Collaborative learning in higher education : design, implementation and evaluation of group learning activities

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— CHAPTER 6 —
Discussion and conclusion

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6.1 Introduction

In higher education, group learning activities (GLAs) are frequently implemented in online, blended or face-to-face educational contexts. GLAs can lead to learning outcomes, such as (shared) knowledge acquisition, student motivation, higher-order thinking skills, metacognitive skills, and social/collaborative skills. Furthermore, by participating in GLAs, students are prepared for their future profession and they start their professional development by working and learning in teams. However, several educational researchers describe that these possible and desired learning outcomes often are not attained (e.g., Franssen et al., 2011; Hmelo-Silver, 2004; Janssen, 2014). The main reason for this failure to attain the learning goals appears to be the limited quality of the design and implementation of GLAs (Dillenbourg, 2013; Hämäläinen & Vähäsantanen, 2011; Payne et al., 2006).

A major problem for the design and implementation of good quality GLAs that lead to the desired learning outcomes is that many approaches to GLAs have been studied, but with different terminology and with various components of the design of GLAs. The central aim of this thesis was to provide insight into how teachers in higher education can be supported in the design, implementation, and evaluation of GLAs by developing a theoretically and empirically underpinned framework for the design of GLAs.
In the first study (Chapter 2), the beliefs and practices of teachers in higher education regarding collaborative learning[5] were explored to establish whether there is a need for support in the design and implementation. In the other three studies, a framework was developed for the design, implementation and evaluation of GLAs (Chapter 3), its empirical validity was examined (Chapter 4) and its usefulness for understanding the relation between GLA design and perceived learning outcomes was explored (Chapter 5).

[5] During the second study, the focus of the research narrowed from collaborative learning in general to GLAs, to distinguish between collaborative learning as a teaching method used during lessons amongst other teaching methods and group learning activities, in which students work collaboratively on a group assignment during a time period longer than one lesson.

6.2 Main findings

6.2.1 Collaborative learning in higher education: teachers' practices and beliefs

This study addressed three research questions. The first research question of this study was: 'How do teachers in higher education characterise collaborative learning in their educational practices?'. The results showed that most of the participating teachers designed and used collaborative learning in their lessons, but the variety in collaborative learning practices was quite limited. The teachers considered the design of collaborative learning to be a complicated task and they stated that the implemented design often did not lead to the desired learning outcomes. The teachers pointed out that they intuitively designed collaborative learning, based on their own experience. They would also appreciate designing collaborative learning in collaboration with colleagues. Furthermore, they stressed that the time they can spend on designing collaborative learning is limited.

The second research question concerned the relationship between the frequency in collaborative learning practices and teachers' beliefs about collaborative learning. The teachers' beliefs about the effects of collaborative learning on student learning outcomes and student motivation were clearly more positive than their beliefs regarding the amount of effort that students are willing to spend on working collaboratively. Teachers who stated that they apply collaborative learning are more positive about students' effort in working collaboratively and also more positive about learning effects of collaborative learning, compared to teachers who claimed not to practice collaborative learning.

The last research question of this study was: 'What is the relationship between the variety in collaborative learning practices and teachers' arguments for applying collaborative learning in their lectures?'. The arguments presented by teachers for the use of collaborative learning are more student-oriented than teacher-oriented. The results also indicated that the more teachers varied in their collaborative learning practices, the more student-oriented arguments they used for applying collaborative learning.
The results of this study justified further research into collaborative learning and how teachers could be supported in designing effective collaborative learning for their teaching.

6.2.2 A comprehensive framework for the design of group learning activities in higher education

The objective of the second study was to investigate how various components in the design of GLAs could be synthesised into one theoretically-informed comprehensive framework for the design of GLAs. Two research questions were formulated: (1) 'How can the components of designing GLAs be synthesised into one comprehensive framework?', and (2) 'How can teachers in higher education use this comprehensive framework in the design of GLAs?'.

In order to answer the research questions, 14 meta-studies that describe design components of GLAs were analysed. Eight components for the design of GLAs were extracted: (1) interaction, (2) learning objectives and outcomes, (3) assessment, (4) task characteristics, (5) structuring, (6) guidance, (7) group constellation, and (8) facilities. These components were inserted into a general model for instructional design, the ADDIE model, to shape the alignment between the eight components and guide the order in which the components can be designed. This resulted in a comprehensive framework for the design of group learning activities: the Group Learning Activities Instructional Design (GLAID) framework. In step 1, the characteristics of the students, the teachers, and the curriculum are determined, as well as the collaborative premise. In step 2, the design process of a GLA starts

with designing the interaction, the learning objectives, and the assessment simultaneously. This is followed by step 3a, in which the instructional methods, task characteristics, structuring of the collaboration and guidance, are designed. In step 3b, the logistics are designed: the group constellation and the facilities. In each step and between each step, the components should be aligned with each other in order to ensure an effective design (linear and cyclical alignment). In step 4, each design component should be monitored separately and in alignment with (all) other components during the implementation; and if necessary, components and their alignment should be adjusted. In step 5, the evaluation of the components and their alignment can support effective reflection on the processes and outcomes of the designed GLAs and inform redesigns of GLAs.

6.2.3 Teacher educators' design and implementation of group learning activities

The aim of the third study was to empirically validate the GLAID framework. The research question was formulated as follows: 'How do teacher educators design and implement GLAs, and to what extent do their considerations match with the GLAID framework?'.
Teacher educators design and implement GLAs on a regular basis, as it is an important part of the curriculum in teacher education. Moreover, in contrast to other higher education teachers, they teach their student teachers to implement GLAs in their future classrooms. Consequently, they can be considered expert educational designers of GLAs. Therefore, teacher educators were asked to describe how they design and implement GLAs and an examination was carried out as to whether their considerations matched the GLAID framework. In their descriptions, all eight components of the framework were touched upon, although the facilities component was only mentioned by some teacher educators. It should be stressed that it is important to include this facilities component in the design of GLAs, because — no matter how well a GLA is designed — without the necessary space, time, and support, students will not be able to attain the learning objectives of a GLA (see Chiriac & Granström, 2012; Dillenbourg, 2002; Gros, 2001; Janssen, 2013; Kobbe et al., 2007; Strijbos et al., 2004).

The interviews further revealed that many teacher educators encounter problems with the structuring component. Several teacher educators indicated that they would like to learn more about how to engage students in the collaboration process. Structuring is perhaps the most difficult yet possibly one of the most important aspects of GLAs. Structuring the interaction increases individual accountability and positive interdependence, and as such can prevent students from free-riding (Dillenbourg, 2002; Johnson & Johnson, 2009; Slavin, 1999). No new components were mentioned by the teacher educators. They underlined the importance of the alignment between the components of a GLA, which is an integral aspect of the GLAID framework.

6.2.4 Student teachers' evaluation of design components related to perceived learning outcomes

The fourth study explored the relationship between student teachers' evaluations of GLA design components and their perceived learning outcomes. Two variables are potential mediators for perceived learning outcomes: verbal interaction and engagement.
The following research questions were investigated: (1) What is the relationship between students' evaluations of the design of GLAs and their perceived knowledge increase?, (2) What is the relationship between students' evaluations of the design of GLAs and their perceived learning outcomes for the future profession?, (3) To what extent do engagement

and verbal interaction mediate the relationship between students' evaluations of the design of GLAs and their perceived knowledge increase?, and (4) To what extent do engagement and verbal interaction mediate the relationship between students' evaluations of the design of GLAs and their perceived learning outcomes for the future profession?.
The findings indicated that students' evaluation of the GLA design components task characteristics and group constellation were positively related to a perceived increase of knowledge. Furthermore, a positive relationship was found between students' evaluation of the components task characteristics and guidance on the one hand, and students' perceived benefits of GLAs for the future profession on the other hand. Additionally, the results revealed that students' self-reported verbal interaction mediated the relationship between the evaluation of the GLA design and both kinds of perceived learning outcomes. The self-reported student engagement only mediated in the relationship between the evaluation of the GLA design and perceived learning outcomes for the future profession.
Regarding the different GLA components, the fourth study generated the following insights: (a) the evaluation of task characteristics directly and indirectly related positively to both kinds of perceived learning outcomes and explained the largest proportion of variance of all design components, (b) full mediation was found for the evaluation of engagement with the evaluation of the contribution, structuring, guidance and group constellation components, on the one hand, and learning outcomes for the future profession, on the other hand, and (c) in contrast to what was hypothesised, no relationship was found between the evaluation of assessment and the mediators, or between assessment and both types of learning outcomes.

6.2.5 Relationship with the central aim

The central aim of this thesis was to provide insights into how teachers in higher education can be supported in the design, implementation and evaluation of GLAs. A theoretically informed framework for the design of GLAs, the GLAID framework, was developed with the aim of improving learning outcomes of GLAs, and contributing to professional development of teachers and teacher educators. The components of the GLAID framework and their alignment can be recognised in the description of the design and implementation of GLAs of experts, in casu teacher educators. Consequently, the GLAID framework was considered to be empirically valid. The findings from the fourth study made clear that positive student evaluation in general, and about the component task characteristics in particular, play a crucial role in student outcomes with GLAs. Students valued components of the GLAID framework as contributing to their perceived learning outcomes, whereby task characteristics, guidance and group constellation were evaluated as the main components related to the perceived learning outcomes, mediated by the evaluation of student interaction and engagement. The fourth study also made clear that designing components with the aim of triggering student engagement might be a good way to increase student outcomes of GLAs.

Reflecting on the central aim of this thesis, the GLAID framework, validated both theoretically and empirically, can be used as support for teachers in higher education to design, implement and evaluate GLAs in higher education.

6.3 Methodological considerations and limitations

In chapters 2, 3, 4 and 5, the specific methodological issues per study were addressed. In the following sections, a more general reflection on the methodology is described regarding: (1) the samples and participants, and (2) the use of self-report measures.

6.3.1 Samples and participants

In the first study, the practices and beliefs about GLAs among teachers in higher education were investigated. The participants were 115 teachers at a university of applied sciences in a large city in the Netherlands. A purposeful sampling technique was used, by inviting teachers from different educational programmes, because it was hypothesised that heterogeneity in disciplines of higher educational programmes may reveal different beliefs and practices in the design and implementation of GLAs. For example, Norton et al. (2005) found differences in beliefs about teaching among teachers from different disciplines. However, no significant differences were found in teachers' self-reported practices and beliefs between educational programmes. This may be due to the fact that the samples of the educational programmes were not of equal size and in some cases relatively small (i.e. TIS, $N = 14$ and ICTM, $N = 16$). Including samples from other higher education institutions might have led to a wider variety of beliefs and practices among teachers on collaborative learning, including research universities, universities of technology, and other, more specialised universities.

In chapter 4 (study 3), teacher educators were selected to empirically validate the GLAID framework as they are considered to be relatively more expert designers of GLAs than other higher education teachers. In study 3, twenty-three teacher educators of the primary education department of six universities of applied sciences in the Netherlands were interviewed. In the fourth study, the participants were student teachers of the same six departments, being educated to teach in primary education. Teacher educators and student teachers may differ from other higher education teachers and students in how they evaluate their GLAs. Learning and education, of which collaborative learning and GLAs are a part, is the focus of their (future) work practices and therefore they are probably more knowledgeable about the (design of) GLAs than students and higher education teachers of other departments. Therefore, the results of the third and fourth study might be biased and probably should be interpreted for teacher education programmes for primary education only.

In the second study, fourteen meta-studies were analysed that described an overall design approach for GLAs. The analysis was performed on four studies on higher education, one on primary education, one on secondary education and one study on both primary and secondary education. In the remaining seven studies, either a non-context specific focus was adopted or the educational level was not specified. Therefore, the GLAID framework may be considered to be an instrument that could be used for several educational levels and in multiple domains. The GLAID framework is comprehensive but general in its specifications per component as the design of components is context-dependent and specific information needs to be searched for in additional literature. The GLAID framework also aims at the alignment between the choices made in every design component, in order to arrive at a balanced educational design for a GLA.

6.3.2 Self-report measures

In three of the four studies, self-report measures were used: surveys and interviews. Self-reports could lead to bias, because respondents are willing to provide a useful and informative

answer and thereby use the questions as a source to do so (Schwarz, 1999). Other researchers argue that self-report data specifically from 'students' should be interpreted cautiously and that the validity of student data can be debated (e.g., Porter, 2011).

There are other perspectives on self-reported data. For example, Bowman (2010) states that, although students' estimates about self-reported learning gains may not adequately reflect longitudinal gains, they do provide useful information: perceived learning gains are positively associated with student satisfaction. Lee, Srinivasan, Trail, Lewis, and Lopez (2011) have shown that students' perceptions of support (operationalised in their study as instructional support, support from peers, and technical support) relate positively to course satisfaction. Furthermore, in a study by Donche, Vanhoof and Van Petegem (2003), self-reports led to the conclusion that student teacher beliefs were influenced by different learning practices of different teacher education institutions: students from teacher education institutions that promoted authentic and self-regulated learning were more positive about using and constructing knowledge than students from teacher education institutions with a more traditional focus on knowledge transmission. Moreover, Cohen and Zach (2012) found that self-reports on student teachers' self-efficacy were positively related to the quality level of their lesson plans. Furthermore, Lizzio, Wilson and Simons (2002) found that students' positive perceptions of the learning environment do not only relate to higher student satisfaction, but also to higher academic achievement and development of key (or transferable) skills. It can be important to collect not only self-reports of students, but also self-reports of teacher educators: teachers' beliefs influence how they design and implement their practices and therefore influence the effectiveness their practices (Cochran-Smith & Zeichner, 2005; Evans & Kozhevnikova, 2011).

In the studies of this thesis, self-reports were considered to be an appropriate data source for answering the research questions. The studies built on the assumption that teachers and students should be aware of GLAs in order to provide useful information on how a GLA can be designed, implemented and evaluated in higher education practice. Observation of teaching practice or testing student outcomes do not give us meaningful data about how teachers think about GLAs in practice, what their reasoning is as to whether or not to use it, and how important student evaluations of GLAs are.

6.4 Theoretical considerations

Three issues will be addressed regarding the theoretical contribution of the dissertation: (1) the GLAID framework as a design tool for new GLAs and an evaluation tool for existing GLAs, (2) the GLAID framework as a tool to evaluate research, and (3) the role of the components and mediators.

6.4.1 The GLAID framework as a design and educational evaluation tool

The strength of the GLAID framework is that each component and the alignment between components can be designed adaptively, based on a specific educational setting. However, additional literature should be consulted to specify the content of each design component and make detailed design decisions. For example, designers may use additional studies about how students interact during collaborative tasks, how to design suitable assessment of GLAs, how to design or select appropriate tasks for GLAs that aim at the desired kinds of learning outcomes (e.g. shared knowledge construction) for the particular target group of students, how to structure the collaboration (e.g. the use of roles, distribution of resources, Jigsaw), how to align guidance with learning goals (e.g. scaffolding, prompts in CSCL), how to compose groups (e.g. heterogeneous versus homogeneous groups, group size) and how to design or select facilities to support collaboration in the groups (e.g. different kinds of blended or online learning environments). The GLAID framework integrates existing (theoretical) design approaches and recommendations (i.e. the eight components and a need for their alignment) – although present in the literature, yet fragmented – into a theoretically-informed comprehensive framework.

6.4.2 The GLAID framework as an evaluation tool for research findings

The majority of educational research regarding GLAs focuses on specific components of the design to increase the effectiveness of collaboration. For example, Schellens, Van Keer, De Wever and Valcke (2007) describe designing the *interaction* between students, by aiming at discussions with more intensive and active individual participation in the discussion, related to a higher level of student knowledge construction. Another example is the study by Kirschner, Paas, Kirschner and Janssen (2011) regarding *task characteristics* in which they found in an experimental setting that learning tasks that imposed a high cognitive load were more efficient for groups compared to learning tasks that impose a low cognitive load. A third example of research on a specific (design) component is the study by Ruiz-Gallardo, Castanjo, Gomez-Alday and Valdes (2011) in which they found that for effective implementation of GLAs, teachers needed to calculate student workload in terms of hours. This refers to the component *facilities*, in which one of the design specifications is to plan the amount of time students need to work on the GLA. The question remains as to the extent to which findings from studies on particular components of group learning activities provide insights into the relationships between the components. Insights into these relationships might be necessary to examine the relative importance of each component for effective group learning activities of students in higher education. The GLAID framework can be used for examining and evaluating these relationships by, for example, meta-analyses or thematic reviews.

6.4.3 The role of components and mediators

Here, we address the findings of the studies of this dissertation about specific components and mediators, specifically the assessment, the task characteristics, the structuring of the collaboration and the mediating role of engagement.

Assessment. In the GLAID framework, the assessment of GLAs is designed simultaneously with the learning objectives and outcomes, and the interaction. In the third study, the teacher educators mentioned assessment, but they did not refer to the alignment of assessment with the other components of this design step. In the fourth study, the evaluation of assessment correlated with the perceived learning outcomes, but in the regression analyses, several other components accounted for more variance and as a result, assessment was no longer significantly related to the perceived learning outcomes. The results of both studies suggest that the assessment, although used by teachers as a design component, does not seem to be sufficiently intertwined with the other components, in both the design and the implementation of GLAs. The findings from both studies suggest that integrating (scientific) knowledge about assessment in GLAs requires more attention in the design of GLAs in teacher education.

Task characteristics. The fourth study revealed that students' evaluation of task characteristics was related to perceived knowledge gains and learning outcomes for the future profession, directly and indirectly via the mediators: verbal interaction and engagement. The evaluation of the design component task characteristics explained the largest proportion of variance in both outcome variables. Therefore, the quality of the task can be understood as a dominant variable for explaining perceived learning outcomes of GLAs.

Structuring. The interviews of the first and third study revealed that many teachers in higher education encounter problems with the structuring component. They consider free-riding to be a major problem in GLAs. Free-riding students deliberately ignore their individual accountability for the GLA and do not seem to feel interdependent. In the third study, several teacher educators indicated that they would like to learn more about how to engage students in the collaboration process. The challenge for teacher educators seems to be that they do not know how to achieve individual accountability and positive interdependence.

Engagement. The findings of the fourth study underline the crucial role of student engagement as a mediator of the relationships between the evaluation of design components of GLAs and perceived learning outcomes. Engagement fully mediated the evaluation of the design components structuring, guidance, and group constellation, on the one hand, and the perceived learning outcomes for the future profession, on the other hand. This leads to the conclusion that the design of GLAs and the constituent components should be aimed at triggering student engagement.

6.5 Practical implications

6.5.1 Design stances

The practical implications of this dissertation will be discussed following paradigms or stances which teachers could take as designer of GLAs. Visscher-Voerman and Gustafson (2004) distinguish four paradigms in educational design: the instrumental paradigm, the communicative paradigm, the pragmatic paradigm and the artistic paradigm.
The instrumental paradigm implies that "the standards are pre-specified and that there is a consistent relationship between goals, learning situations and processes, and outcomes of the design" (Visscher-Voerman & Gustafson, 2004, p. 77). According the communicative paradigm, good designs are designs that are discussed and agreed upon by the design team and other stakeholders involved. Teachers who design according the pragmatic paradigm create products in a quick manner, testing and revising their product versions in an early stage of the design. Finally, designs that are developed according to the artistic paradigm are constructed and developed in a unique way; the designers' distinctive expertise and experience greatly influences the design process, and therefore it cannot be planned.
These paradigms are worked out below for the GLAID framework. The term "stance" is used as it refers more to the position of teachers as designers of GLAs, compared to the term "paradigm", which can be understood as a broader perspective on educational design.

At first sight, there is an obvious relationship between the GLAID framework and the i*nstrumental* design stance. The design process is structured by a number of design components, such as the interaction, the learning goals, and the task characteristics, and those components are designed in a pre-specified order, and have to be aligned with one another. A structured approach to the design is considered important, because an intuitive approach of the teachers to design GLAs often generally does not lead to the outcomes they aimed for (see chapter 2).

In addition, GLA designs require that multiple stakeholders or roles are involved: designers, teachers that implement the design, and students. Those stakeholders each influence the effectiveness of the design. This means that a *communicative* stance on the design of GLAs also applies: teachers designing GLAs should discuss (components of) the design with their colleagues and probably with their students, to improve their design and raise its effectiveness. Moreover, during the implementation of the GLA, teachers can evaluate the components and their alignment with their colleagues and students.
When necessary, the components and their alignment could be adjusted to improve the process of collaboration. After completion of a GLA, teachers and students preferably communicate about and reflect on the quality of the GLA and each of the implemented components, in order to guide future reuse and redesign of the GLA.

The *pragmatic* stance also applies to the GLAID framework, although more work has to be done to make the framework practical for teachers. To make the GLAID framework practical for teachers, design decisions should be developed that can easily be implemented in class. Another way to make the GLAID framework and GLAs in general practical for teachers is to subdivide a GLA into smaller activities. These smaller activities could be more easily tested before using in class, compared to the entire design of a GLA. For example: a smaller activity like a collaborative quiz to test group knowledge about a particular subject could be first tested with a small group of students (from other classes) before it is integrated into the design of the GLA, which also includes other collaborative activities.
Finally, the artistic stance can be related to the design of effective GLAs, although the

relationship might be less obvious than with the other three stances. Although the GLAID framework implies that the design steps are to be taken in the described order, this is meant as a guideline and not a prescription. Designing GLAs also requires creativity in order to create variety and complexity. Designers could first let their creativity flow and design by freely choosing from a variety of possibilities, to prevent their design being too much like their other designs and create more variety in their GLA designs. After the first global creative design, they can consider with the GLAID framework whether all components were addressed, whether the different components of their design were aligned and further specify the components when needed.

6.5.2 Practice of higher education

The GLAID framework can be used to design, implement and evaluate GLAs in higher education. However, higher education practice both restricts and enables teachers in how they can design and implement GLAs, which are related to 1) fixed part of the curriculum, 2) the number of students who attend a course, 3) the time available within the limits of the curriculum, 4) the possibility to evaluate and redesign GLAs and 5) students with diverse experiences of and preferences for GLAs.

First, in higher education, teachers are not entirely free in what and how they design. It is common that a part of the curriculum is predetermined. These so-called fixed parts of the curriculum need to be taken into account when a GLA is designed. This means that teachers who design new curriculum parts should design their GLAs aligned with the fixed parts.

Secondly, the number of students on a higher education course can be enormous. For example, two teachers are appointed to guide a GLA in which 200 students participate. This has consequences for the frequency and intensity of the guiding activities of those teachers, but also for the design of other components, such as the choice of the task type and the size of student groups.

Thirdly, the time students can invest in a GLA is sometimes limited by other courses they take at the same time. When students are required to work on another time-consuming assignment in the same period, this of course affects the time and effort students are able to invest in the GLA. Therefore, the time (part of the component facilities) students need to work on the GLA should be aligned with the time students have to invest in other assignments (of other courses).

Fourthly, not all GLA designs will be completely new designs. Certain GLAs are sometimes implemented year after year. This makes it possible to redesign GLAs on the basis of earlier experiences of teachers and students in order to enhance the design.
To redesign GLAs using the GLAID framework, first, every component needs to be evaluated. This provides insights about which components are evaluated positively and which are evaluated as problematic, and it can highlight insufficient alignment of the components of the design. These outcomes of the evaluation can be used to feed the redesign of the GLA.

Fifthly, students have experienced GLAs in other courses and in primary and secondary education, before they enter a particular course in higher education. This means that they have developed particular ideas about collaborative learning and of participating in a GLA. There might be a discrepancy between the design of the GLA and students' ideas of and preferences for GLAs (cf. Kollar et al., 2006). This discrepancy needs to be taken into account and it might be necessary to adjust the design to reach the desired learning outcomes.
For example, a teacher designs a Jigsaw task, but the students' ideas about effective

collaboration include dividing tasks: the teacher can adapt her/his guidance to scaffold for students during their collaboration to engage students in peer interaction instead of dividing tasks.

6.5.3 Implications regarding the role of engagement

The fourth study unambiguously showed that students who feel engaged in GLAs experience higher perceived learning gains. This implies that design components that relate to engagement (task characteristics, structuring, guidance and group constellation) need to be designed in such a manner that they contribute to student engagement. Tasks that induce engagement are tasks that are authentic (e.g. Gros, 2001; Hämäläinen & Vähäsantanen, 2011; McLoughlin, 2002), complex (Kirschner, Paas, Kirschner, and Janssen, 2011), tasks that match the competence level of students (Boekaerts and Minnaert, 2006), and tasks that make use of resources that induce intellectual conflict (Johnson and Johnson, 2009b). Structuring tasks (i.e. use of roles or distribution of the resources) contributes to student awareness of what they need to do in the collaboration (Strijbos, Martens, Jochems, & Broers, 2004, 2007), probably leading to more self-efficacy and in turn leading to engaged and motivated students (Pintrich, 2003). Another way to provoke engagement is to insert into the guidance component the consultation of students regarding the design. Teachers could, for instance, discuss with students the frequency and kind of guidance they think they need to attain the learning goals. The fourth study also showed that the more students are satisfied with group size and group composition, the more they feel engaged. Optimising group constellation can, for example, be achieved by taking into account personal content goals (Wosnitza & Volet, 2012) or by matching the team characteristics with the task demands (Fransen et al., 2011).

In addition to designing the components in order to provoke engagement, a more general recommendation for the design is to start every GLA by considering the collaborative premise: to give ample consideration to the purpose of student collaboration. If students are convinced that the assignment of a GLA can better be performed in collaboration with other students than individually, this will contribute to their engagement in the GLA.

6.6 Future research

With future research on the usefulness and the effectiveness of the GLAID framework for GLA design, implementation and evaluation, this framework may develop from a comprehensive framework to one that guides teachers more specifically in their design decisions. Both scientific and practitioner research can contribute to this aim.

Scientific research. Findings of the fourth study showed that verbal interaction and engagement complementary mediated the learning outcomes, indicating the existence of at least one other mediator. To gain a more comprehensive insight into the relationship between the evaluation of the design components and the perceived learning outcomes, future research may explore other mediators in this relationship, such as mutual trust between the group members or the building of shared mental models.

The meaningfulness of the GLAID framework could also benefit from future research on the effectiveness of particular design components by examining causal relationships of design components with learning outcomes with a quasi-experimental design. In such a research design, design components could not only be manipulated, but also compared with similar designs in which a particular component is designed in another way. Learning outcomes can take the form of test scores and student observations.

Finally, future research could be focused on assessment as one of the components of the GLAID framework. The findings of this dissertation suggest that assessment is not yet sufficiently integrated into (scientific) knowledge about the design of GLAs. Future research could investigate what kind of assessment (formative or summative) leads to higher learning gains. Furthermore, research could be carried out to determine whether the assessment of collaborative skills contributes to better alignment and decreases social loafing – assuming that the structuring component is aligned with the assessment component.

Practitioner research. Practitioners could be involved in research on GLAs and the GLAID framework. This involvement can contribute to the practical relevance of this framework for teachers. Research into their own GLA design and teaching practices could increase teachers' awareness of their GLA practices as well as directions for improving their practice. In this way, teachers could become more proficient in the implementation of GLAs and they add new insights to the existing knowledge base on GLAs in higher education (cf. Scholarship in Teaching and Learning, see e.g. Hutchings, 2010).

Another direction for practitioner research could be the balance between individual learning and collaborative learning in higher education. Some teachers in study one voiced their dissatisfaction with the large number of projects involving student collaboration. This leads to the question of whether a balance should be established between individual learning and collaborative learning in order to optimise all learning outcomes, and if so, what kind of balance.

6.7 Concluding remarks

Summarising the findings of this thesis, the studies significantly advanced the understanding of the components and process of GLA design, implementation and evaluation with the help of the GLAID framework. Future research can contribute to developing this framework from a general design tool to a framework that provides teachers with specific support for each of the components and the alignment between the design components, in order to further improve learning outcomes of GLAs in higher education.