Chapter 6
A Socially Shared Regulation Approach to Improving Group Cohesion, Collective Efficacy, and Regulation Skills in CSCL

Abstract Socially shared regulation has emerged as a new research area in collaborative learning. How to promote socially shared regulation in a collaborative learning context is a central issue for researchers. This study sought to develop a CSCL platform with a socially shared regulation mechanism to facilitate group members' socially shared regulation skills. The empirical study was conducted to validate the proposed approach in a natural learning environment. In total, 90 college students participated in this study over 2 months. The results indicated that the proposed socially shared regulation mechanism can significantly improve groups' task cohesion, social cohesion, collective efficacy, and socially shared regulation skills. The implications and limitations of this study are also discussed in detail.

Keywords Socially shared regulation · Group cohesion · Collective efficacy · CSCL

6.1 Introduction

Learning has been shifted from individual learning to collaborative learning in the formal or informal learning environment (Strijbos et al. 2004). Learners can acquire higher levels of learning skills, engage in more complex tasks, and make higher quality decisions in a CSCL context (Hertz-Lazarowitz and Bar-Natan 2002; Janssen et al. 2007). Traditionally, collaborative knowledge building, through productive interactions, has been a major concern in the field of collaborative learning (Bereiter 2002; Resnick et al. 1991). Numerous studies focus on how group members collaboratively construct knowledge in an online learning environment (Lai and Law 2013; Zhang et al. 2009), in a mobile learning environment (Looi et al. 2008), or using social media (Kimmerle et al. 2015). Knowledge building is described as a social process focused on the production and sustained improvement of ideas contributing to a community (Scardamalia and Bereiter 2006). Social interactions among group members can promote co-construction of

L. Zheng, *Knowledge Building and Regulation in Computer-Supported Collaborative Learning*, Perspectives on Rethinking and Reforming Education,
DOI 10.1007/978-981-10-1972-2_6

knowledge and contribute to the development of collective knowledge (Scardamalia 2002). However, few studies focus on how group members regulate collaborative learning processes via social interactions in order to construct knowledge.

Although numerous studies reported positive findings about collaborative leaning, there are still some negative aspects about collaborative learning to be found in literature. For example, Straus and McGrath (1994) found students were lacking group cohesiveness during collaborative learning. Hobman et al. (2002) reported that group members had many conflicts in both computer-mediated collaborative learning and face-to-face collaborative learning. In addition, previous studies also found learners fail to collectively regulate the whole groups' goals, plans, strategies, learning processes, and group products (Zimmerman and Schunk 2011). The main reason for this was the regulation of one's own learning is difficult and needs to be supported with specific tools or the correct environment (Hadwin et al. 2010). It is more difficult to jointly regulate group members' learning.

Recently, contemporary studies have started to pay attention to SSRL. This emphasizes the need to be aware of meta-communication and success strategy negotiation (Järvelä et al. 2014; Miller and Hadwin 2015). The main reason for this is that socially shared regulation can facilitate establishing and maintaining a shared understanding of subject matter in order to achieve shared outcomes. As Roschelle and Teasley (1995) reported, collaboration refers to the construct of shared understanding by social interactions with others. Thus, socially shared regulation can serve as a bridge between collaborative learning processes and shared outcomes.

Therefore, the purpose of this study was to propose and validate a new approach to the facilitation of group cohesion, collective efficacy, and socially shared regulation in a CSCL environment. The following section oriented this study according to the findings of the literature review. The methodology of this empirical study is then described. Finally, the results of this study are reported and explained.

6.2 Literature Review

6.2.1 Promoting Socially Shared Regulation in a Computer-Based Environment

Socially shared regulation occurs when group members collaboratively construct knowledge or maintain interdependent processes to achieve joint outcomes (Miller and Hadwin 2015). SSRL involves jointly regulating motivations, emotions, meta-cognition, cognition, and behaviors during collaborative learning (Hadwin and Oshige 2011). During SSRL processes, students need to construct shared task perceptions and establish shared goals as well as plans. When group members have conflicts, they need to negotiate with each other so as to reach a shared

understanding of the subject matter. In addition, group members need to collectively monitor the learning process and evaluate group products. In doing so, group members are engaged in shared regulation.

Kempler Rogat and Linnenbrink-Garcia (2011) indicated that socially shared regulation played a crucial role in the collaborative learning process. Therefore, it is very necessary to model socially shared regulation. Winne and Hadwin (2008) proposed a very effective framework for modeling shared regulation. This framework included four phases. The first phase was to establish shared task understanding by analyzing task conditions, standards, and target outcomes. The second phase was to collectively set goals and make plans by negotiating so as to achieve the goals. The third phase was to enact strategies and complete tasks. The last phase was to make adaptations to the task perceptions, goals, plans, and strategies to optimize outcomes.

Numerous studies have demonstrated that technological environments have great potential to help students to be more self-regulated (Aleven et al. 2010; Azevedo and Hadwin 2005; Dabbagh and Kitsantas 2005; Perry and Winne 2006). However, few studies have developed tools to promote socially shared regulation. Many researchers have indicated that elaborately designed collaborative learning tools can provide a rich environment for supporting and promoting knowledge building and coordination (Dillenbourg et al. 2009; Soller et al. 2005). Thus, only a few socially shared regulation tools were proposed and developed in recent years.

There are three types of computer-based environments which can support socially shared regulation. The first type is a script tool that supports macro-script regulation and micro-script regulation (Miller and Hadwin 2015). This tool can structure and sequence socially shared regulation from macro and micro perspectives. Macro-scripts include five key steps, namely preparatory expertise, solo planning, monitoring, group planning, task enactment, and solo reflection. Micro-scripts consist of question prompts and sentence starters that provide learners fine-grained support. The second type are group awareness tools. Group awareness tools have gained attention in the CSCL field as a useful approach to support collaboration. Group awareness tools mainly help learners to be aware of knowledge, behaviors, or the social functioning of their own group and members of other groups (Bodemer and Dehler 2011). Sangin et al. (2011) examined the effectiveness of a knowledge awareness tool on students' collaborative processes and outcomes. Their findings indicated that the knowledge awareness tool prompted students' awareness of knowledge differences and triggered negotiation as well as learning outcomes. The third type was an environment that integrated the awareness tool, shared space, and regulation tool to promote socially shared regulation (Järvelä et al. 2014). The awareness tool can increase learners' awareness of their own groups, and members of other groups, learning processes. A shared space can support group members to collaboratively construct knowledge. In addition, the environment should support the specific phases of regulated learning, including task perception, goal setting, planning, strategic action, and adaptation. Järvelä et al. (2014) developed a Radar tool to promote the awareness of individual self-regulation and the regulation processes of a group. They also developed a

group *Ourplanner* and *OurEvaluator* to externalize group planning and learning processes as well as facilitate socially shared regulation.

6.2.2 Task Cohesion, Social Cohesion, and Collective Efficacy

Group cohesion has been recognized as an important factor that influences the collaborative learning process (Mullen and Copper 1994). Group cohesion is characterized as the force binding group members together to achieve goals (González et al. 2003). Previous studies have indicated that group cohesion is positively related to group performance (Mullen and Copper 1994).

Generally speaking, group cohesion includes two aspects: task cohesion and social cohesion. Task cohesion is defined as the degree of group members' commitment to the group task, while social cohesion is conceptualized as the degree of positive interpersonal relationships (Zaccaro and Lowe 1988). Social cohesion also represents the connection one feels to a group (Yamamoto 2011). The meta-analysis results indicate that only task cohesion significantly predicts group performance (Mullen and Copper 1994). Wang and Hwang (2012) also demonstrated that task cohesion positively predicts group performance. Previous studies revealed that groups which were assigned roles outperformed groups without roles in terms of task cohesion (Zheng et al. 2014).

Collective efficacy is conceptualized as a group's shared beliefs in its abilities to achieve group goals (Bandura 1997). Therefore, collective efficacy represents the collective performance ability. Previous studies have revealed that collective efficacy has great impact on group performance (Bandura 1997; Goddard 2001; Gully et al. 2002; Peterson et al. 2000). In addition, collective efficacy also has significant influence on group cohesion (Lee and Farh 2004; Wang and Lin 2007).

Socially shared regulation represents the entire group members collectively regulate their collaborative learning activities. This study hypothesizes that socially shared regulation can promote group task cohesion, social cohesion, and collective efficacy. This study is twofold in its purpose. First, it develops a CSCL platform with a socially shared regulation mechanism. Second, to examine whether group task cohesion, social cohesion, collective efficacy, and socially shared regulation skills can be improved through the socially shared regulation approach. Thus, the five research questions are formulated as follows:

- Can the socially shared regulation approach improve groups' task cohesion?
- Can the socially shared regulation approach improve groups' social cohesion?
- Can the socially shared regulation approach improve groups' collective efficacy?
- Can the socially shared regulation approach improve groups' socially shared regulation skills?
- Can group task cohesion, social cohesion, and collective efficacy predict groups' socially shared regulation skills?

6.3 Development of a CSCL Platform with a Socially Shared Regulation Mechanism

In this study, a CSCL platform with a socially shared regulation mechanism was developed to promote students' shared regulation skills. Overall, the platform can support group members conducting online collaborative learning by task perception, goal setting, making plans, online discussion, monitoring learning progress, as well as evaluating and reflecting. The following section will illustrate how the platform worked with a socially shared regulation mechanism.

Initially, students needed to login to the system after registering. After logging in, students could click the task perception in order to view the current collaborative learning task (Fig. 6.1). Students could then evaluate the current task in terms of difficulty, prior knowledge, expected quality, and required skills (Fig. 6.2). Students could also select prior knowledge linked to the current task and therefore check the prior knowledge of other group members. The group members could set their goals and make plans (Fig. 6.3). After one group member set their goals and made their plans, other group members could revise the goals and plans. Only if all group members agreed with the goals and plans, could they begin to learn. If group members had any questions, they could discuss them online anytime and anywhere (Fig. 6.4). As shown in Fig. 6.4, eight kinds of emotions could be selected during discussion, namely enjoyment, hope, pride, shame, anxiety, anger, hopelessness, and tired. If anyone input negative emotions, prompts would automatically pop-up to remind students to keep with positive emotions. In this way, students could regulate their emotions themselves. Group members could also monitor the learning process through clicking for the latest progress. After group members completed the collaborative learning task, they could upload their group products via our platform. Finally they could conduct self-evaluation via our platform. If they did not achieve

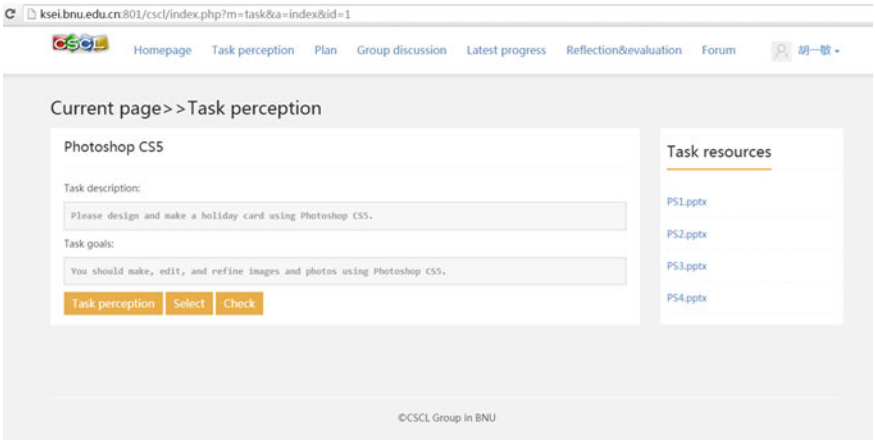

Fig. 6.1 A screen shot of the task description

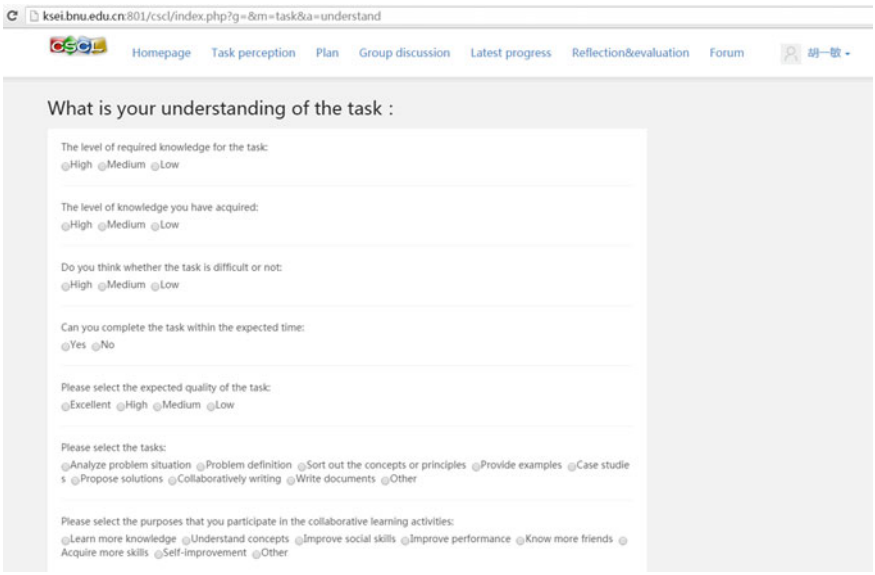

Fig. 6.2 A screen shot of the task perception

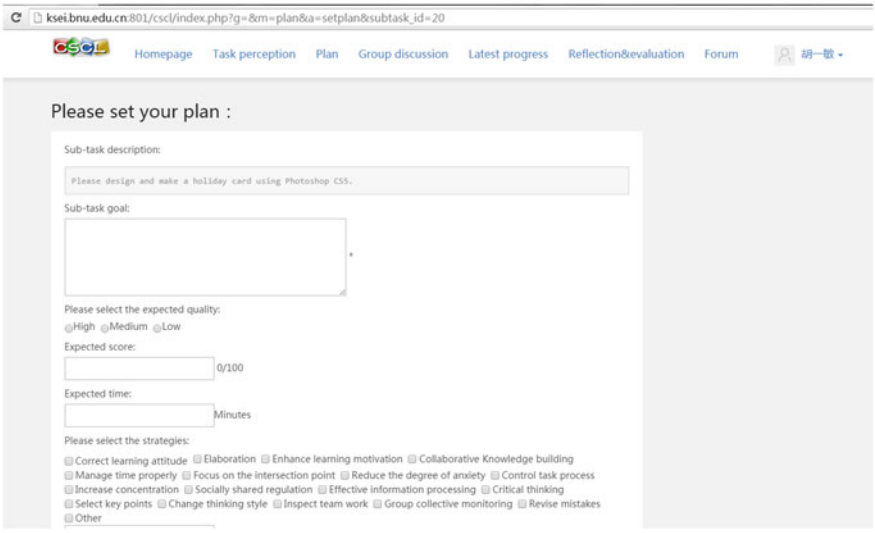

Fig. 6.3 A screen shot of making plans

their goals after self-test, our system would guide students to reset the goals and revise their plans. Sometimes they needed to learn again so as to reach the expected goal. All students could also discuss the topics closely related to the course via our forum (Fig. 6.5).

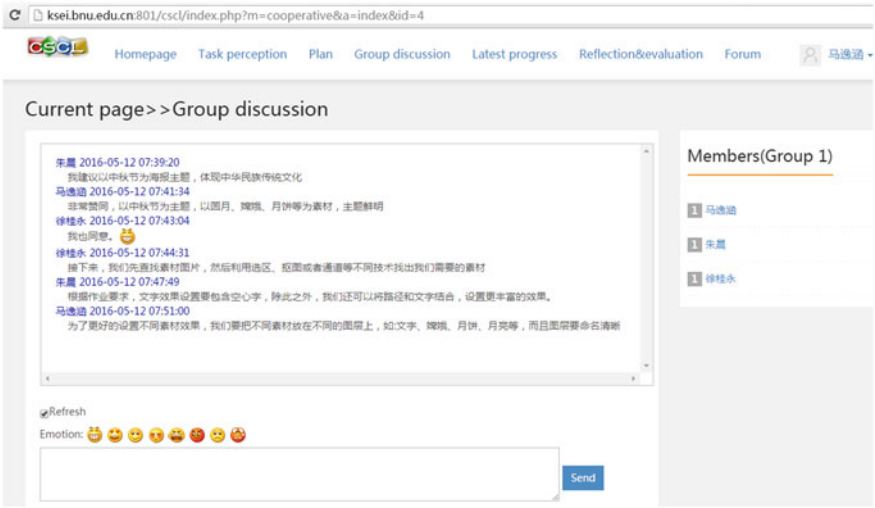

Fig. 6.4 A screen shot of the group discussion

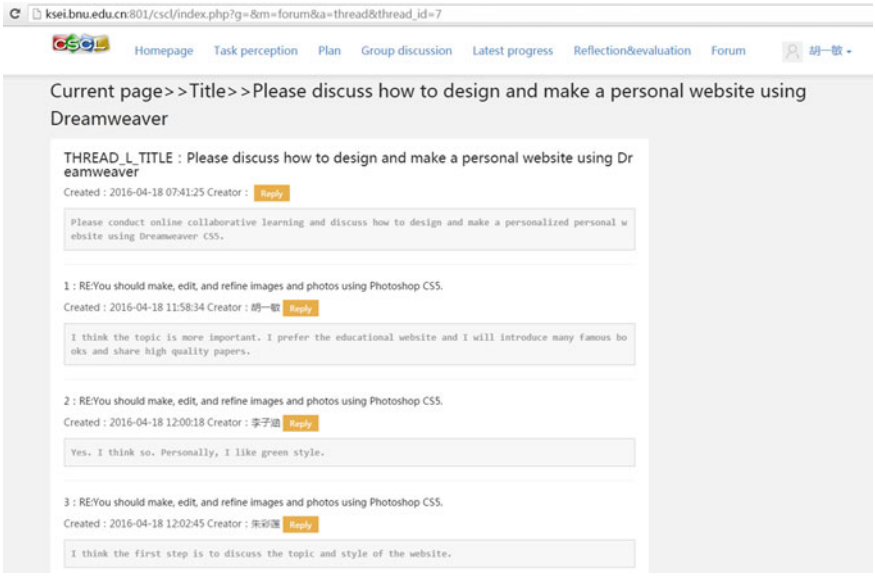

Fig. 6.5 A screen shot of the forum

6.4 Method

In order to examine the influence of a CSCL platform with a socially shared regulation mechanism, a pre-test and post-test quasi-experiment was conducted in one mandatory course for three months. This course was the application of computers worth three academic credits. Several measurement tools were adopted to assess student task cohesion, social cohesion, collective efficacy, and socially shared regulation skills. The following section will describe the research design in detail.

6.4.1 Participants

In total, 90 college students enrolled on the introduction to computers course and voluntarily participated in this study. All of the participants were freshmen in one university in Beijing. About 78 % of them were female. They all majored in law or art. The average age of the participants was 18 years. All of the participants were randomly assigned into 27 groups of 3 or 4 people.

6.4.2 Procedure

In order to examine the effectiveness of the socially shared regulation mechanism, a pre-test and post-test quasi-experiment was conducted in the application of computers course over two months. All of the students needed to collaboratively complete three tasks via the CSCL platform with a socially shared regulation mechanism. The first task was to design a plan about how to set up a wireless network. The second task was to make a poster using Microsoft Word 2013. The third task was to make a courseware using Microsoft Powerpoint 2013. Group members could set their goals, make plans, select and enact strategies, as well as make adaptations through our platform. The final group product could be uploaded via this platform.

Before the first task, the pre-questionnaires about task cohesion, social cohesion, collective efficacy, and socially shared regulation were administered to all participants. This took about 20 min to finish all the items. Subsequently, 27 groups began to conduct online collaborative learning to complete the first task after a teacher's lecture. It took two weeks for groups to finish their first task. Before students completed the second task, the related learning content was taught and shared by teachers and students. All the groups completed the second task within three weeks. When all the groups uploaded their group products, teachers and students evaluated them based on a scoring rubric. The procedure of the third task was the same as that of the second. Thus, two months after the tasks, a post-questionnaire were

administered to all of participants. It took about 20 min to finish all the questionnaires.

6.4.3 Instruments

The present study adopted four kinds of questionnaires to measure student task cohesion, social cohesion, collective efficacy, and socially shared regulation skills. The task cohesion questionnaire consisted of seven items with a 5-point Likert scale from (1) "not at all true of me" to (5) "very true of me". Cronbach's α value for the task cohesion questionnaire was 0.841, showing acceptable reliability and internal consistency. The social cohesion questionnaire consisted of eight items with a 5-point Likert scale. Cronbach's α value for the social cohesion questionnaire was 0.816, implying good reliability and internal consistency. The collective efficacy questionnaire consisted of 10 items with a 5-point Likert scale. Cronbach's α value for the collective efficacy questionnaire achieved 0.914, indicating excellent reliability. The socially shared regulation questionnaire consisted of 20 items with a 5-point Likert scale. Cronbach's α value for the socially shared regulation questionnaire reached 0.939, implying excellent reliability and internal consistency. All of these questionnaires were developed by the author. The questionnaires about task cohesion, social cohesion, and collective efficacy were adopted and validated in a previous study (Zheng et al. 2014).

6.5 Results

6.5.1 Analysis of Task Cohesion

Table 6.1 shows the results of the pre-test and post-test for task cohesion. Before the collaborative learning activity, the mean value and standard deviations of the pre-test were 3.57 and 1.23. After the collaborative learning activity facilitated by the socially shared regulation platform, the post-test was administered to all groups. The mean value and standard deviations of the post-test were 4.07 and 0.75. The result demonstrated that there was significant difference between the pre-test and post-test in task cohesion ($t = 3.806$, $p < 0.01$). This indicated that student task cohesion significantly improved through the socially shared regulation mechanism.

Table 6.1 Descriptive data and *t*-test for the pre-test and post-test results for task cohesion

Test	N	Mean	Standard deviation	*t*
Pre-test	90	3.57	1.23	3.806**
Post-test	90	4.07	0.75	

*$p < 0.01$

Table 6.2 Descriptive data and *t*-test of the pre-test and post-test results for social cohesion

Test	N	Mean	Standard deviation	*t*
Pre-test	90	3.71	1.28	3.691**
Post-test	90	4.20	0.65	

*$p < 0.01$

6.5.2 Analysis of Social Cohesion

Table 6.2 shows the descriptive data and *t*-test results for social cohesion. The mean value and standard deviations of the pre-test were 3.71 and 1.28, and 4.20 and 0.65 for the post-test. It was found that there was significant difference between the pre-test and post-test in social cohesion ($t = 3.691$, $p < 0.01$). This result indicated that the groups' social cohesion significantly improved through the socially shared regulation mechanism.

6.5.3 Analysis of Collective Efficacy

In order to examine the collective efficacy of all groups, the pre-test and post-test questionnaires were administered to all students. As shown in Table 6.3, the mean value and standard deviations of the pre-test were 3.63 and 1.20. The mean value and standard deviations of the post-test were 4.08 and 0.66. The results of a paired-sample *t*-test revealed that there was significant difference between the pre-test and post-test in collective efficacy ($t = 3.419$, $p < 0.01$). This finding indicated that the groups' collective efficacy significantly improved after the facilitation of socially shared regulation.

6.5.4 Analysis of Socially Shared Regulation Skills

In this study, the means and standard deviations of the socially shared regulation skills pre-questionnaire were 3.44 and 1.16, and 3.83 and 0.63 for the post-questionnaire (see Table 6.4). The *t*-test results demonstrated there was significant difference between the pre-test and the post-test in socially shared regulation skills ($t = 3.121$, $p < 0.01$), showing that the socially shared regulation approach had a significant impact on students' socially shared regulation skills.

Table 6.3 Descriptive data and *t*-test of the pre-test and post-test results for collective efficacy

Test	N	Mean	Standard deviation	*t*
Pre-test	90	3.63	1.20	3.419**
Post-test	90	4.08	0.66	

*$p < 0.01$

Table 6.4 Descriptive data and *t*-test for the pre-test and post-test results for socially shared regulation skills

Test	N	Mean	Standard deviation	*t*
Pre-test	90	3.44	1.16	3.121**
Post-test	90	3.83	0.63	

*$p < 0.01$

6.5.5 *Analysis of the Predictive Power of Task Cohesion, Social Cohesion, and Collective Efficacy*

In order to examine whether task cohesion, social cohesion, and collective efficacy can predict socially shared regulation skills, linear regression analysis was performed. The results indicated that only collective efficacy can significantly predict socially shared regulation skills ($\beta = 0.754$, adjusted $R^2 = 0.563$, $t = 10.764$, $p < 0.01$). In other words, students with higher collective efficacy had better socially shared regulation skills.

6.6 Discussion

This study examined whether the socially shared regulation approach can improve the groups' task cohesion, social cohesion, collective efficacy, and socially shared regulation skills. In addition, this study also examined whether a group's cohesion, social cohesion, and collective efficacy can predict socially shared regulation skills.

The results demonstrated that the socially shared regulation approach can significantly improve the groups' task cohesion, social cohesion, collective efficacy, and socially shared regulation skills. The findings can be explained because our platform provided the functionalities, including task perceptions, task standards, task evaluation, and prior knowledge awareness, to promote group members to make a commitment to the group task. In addition, our platform supports group members to collectively set goals, make plans, select strategies, and make adaptations, which can promote social cohesion and collective efficacy. Consequently, the group members' socially shared regulation skills were improved by the facilitation of the socially shared regulation mechanism. These findings were consistent with Järvelä and Hadwin (2013) who proposed that technologies had great potential to facilitate socially shared regulation. These results were also in line with what had been reported by Aleven et al. (2010), namely that technology tools can be used to support students' regulatory skills.

Furthermore, the results demonstrated that only collective efficacy can significantly predict socially shared regulation skills. This means if a group had strong collective efficacy, the group will have good socially shared regulatory skills. This

finding was consistent with Bandura (1997) who defined collective efficacy as shared cognition and a belief in the collective capabilities of the group to complete tasks and achieve goals. Socially shared regulation also represented the collective regulatory of goals, plans, strategies, processes, group products, and engagement.

This study has several implications for educators and practitioners. First, in order to equip group members with socially shared regulatory skills, it was necessary to foster the groups' collective efficacy because collective efficacy can promote socially shared regulatory skills. Second, technology tools and scaffolds can indeed promote task cohesion, social cohesion, collective efficacy, and socially shared regulation. Therefore, it is crucial to design a rich collaborative learning environment with a socially shared regulation mechanism in order to promote joint regulatory skills. Third, collaborative knowledge building was only one aspect of collaborative learning. Attention should also be given to socially shared regulation as this represents another crucial aspect of collaborative learning. Teachers and practitioners in collaborative learning should foster socially shared regulation skills for students prior to collaborative learning.

6.7 Conclusion

In summary, the purpose of this study was to contribute to the emerging field of socially shared regulation through the design, development, and validation of a collaborative learning platform with a socially shared regulation mechanism. The results indicated that the socially shared regulation approach can significantly improve groups' task cohesion, social cohesion, collective efficacy, and socially shared regulation skills throughout the 2-month investigation. This study shed light on how to improve socially shared regulation skills in collaborative learning.

However, this study was constrained by several limitations. First, our platform was lacking an adaptive and intelligent scaffold to facilitate socially shared regulation in collaborative learning. Future studies will develop adaptive scaffolds to promote socially shared regulation. Second, currently, socially shared regulation skills are obtained through a self-reported questionnaire. It is very interesting to use trace data or content analysis to analyze how socially shared regulation skills evolve as well as the relationships between socially shared regulation skills and group performance. Third, current collaborative learning tasks mainly focus on one subject domain. Future studies will examine the effectiveness of a socially shared regulation mechanism in other learning domains. Finally, analysis of knowledge building and group performance has not been conducted in this study. Future studies will explore the relationships among group performance, socially shared regulation, group cohesion, and collective efficacy.

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