stronger for some specific types of SRL actions in comparison to others. The results for specific types of SRL actions revealed that the Canadian pairs demonstrated higher proportions of individually-oriented SRL actions relative to socially-oriented SRL actions than did the Chinese pairs for several types of SRL actions: motivation, monitoring, elaboration, clarification, and environment structuring. Thus, cultural differences were found for these particular types of SRL actions. A possible explanation of this finding is that these types of actions may be more sensitive to cultural norms during collaboration than other types of SRL actions. For example, one’s own choice of how to structure environment is honored in Canadian Culture (individual orientation) whereas in Chinese culture an action of environment structuring is better to be taken after one consults other stakeholders (social orientation).

In a third research question, we focused on the orientation of SRL actions by individual Chinese and Canadian participants within the mixed Chinese and Canadian dyads. We predicted that Chinese participants, in comparison to Canadian participants in these dyads, would place a greater emphasis on socially oriented SRL actions in their conversational interactions with their partner within the dyad, and thus that the pattern of differences between the Canadian and Chinese participants would be similar to that of the Canadian and Chinese dyads (Hypothesis 3). Results from the comparison between Canadian and Chinese participants in the mixed pairs dyads support this hypothesis. Although the results for mixed pairs dyads were similar to those for the Canadian pairs, indicating that acculturation had occurred, the Chinese members in the mixed pairs dyads continued to emphasize socially oriented SRL actions in their interactions with their Canadian partners. Thus they maintained an orientation consistent with their Chinese cultural identity within the context of the interaction, indicating that the values and expectations of their home culture continued to be expressed in their choices of orientation in their interactions with their partners.

5.2. Conclusions and implications for theory and practice

The results obtained in this research are consistent with predictions based on a contextual and socio-cultural theoretical perspective on SRL processes. From this perspective, individuals may demonstrate individually oriented SRL actions in collaborative learning situations when they want to maintain their own goals or need to refuse others’ opinions; they may, however, perform socially oriented SRL actions when their goals are to meet the needs and expectations of the group or of other individuals within the group. While individuals usually need to balance both an individual and a social orientation in their choice of SRL actions in any particular social situation of learning, their tendency to exercise individually or socially oriented SRL actions is influenced by their cultural expectations and framing of the social learning context and activity.

Both types of SRL orientations complement each other in that it is desirable to refuse others’ opinions when they are incorrect (IND-SRL) and to accept others’ meaningful advice when it is correct (SOC-SRL) to achieve effectiveness and efficiency in one’s learning. However, in the context of discourse interaction with others in complex learning situations, individuals may have difficulty deciding what type of orientation of SRL action is preferable to exercise at each instance in the learning dialog. Therefore, they unconsciously resort to preferences based on their previous cultural experience.

If these conclusions are supported by subsequent research, they will help us to better understand SRL processes and address many
contradictions in current SRL research. For example, we previously
identified cross-cultural studies that reported that students from
collectivistic cultures are less self-regulated than those from indi-
vidualistic cultures, but that they are often strong competitors in
academic situations. Our study found that the extent of these
students’ actual engagement in SRL was not low when socially
oriented SRL actions were taken into account. Our results show how
important social and cultural contexts of learning groups can be in
influencing how individuals frame a learning situation to enable them
to adopt individual and social orientations to SRL that can effectively
support their learning and that of the group. Thus, the theoretical
framework, methodology, and findings of this study can contribute to
opening new research directions in SRL research to investigate how
individually and socially oriented SRL processes function to support
effective learning in social and multicultural contexts.

The results also have potential implications for educational
practice by providing a research perspective that can help enable
educators to better understand both how individually oriented and
socially oriented SRL are natural processes that can complement
each other to support students’ learning in social contexts, and how
these processes are influenced by the cultural experience and
orientation of students in multicultural contexts of learning. Such
an understanding can help educators facilitate the functioning of
collaborative learning groups, of individuals within these groups,
and integration of students from different cultures into multcul-
tural contexts of learning.

5.3. Future research

This study represents a first attempt to validate predictions
derived from a contextual and socio-cultural theoretical perspective
on SRL processes in social and multicultural contexts. Additional
studies will be needed in other social and collaborative learning
contexts, including studies in different cultures and multicultural
learning contexts, to further validate and flesh out this theoretical
account of SRL processes. Studies of gender effects in such contexts
also will be needed. While we advocate a perspective that focuses on
the study of individual and social SRL actions in authentic social and
multicultural contexts, such research may be complemented by
other research approaches. For example, future studies also might
investigate cultural preference as a controlled variable by using
a priming procedure to influence a learner to adopt an individual or
social orientation to a learning situation. Moreover, further analysis
of the interactions that take place in such learning situations and of
the content of learning actions will be needed to enrich the
contextual account of SRL processes.

Appendix A

Descriptions and Examples of the Variables Used to Code Learners’ IND- and SOC-SRL Actions.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal setting (G)</td>
<td>An intended outcome for learning related to obtaining declarative or procedural knowledge</td>
<td>A: So the first thing we have to do is to find information about the score model, right? (SOC-G) B: Yes, we need to figure out what a score model means. (SOC-G)</td>
</tr>
<tr>
<td>Planning (P)</td>
<td>Choice of an action or a sequence of actions to achieve a learning goal</td>
<td>A: First we are going to look at the score model to answer the first question. (IND-P) B: Ok, let’s do this first. (SOC-P)</td>
</tr>
<tr>
<td>Motivation (M)</td>
<td>Desire to succeed in learning such as interest, confidence, and duty.</td>
<td>A: The score model is interesting, right? (SOC-M) B: Not as interesting as what you think. (IND-M)</td>
</tr>
<tr>
<td>Searching information (S)</td>
<td>Search for new information needed to solve a problem or improve understanding</td>
<td>A: Do you want to go to part two at the next page? (SOC-S) B: No, I want to look at part three. (IND-S)</td>
</tr>
<tr>
<td>Clarification (C)</td>
<td>Expression of the meaning of what is currently read</td>
<td>A: SS is a kind of variance, right? (SOC-C) B: I think MS is a kind of variance. (IND-C)</td>
</tr>
<tr>
<td>Elaboration (E)</td>
<td>Explanation of a concept by citing what was learned before</td>
<td>A: I remembered in the elementary statistics course the null hypothesis is that all group means are equal. (IND-E) B: Right, mu one equals mu two equals mu three. (SOC-E)</td>
</tr>
<tr>
<td>Summarization (SUM)</td>
<td>Brief account covering several points of what was learned</td>
<td>A: Basically this page says which part of score is due to the group, and which is due to the deviation from the group. (IND-SUM) B: Yes, it divides a score into several effects. (SOC-SUM)</td>
</tr>
<tr>
<td>Review (R)</td>
<td>Re-examine previous records, such as notes, and learned topics</td>
<td>A: Let’s reread the problem description. (IND-R) B: Ok, (read). (SOC-R)</td>
</tr>
<tr>
<td>Note-taking (N)</td>
<td>Writing or copying pieces of information</td>
<td>A: Copy and paste the whole page the paragraph? (SOC-N) B: No, just the formula. (IND-N)</td>
</tr>
<tr>
<td>Prediction (PRED)</td>
<td>Statement of whether concerned information will be found somewhere</td>
<td>A: The critical value may be in part two? (SOC-PRED) B: No, I think it is explained in part three. (IND-PRED)</td>
</tr>
<tr>
<td>Locating (L)</td>
<td>The exact place where learning happened for a review purpose</td>
<td>A: We were in part seven just now? (SOC-L) B: I think we were in part six. (IND-L)</td>
</tr>
<tr>
<td>Environment structuring (ES)</td>
<td>Efforts to organize the learning context in ways that help learn better</td>
<td>A: Can we open the new topic in a new window? (SOC-ES) B: No, too many windows will be distractive. (IND-ES)</td>
</tr>
<tr>
<td>Help seeking (H)</td>
<td>Solicitation of unknown information from other people</td>
<td>A: What’s the R square? (IND-H) B: Do you know whether the R square is a required concept in our joint report? (SOC-H)</td>
</tr>
<tr>
<td>Monitoring (MON)</td>
<td>Tracking the appropriateness of learned material and others' intention</td>
<td>A: I feel this page is not important. (IND-MON) B: So you may hope to drop this topic? (SOC-MON)</td>
</tr>
<tr>
<td>Self-evaluation (SE)</td>
<td>Judgment on effectiveness of learning processes</td>
<td>A: Have we learned enough for question one? (SOC-SE) B: No, I don’t think so (IND-SE)</td>
</tr>
<tr>
<td>Satisfaction (SAT)</td>
<td>Positive reaction to a piece of expression</td>
<td>A: MSE is SSE divided by its degree of freedom. (IND-C) B: Great. (SOC-SAT)</td>
</tr>
<tr>
<td>Adaptation (A)</td>
<td>Change on learning directions based on dissatisfaction</td>
<td>A: So far we have read a lot but I don’t know whether we could answer a question. (IND-SE) B: Yes, we need to learn according to a question (SOC-A)</td>
</tr>
</tbody>
</table>
References


