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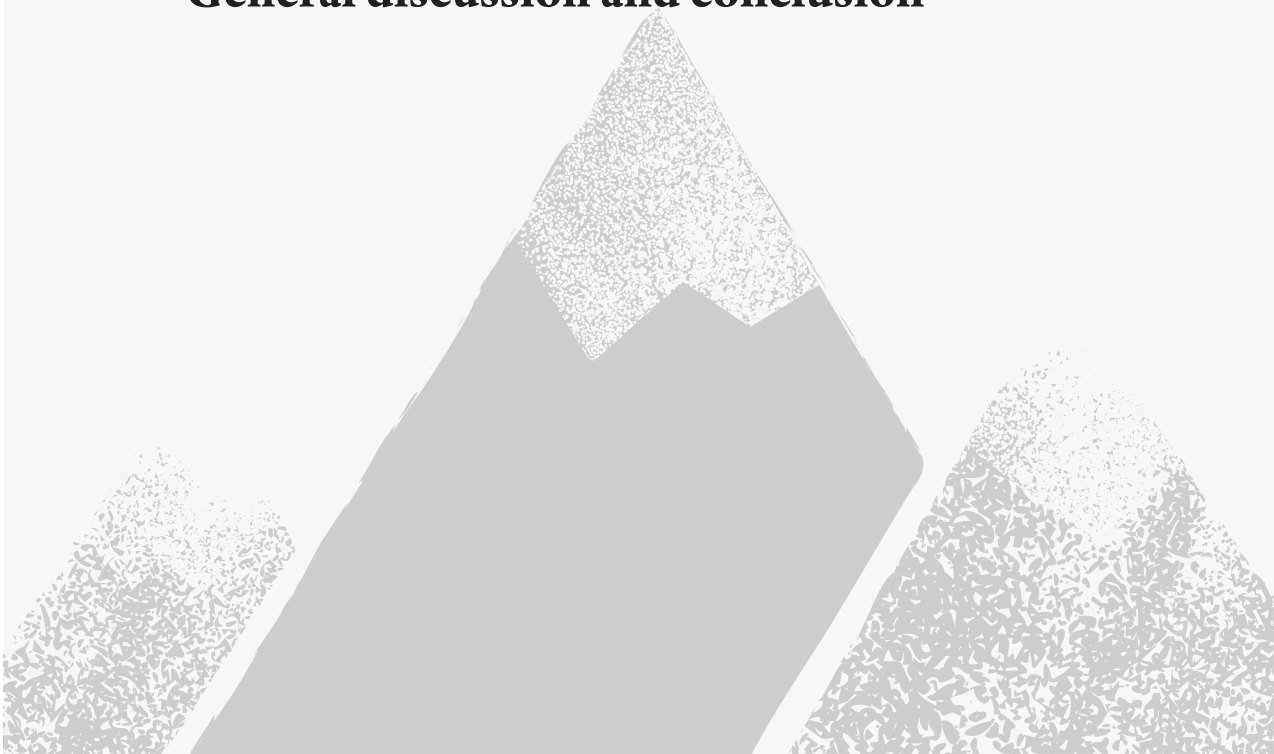
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Chapter

6

General discussion and conclusion

The main research aims of this dissertation are to understand and investigate (1) the state of the art of research about project-based learning (PjBL) in higher education and (2) the teaching and learning process in PjBL in higher education. In Chapters 2 to 5, we present one review study and three empirical studies to respond to these aims. This Chapter summarizes the main findings of these four studies and discusses these findings in terms of (1) answering the research questions, (2) theoretical and practical relevance, and (3) limitations and future directions.

6.1 Summary of the main findings

In the review study presented in **Chapter 2**, a total of 450 articles were found and 76 articles were selected for review with a focus on student outcomes and measures. The results revealed that affective outcomes were most applied, which were measured by questionnaires, interviews, observation, and self-reflection journals. Cognitive outcomes and behavioral outcomes were measured by questionnaires, rubrics, tests, interviews, observation, self-reflection journals, artifacts, and log data. The outcome of artifact performance was assessed by rubrics. While various outcomes were identified, previous studies lacked sufficient information about students' motivation for PjBL, the learning process in PjBL, and the evaluation of artifacts, particularly in the online environment. These findings constitute the basic ideas in the next studies.

The study presented in **Chapter 3** investigated the relation between students' motivation for, learning strategies used in, and evaluations of online collaborative PjBL. The results showed that regarding motivation, autonomous motivation and amotivation were positively and negatively related to students' perceived benefits and satisfaction, respectively. Controlled motivation was not related to students' evaluations of PjBL. As for strategies, the strategies considering others' opinions and challenging others are positively associated with students' perceived benefits. Challenging others was also related to students' satisfaction with PjBL.

In **Chapter 4**, students' social and cognitive presences in asynchronous online discussions during collaborative PjBL was characterized and their relation with students' academic performance was explored. The results found that affectiveness and exploration were the most frequently used social and cognitive presences during students' online group discussions, respectively. Students' group academic performance was positively related to the social presence of affectiveness, humor use, and vocatives and the cognitive presence of exploration and offering opinions.

The study presented in **Chapter 5** adopted the same theoretical framework as in Chapter 4 and focused on the relation between the role of teachers,

students' social and cognitive presences, and evaluations of online collaborative PjBL. The results found that in the early course stage, the role of instructional design and organization positively influenced perceived learning while the role of directed facilitation negatively influenced perceived learning. However, these two roles had no impact on perceived learning in the entire course stage. In addition, these two roles had no influence on course satisfaction, no matter in which course stages. Furthermore, when social presence was added as the mediator, the effects of directed facilitation changed. More specifically, teachers' directed facilitation, through social presence, had a positive influence on both students' perceived learning and satisfaction in the two-course stages.

6.2 Discussion of the main findings

Each of the studies presented in this dissertation examined students' learning with a focus on learning outcomes. Below, it is discussed whether PjBL is, in general, can be a suitable pedagogy for Chinese college students, whether WeChat is an appropriate tool that facilitates students' online collaborative PjBL, and what the possible role of teachers during the learning process can be.

6.2.1 Can PjBL be a suitable way for Chinese higher education?

In response to the need to transform the teaching in the Chinese university from direct teacher-centered instruction to student-centered active learning, the pedagogy of PjBL is proposed (see Chapter 1). Studies in Chapters 2 to 5 try to investigate whether PjBL can be suitable for Chinese higher education. This question can be answered through the exploration of whether PjBL benefits students' diverse types of learning outcomes and whether students positively evaluate PjBL. The results of the study in Chapter 2 reveal that PjBL is positively associated with various student outcomes, showing that PjBL is understood to be a promising approach that improves student learning in higher education. To further answer the question, based on the results from Chapter 2, Chapters 3 to 5 mainly explore college students' (both undergraduate and

graduate students) evaluations of PjBL (i.e. perceived benefits and satisfaction), academic performance (i.e. artifact performance), and factors associated with these. In general, results from these studies show that students are motivated for PjBL (Chapter 3) and have positive evaluations of PjBL (Chapters 3 and 5). They also use various learning strategies during PjBL (Chapter 3) and actively create artifacts socially and cognitively (Chapters 4 and 5). Therefore, it might be possible to conclude that PjBL is suitable for the curriculum, and the social science curriculum, in particular, in Chinese universities as the subjects involved in the studies in Chapters 3 to 5 are social science (i.e. mental health education and legal education). This is important information that this dissertation adds to the literature as only a limited number of previous studies have investigated PjBL in social science in comparison to the field of STEM. These studies have shown that PjBL contributed to students' better learning outcomes, such as learning engagement, self-identification, and critical thinking skills (e.g. Chang & Lee, 2010; Johnson et al., 2013).

6.2.2 Is WeChat a good ICT tool for online collaborative PjBL?

Online discussion forums in online learning platforms, such as Zoom, Moodle, and Coursera, are often used for students' collaboration in online PjBL (Cortázar et al., 2021; Usher & Barak, 2018; Yilmaz et al., 2020). WeChat, as an instant messaging app, might have advantages in comparison to online discussion forums when it comes to Chinese students' knowledge construction during online collaborative PjBL. In general, the communication function of online discussion forums is limited to text messages and simple emojis or emoticons. This might make online discussion forums weak in capturing students' social presence in group discussions in detail (e.g. Galikyan & Admiraal, 2019; Li & Yu, 2020). On the contrary, WeChat contains various forms of communication, including text messages, diverse emojis and stickers, uploaded pictures and documents, audio messages, (group) audio calls, and (group) video calls. Students in Chapter 4 adopted most of these ways to communicate with their group members, both synchronously and asynchronously. Previous studies either neglected student social presence (e.g. Richardson & Ice, 2010; Vaughan

& Garrison, 2005) or examined it at a general level (e.g. Galikyan & Admiraal, 2019; Meyer, 2003). The study presented in Chapter 4 provided contributions to the literature by depicting a comprehensive image of students' social presence in online discussions. In this study, we revealed not only the three main components of social presence, namely affectiveness, open communication, and group cohesion, but also sixteen sub-components of social presence, such as the use of humor, asking questions, and using vocatives in students' WeChat discussions. In addition, WeChat is user-friendly and easy to be accessed seamlessly on multiple devices, which could make students' learning processes easier. These features of WeChat using as an educational tool might contribute to students' inherent interests and enjoyment to complete the project (Chapter 3). Furthermore, nowadays, WeChat has become one of the most frequently used educational tools among Chinese college students. Almost every college course has a WeChat group for students to sign in the course, to receive course-related information, as well as to ask questions and get feedback (see the course setup in Chapter 5). That is to say, students are familiar with using WeChat in such a way. This further supports that WeChat might be a good tool to facilitate Chinese students' learning processes in PjBL.

6.2.3 What should be the role of teachers during online collaborative PjBL?

Literature has depicted the role of teachers during PjBL, with a focus on the role of facilitation and management. Several studies have indicated that teachers usually act as facilitators during PjBL (Bell, 2010; Tseng, Chang, Lou, & Chen, 2013) who promote learners' autonomy during the learning process (e.g. Meisani & Rambet, 2017; Stefanou et al., 2013; Tsybulsky & Muchnik-Rozanov, 2019). Other studies, however, have claimed that teachers should monitor students' learning process and actively assist them to concentrate on projects and discussions (e.g. Çakiroğlu & Erdemir, 2019; Gomez-Pablos et al., 2017; Maor, 2003). It is therefore unclear under what circumstances can students learn independently or when teachers need to provide students with necessary assistance. The studies presented in Chapters 4 and 5 are related to these issues.

The results of the study in Chapter 5 imply that the most important role of teachers in online PjBL is to encourage students to interact with group members. Does this mean that teachers' instruction and facilitation on students' discussions are not necessary anymore? In other words, can students rely on the communication and interaction between each other to obtain good learning outcomes? The answer might depend on different student groups. More specifically, the first-year college students lack sufficient prior knowledge and academic experience and have limited understanding of the content knowledge (Chapter 4). These might cause problems to effective discussions when facing ill-structured and open projects. In this case, teachers need to take the initiative to provide students with direct assistance and guidance, such as the direction and topic of discussions, and the autonomy of students is not so important (e.g. Harmer & Stokes, 2016). Without help from teachers for discussions, students are likely to fall into lower cognitive levels like the exploration phase and unable to reach higher cognitive levels (Chapter 4). Therefore, it seems to be possible to say that teachers' instruction and facilitation are important for students who are at early phases of their study (e.g. first-year college students), particularly when they face ill-structured projects. Graduate students, however, usually have a deeper understanding of the content knowledge, are more used to collaborative learning and discussions, and have the ability to reflect on their learning. Thus, it seems that graduate learners are more like to benefit from collaboration with peers in an autonomous way (Chapter 5).

6.3 Limitations and future directions

All three empirical studies (in Chapters 3, 4, and 5) in this dissertation mainly adopted quantitative research methodology. This sometimes makes it difficult for us to interpret the results in a deep way without further qualitative information. An explanatory sequential design as described in Creswell (2012) and Leavy (2017) is suggested to be adopted in future studies. This means after the collection and analysis of quantitative data, qualitative data from, for example,

interviews and reflection journals, are collected and analyzed to further explain the quantitative results. With qualitative data, we could explore the reasons that explain finding different results compared to previous studies. For example, to explain the insignificant relationship between controlled motivation and students' evaluations of PjBL (Chapter 3) found from quantitative data, students with different levels (i.e. high, medium, and low) of controlled motivation can be first interviewed to describe and explain why they had such motivation levels during the learning process. Then, we might get relevant information, such as students' experience during PjBL and perceptions of PjBL, to explain the quantitative results.

Another limitation is that the three empirical studies in Chapters 3, 4, and 5 did not implement the research designs that allow claims about the effects of PjBL on student learning outcomes. There are two reasons that we did not implement the experimental design in this dissertation. First, from the perspective of research, since few previous studies were available about PjBL implemented in Chinese higher education, preliminary exploration is needed to first determine what are the important variables that might influence student learning outcomes. Findings from these three empirical studies have laid the foundations for future experimental studies. Second, from the perspective of practice, there were challenges when conducting experimental studies. After the break out of COVID-19, all universities in China have switched to online teaching and learning. The primary task of (at least) the universities that we collaborated with was to quickly adapt to a new way of teaching and redesign and reorganize the curriculum without reducing too much of the quality of teaching and learning. Thus, during that period it was difficult to organize and coordinate multiple teachers and classes to cooperate with us to conduct a series of experimental studies.

Therefore, for future research, we recommend that more experimental research should be done to determine the benefits of PjBL on diverse student learning outcomes. This includes the comparison between PjBL and other pedagogies, such as teachers' direct instruction and problem-based learning. This could help teachers understand whether PjBL is suitable for their course

design and students' learning. Moreover, studies about the effects of PjBL with different features can be conducted. These include, for example, comparisons between PjBL with the support of WeChat and other communication tools and PjBL with different levels of teacher support, and so on. This might provide teachers with the important factors affecting the effect of PjBL and therefore, they could better design the course accordingly.

A third direction for future research relates to the completeness of data collection. The study in Chapter 4 shows that the data of student online presences were not completely recorded due to the lack of some functions of WeChat (e.g. audio recording function). Future research, no matter which ICT tools will be used, should record all types of data by using, for example, extra recording tools.

Fourth, another direction for future research relates to the generalizability of the study findings due to the small sample of participants in specific courses (Chapters 3 and 5). Future research could integrate PjBL with MOOCs that provide large samples in a variety of contexts in order to increase the generalizability of the findings.

Finally, in the study in Chapter 4, students' social and cognitive presences in 24 groups was analyzed as a whole, which ignores the differences within groups. Future studies could examine the pattern of students' presences in each group via the analysis of, for example, the density, centrality, and reciprocity of students' discourse (e.g. An et al., 2009). These examinations help teachers and researchers better understand to what extent everyone talks to other group members, the extent to which the discourse centers on one person, and how many students receive responses from other group members that they post to (Lowes et al., 2007) and therefore, contribute to a better course design in the future curriculum.

In addition, since a project usually lasts for several weeks, it is interesting to investigate the dynamic development of students' social and cognitive presences in each group and explore its relation with student learning outcomes. For example, do students engage more in the early, mid, or later stages of the project and does it relate to their academic performance?

6.4 Implications for practice

While the research presented in this dissertation was conducted in the Chinese context, it has two implications for practice in general. Regarding the design and organization of curricula, projects, and final products, curriculum-related parameters, such as course schedules and the design and administration of course activities, should be explained to students in a clear and detailed way, particularly in the early stage of the course (Chapter 5). The design of the project activities and the artifact should be authentic and closely related to learners' real life so as to motivate them to engage in the learning process (Chapter 3). Before setting up and participating in group discussions for projects, students should be required to finish learning the basic course materials in order to avoid too much time and effort on low levels of cognitive presence (Chapter 4).

As for the role that teachers need to accomplish and improve, teachers should create a safe and comfortable environment for students' collaboration and encourage students to interact with peers and openly express their feelings, attitude, and opinions so as to contribute to better collaboration (Chapters 3 and 5). For students who lack sufficient academic experience and content knowledge, teachers should join in and actively assist them with group discussions during PjBL (Chapter 4).

6.5 Concluding remarks

In conclusion, PjBL is understood to be a good approach that improves Chinese students' learning in higher education. Students in general have positive evaluations of online collaborative PjBL and good academic performance during the learning process. These are related to students' motivation, learning strategies, social and cognitive presences, and teachers' role during PjBL. We, therefore, encourage college teachers in China to implement PjBL more in their future courses in order to benefit both the teaching and learning process.