COLLABORATIVE LEARNING IN HIGHER EDUCATION

Design, implementation and evaluation of group learning activities

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ICLON, Leiden University Graduate School of Teaching

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VOOR MILA EN DONNA

In ideal collaborative learning students can be imaged as building blocks of a larger work of art. Each block, although individually recognizable, is indispensable to complete the work of art. The blocks support each other and are connected. The blocks are transparent so that they can effectively and openly interact with each other and evaluate their interaction to continuously improve and/or sustain the quality of the work of art.

Collaborative learning in higher education

Design, implementation and evaluation of group learning activities

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— CHAPTER I —
General Introduction

Chapter 1 General introduction

Collaborative learning is a frequently used learning approach in higher education curricula. In collaborative learning "students actively contribute to the attainment of a mutual learning goal and try to share the effort to reach this goal" (Janssen, 2014, pp. 4-5). Educational researchers have emphasised the importance of collaborative learning in higher education. Collaborative learning can (a) promote students' deep-level understanding by engaging in collaborative discourse and collaborative argumentation (Nussbaum, 2008), (b) contribute to students' motivation and shared knowledge construction (Hämäläinen & Vähäsantanen, 2011; Hmelo-Silver, 2004; Johnson & Johnson, 2003), (c) foster the development of higher-order thinking skills and metacognitive skills (Johnson & Johnson, 2009), and (d) enhance the development of prosocial behaviour such as showing empathy and helping others (Gillies, Ashman, & Terwel, 2008; Järvelä, Volet, & Järvenoja, 2010). Furthermore, collaborative learning prepares students for learning and working in teams during further education and future work. Teamwork in their academic education is a first step to initiate their professional development (Slotte, Palonen, & Salminen, 2004). Additionally, collaborative learning prepares students for participation in a society of networking and sharing information (Koroneou, Paraskeva, & Alexiou, 2013). All in all, collaborative learning shows potential for learning and development in higher education settings, under the condition that it is carefully designed and facilitated.

Teachers play an essential role in both the design and facilitation of collaborative learning activities (Gillies & Boyle, 2010; Onrubia & Engel, 2011; Oortwijn, Boekaerts, Vedder, & Strijbos, 2008). The teacher as a designer is crucial for successful collaborative learning. For example, teachers can decide on group size and group constellation, choose tasks that are motivational to students and are attuned to their ability level, and prepare students to participate in the collaborative learning (Brown & McIlroy, 2011; Chiriac & Granström, 2012; Gillies & Boyle, 2010). Furthermore, the effectiveness of collaborative learning depends on the facilitating role of the teacher during the collaborative process: the instructor needs to be available for feedback, might intervene to keep discussions on track, can help students stay focussed on the task, and can support the building of relationships (Brindley, Walti, & Blaschke, 2009; Chiriac & Granström, 2012; Onrubia & Engel, 2012). To enhance collaborative learning teachers should model desired interaction and behaviour (Brown & McIlroy, 2011). The focus of this dissertation is on the role teachers have in the design, implementation and evaluation of collaborative learning in higher education.

Not all teachers in higher education acknowledge the advantages and benefits of collaborative learning, and not all teachers design and implement collaborative learning in an effective manner. Some teachers believe that collaborative learning does contribute to the development of social skills, but not to the acquisition of academic knowledge (Frykedal & Chiriac, 2011). Teachers can also experience difficulties in supporting and guiding students during collaborative learning (McLoughlin, 2002). Furthermore, teachers find the assessment of collaborative learning problematic, because they have difficulties in determining what to assess and how to assess collaborative learning and they feel uncertain about (contradictory) demands concerning this assessment, such as whether it should be formative or summative, whether it should be focused on the product or the process, or whether it should be assessed by the teacher or by peers (Frykedal & Chiriac, 2011). Teachers may have concerns regarding free-riding of students (Cohen, 1994; Panitz, nd) and

teachers may find it difficult to achieve a good balance between individual accountability and group accountability (Ross, Rolheiser, & Hogaboam-Gray, 1998). Another problem is that preparations for collaborative learning are generally insufficient or even non-existent (Janssen, 2014; Gillies & Boyle, 2010; Ross et al., 1998). Moreover, some teachers doubt whether their students will learn what they need to learn when they work on a collaborative assignment, because students are not always capable of working and learning collaboratively in an effective manner (Franssen, Kirscher, & Erkens, 2011; Gillies & Boyle, 2010).

In the literature, nine causes are described for students not attaining the desired learning outcomes of collaborative learning: (1) students and teachers experience resistance towards collaborative learning (Payne, Monk-Turner, Smith, & Sumter, 2006; Smith, Sorensen, Gump, Heindel, Caris & Martinez, 2011), (2) teachers are not convinced they can successfully implement collaborative learning in their own context (Abrami, Poulsen, & Chambers, 2004), (3) the technology used in blended or online environments to support collaborative learning causes problems, because of the teachers' limited technology literacy or the lack of user-friendly technology (Dillenbourg, 2013), (4) the design of collaborative learning in practice is often not grounded in design guidelines from the literature (Hämäläinen & Vähäsantanen, 2011), possibly because teachers are unfamiliar with this literature or because scientific results are hard to translate into practice, (5) the different aspects of the design, such as the guidance, the task type, and the instructions on how to collaborate, are not sufficiently aligned (Dennen & Hoadley, 2013; Hämäläinen & Vähäsantanen, 2011; Strijbos, Martens, & Jochems, 2004), (6) collegial collaboration is not yet everyday work-practice within educational organisations and therefore teachers have little opportunity to develop their collaborative creativity that may lead to better designs for collaborative learning environments for the students (Hämäläinen & Vähäsantanen, 2011), (7) the effectiveness of collaborative learning largely depends on how core aspects such as positive interdependence, individual accountability and interaction are designed and implemented (Johnson & Johnson, 2009; Strijbos et al., 2004), (8) many aspects of the design and implementation of collaborative learning need refinement to maximise its effectiveness (Koh, Wang, Tan, Liu, & Ee, 2009), and (9) collaborative learning is sometimes used for reasons of efficiency only. For example, teachers want to save time for teaching and grading a very large group of students and therefore let students work together and use group grades. Dennen and Hoadley (2013) stress that it is very important for successful collaborative learning to consider the collaborative premise: teachers should justify why student interdependence is an important part of the learning process, and in what manner collaboration with other students is needed for the attainment of the learning goals. In other words: if students can achieve all learning goals by working individually, collaborative learning has no added value, and students may even become reluctant to invest effort in the group process.

The abovementioned findings from literature might lead to a conclusion that teachers generally are not very positive about either designing or implementing collaborating learning in their teaching. Consider the following interview excerpts of teachers who reflect on collaborative learning in their teaching. The first teacher shortly describes her/his experiences with students' capability to collaborate:

> 'You could ask students: is your group working alright? And they'll all say that they're fine. And then, one hour before the deadline a girl comes into your office, crying and saying: "Ben did nothing at all and I'm doing all the work".

> Those things come up at the last moment. They have difficulty in talking to each other about the way they behave. Yes, I do sound cynical but it is a generation hardly able to talk face-to-face.'

A second teacher articulated that the problems that may occur in collaborative learning could be due to the expertise of the guiding teacher:

> 'Students are able and willing to learn to collaborate with appropriate guidance, but many teachers do not know how to communicate with students and how to guide them during collaborative learning.'

The importance of teacher guidance is also stressed by a third teacher, who articulated the need for sufficient and appropriate guiding of collaborative learning as follows:

> 'I think the guiding teacher is crucial in the collaboration process. He is the one that can confront students with their behaviour, guide a group in the right direction and discuss dilemmas. You cannot just tell students, "Here you are: your group assignment. Please complete it with four students and show us the results in three weeks".'

These three quotes from interviews with teachers in higher education illustrate that the guidance by the teacher and the interaction between students clearly are issues in the implementation of collaborative learning in higher education settings. Problems in the implementation of collaborative learning may not, and probably will not, lead to students' attainment of the desired learning outcomes.

1.1 Problem statement

The different causes of unsuccessful implementation of collaborative learning motivated the problem statement of this dissertation: "Collaborative learning in higher education often does not lead to the desired learning outcomes, because of problems teachers experience with the design and implementation of collaborative learning".

The central assumption in this dissertation is that collaborative learning can lead to students' learning outcomes, if (1) properly designed and implemented, (2) taking the collaborative premise into account, and (3) grounded in recent scientific research findings about effective collaborative learning. Possible learning outcomes may be (a) knowledge acquisition, (b) motivation and engagement, (c) higher-order thinking skills, (d) metacognitive skills, (e) social/collaborative skills, and (f) preparation for students' future profession, professional development, and participating in the society of networking and sharing information.

In the literature, the terminology used for collaborative learning differs. Instead of collaborative learning, cooperative learning, problem-based learning, group work and team-based learning are also used. These terms all originate from the constructivist view of learning and instruction (Kirschner, Martens, & Strijbos, 2004) and they have in common that students need to work together to attain learning benefits that cannot be attained by working individually. During the development of this thesis the focus shifted from collaborative learning as a general teaching method to group learning activities.

This shift was made 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. In this dissertation, a group learning activity (GLA) is defined as a curriculum activity in which students learn collaboratively and which covers a time period that is longer than one lesson.

1.2 Aim of the dissertation

Conclusions from the abovementioned literature suggest that teachers in higher education should be more supported in the design, implementation and evaluation of GLA in order to improve the effectiveness. Therefore, the central aim of this dissertation is to provide insights 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. The use of this framework may improve learning outcomes of GLAs, and contribute to professional development of teachers and teacher educators.

1.3 Overview of the dissertation

The next sections describe four studies that were conducted to accomplish the research aim. Figure 1 visualises the relationship between the four studies and the chronological order of the studies.

Figure 1. Visualisation of the research aim of the dissertation and the four studies.

General research aim: a theoretically and empirically underpinned framework for the design of group learning activities (GLAs) to support teachers in higher education in the design and implementation of GLAs.

Study 1 **Research aim:**	**Study 2** **Research Aim:**	**Study 3** **Research Aim:**	**Study 4** **Research Aim:**
Demonstrate the urge to provide teachers in higher education with guidelines for the design of GLAs	Develop a theoretically underpinned comprehensive framework to guide teachers in the design and implementation of GLAs	Empirically validate the comprehensive framework for the design and implementation of GLAs	Ascertain which components of the design of GLAs are of major importance for which learning outcomes

In the first study, practices and beliefs concerning collaborative learning were explored among teachers in higher education. This exploration emerged from the observation that teachers have a need for specific guidelines to cope with the problems they encounter in the design and implementation of collaborative learning.

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. This second study investigated to what extent approaches for the design of GLAs are similar, and which aspects of the various approaches are crucial for the design of GLAs. This resulted in a thematic review, synthesising different approaches for the design of group learning activities into one theoretically informed framework. In the third study, this framework was empirically validated using interviews with teacher educators. The final study examined the aspects valued by students in implemented designs of group learning activities, distinguishing the various components of this framework.

Chapter 2: Collaborative learning in higher education: teachers' practices and beliefs

In the first study, practices and beliefs of teachers about collaborative learning were explored to investigate the assumption that there is a need for more insights into collaborative learning design in higher education and for guiding teachers in this complex matter. Teachers' educational beliefs and personal theories of teaching and learning strongly influence their classroom practices (Cochran-Smith & Zeichner, 2005; Evans & Kozhevnikova, 2011). The research questions were: (1) How do teachers in higher education characterise collaborative learning in their educational practices?, (2) What is the relationship between the frequency in collaborative learning practices and teachers' beliefs about collaborative learning?, and (3) What is the relationship between the variety in collaborative learning practices and teachers' arguments for applying collaborative learning in their lectures?.

In this study 115 teachers from five faculties of a university of applied sciences in a large city in the Netherlands participated. They completed a survey on three topics: 1) effort beliefs (i.e. beliefs about the amount of effort students are willing to dedicate to collaborative learning), 2) learning beliefs (i.e. beliefs about the effect of collaborative learning on learning outcomes) and 3) motivational beliefs (i.e. beliefs about the effects of collaborative learning on motivation). The survey consisted of 33 items with pre-structured answering options regarding teachers' beliefs about collaborative learning. Three open-ended questions concerned the way in which teachers applied collaborative learning, whether and how students were credited and whether peer-assessment was used. Ten randomly selected teachers participated in follow-up interviews; two from each of the five faculties: Teacher Education, European Studies, Communication Management, Health Care and Technology, Innovation and Society. The transcribed interviews were used to obtain more detailed information about the practices of the teachers.

The results revealed problems with the design and the implementation of collaborative learning in the practices of teachers in higher education. The conclusion was that there is indeed a need for formulating theoretically-informed practical guidelines to provide professionals in education with the opportunity to utilise collaborative learning in such a way that it leads to desired learning outcomes.

Chapter 3: A comprehensive framework for the design of group learning activities in higher education

In order to meet the need for theoretically underpinned practical guidelines for teachers, a thematic review of approaches for designing collaborative learning in higher education was performed. During the literature search, collaborative learning was further specified as Group Learning Activities (GLAs). GLAs can be found in face-to-face, online (also referred to as Computer Supported Collaborative Learning) and blended learning environments. Various frameworks for the design of GLAs exist, but they differ in their design components and how the design process is structured. This review aimed at generating a comprehensive framework for the design of GLAs in higher education from a constructivist view on learning and instruction. Reiser (2001) suggests that when constructivist views are used in instructional designs, those designs include that learners have to work together to solve complex and realistic problems, and examine those problems from multiple perspectives, thereby becoming aware of their own role in the knowledge construction process.
The following research questions were formulated to develop a framework for the design of group learning activities: (1) How can the components of designing GLAs be synthesised into one comprehensive framework?, and (2) How can teachers in higher education use this framework in the design of GLAs?.

A literature search was performed from which 14 peer-reviewed meta-studies (such as narrative reviews, meta-analysis and theoretical abstractions) for the design of GLAs were selected. As a starting point for the analysis, the study of Strijbos et al. (2004) was used, which defines and describes six components for the design of GLAs. The analysis resulted in two additional components and an extension of three of Strijbos et al.'s (2004) original components. The newly developed comprehensive framework for the design of GLAs consists of eight components: (1) interaction, (2) learning objectives and outcomes, (3) assessment, (4) task characteristics, (5) structuring, (6) guidance, (7) group constellation, and (8) facilities. From the studies reviewed, design decisions were distilled to provide teachers with more specific guidance for the design of each component.

To synthesise the components into one comprehensive framework and to formulate implications for the practice of teachers in higher education, it was determined whether the components should be designed in a specific order. Furthermore, the alignment between the components had to be explicated. Alignment implies that (a) decisions made in the design of each component are related to the design of other components and (b) all steps in the design are attuned with one another. For this purpose the ADDIE-model was used.

The framework was called the Group Learning Activities Instructional Design (GLAID) framework. The GLAID framework can guide educational designers and teachers in higher education with the complex process of designing GLAs. Additionally, the framework can be used for the monitoring and evaluation of GLAs. Finally the GLAID framework can be used to interpret the outcomes of research on GLAs.

Chapter 4: Teacher educators' design and implementation of group learning activities

The GLAID framework is a theoretically underpinned framework to design and implement GLAs. In order to empirically validate the GLAID framework, it was necessary to verify whether teachers use the components and alignment when designing and implementing GLAs.

Teacher educators were selected as participants. Teacher educators design and implement GLAs on a regular basis as it is an important part of the curriculum in teacher education. Moreover, unlike other higher education teachers, they train their student teachers to implement GLAs in their future classrooms. Consequently, they can be considered to be expert educational designers of GLAs. The following research question was formulated: 'How do teacher educators design and implement GLAs, and to what extent do their considerations match with the GLAID framework?'.

Twenty-three teachers of teacher education programmes (primary education) of six universities of applied sciences in the Netherlands participated in individual face-to-face semi-structured interviews. The following topics were covered in the interviews: (a) the design of GLAs, (b) the implementation of GLAs (the experiences of teacher educators with students working on GLAs), and (c) the evaluation of the implementation of GLAs and the learning outcomes in relation to the designed learning objectives. The transcribed interviews were subjected to selective coding, which was guided theoretically by the design components of the GLAID framework. It was also coded whether teacher educators addressed the alignment between those components. The interviewees were not familiar with the GLAID framework, and were not informed about the framework and its components.

Teacher educators addressed all components of the framework. However, the facilities component was only addressed by a minority of the teacher educators. Teacher educators did not mention new components in the interviews and underlined the importance of the alignment between the components, an integral aspect of the framework. The interviews revealed that the components of the GLAID framework are not only grounded in the academic literature, but are used by practitioners as well. Furthermore, it was concluded that the GLAID framework can be useful as a practitioner guide in teacher education and higher education for teachers who wish to design, implement and evaluate GLAs.

Chapter 5: Student teachers' evaluation of design components related to perceived learning outcomes

After empirically validating the GLAID framework, an exploration was conducted as to how students experience the various components of GLAs when they work on such a group assignment and what components they perceive to have contributed to their learning outcomes. Student perception of the learning outcomes and their appreciation of the design components of GLAs are an indication of the satisfaction of students with the curriculum (Bowman, 2010). For teacher educators it is important to not only design good quality group assignments that contribute to a high quality curriculum, but also to design and implement GLAs that are highly valued by their students. Positive student evaluations of GLAs lead to positive evaluations of the learning outcomes, thereby diminishing students' resistance to group work (Smith et al., 2011).
In the literature, two variables are considered to be mediators for learning outcomes: student (verbal) interaction (Strijbos et al.,; Janssen, 2014) and engagement (Ferreira, Cardoso, & Abrantes, 2011; Reyes, Bracket, Rivers, White, & Salovey, 2012). Four research questions were formulated: (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?.

GLAs were studied as they naturally occur in teacher education programmes. The (perceived) learning that takes place in those GLAs relates to how students value (a) the design aspects themselves and (b) the implementation of those design aspects.
Teacher education students ($N = 290$) from six Dutch universities of applied sciences completed a survey with pre-structured answering options about how they value different design components of the GLA(s) they worked on.

The results showed that the more student teachers valued task characteristics and group constellation, the more they perceived that they had attained learning outcomes regarding knowledge. Furthermore, task characteristics and guidance were positively related to their perceived development as primary school teachers. Finally, verbal interaction mediated both kinds of learning outcomes and engagement only mediated the learning outcomes for their perceived development as primary school teachers.

Chapter 6: Discussion and conclusion

In chapter 6, the main findings are summarised. The attainment of the central aim of this dissertation will be evaluated. Subsequently, methodological and theoretical considerations and limitations will be described. Finally, practical implications for the design and implementation of group learning activities in higher education will be discussed, as well as ideas for further research that could extend the findings.

— CHAPTER 2 —

Collaborative learning in higher education: Teachers' practices and beliefs

Chapter 2 Collaborative learning in higher education: Teachers' practices and beliefs[1]

In this chapter collaborative learning practices in higher education and the relationship between these practices and teachers' beliefs about collaborative learning were explored. To this end, 115 teachers in higher education completed a survey on collaborative learning practices and beliefs. Additionally, ten teachers participated in a semi-structured interview. Teachers considered the design of collaborative learning to be complicated. Their beliefs about the contribution of collaborative learning to (a) learning outcomes and (b) student motivation, were more positive than beliefs about the effort that students are willing to dedicate to collaborative learning. Teachers' arguments for applying collaborative learning were consistently more student-oriented than teacher-oriented. More student-oriented teachers varied more in their collaborative learning practices. To enhance the benefits of collaborative learning, teachers need more support in the design and implementation of collaborative learning to translate knowledge about collaborative learning into effective practice.

[1] This chapter has been published in adapted form as: De Hei, M. S. A., Strijbos, J. W., Sjoer, E., & Admiraal, W. F. (2015). Collaborative learning in higher education: Lecturers' practices and beliefs. *Research Papers in Education, 30*(2), 232-247. doi: 10.1080/02671522.2014.208407

2.1 Introduction

Collaborative learning is a commonly used teaching methodology. Research on collaborative learning concludes that it contributes to cognitive learning as well as pro-social and emotional development (e.g., Järvelä, Volet, & Järvenoja, 2010; Slavin, 1999). Collaborative learning is also a valuable teaching strategy in higher education, because it prepares students for jobs where they work in teams (Slotte, Palonen, & Salminen, 2004). However, Fransen, Kirschner and Erkens (2011) concluded that not all learning teams in higher education collaborate effectively. According to these authors learning teams in higher education tend to focus primarily on the task aspects of performance and not on the team aspects. The effectiveness of collaborative learning largely depends on how core aspects such as interdependence, individual accountability and interaction are designed and implemented (Johnson & Johnson, 1994; Strijbos, Martens, & Jochems, 2004). Teachers play an important role in both the design and implementation of collaborative learning. However, teachers' practices do not always correspond with their beliefs about teaching and learning, because of, for example, constraints by departments' and university bureaucracy (Norton, Aiyegbayo, Harrington, Elander, & Reddy, 2010). Beliefs of teachers about teaching and learning can be oriented towards the learning process of students (student-oriented) and towards the teaching process (teacher-oriented). The former is referred to by Biggs (2001) as conceptions of teaching as 'facilitating learning'; the latter as conceptions of teaching as 'teaching as transmitting knowledge'. One could expect that the more student-oriented teachers are the more they are willing to implement collaborative learning in their teaching practice.
Research findings about the congruence between teachers' teaching practices and their beliefs about teaching are ambiguous (Evans & Kozhevnikova, 2011). Donche and Van Petegem (2011) found that the relationship between teacher beliefs and practices was highly influenced by individual (e.g., years of teaching experience) and contextual (e.g., student attitudes) factors. Kember and Kwan (2000) earlier stated that in the beliefs of teachers with learner-oriented teaching strategies, motivating students was an important part of their role as a teacher.

In sum, teachers' beliefs about teaching and learning in general, and beliefs about collaborative learning in particular, may influence how collaborative learning is designed and used and therefore influence its effectiveness. In this study the teachers' beliefs and practices on collaborative learning in five different higher education programmes are examined in order to get more insight into the relationship between beliefs and practices of collaborative learning in higher education.

2.1.1 Educational design of collaborative learning

Collaborative learning offers students the opportunity to develop both cognitive skills, like analysing and problem solving, and pro-social behaviour, like empathy and helping behaviour (Gillies, Ashman, & Terwel, 2008). However, the use of collaborative assignments in education does not automatically lead to learning. Kreijns, Kirschner and Jochems (2003) identified two pitfalls for the design of collaborative learning: (a) teachers often take for granted that participants will interact socially because the environment enables such interaction, and (b) teachers often neglect the social (psychological) dimension of the desired social interaction, such as group cohesion, trust, respect and belonging.
Therefore, it is important that teachers establish conditions to facilitate effective interaction prior to the group assignments they teach.

2.1.2 Collaborative learning practices

Teachers play an important role in collaborative learning, as they typically design and support collaborative learning activities (Oortwijn, Boekaerts, Vedder, & Strijbos, 2008). Even though teachers regard collaborative learning as important, they experience difficulties in enabling interaction in their classes (Cohen, 1994). Teachers tend to have (a) no clear vision on how they could compose effective groups, (b) limited knowledge of research and theoretical perspectives on collaborative learning, and (c) limited knowledge on how to translate theoretical and empirical findings into a practical application of collaborative learning. Reid and Johnston (1999) demonstrated that teachers regard interaction between their students an important aspect of good teaching, but they also have doubts whether they are able to promote interaction between their students and between students and themselves. Although Reid and Johnston state that interaction has priority in contemporary educational theories, their research revealed that students appreciate interaction with fellow students considerably less than interaction with their teachers. The study of Koh, Wang, Tan, Liu and Ee (2009) on students' and teachers' perceptions of the effectiveness of group project work revealed that refinement of many aspects of this group project work is required to maximise the effectiveness of collaborative learning. They suggest that the gap between teachers' and students' perception should be bridged in order to improve students' motivation for group project work. There should be an agreement between students and teachers on the outcomes and expectations of collaborative learning. They also stress the urgency of "tailoring the nature of the project work tasks to the different ability of students" (p. 346).
Finally, the teachers in their study indicated that the quality of their supervision was not optimal, because they had to supervise too many groups simultaneously.

In addition, Panitz (n.d.) identified the following reasons which might explain why teachers perceive drawbacks to the application of collaborative learning in their classrooms: (a) a fear for loss of control when they would award their students more responsibility for their own learning process, (b) a lack of self-confidence resulting from problems they experienced with earlier use of collaborative learning, (c) a fear that the subject matter is not covered entirely, (d) unfamiliarity with assessment techniques of collaborative learning, (e) a reluctance due to students being unfamiliar with collaborative learning, and (f) a lack of knowledge of methods for collaborative learning and classroom management. Unfamiliarity with assessment often results in a common practice of group grades, which is strongly criticised by Kagan (1995) since they (a) are unfair, (b) undermine collaborative learning since they neglect individual accountability (and group members are thus invited to free riding), (c) de-motivate students who often have no say in group constellation or they are grouped with students by chance (possibly with low achieving students or students with no devotion to the task or group), (d) do not reward the high achieving group members, because they profit less from group grades compared to medium or low achieving group members and (e) evoke reluctance for group assignments. These findings on teachers' perceived drawbacks to the assessment of collaborative learning are confirmed in recent literature. For example, according to Strijbos (2011) the assessment of collaborative learning is hardly addressed as a complex part of the design of collaborative learning in recent literature.

Similar to teachers, students sometimes tend to object to collaborative learning and they need to be convinced about the advantages. Students can also experience difficulty in being (partly) responsible for their own learning process. They typically regard collaborative learning as meaningful when (a) they can contribute in a valuable manner to the group product, (b) they see the similarity between their contribution and the final

result, (c) their contribution is necessary for the group product and irreplaceable, and (d) the demands for contributing are not too high (McWhah, Schnackenberg, Sclater, & Abrami, 2003). When teachers, and their students, do not perceive collaborative learning as worthwhile or easily applicable, effective implementation in educational practices is unlikely to occur.

2.1.3 Teachers' beliefs

Some researchers found that teachers' educational beliefs and personal theories of teaching and learning strongly influence their classroom practices (Cochran-Smith & Zeichner, 2005; Evans & Kozhevnikova, 2011; Richardson, 1996). Hence, different beliefs are likely to lead to different teaching practices. The results of a study with 638 teachers in higher education performed by Norton, Richardson, Hartley, Newstead and Mayes (2005) indicate that the relationship between teachers' beliefs and their teaching intentions were different in different academic and social contexts. They found that beliefs about teaching differed between men and women, and across different disciplines. They also found that intentions for particular teaching strategies differed across institutions and levels of teaching experience. A recent study by Donche and Van Petegem (2011) amongst teacher trainers confirmed that differences in beliefs regarding education and teaching practices could be explained by individual (e.g., extent of teaching experience) and contextual (e.g., student attitudes) factors. Finally, in their review Wayne and Youngs (2003) found a positive effect of the level of teacher certification on learning gains in mathematics of high school students.

However, Murray and Macdonald (1997) found in their survey amongst teachers of a business school in higher education on beliefs and claimed practices, that the attitudes and beliefs of teachers are not translated into their teaching practice. Teachers described their role as a teacher as motivating, supporting and facilitating students, but lectures and tutorials with the purpose of disseminating information and checking knowledge or understanding proved to be predominant practices. One of the possible explanations they put forward for this disjunction was that accepted theories on learning could not be applied because of environmental constraints in the context of teaching.

In all, it is thus far not yet clear how beliefs and practices of the use of collaborative learning in higher education are related. The present study explores collaborative learning practices in higher education and the relationship between these practices and teachers' beliefs about collaborative learning. The following research questions will be investigated:

(1) How do teachers in higher education characterise collaborative learning in their educational practices?
(2) What is the relationship between the frequency in collaborative learning practices and teachers' beliefs about collaborative learning?
(3) What is the relationship between the variety in collaborative learning practices and teachers' arguments for applying collaborative learning in their lectures?

2.2 Method

2.2.1 Participants & Design

A purposeful sampling technique was used to gather data from different educational programmes. Heterogeneity in disciplines of higher educational programmes might reveal different beliefs and practices of the design and implementation of collaborative learning. Donche and Van Petegem (2011) for example found that differences in teachers' beliefs on education, could be explained by individual and contextual factors.

A survey was administered to 235 teachers of five colleges of a University of Applied Sciences in a large city in the Netherlands. One hundred and fifteen teachers participated (49%): Teacher Education (TE, $N = 34$), European Studies and Communication Management (ESCM, $N = 29$), ICT and Media (ICTM, $N = 16$), Healthcare (HC, $N = 22$), and Technology, Innovation and Society (TIS, $N = 14$).There were 61 female and 54 male teachers and their age ranged from 23 to 66 years ($M = 47.81$, SD = 10.71).

After completing the survey the teachers could indicate whether they would also be willing to participate in a follow-up interview. From the 41 lectures who indicated that they were willing to participate in a follow-up interview, 10 teachers were randomly selected, two from each college. From the ESCM college two male teachers participated, from HC two female teachers, and from the other colleges one male and one female teacher each.
The age of interviewees was 31 to 62 years ($M = 42.80$, $SD = 11.42$). Five interviews were conducted in the researcher's office and the other five in the participants' offices. The sample of teachers for the interviews is comparatively small because the purpose of the interviews was to find illustrative and more explicit statements on collaborative learning complementing the findings of the survey.

2.2.2 Measures

The survey was administered to collect data on teachers' beliefs about collaborative learning and their reported practices of collaborative learning. First, the project was briefly introduced to the participants. Subsequently they were asked to complete the survey bearing in mind their current teaching practices. The interviews were carried out to obtain more detailed information about the teachers' practices of collaborative learning.

2.2.2.1 Practices

Teachers' collaborative learning practices were collected during the survey and the interview. In the survey, five open-ended questions referred to teachers' practices of collaborative learning. The first question asked whether the participants applied collaborative learning in their lectures. Two participants did not answer any of the five open-ended questions. Of the remaining 113, 90% ($N = 102$) reported the use of collaborative learning in their lectures and 10% ($N = 11$) reported that they did not use collaborative learning. The second question asked teachers who applied collaborative learning for more detail on the practices they used: 'In what manner do students collaborate in your lectures (for example consulting each other, discussing about a question or assignment before dealt with in plenary, jointly prepare and conduct a presentation, conduct a group assignment that is assessed during or at the end of the course)?'. The answers were coded with the coding scheme presented in Table 1. Each answer could be assigned more than one code. The first author and a research assistant coded all answers with an Cohen's κ interrater reliability of .76 (with a 95% confidence interval of $.68 \leq \kappa \leq .82$). The 13% of codes the coders disagreed on were excluded from the analyses.

Table 1 Coding scheme for collaborative learning practices applied

Code	Description
A	All examples of practices mentioned in the question students consult each other before a question/ assignment is discussed plenary in class students jointly prepare and perform a presentation students work on a group assignment that is being assessed during or at the end of the course
P	Part of the examples mentioned in the question
EF	Extra practice mentioned: peer feedback
ER	Extra practice mentioned: role-play
EP	Extra practice mentioned: project
EO	Extra practice mentioned: other

The number of collaborative learning practices was counted as follows: 2 points for code A, and 1 point for all other codes. The higher the score, the larger the variety of collaborative learning practices. The range of collaborative learning practices was 1 to 4 ($M = 2.50$, $SD = 0.81$).

The three other open-ended questions asked the participants who applied collaborative learning in their lectures to specify (a) how frequently they applied collaborative learning, (b) whether students' were credited for their contribution to collaborative learning, and (c) whether peer assessment or peer feedback was used in their collaborative learning practices.

In the interviews, participants were asked to describe their approach to collaborative learning design and their collaborative learning practices in more detail. The questions concerned the topics: (a) how teachers design courses that include collaborative learning, (b) how much time they use for designing the collaborative learning part, whether the time available was sufficient, and how much time they would like to spend on collaborative learning design, (c) what problems they perceived in having their students collaborate and (d) on what aspects of collaborative learning they would like to receive advice. The semi-structured nature of the interviews offered the interviewer the possibility to ask for clarifications and elaborations. The interviews were audio-recorded and transcribed by the first author. The transcribed interviews were read several times with the focus on the four recurring themes: 'Teacher as educational designer', 'Available time for designing collaborative learning', 'Issues with respect to collaborative learning' and 'Issues for which teachers desire advice'. The answers were summarised per theme.

2.2.2.3 Beliefs

The survey included 33 items with pre-structured answering options on teachers' beliefs about collaborative learning. The items measuring collaborative learning beliefs were specifically designed for this study based on literature on teachers' beliefs about learning and teaching in primary and secondary education (e.g., Bolhuis & Voeten, 2004; Saban, 2003; Watt & Richardson, 2008). The items were answered on a 6-point Likert type scale (1 = *fully disagree*, 6 = *fully agree*). Four scales were constructed: General Beliefs (GB), Learning Beliefs (LB), Motivational Beliefs (MB) and Teacher-Role Beliefs (RB).
The reliability of the scales appeared to be sufficient, except for the RB-scale. Therefore the items of this scale were excluded from further analyses. Next, a Principal Component analysis (PCA) was performed on the remaining items to examine the construct validity of the survey. The results led to a somewhat different interpretation of the scales about teachers' beliefs: Effort Beliefs (EB, beliefs about the amount of effort students are willing to dedicate to collaborative learning), Learning Beliefs (LB, beliefs about the effects of collaborative learning on learning outcomes) and Motivational Beliefs (MB, beliefs about the effects of collaborative learning on motivation) using a standard of loading of ≥ .5 on one factor only. Confirmatory Factor Analysis was performed to confirm the fit of the model with these three scales and revealed a reasonable fit, $\chi 2(132) = 198.24$, $p < .001$, RMSEA = .074, SRMR = .067, CFI = .92, AIC = -65.76. Three examples of items of this survey are provided in Table 2. All of the items of each scale (in Dutch) can be found in Appendix A.

Table 2 Cronbach's alpha for the collaborative learning beliefs sub-scales ($N = 115$)

	N items	Example item	α
Effort Belief (EB)	5	Students put more effort in their assignments if they are allowed to work collaboratively.	.77
Learning Belief (LB)	10	Collaborative learning contributes to a students' capacity for collaboration.	.91
Motivational Belief (MB)	3	Collaborative learning influences the learning motivation of students in a positive manner.	.76

2.2.2.4 Arguments for applying collaborative learning

The survey also asked the 102 participants who applied collaborative learning in their lectures to provide their arguments for doing so. The first author deduced both student-oriented and teacher-oriented arguments and designed a coding scheme (see Table 3). Subsequently the first author and the research assistant coded all 102 answers with an Cohen's κ interrater reliability of .81 (with a 95% confidence interval of $.76 \leq \kappa \leq .87$). The 10% of the codes the coders disagreed were excluded from the analyses. The degree of student orientation in the teachers' argumentation was computed for each individual teacher by dividing the number of his/her S-oriented arguments by the sum of his/her S-oriented and L-oriented arguments.

Table 3 Coding scheme for teachers' arguments to apply collaborative learning

Orientation	Code	Description	Example
Student (S)	SM	Motivation/activation	The purpose is to activate students and connect them to the course topic.
	SA	Attitude/responsibility	Students will become aware of their responsibility towards each other.
	SR	Reflection/feedback	When students conduct a practical to stimulate an explorative attitude, they must observe each other.
	SS	Supportive	Collaboration could help relieve to the burden of the task for the students.
	SL	Learning outcome	Collaboration supports their learning.
	SLS	Learning skills	Students collaborate to practice skills.
	SLK	Learning knowledge	Knowledge transfer.
	SLI	Learning interaction	One of the goals of this course is to learn to collaborate.
	SLP	Learning professional practice	Foreign language education, beginners, practicing conversation.
Teacher (T)	TE	Efficiency	More efficient way to use available time in courses.
	TM	Method variation	To provide a variation in methods.
	TT	Task suitability	In role-play collaboration is inevitable.
	TV	Vision on education	I believe in the constructivist view on education.
	TO	Obligatory component	The main argument actually is that it is a fixed part of some courses.
	TI	Insight in students	The main argument is to explore different ways in which students handle the matter.

2.2.3 Analyses

In addition to descriptive statistics, the relationship between collaborative learning practices and teachers' beliefs about collaborative learning were analysed using a multivariate analysis of covariance with the use of collaborative learning as independent variable (yes/no), the background variables gender, age, years of teaching experience and graduation level as covariates, and the three belief scales as dependent variables. In order to examine the relationship between practices of collaborative learning and teachers' orientation towards student learning, regression analysis was used with the variety of collaborative learning practices as independent variable, the background variables gender, age, years of teaching experience and graduation level as covariates, and the student-oriented argumentation as dependent variable. Although the data on teachers are nested within colleges, multilevel analyses were not applied because the variances in the dependent variables at the college level were not different from zero. Finally, in order to examine differences between the three belief scales and between the amount of student and teacher orientated arguments to apply collaborative learning, paired-sample t-tests were performed. The relationships between teachers' beliefs, argumentation and practices are analysed separately as the sample size does not allow path analyses with sufficient power.

2.3 Results

2.3.1 Collaborative learning practices in higher education

Of the 113 participants who answered the question whether they use collaborative learning in their lectures, 102 reported that they used collaborative learning and 11 did not use collaborative learning. Of those who did not apply collaborative learning, eight provided one or more grounds for doing so: (a) ineffectiveness (2×), (b) collaborative learning is not suitable for training practical skills (3×), (c) students prefer individual work (1×), (d) inefficient use of time (2×), (e) high complexity of content (1×), (f) language education (1×), and (g) concern about losing control of the group in group discussions (1×). The participants who used collaborative learning were asked for specific collaborative learning practices and Table 4 shows these practices, per college.

Table 4 Collaborative learning practices mentioned by college

Practices	TE	ESCM	ICTM	HC	TIS	Total	%
All example practices	12	7	8	5	4	36	30
Part of the examples	14	16	4	9	6	49	41
Extra: peer feedback	4	1		2	1	8	7
Extra: role-play		5		3		8	7
Extra: project		1	4	5	1	11	9
Extra: other	3	3	1			7	6
Total	33	33	17	24	12	119	100

Note. TE = Teacher Education, ESCM = European Studies and Communication Management, ICTM = ICT and Media, HC = Healthcare, TIS = Technology, Innovation and Society.

Table 4 shows that 71% of the teachers use all practices or a part of the practices that were mentioned in the question. The sum score for these practices show limited variation between colleges, as only few lectures mention additional practices.

In all, 99 participants answered the question how frequently they used collaborative learning, 23 participants did not specify their answer (i.e., 'almost always'). Of the other 76 participants, 22% ($N = 15$) stated that collaboration takes place in 0 to 40% of their lectures, 29% ($N = 22$) in 41 to 60%, 11% ($N = 8$) in 61 to 90% of their lectures and 41% ($N = 31$) stated that students are allowed to collaborate in at least a part of every lecture.

There were 100 participants who answered the question about their approaches to assessment of collaborative learning. In 84 answers assessment of collaborative learning or collaborative assignments were part of the grade for the course. Out of those these 84 responses, 42 teachers answered that collaborative learning was assessed in a formative manner and 21 lectures answered that assessment of collaborative learning was formative as well as summative. Hence collaborative learning is assessed mostly in a formative manner and less used in a summative way.

Of the 96 participants who answered the question about peer assessment and peer feedback, 72% ($N = 69$) confirmed that students assess each other. Of those 69 teachers, 29% ($N = 20$) answered just 'yes'. Of the other teachers, 55% ($N = 38$) stated that peer feedback was used, 13% ($N = 9$) stated that peer assessment was used and 3% ($N = 2$) stated they use both.

Nine of the 10 interviewees reported that they designed their courses themselves. Six of them have a preference for doing so, because they can choose their own content and rely on how they want to interpret the course design. Although most interviewees designed their own collaborative learning courses, teachers are mixed with respect to the time they spend on designing the course. The following quote illustrates that designing collaborative learning is not a priority for some teachers:

> 'I think in general we are allowed to use very little of our time to design our courses, I think that's a pity. And this being so I consider a good content of more importance than collaborative learning.' (teacher 1, TE)

Some other teachers expressed a different perspective with regard to the time investment for the design of collaborative learning, as reflected in the following two excerpts:

> 'In designing a course I take as much time as it takes and I like to do it well and I don't like to do it only half, so I don't know. It is not clear for me how much time we are allowed to spend on this.' (teacher 10, TIS)

> 'I've noticed that we often use a lot of time to repair things that were not thoughtfully designed. And yes, I think if you gain time by doing it right, you could relatively use more.' (teacher 9, TIS)

2.3.1.1 Issues with the educational design of collaborative learning

The 10 interviewees mentioned six issues with designing collaborative learning in their courses: (a) the need for a gradual introduction of collaborative learning (students have to learn to collaborate), (b) to mind the growth of students' content knowledge, (c) learning effects of collaborative learning depend strongly on the group students are part of, which raises the question how groups should be composed, (d) groups often consist of students with different learning styles and different abilities, (e) different levels in learning objectives for collaboration should be established for novice students and intermediate students, and (f) how to assess the quality of the collaboration.

2.3.1.2 Issues with the implementation of collaborative learning

Six issues were mentioned in the interviews with the implementation of collaborative learning in courses: (a) disagreements and conflicts between students in a group, (b) free riding, (c) students who divide tasks and do not communicate with each other and with their teacher, (d) students who only appreciate feedback from their teacher and do not accept feedback from their peers, and (e) limited coaching skills of the teacher. According to one teacher the main bottleneck are the teachers themselves:

> 'Students are able and willing to learn to collaborate with appropriate guidance, but many teachers do not know how to communicate with students and how to guide them during collaborative learning.' (teacher 10, TIS)

In the interviews, the 10 teachers suggested eight aspects they would like to learn more about: (a) coaching and guiding collaborative learning, (b) developing a task that triggers students' collaboration and collaborative learning, (c) how to guarantee equal contribution of each student, (d) how to teach students to provide peer feedback and fostering a atmosphere in which peer feedback is considered valuable, (e) teaching students to be individually accountable for the task and the teamwork, (f) motivating students to collaborate, especially the students with a preference for individual learning, (g) assessment of the collaboration process, and (h) which criteria should be used to compile groups.
Below a teacher argues that she/he thinks students are not able to discuss rules and procedures in collaboration:

> 'You could ask students next time: is your group working all right? And they'll all say that they're fine. And then, one hour before the deadline a girl crying comes to your office saying: "Ben did nothing at all and I'm doing all the work". Those things come up at the last moment. They have difficulty in talking to each other about the way they behave. Yes, I do sound cynical but it is a generation hardly able to talk face-to-face. The only thing they are good at [red. texting gesture]. When I talk to the students it seems to me that they don't read books, they don't read papers, they don't watch television, in fact they do nothing at all. All they do is [red. texting gesture]. But what on earth are they texting about? I was at Avatar [red. a movie], a boy sitting next to me was texting the whole time. What are they talking about: what do you do? – I'm watching Avatar – what is it about – I don't know, I'm texting with you. But talking to each other and pointing out to each other their responsibilities, checking quality, that's what is really difficult for them.' (teacher 3, ESCM)

2.3.2 Relationship between collaborative learning practices and beliefs about collaborative learning

Table 5 provides the descriptive statistics for the three belief scales.

Table 5 Descriptive statistics of the collaborative learning belief scales by college

	TE (N = 34)		ESCM (N = 29)		ICTM (N = 16)		HC (N = 22)		TIS (N = 14))		Total (N = 115)	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
EB	3.62	0.82	2.95	0.71	3.48	0.49	3.59	0.61	3.34	0.68	3.40	0.74
LB	4.00	0.73	4.11	0.86	4.44	0.61	4.49	0.53	4.25	0.73	4.33	0.72
MB	4.62	0.64	4.31	0.97	4.38	1.01	4.20	0.77	4.21	0.70	4.38	0.83

Note. EB = Belief about the amount of effort that students are willing to dedicate to collaborative learning, LB = Belief that collaborative learning stimulates learning outcomes, MB = Belief that collaborative learning stimulates motivation.

Note. TE = Teacher Education, ESCM = European Studies and Communication Management, ICTM = ICT and Media, HC = Healthcare, TIS = Technology, Innovation and Society.

Paired t-tests showed that teachers reported significantly higher scores on beliefs about positive effects of collaborative learning on students' learning outcomes, $t(114) = 16.31$, $p < .001$, Cohen's $d = 1.29$, and on students' motivation, $t(114) = 12.45$, $p < .001$, Cohen's $d = 1.26$, compared to beliefs about students' effort in working collaboratively. A multivariate effect was found for 'use of collaborative learning' on the three types of beliefs about collaborative learning, Wilk's $\lambda(3, 103) = 0.91$, $p = .018$, $\eta^2 = .10$. The univariate results pointed out that lectures who applied collaborative learning showed higher scores on beliefs about students' effort in working collaboratively, $F(1, 110) = 6.23$, $p = .014$, $\eta^2 = .06$, and beliefs about positive learning effects of collaborative learning, $F(1, 110) = 9.63$, $p = .002$, $\eta^2 = .08$, compared to teachers who did not practice collaborative learning. Although they also showed higher scores on beliefs about positive motivational effects of collaborative learning, this difference was not significant. No significant differences were found for gender, age, years of teaching experience and graduation level.

2.3.3 Relationship between collaborative learning practices and arguments for applying collaborative learning

In Table 6, the arguments of the 102 lectures who mentioned that they used collaborative learning are presented. Each argument could be assigned more than one sub-code. In all 160 arguments were extracted.

A paired t-test showed that teachers use significantly more student-oriented arguments than teacher-oriented arguments for using collaborative learning in their lectures, $t(94) = 6.96$, $p < .001$, Cohen's $d = 1.15$). Table 6 shows that student-oriented arguments mostly referred to motivation (20%), reflection and feedback (25%), learning outcome (20%), learning skills (12%) and learning as professional practice (16%). Teacher-oriented arguments reflected mostly methods variation (9%), efficiency (5%) and task suitability (4%). Regression analysis showed that the more teachers varied their collaborative learning practices, the more they used student-oriented arguments for applying collaborative learning ($\beta = 0.21$, $p = .044$, $R2 = .03$). No significant effects were found for the covariates.

2.4 Discussion and conclusion

2.4.1 Collaborative learning practices in higher education

Most teachers participating in this study used collaborative learning in their lessons, although the variety in collaborative learning practices of these teachers was quite limited. The teachers in this study considered the design of collaborative learning to be a complicated task, and they realised that it often did not lead to collaborative learning the way they wanted. The findings confirm what Cohen (1994) noted in her seminal review, that is, that teachers appear to have difficulty in realising collaborative learning settings due to limited knowledge of empirical and theoretical perspectives on collaborative learning, and sometimes appear incapable of transferring this information to a practical application. Regarding the assessment of collaborative learning, half of the teachers pointed out that assessment of collaborative learning is used in a formative manner and a quarter also used assessment of collaborative learning in a summative manner. More than half of the teachers confirmed that their students were involved in the assessment of their peers.

Table 6 Frequencies of Student (S) and Teacher (T) oriented arguments by college

Orientation	Argument	TE	ESCM	ICTM	HC	TIS	Total	%
Student	Motivation/activation	10	3	1	5	1	20	13
	Attitude/responsibility	4			2	1	7	4
	Reflection/feedback	13	3	2	6	1	25	16
	Supportive	1				2	3	2
	Learning outcome	6	4	2	6	2	20	13
	Learning skills	3	6		3		12	8
	Learning knowledge	4	1		2		7	4
	Learning interaction		2	2	4	1	9	6
	Professional practice	2	3	3	5	3	16	10
Teacher	Efficiency	3		1	2	2	8	5
	Method variation	9	4		2		15	9
	Task suitability	1	1	1	2	2	7	4
	Vision on education	3		2			5	3
	Obligatory component		2	3			5	3
	Insight in students			1			1	
S-oriented arguments		43	22	10	33	11	119	76
T-oriented arguments		16	7	8	6	4	41	24

Note. TE = Teacher Education, ESCM = European Studies and Communication Management, ICTM = ICT and Media, HC = Healthcare, TIS = Technology, Innovation and Society.

Although the teachers felt a mismatch between what they designed and what they see in practice, all lectures designed their courses themselves. They added that they designed collaborative learning intuitively, based on their own experience, and would appreciate to design a course in collaboration with colleagues. However, time to design collaborative learning is limited. Oortwijn et al. (2008) already emphasised that it takes time and effort to create a course with collaborative learning that works in an effective and efficient way. According to Goodyear, Dimitrias and Retalis (2009) the design of useful and pedagogical effective (interactive) learning environments, that also meets demands of efficiency and cost, is a stringent assignment and requires a considerable amount of creativity and experience. They argue that the use or reuse of design patterns, i.e. a solution for recurring design problems, is an effective approach to communicate experiences with excellent (collaborative learning) educational designs.

2.4.2 Relationship between collaborative learning practice and beliefs about collaborative learning

The teachers' beliefs about positive effects of collaborative learning on students' learning outcome and student motivation were clearly more positive than their beliefs of 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. No significant differences were found for gender, age, years of teaching experience and graduation level. In contrast to the findings of Norton et al. (2005), no difference was found in collaborative learning beliefs between teachers from different colleges.

2.4.3 Relationship between collaborative learning practice and arguments for applying collaborative learning

The arguments presented by teachers for the use of collaborative learning, are more student-oriented than teacher-oriented. This is congruent with the findings of Norton et al. (2005) that beliefs (in combination with the academic and social context) lead to similar teaching intentions; in this case to student-oriented teaching intentions. 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.

2.4.4 Limitations

The beliefs as well as the practices reported in this study were measured by self-reports: survey and interview. 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). In this case, teachers with certain beliefs might have responded in congruence with their ideas about their practices, which might have led to the observed relationship between practices and beliefs. Nevertheless, Donche, Vanhoof and Van Petegem (2003) also applied self-reports and found that student teacher beliefs were influenced by different learning practices by different teacher training institutions. Likewise, Cohen and Zach (2012) found that self-reports on student teachers' self-efficacy related to their lesson plans (practices).

2.4.5 Implications

Although collaborative learning is frequently used by teachers in higher education, their justification to use collaborative learning is student-oriented and their beliefs about collaborative learning are moderately positive, the practices are still not (yet) aligned with their beliefs about collaborative learning. Although this study was a small-scale study with some 100 teachers of five colleges in higher education, designing and implementing collaborative learning in higher education seems to be a complicated and demanding task, which should be supported and facilitated in the professional development of teachers. Research into their own teaching practices could increase teachers' awareness of their practices and of the inconsistencies between their practices and beliefs. This kind of critical reflection on their teaching seems to be an essential condition for changing teaching practice to be more aligned with beliefs about collaborative learning. In this way, teachers could become more proficient in the use of collaborative learning and they add new insights to the existing knowledge base on collaborative learning in higher education (cf. Scholarship in Teaching and Learning, see e.g., Hutchings, 2010).

The results of this study justify further research into potential methods for teachers to achieve effective interaction in collaborative learning by means of an educational design. Below out two possible topics of future research on collaborative learning in higher education are pointed out.

Some of the teachers tended not to be satisfied regarding the large number of projects involving collaboration between students. This leads to the question whether and/or what kind of equilibrium can be found between individual and collaborative learning, concerning the learning outcomes and the relation to professional activities in the students' future.

Analysis of the teachers' answers to the open-ended questions and from the interviews, it is evident that they consider free-riding and therefore the grading of collaborative learning a difficult task. Kagan (1995) describes group marks as absolutely unfair, undermining the positive effects of collaborative learning. Research findings regarding different assessment practices and a fair grading could contribute to the motivation of teachers to apply collaborative learning in their courses and to the motivation of students to make a serious effort during collaborative learning.

Based on the results of the current study, it can be concluded that collaborative learning can contribute to motivation and domain knowledge as well as to the skill of collaborative learning. However, lectures also experience many difficulties in achieving an effective design as well as meaningful and effective implementation of collaborative learning in their courses. In sum, this signifies an urgent need for formulating practical guidelines to provide professionals in education the possibility to utilise the surplus collaborative learning has to offer.

— CHAPTER 3 —

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

Chapter 3 A comprehensive framework for the design of group learning activities in higher education[2]

In this chapter a thematic review is performed to synthesise insights from various approaches for designing group learning activities (GLAs) into one comprehensive framework. This comprehensive framework, the Group Learning Activities Instructional Design (GLAID) framework, includes eight components: (1) interaction, (2) learning objectives, (3) assessment, (4) task characteristics, (5) structuring, (6) guidance, (7) group constellation, and (8) facilities. Each component, associated design decisions, and the corresponding design process are described. The GLAID framework aims to guide teachers in higher education in designing, implementing, and evaluating GLAs in their courses.

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3.1 Introduction

Group learning activities are a key ingredient of course designs in higher education and refer to activities during the learning process in which students collaborate in small groups to contribute to the attainment of mutual goals (Janssen, 2014). GLAs can be found in face-to-face, online (often also referred to as Computer Supported Collaborative Learning (CSCL), e.g. Isotani, Mizoguchi, Inaba, & Ikeda, 2010; Villasclaras-Fernández, Hernández-Leo, Asensio-Pérez, & Dimitriadis, 2009) and blended learning environments (i.e. Dillenbourg, 2002; Yeh, 2010). Group learning activities are claimed to foster higher-order skills (Kollar, Fischer, & Hesse, 2006) and shared knowledge construction (Hämäläinen & Vähäsantanen, 2011; Hmelo-Silver, 2004). In this thematic review, the term "Group Learning Activities" (GLAs) (Brown & McIlroy, 2010; Tomcho & Foels, 2012) is adopted to include terms such as collaborative learning, cooperative learning, problem-based learning and team-based learning. These terms all emanate from the constructivist view of learning and instruction (Kirschner, Martens, & Strijbos, 2004). Although the principles of learning environments can be different regarding a number of aspects, such as the origin of the domain, the flexibility of the format and the underlying learning theories, they have in common that students need to work together to attain learning benefits that cannot be attained by working individually.

Even though GLAs can contribute to learning outcomes such as students' engagement in learning and improvement in their higher-order thinking skills (Järvelä, Volet, & Järvenoja, 2010; Johnson & Johnson, 2003), these learning objectives are not always attained (Fransen, Kirschner, & Erkens, 2011; Hmelo-Silver, 2004; Janssen, 2014). Four factors decrease the likelihood that GLAs will lead to the desired learning outcomes:

(1) Resistance of students and teachers. Payne, Monk-Turner, Smith, and Sumter (2006) found that appropriate scaffolding of group work is necessary to overcome teachers' and students' resistance to GLAs.

(2) Problems with the use of technology to support GLAs. Technology to support GLAs, although present, is hardly used, because it is not user friendly or teachers are not trained in the use of the specific technology. Dillenbourg (2013) advocates orchestration, which includes the integration of pedagogy and technology.

(3) Designs of GLAs are not grounded in theories on teaching and learning. Hämäläinen and Vähäsantanen (2011) conclude that the designs of GLAs should be better grounded in theoretical knowledge about orchestrating, scaffolding, facilitating, and supporting students in the process of shared knowledge construction.

(4) Design components are not aligned. Design components – such as learning goals, task characteristics, instructions on how to collaborate, and support of this collaboration – are worked out separately (Dennen & Hoadley, 2013; Hämäläinen & Vähäsantanen, 2011; McLoughlin, 2002; Strijbos, Martens, & Jochems, 2004). Alignment of the components means that, in every decision about a component, the designer takes into account every decision made regarding other components in former steps.

These factors stress that the design of GLAs is a crucial issue to be considered for successful implementation of GLAs in higher education settings.

The issue of GLA-design is not new and various approaches for the design of GLAs exist. However, they differ in their design components and how the design process is structured. Moreover, the metaphors and vocabulary differ as well: designing for interaction (Strijbos, Martens, & Jochems, 2004), scripting (Kollar, Fischer, & Hesse, 2006),

orchestrating (Dillenbourg, 2013; Hämäläinen & Vähäsantanen, 2011), and scaffolding (McLoughlin, 2002). This variety makes it difficult for teachers to determine how to design a GLA. The current review aims to generate a comprehensive generic framework (for face-to-face, online and blended contexts) for the design of a GLA from a constructivist view on learning and instruction. The majority of research on the design components and the design process focuses on specific components of (the design of) GLAs (e.g., the most appropriate instruction to increase the effectiveness of small group interaction, such as the studies of Webb, Franke, Tondra, Chan, Freund, Shein and Melkonian (2009) and Saab, Van Joolingen and Van Hout-Wolters (2007)).

This chapter aims to generate an overview of existing design approaches of GLAs as well as a synthesis of these approaches to determine the crucial components for the design of GLAs in order to support designers and teachers in this complex matter. Hence, a thematic review for design approaches of GLAs was conducted, guided by the following research questions:

(1) How can the components of designing GLAs be synthesised into one comprehensive framework?

(2) How can teachers in higher education use this comprehensive framework in the design of GLAs?

3.2 Method

3.2.1 Procedure

In February 2014, a literature search was carried out using a combination of databases that are commonly used in systematic literature reviews, such as ERIC (Educational Resources Information Center), PiCARTA, Web of Science, Science direct, Taylor and Francis online, Sage Publications, Springerlink, Directory of Open Access Journals (DOAJ), PsycINFO, and Wiley Online library. The following search terms were used: "educational design", "instructional design", instruction*, "problem based learning", "team based learning", "inquiry based learning", "assignment", "task", "teacher role", "assessment", and "orchestration". These terms were combined with collaborati* or cooperati* or team* or group*/ or collective* (with * as a joker). The search terms were used in combination with the following basic criteria:

(a) manuscripts in English;
(b) studies in peer-reviewed journals, book chapters, or conference proceedings;
(c) manuscripts published after 2001.

The year 2001 was chosen because in the narrative review of Strijbos et al. (2004) on the design of computer-supported group-based learning the latest references used are dated 2001. The intention for the current review was to follow-up as well as to broaden the review of Strijbos et al. (2014).

3.2.2 Data

The searches yielded 1573 hits from which manuscripts with a main research focus on group learning *activity of students* were selected. Manuscripts were excluded if they, for example, referred only to students' *perceptions* of GLAs, or concerned studies about *schools* collaborating. This first selection contained 230 relevant studies. The selection was subsequently narrowed to a set of studies that was explicitly focused on the design of group learning activities, leading to 110 studies (second selection, see appendix B). Next, these 110 studies were analysed using the following criteria:

(a) the design of GLAs covers a time period that is longer than one lesson,
(b) the design of GLAs includes at least two *components*, which are instructional design features that can be manipulated,
(c) the study describes an overview of how to design GLAs based on peer reviewed literature (meta-study: narrative review, meta-analysis or theoretical abstraction).

An overall design approach of GLAs was initially identified in 12 meta-studies out of the selection of 110. In order to assure the reliability of this selection, the co-authors analysed in total 20 manuscripts out of the set of 110 studies; 15 of these were randomly selected and 5 manuscripts were selected because the first author had doubts whether these manuscripts could be considered design approaches. The co-authors assessed whether the manuscripts met the criteria for an overall design of GLAs and, therefore, should be included. The result was that one more meta-study (Chiriac & Grangström, 2012) was added to the selection of articles on design approaches. Furthermore, references that were identified as design approaches were further checked (snowballing) for any design approaches that did not show up previously. This yielded one more article used in the final selection (Kutnick, Blatchford, & Baines, 2002). Therefore, the final selection that used for analysis consisted of 14 meta-studies.

3.2.3 Analysis

In order to answer the first research question 'How can the components of designing GLAs be synthesised into one comprehensive framework?' a matrix of the 14 meta-studies was composed to (a) generate an overview of the design components per study, and (b) identify design components used across meta-studies for the design of GLAs. As a starting point for the analyses, Strijbos et al.'s (2004) study was used, which defines and describes six components for the design of GLAs: (1) interaction, (2) learning objectives, (3) task type, (4) level of pre-structuring, (5) group size, and (6) computer support. If a component was confirmed in at least two of the other meta-studies, this component was kept in the final comprehensive framework. If a new component was mentioned in at least two of the other meta-studies, it was added to the framework. This procedure led to a framework with eight components, which will be described in the results section.

This framework differs from the approach of Strijbos et al. (2004) in three ways: (1) Strijbos et al. (2004) focus on critical elements that directly shape interactional processes in a small group, whereas the new framework also includes elements that more indirectly shape the interaction in groups (i.e., guidance and assessment), (2) the new framework adopts a whole class and course perspective instead of the rather narrow small group perspective, (3) the aim is for the new framework to be applicable to face-to-face, blended and online learning environments, whereas the approach of Strijbos et al. (2004) is solely about online learning. The analysis resulted in two additional components (Assessment and Guidance) and an extension of three of Strijbos et al.'s (2004) original components: "group size" was extended to "group constellation", "pre-structuring" was extended to "structuring" and "computer support" was extended to "facilities".

To answer the second research question, 'How can teachers in higher education use this comprehensive framework?' an adequate procedure to guide teachers through the design process was searched for. Therefore, it was necessary to determine whether the components should be designed in a specific order (and if so, which order) and how the alignment between the components could contribute to a comprehensive design. To this end the ADDIE model (Reigeluth, 1999; Ross et al., 2008) was opted for. This is a general instructional design model that summarises the design process in five steps: (1) Analysis, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation.

3.3 Results: Design components of group learning activities

The 14 meta-studies considered to describe a design approach of group learning activities consisted of two book chapters (Dennen & Hoadley, 2013; Dillenbourg, 2002), two meta-analyses (Janssen, 2014; Tomcho & Foels, 2012), eight literature reviews (Gros, 2001; Hämäläinen & Vähäsantanen, 2011; Hmelo-Silver, 2004; Kobbe, Weinberger, Dillenbourg, Harrer, Hämäläinen, Häkkinen, & Fischer, 2007; Kollar, Fischer, & Hesse, 2006; McLoughlin, 2002; Strijbos, Martens, & Jochems, 2004; Wilson, Ludwig-Hardman, Thornam, & Dunlap, 2004), and two literature reviews that also use empirical research to underpin their literature review (Chiriac & Granström, 2012; Kutnick, Blatchford, & Baines, 2002). Before describing the eight components, first the label of each component is related to the terminology/labels used in the 14 meta-studies that were reviewed.

The component "interaction" was found in six studies (Dillenbourg, 2002; Gros, 2001; Hämäläinen & Vähäsantanen, 2011; Janssen, 2014; Kutnick, Blatchford, & Baines, 2002; Strijbos et al., 2004). Two other studies also refer to interaction, but use a different terminology: (1) Wilson et al. (2004) use "Progressive Discourse" to describe the process of sharing, questioning and revising opinions within a learning community, and (2) Dennen & Hoadley (2013) use "discourse norms and values" to refer to participation expectations and process contributions of the learners.

The component "learning objectives and outcomes" was found in nine of the fourteen studies although the terminology differed: learning goals (Dennen & Hoadley, 2013; Hämäläinen & Vähäsantanen, 2011; Hmelo-Silver, 2004; Janssen, 2014), learning objectives (Kollar, et al., 2006; Strijbos et al., 2004), shared goals (Wilson et al., 2004), learning orientation (Dillenbourg, 2002) and goal orientation (Mc-Loughlin,2002).

Assessment is explicitly mentioned as a component by Chiriac and Granström (2012). Tomcho and Foels (2012) included the component "peer-assessment". In other studies, assessment is not explicitly mentioned as a separate component, but four studies referred to an assessment of the GLA that is to be designed: Dillenbourg (2002) speaks of "task completion criteria", Janssen (2014) refers to assessment when he describes rewards based on group or individual performance related to interdependence of the participants, and Strijbos et al. (2004) suggest to consider in the design of a GLA the grading of students.

Only Janssen (2014) used the term "task characteristics", although in seven of the studies similar terminology is used: tasks (Chiriac, & Granström, 2012; Gros, 2001; Kutnik, Blatchford, & Baines, 2002), task definition (Dillenbourg, 2002;), task types (Strijbos et al., 2014), task complexity (Tomcho & Foels, 2012), or task structures (Hämäläinen, &Vähäsantanen, 2011). In the other studies, authors refer to the task characteristics implicitly, such as using the "activities" (Kobbe et al, 2007; Kollar et al., 2006), "events and activities in collaboration scripts" (Dennen, & Hoadley 2013), and "role of the problem" (Hmelo-Silver, 2004). The term "task characteristics" was chosen, because this word seems to cover all terms related to the task in the other studies.

The component structuring refers to "roles" in four of the studies: Dennen and Hoadley (2013), Gros (2001), Kobbe et al. (2006) and Kollar et al. (2007). The term "distribution" is used by Dillenbourg (2002) when he refers to structuring. Finally, Chirac and Granström (2012) refer to structuring as "participation" ("all members take part in the work", p. 353), Strijbos et al. (2004) refer to "level of pre-structuring", Janssen (2014) refers to " pre-activity preparation" and Wilson et al. (2004) to "mutual appropriation". The term

Structuring, because this can take place before, during and after the collaboration.

The guidance component is referred to as the "role of the teacher" in four studies (Chiriac, & Granström, 2012; Hämäläinen, & Vähäsantanen, 2011; McLoughlin, 2002; Wilson, et al., 2004), and by Dennen and Hoadley (2013) as "Types of facilitation", by Gros (2001) as "tutoring", by Hmelo-Silver (2004) as "role of the facilitator", and by Kutnik et al. (2002) as "adult presence and support of groups".

The group constellation component is not used as a label in any of the studies, however, Strijbos et al. (2004) and Tomcho and Foels (2012 both refer to "group size", and other studies refer to "group composition" (Chiriac, & Granström, 2012; Dennen, & Hoadley, 2013; Dillenbourg, 2002; Hämäläinen, & Vähäsantanen., 2011; Janssen, 2014; Kobbe et al., 2007; Kutnik et al., 2002). The term "group constellation" was chosen, because "constellation" does not only refer to group size or how groups are composed but also to why groups are composed in a specific way.

The final component "facilities" is referred to by Dillenbourg (2002) as "mode of interaction", by Gros (2001) as "telematic support", by Hämäläinen and Vähäsantanen (2011) as "External resources", by Janssen (2014) as "Tools, support and scaffolds", and by Kobbe et al. (2007) as "Resources". However, these authors do not only refer to computer support, as Strijbos et al. (2004) do, but also to other means to support learners in GLAs, such as books, cases to work with, etc. Therefore the term "facilities" was opted for.

In the following section the eight design components will be described in more detail and they will be related to the original design approaches for GLAs. Furthermore, possible design decisions are distinguished that are discussed in the 14 meta-studies. These design decisions refer to considerations and choices teachers can make when designing a particular component.

3.3.1 Interaction

In the context of GLAs, "interaction" refers to the process of collaboration needed to attain the learning goals (Dillenbourg, 2002; Janssen, 2014; Strijbos et al., 2004; Wilson et al., 2004). There are two design decisions that can be addressed according to the studies considered in this review: (a) interaction about *declarative and procedural (domain) knowledge*, and (b) interaction as *social and metacognitive activities*.

In his literature review, Janssen (2014) distinguishes interaction aimed at gaining deeper understanding of the knowledge domain (for example, verbalizing ideas, asking questions to elicit important content information) and interaction aimed at attaining and maintaining a shared understanding of the task, well-being of group members, and group cohesion. The latter kind of interaction includes meta-cognitive activities that consist of regulative activities such as planning, monitoring, and evaluating the collaboration. Other authors also address the collaborative interaction process, including (meta-) cognitive and social activities of students by which they learn to understand each other and to regulate their way of working in GLAs (Dennen & Hoadley, 2013; Dillenbourg, 2002; Gros, 2001; Hämäläinen & Vähäsantanen, 2011; Hmelo-Silver, 2004).

3.3.2 Learning Objectives and Outcomes

The second design component extracted from the selection of studies refers to learning objectives or learning goals. Learning objectives are defined as the intended learner outcomes regarding declarative and procedural (domain-specific) knowledge or (social) skills. Strijbos et al. (2004), and Dillenbourg (2002) emphasize that learning objectives should be designed

simultaneously with the desired interaction. In the studies the following design decisions for the learning objectives component were found: (a) *the goal setting*, and (b) t*he content of learning*.

Goal setting. The design can focus on individual learning goals (e.g., learning to give feedback to a peer or to acquire knowledge about a particular topic) as well as group learning goals (such as achieving shared understanding) (Janssen, 2014). Wilson et al. (2004) emphasize that "(...) by establishing goals and rules that mandate interaction and co-dependence, students can develop a shared goal that gives real purpose in collaboration" (p. 5). Thus, learning objectives do not always have to be set in advance by the teacher, but can also be formulated collaboratively by the students during the process of a GLA. Moreover, Kollar, Fischer, and Hesse (2006) state that the "goal-setting control", i.e., who has control over determining what the learning goals are, is also part of the design of GLAs. Learning goals may be set by the educational designer or the teacher, but also by the students themselves, possibly together with the teacher.

Content of learning. In his literature review, Janssen (2014) describes two types of learning objectives: 1) declarative and procedural knowledge about a specific domain or subject and 2) social skills, such as how to give each other compliments, provide positive feedback, and contribute to group cohesion. Gros (2001) also distinguishes two kinds of learning objectives, which she labels "specific content" and "procedural learning". Hmelo-Silver (2004) labels learning goals related to these social skills as the learning objective of knowing how to function well as part of a team. Both Hämäläinen and Vähäsantanen (2011) and Kobbe et al. (2007) emphasize an "open" design of the learning goals. The former authors state that "the learning goal and its contextual needs set the limits for how much learning should be designed and instructed" (p. 179), and the latter authors claim that the type and the degree of learning depends on the kinds of activities that are described in the collaborative task. This perspective relates to the studies by Dennen and Hoadley (2013) and Strijbos et al. (2004), who emphasize that in collaborative learning the learning outcomes are probabilistic. This means that it depends on the context which particular learning goals can be achieved by the learners through the GLA, and to what extent.

3.3.3 Assessment

The assessment component refers to measuring the extent to which students attain the learning goals of a GLA design. The description of assessment in the 14 studies leads to the conclusion that teachers should decide on (a) what means they will use for the assessment (Janssen, 2014; Strijbos et al., 2004; Tomcho & Foels, 2012) and (b) what criteria they will use (Dillenbourg, 2002; Chiriac & Gronström, 2012). These 'big' decisions about assessment are based on other 'smaller' decisions such as:

1) *Individual or group assessment*: whether an individual or a group assessment is conducted, or a combination of both. Chiriac and Granström (2012), for example, emphasize that the reward system should match the task, and that assessment procedures should stress group as well as individual accountability.
2) *Assessor*: this refers to the use of co-assessment, peer assessment, and self-assessment. Tomcho and Foels (2012) discuss the contribution of peer assessment in relation to the effectiveness of group learning activities. They suggest, in line with Chiriac and Granström (2012), that if peer assessment is used the criteria should be clear and developed together with the students.
3) *Formative or summative*: this concerns the decision to use assessment for learning or

assessment of learning. The probabilistic outcome and the decision whether goals should be fixed or focused (Dennen & Hoadley, 2013; Strijbos et al., 2004) require consideration of whether the assessment should be formative or summative.

4) *Number, timing, and integration* of assessment measures. One of the task characteristics of a GLA (described in 3.4) implies that it can be divided into several phases (Dennen & Hoadley, 2013; Dillenbourg, 2002; Kobbe et al., 2007; Kollar et al., 2006) that contain different activities in which students work on the attainment of (a variety of) learning objectives. This variety of learning activities can be assessed separately or as a whole.

3.3.4 Task Characteristics

The task characteristics are the activities that students have to perform to attain the learning objectives. From the studies the following design decisions that teachers at least should make in designing a task for GLAs were derived: (a) *kind of activities* (task type), (b) *phases in or sequencing of activities,* (c) *duration and frequency of group meetings,* and (d) *performance control.*

Kind of activities. Requirements for tasks that result in "real group work" imply that a task demands common effort, employing the group's competence and joint problem solving (Chiriac & Granström, 2012). As task types for GLAs, complex authentic tasks, i.e., tasks that require open skills (i.e., Gros, 2001; Hämäläinen & Vähäsantanen, 2011; McLoughlin, 2002), and activities that concern problem solving (i.e., Hmelo-Silver, 2004) are often recommended for GLAs.

Phases in or sequencing of activities. In a GLA, the task can consist of several activities in a particular sequence (Dennen & Hoadley, 2013; Dillenbourg, 2002; Kobbe et al., 2007; Kollar et al., 2006). The sequencing of activities can also be referred to as dividing GLAs into different phases. The activities can be collaborative, but it is also possible that one or several phases include individual activities. It should be specified for each phase how the students should collaborate (component Structuring, see 3.5) and how they are to work on the task.

Duration and frequency. According to Dillenbourg (2002), the duration of the activities of students in a task should be designed as well. Therefore, it may be beneficial to determine whether a certain frequency of collaboration is necessary and how many group meetings are required.

Performance control. In line with the learning objectives and the assessment, the design of the task implies considerations about who decides how the task will be performed, that is, the performance control (Kollar et al., 2006): the teacher, the students, or the teacher together with the students.

3.3.5 Structuring

Collaborative interaction between students does not automatically develop and continue during GLAs. Therefore, some kind of structuring is needed to support the process, ensuring positive interdependence and individual accountability (Johnson & Johnson, 2009). From the 14 studies can be concluded that teachers can decide during different phases of GLAs how to structure the GLAs, distinguishing between (a) structuring *a priori,* (b) structuring *during GLAs,* and (c) *reflection on and evaluation of* the collaboration.

Structuring a priori. In the14 studies the framework is based upon, the use of roles is considered an important approach to structure student interaction (Dennen & Hoadley, 2013; Dillenbourg, 2002; Gros, 2001; Janssen, 2014; Kollar et al., 2006; Kobbe et al., 2007; Strijbos et al., 2004). Strijbos et al. (2004) describe structuring of GLAs along the

continuum highly structured (strong task division) to poorly structured (no task division). Janssen (2014) describes two ways to structure the interaction: reward-interdependence (e.g., giving a group grade) and task-interdependence (e.g., dividing the resources amongst group members or by assigning roles). Supporting materials (also described in the facilities component: 3.8) can be distributed amongst students to induce social interdependence – students need other students to access the resources (Kobbe et al., 2007; McLoughlin, 2002) – or to induce controversy by providing students with materials containing conflicting evidence (Hämäläinen, & Vähäsantanen, 2011). Wilson et al. (2004) state that a designer needs to establish clear rules and support for including all group members in the activities and decision-making processes. In other words, teachers should include students in the collaboration process by structuring it. Another way to structure how students should collaborate before they start working on a GLA is to provide them with training in collaborative skills. Such training can contribute to on-task behaviour, higher levels of task-related discussions, high-level elaborations, and social skills (Janssen, 2014).
Structuring during GLAs. Structuring during GLAs gives the teacher the possibility to adapt the way students collaborate. Structuring the collaboration during the activities is described, for example, by Chiriac and Granström (2012), who state that the teacher needs to support student collaboration during the group work. McLoughlin (2002) states that teachers should monitor the collaboration of their students and intervene during the process. She describes that in online settings it is possible to provide students with scaffolds for collaboration using tutorial supports, for example, by using a FAQ (frequently asked questions)-tool with input from a moderator if needed.

Reflection and evaluation. Related to structuring is reflection on and evaluation of the collaboration and interaction by students. Hmelo-Silver (2004) states that after completion of the task students should reflect on whether they attained the learning goals, how they collaborated, and how they managed to direct their own learning. Gros (2001) and McLoughlin (2002) also stress the importance of evaluating the collaboration process to help students determine how well their group is functioning.

3.3.6 Guidance

"Guidance" is defined in the framework as the coaching of students during GLAs, supporting their learning process during collaboration. In the studies the following decisions need to be made for the design of the guidance were found: (a) *executor*: who guides the students (i.e., teacher, peers, software), (b) the *teacher's role* (i.e., facilitator, expert, coach, or observant), (c) the *communication mode* (e.g., oral, written, or electronically such as email, texting, or discussion fora), and (d) the *duration and the timing* of the guidance (i.e., in what phase do the learners need which form of support).

Executor. The guidance can be performed by persons or technology. The teacher may guide the GLA, but the collaborating students also may guide their peers during a GLA. Kutnick et al. (2002) describe that it should also be considered whether groups can work on a GLA autonomously, guiding themselves during the assigned task. Furthermore, technology can support students in the GLA, for example, Kollar et. al. (2006) examined prompts or guiding questions for learners to discuss a particular topic.

Teachers' role. The teachers' role can consist of monitoring interaction and learning (Dennen & Hoadley, 2013; Dillenbourg, 2002; Gros, 2001; Hmelo-Silver, 2004; Wilson et al., 2004), guiding and supporting student activities (Chiriac and Granstrom, 2012; Dennen & Hoadley, 2013; Gros, 2001; Hämäläinen and Vähäsantanen., 2011; Kutnick

et al., 2002; Wilson et al, 2004), providing feedback on the collaboration and the outcomes of student activities (Dennen & Hoadley, 2013; Dillenbourg, 2002), and evaluating the process of collaboration and learning (Gros, 2001; McLoughlin, 2002).

Communication mode. The guidance of a GLA can be performed orally by the teachers or the peers in a face-to-face or electronic group meeting (e.g., video-conference), but also written (electronically). McLoughlin (2002) for example describes threaded computer conferencing when a problem should be solved collaboratively.

Duration and timing. As GLAs can consist of different phases, the extent of the guidance and the kind of guiding activities can differ per phase. Guiding the process of a GLA is a subtle skill (Dillenbourg, 2002; Hmelo-Silver, 2004). It requires the teacher to be proficient in metacognitive questioning. Furthermore, the teacher should be skilled at posing questions that focus students' attention on the learning goals and the task. The guidance should also aim at eliciting causal explanations. Timing the different phases of a group learning activity and thereby also the timing of the guidance is important. Teachers should determine whether the guidance is obligatory (at fixed moments or a specific number of times) or on demand (Dillenbourg, 2002; Strijbos et al., 2004). Hämäläinen et al. (2011) stress that teachers need to consider how to give guidance *at the right moment* (when and for as long as it is needed).

3.3.7 Group Constellation

Group constellation refers to how groups of students are composed. Based on the 14 studies, at least the following design decisions should be taken into account: (a) *number of groups* and *group size*, (b) *heterogeneous or homogeneous groups*, and (c) *group duration*.

Number of groups and group size. Depending on the learning goals and task characteristics, and the number of students taking part in a course, the number of groups and the group size can vary (Kobbe et al., 2007; Kutnick, et al., 2002). For example, Kutnick et al. (2002) found that teachers mostly teach dyads and triads in tasks that involve application of knowledge to new areas, and that teachers teach with large groups (7-10) for tasks that involve introduction of new information. Both the quantity and the quality of the interaction between participants are likely to differ with different group sizes (Chiriac & Granström, 2012; Janssen, 2014; Strijbos et al., 2004). Chiriac and Granström (2012) found that students consider a group with about three members the optimal size, and students feel that larger groups (more than six members) are a hindrance to good group work. However, both Janssen (2014) and Strijbos et al. (2004) state that the effects of group size are inconclusive and further research is needed

Heterogeneous or homogeneous. The composition of the groups can be either homogeneous or heterogeneous (Dennen & Hoadley, 2013; Janssen, 2014), which influences the productivity of the student interaction (Hämäläinen & Vähäsantanen, 2011). The criteria used for the composition can be either set externally, for example, by age, gender, friendship, level of ability or expertise, domain of expertise, or geographical, social, or cultural background, or set internally by, for example, student behaviour or the products of previous phases of the GLA (Dillenbourg, 2002).

Group duration. In their meta-analysis, Tomcho and Foels (2012) found a negative relationship between group duration and learning outcomes: the learning outcomes diminish as the time the same students work together increases. They suggest varying the group constellation during a GLA. In contrast, Wilson et al. (2004) stress the importance of continuing in identical groups in subsequent courses as this stimulates a collective identity

within bounded learning communities in formal courses. Therefore, it is suggested that group duration should be aligned with the task characteristics as well as with duration of the activities. As activities can differ per phase of the GLA, the teacher also has to decide whether each phase should have different groups or not (Tomcho & Foels, 2012).

3.3.8 Facilities

The component Facilities embraces all supporting materials, virtual and physical, to facilitate GLAs. The authors of the studies mention the following design decisions of the facilities component: (a) *learning resources,* (b) *technology resources,* and (c) *space and time* for the GLA.

Learning resources. Learning resources can consist of (a) information resources, e.g., books, articles, websites, case descriptions, concept maps, or graphical diagrams, (b) functionality resources, e.g., software, tools such as calculators, libraries or dictionaries, and (c) modifiable resources, e.g., argument sheets or tables to complete (Kobbe et al., 2007). Those resources can be made available physically or on computers.

Technology resources. In this design decision is referred to the use of computers, mobile phones, and any other possible technology students can use to communicate, interact, and collaborate. For example, teachers can decide whether students collaborate with technology or through technology, whether technology is used to support synchronous or asynchronous collaboration, and whether technology is used as a resource to facilitate and structure GLAs (Dillenbourg, 2013; Strijbos et al., 2004), to online assess GLAs (Strijbos, 2011), or to implement learning analytics (Suthers & Verbert, 2013).

Space and time. In terms of contextual settings, two more aspects could be considered: the time students have available to work on the GLA (Chiriac & Granström, 2012; Dillenbourg, 2002) and the available physical and/or electronic space for the groups to work together (Chiriac and Granström, 2012; Gros, 2001).

3.4 Results: Alignment of the components

To design GLAs it is necessary to determine how the eight components should be used in the design process. This means that a decision has to be made in which order the components should be designed as well as how they can be aligned. Alignment between the components is described by several studies as very important for a successful design (Dennen & Hoadley, 2013; Hämäläinen & Vähäsantanen, 2011; McLoughlin, 2002; Strijbos et al., 2004), but specific recommendations on how to achieve such alignment are missing. In order to shape the alignment in the design of GLAs the ADDIE model is used (a general model commonly used for instructional design). The Group Learning Activities Instructional Design (GLAID) framework thus mirrors the five general steps of instructional design (see Table 1). Only steps 2 and 3 refer to the design of GLAs; the other steps are not specific to the design of GLAs and include preparing the design (step 1) or refer to activities that occur after the design: the implementation and the evaluation (steps 4 and 5).

Step 1: Analysis. The process of designing a group learning activity starts with determining the *fixed characteristics* of the learning environment. The teacher ascertains what characteristics are already fixed in the curriculum, (e.g., the number of students), and what characteristics should be fixed: (e.g., whether there should be criteria for the students to be allowed to participate). The teacher inquires what is already known about student characteristics, for example their prior knowledge about collaboration and the learning content (Brown & McIlroy, 2011; Kobbe et al., 2007, Kollar et al., 2006). If the teacher who designs the GLA does not conduct the GLA, she/he also needs to determine (a) characteristics of the teacher(s) assigned to conduct the GLA, such as experience in and knowledge about the domain and guiding group learning activities (Hämäläinen, & Vähäsantanen, 2011; Ozdilek, & Robeck, 2009; Siegel, 2012; Van den Akker, McKenney, Nieveen, & Gravemeijer, 2006), and (b) curriculum characteristics, such as the social and physical characteristics of the learning environment and the cohesion of the different curriculum parts (Van den Akker et al., 2006). The designer also needs to decide on the collaborative premise (Dennen & Hoadley, 2013; Van den Akker et al., 2006): why students need to work together. Three of the 14 studies stress the importance of determining the fixed characteristics beforehand (see Hämäläinen & Vähäsantanen, 2011; Kobbe et al., 2007, Kollar et al., 2006).

Step 2: Design. The design of three components is included in step 2: interaction, learning objectives and outcomes, and assessment. These components are designed simultaneously because they need to be aligned with one another, and with the fixed characteristics of step 1.

Step 3: Develop. In step 3, the design activities are divided in two sub-steps: the instructional strategies (step 3a), and the logistics, which are the organizational decisions needed to facilitate the instructional strategies (step 3b).

Step 3a: Instructional strategies. The components from the 14 studies that relate to instructional strategies are as follows: the tasks students have to complete (component task characteristics), structuring student collaboration and interaction (component structuring), and how students can be guided through the group learning process (component guidance). The instructional strategies described in those three components need to be aligned, taking into account the fixed aspects of step 1 and the design decisions in step 2.

Step 3b: Logistics. In this step, the design decisions refer to two components: the composition of groups (component group constellation) and the facilities that students need to carry out the tasks (component facilities). As in the former steps, the decisions regarding these two

components should be aligned. The design of these two components should also be aligned with the results of all earlier decisions of step 1, step 2, and step 3a.
Step 4: Implementation. In the framework, step 4 concerns the implementation of an instructional design. In this step, the process of the GLA should be monitored. Each design component should be monitored separately and in alignment with (all) other components and, if necessary, components and their alignment should be adjusted.
Step 5: Evaluation. The final step consists of the evaluation of both the design and the implementation of GLAs. The evaluation of the components and their alignment can help in effectively evaluating the processes and outcomes of the designed GLAs and inform redesigns of GLAs. The design components inserted in the GLAID framework can be found in Table 1.

Table 1 summarises the comprehensive framework for the design of group learning activities. It is called the GLAID (Group Learning Activity Instructional Design) framework; it is a synthesis of 14 studies of GLAs. In order to ensure adequate alignment it is recommend that teachers design the components in a *linear* as well as in a *cyclical* manner. Figure 1 illustrates how the alignment of the eight components could be established by using the GLAID framework for the design of a GLA. Such alignment will also depend on the institutional environment, for example whether the designer can decide on criteria for student admission, which teacher(s) will be guiding the GLA, or what facilities are available.

Figure 1 Illustration of the application of the GLAID framework.

The *learning objective* of a GLA in this example is described as the ability of students *to help each other* to develop oral presentation skills. This means that the teacher needs to decide how the *interaction* regarding this learning objective should take place. Perhaps students have to give each other feedback on an oral presentation. As *helping* is the learning objective, and not the oral presentation itself, the assessment should focus on grading the quality of students' helping behaviour. This also means that giving each other feedback in order to help in the development of presentation skills should be one of the activities described in the *task characteristics*. The task, therefore, should be to give an oral presentation (which is conditional for providing feedback on presentation skills) as well as provide feedback on the presentations of peers. *Structuring* the collaboration and interaction between students to attain this learning objective can be performed by the teacher by determining in what manner (for instance, by using a given format) and how often students should provide feedback. Another consideration as part of structuring could be whether the teacher prescribes the manner of providing feedback or whether the students are allowed to determine themselves how they organise the feedback sessions. The extent and the manner of *guidance* the teacher foresees as necessary is what should be decided next. This guidance should be focused on coaching students in how to provide feedback. The next step in the design is to determine the *group constellation*: what group size and composition is the most suitable for this task. The teacher could decide, for instance, that groups of four students are suitable, consisting of two more and two less skilled students. The *facilities* for helping each other may be instructions for and formats of providing feedback, and a digital environment that enables students to watch the presentations of their peers multiple times, and to download all information and upload their feedback.

Table 1 Design components and possible design decisions of the GLAID framework.

Step 1: Analyse	Determine Student characteristics		
	Determine Teacher characteristics		
	Determine Curriculum characteristics		
	Determine Collaborative premise		
	Determine Global goals		
Step 2: Design	**Interaction**	**Learning objectives and outcomes**	**Assessment**
	Declarative and procedural (domain) knowledge	*Goal setting*	*Means*
		Content of learning	*Criteria*
	Social and meta-cognitive activities		
Step 3: Develop			
Step 3a: *Develop Instructional Strategies*	**Task characteristics**	**Structuring**	**Guidance**
	Kind of activities	*A priori*	*Executor*
	Phases/sequencing	*During GLA*	*Teachers' role*
	Duration and frequency of group meetings	*Reflection and evaluation*	*Communication mode*
			Duration and timing
	Performance control		
Step 3b: *Develop Logistic*	**Group constellation**	**Facilities**	
	Number of groups and group size	*Learning resources*	
		Technology resources	
	Heterogeneous or homogeneous	*Space and time*	
	Group duration		
Step 4: Implement	Monitor the instructional process		
Step 5: Evaluate	Evaluate the processes and outcomes		

3.5 Discussion and conclusion

The current study aimed to develop a comprehensive framework that teachers in higher education can use to design GLAs. The first research question concerned how various components for the design of GLAs can be synthesised into one theoretically informed comprehensive framework. To develop this comprehensive framework 14 meta-studies that describe design components of group learning activities 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. In addition, multiple design decisions within each component were distinguished.

The second research question focused on how teachers in higher education can use this comprehensive framework for their teaching. Therefore, these eight components were inserted in steps 2, 3a, and 3b of the ADDIE model, resulting in a comprehensive framework for the design of Group Learning Activities: the GLAID framework. Prior to step 2, characteristics of the students, the teachers, and the curriculum should be determined, as well as the collaborative premise. In step 2 of the GLAID framework, 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. Finally, in step 3b, the logistics are designed: the group constellation and the facilities. In each step and between steps, the components should be aligned with each other in order to ensure an effective design (linear and cyclical alignment).

3.5.1 Limitations

For the sake of clarity, the design of group learning activities was separated into components and clustered in three steps (2, 3a, and 3b). However, these steps relate to one another and have a certain amount of overlap. An example is peer feedback: it can be used for assessment purposes and, therefore, may be regarded as part of the Assessment component, but it can also be considered as part of the Interaction component, the Task component, or the Guidance component, depending on the purpose of peer feedback.

Furthermore, the design decisions deduced from the fourteen meta-studies are not exhaustive. Design decisions to illustrate the choices explicated in the fourteen meta-studies per design component were described. Many more examples can be found elsewhere for each component and component related issues, such as sequencing activities or assessment for/of learning. The advice for educational designers is to consult additional literature for each of the GLA components whenever there are issues raised as to how it can be shaped best.

Although many studies on GLAs originate from studies on collaboration with and through technology, technology in the GLAID framework is addressed within the component facilities. As with other types of facilities, the use of technology can strongly influence how the other components are designed so as to trigger effective and efficient GLAs (e.g. Zahn, Pea, Hesse, & Rosen, 2010). However, attention for the quality of course design should precede attention for the technological facilities (Bernard et al., 2004).

3.5.2 Practical implications

This section will elaborate on how the newly developed GLAID framework can support teachers in higher education with their design, implementation and evaluation of GLAs. It is not the intention to suggest that the design of GLAs always starts from scratch, although teachers should make decisions for all components.

First, in university teaching parts of the curriculum are sometimes fixed and the design has to be aligned with these fixed parts. Examples of fixed curriculum parts are: a task that is an obligatory part of the curriculum (such as students performing market research for a client), learning objectives students need to attain in a specific academic year (such as students showing they are able to perform a math lesson for a third grade primary school class using specific didactics) and student characteristics (such as whether they are freshmen or sophomores; prior knowledge or experience of the students). Using the GLAID framework to design a new GLA in this case means that the components or steps that are fixed in the curriculum serve as the starting point. The design of all other components is aligned with what is already fixed.

Secondly, parts of a course can already exist for some years, and teachers may want to adjust an existing GLA design for the new academic year. In this case the components of the GLAID framework can be used to evaluate the design per component, taking into account former experiences of the teacher(s) with this GLA and student evaluations of the GLA. For example, students can provide feedback about (the lack of) clarity in the description of the task or learning objectives, the teacher may have experienced shallow student conversations that did not contribute to them attaining the desired learning outcomes. Part of this evaluation could also be whether the components were aligned properly (e.g., whether the assessment was suited given the learning objectives).

One major aspect to take into account in the design of GLAs is the collaborative premise: the reason why students need to work on a particular assignment collaboratively. If the assignment can be performed equally successful by individual students, this may lead to a resistance to the group work. Teachers should justify why student interdependence is an important part of the learning process and how the collaboration is related to the attainment of the learning goals (Dennen and Hoadley, 2013). Teachers are advised to start every GLA design or redesign with the consideration of the collaborative premise and be explicit to students about why it is necessary for them to collaborate.

The GLAID framework should not be used as a one-size-fits-all solution. Dillenbourg (2002) already pointed out the risk of over-scripting collaborative learning, and asks whether "the fun and the richness of group interactions will survive the quest for effectiveness" (p. 61). He stated that the answer lies in the design rationale: the designer should keep in mind how the expected interactions can lead to the desired learning effects. Dennen and Hoadley (2013) and Strijbos et al. (2004) both noted that collaborative learning has a probabilistic outcome: there is no certainty what the outcomes will be, because of the uncertainty of human interactions. Hence, learning goals can be designed for, but their attainment by all students is not guaranteed by the design. For example, formulating the learning objectives together with students can be part of the design of a GLA (i.e., Wilson et al., 2004; Dobber, Akkerman, Verloop, Admiraal, & Vermunt, 2012). This flexible way of designing GLAs is possible using the GLAID framework too, as the framework is not about fixing the components, but about making decisions on how to design these components. Teachers should adapt components of the design during the implementation whenever this seems to be necessary for students to attain the learning goals.

Another possible danger of fixing the script may be a discrepancy between the design of the GLA (the external script) and the students' internal script of collaborative learning (Kollar et al., 2006). If the design of the GLA is not adaptive to students' prior knowledge of collaboration, their collaboration skills, and how they evaluate collaboration, this will have a negative impact on the attainment of the learning goals. In GLAs, students need to come to a mutual understanding, have to learn to collaborate, and need to have a common understanding of the task (Beers et al, 2005). Therefore, students need to attune their internal collaboration scripts and come to a mutual understanding of the external collaboration script (Kollar et al., 2006). Teachers could check whether the external collaboration script (what students should do) is congruent with students' internal collaboration script (what students are inclined to do).
In sum, although the structuring approach to the design of GLAs is considered important for its effectiveness and efficiency, educational designers should consider how much of the design needs to be fixed and which parts of the design can be kept more flexible and adaptable to its users.

3.5.3 Concluding remarks

The GLAID framework is developed for the design of GLAs to guide educational designers and teachers in higher education in the complex process of designing group learning activities. Additionally, the framework can be used for the monitoring and evaluation of GLAs. Finally, the framework can also be used to interpret the outcomes of research on GLAs in higher education in terms of all design components that can be used in designing group learning activities in higher education.

— CHAPTER 4 —

Teacher educators' design and implementation of group learning activities

Chapter 4 Teacher educators' design and implementation of group learning activities[3]

In this chapter is described how teacher educators design and implement group learning activities to empirically validate the Group Learning Activities Instructional Design (GLAID) framework. Interviews with 23 teacher educators were analysed to acquire an in-depth understanding of how they design and implement group learning activities. The conclusion is that teacher educators use all the components of the framework. They report difficulties with structuring group learning activities. Only nine teacher educators mentioned the facilities component. The findings are discussed and the usefulness of the GLAID framework for teacher education is commented upon.

[3] This chapter has been accepted in adapted form as: De Hei, M. S. A., Sjoer, E., Admiraal, W. F., & Strijbos, J. W. Teacher educators' design and implementation of group learning activities. *Educational Studies*.

4.1 Introduction

> 'I try to visualise the process of collaborative learning activities. I explore what I want to achieve with it. Then I search for possibilities to attain the goals. And I try to develop options for students. I mean that they can choose various ways of working on a group assignment. Some students love to dive into the literature, while others use their experiences, want to experiment with teaching in schools and, based on that, search in the literature. I think it is essential that those options are available. But I also reflect on the learning materials that need to be available for the collaborative learning activities.' (14, D)

In teacher education, group learning activities (GLAs) are an important instructional method, because they can lead – if properly applied – to multiple learning benefits, such as knowledge and skill acquisition (Janssen, 2014). Furthermore, GLAs can contribute to the motivation of students (Järvelä, Volet, & Järvenoja, 2010), prepare students for working in teams (Kluth & Straut, 2003), and demonstrate to students how they can implement group work in the future as teachers (Ruys, Van Keer, & Aelterman, 2010).

To implement curricula, and, therefore, also to implement GLAs, a proper design is necessary (i.e., Van den Akker, McKenney, Nieveen, & Gravemeijer, 2006). Teachers in teacher education design and implement GLAs on a regular basis, and think about the design, as illustrated in the quotation above from a teacher. However, group work does not always lead to the desired outcomes (Fransen, Kirschner, & Erkens, 2011; Gros, 2001; Hmelo-Silver, 2004; Janssen, 2014). Teachers consider the design of group learning activities as a challenging task and express the need for more support in the design and implementation in order to enhance the learning benefits of GLAs (De Hei, Strijbos, Sjoer, & Admiraal, 2015; Gillies & Boyle, 2010; Ross, Rolheiser, & Hogaboam-Gray, 1998). In their thematic review De Hei, Strijbos, Sjoer and Admiraal (2016) noticed that various approaches for the design of GLAs are presented in the literature. They synthesised fourteen approaches from the literature, and described in their synthesised framework eight major components for the design of GLAs. They refer to these components and their alignment as the Group Learning Activities Instructional Design (GLAID) framework. The aim of the GLAID framework is to guide teachers in designing and implementing GLAs. The objective of the current study is to describe how teacher educators design and implement GLAs and to match their considerations with the GLAID framework.

The GLAID framework consists of eight design components: (1) interaction, (2) learning objectives and outcomes, (3) assessment, (4) task characteristics, (5) structuring, (6) guidance, (7) group constellation, and (8) facilities. The interaction component refers to the process of collaboration itself, whereby students strive to attain learning objectives by being involved in social, cognitive, and metacognitive activities. In the learning objectives and outcomes component, teachers can decide on objectives for GLAs regarding declarative and procedural knowledge and/or social skills they expect to lead to desired learning outcomes. The assessment component concerns the measurement procedures used to assess the attainment of learning objectives. The task characteristics component refers to decisions on the (sub-) activities that students have to perform to attain the learning objectives. The structuring component refers to how the process of collaborative interaction is structured in order to guarantee positive interdependence and individual accountability.

In the guidance component, teachers decide on which undertakings are needed – performed by persons or computer software – to guide students through the process of a GLA. The group constellation component refers to group composition as well as to group size. In the facilities component, teachers address all supporting materials, virtual and physical, that facilitate collaborative interaction and activities in a GLA.

Another major aspect of the design of GLAs that is addressed in several approaches is the alignment between the different components (Dennen & Hoadley, 2013; Strijbos, Martens, & Jochems, 2004) and between the different curriculum levels: the intended, implemented, and evaluated curriculum (Reigeluth, 1999; Van den Akker et al., 2006).

To shape these two kinds of alignment, De Hei et al. (2016) used the ADDIE model, consisting of five steps, of which steps 2, 3a, and 3b are addressed in the GLAID framework: (1) *Analyse* the learning environment (the learning environment of the GLA includes the learners' characteristics, teachers' characteristics, curriculum characteristics, and collaborative premise: why students need to work in groups and not individually); (2) *Design*: the learning objectives, the interaction, and the assessment; (3a) *Develop* instructional strategies: the task characteristics, the structuring of the collaboration, the guidance, and (3b) *Develop* logistics: the group constellation and the facilities; (4) *Implement* the design; and (5) *Evaluate* the design. The design steps require both a linear way of working, using a particular sequence, and a cyclical way: the designer continuously checks whether his/her decisions are in line with all the previously designed components and decisions. The GLAID framework is summarised in Table 1.

The GLAID framework is meant to be a comprehensive design approach, which is grounded in the literature on GLAs. However, research is needed to empirically validate whether this framework responds to teacher's design practices and can contribute to better GLA design and thus enhance the attainment of the desired learning outcomes. Therefore, the following research question has been formulated: 'How do teacher educators design and implement GLAs, and to what extent do their considerations match with the GLAID framework?'.

Table 1 The Group Learning Activity Instructional Design Framework

Step 1: Analyse	Determine Student characteristics		
	Determine Teacher characteristics		
	Determine Curriculum characteristics		
	Determine Collaborative premise		
	Determine Global goals		
Step 2: Design	**Interaction**	**Learning objectives and outcomes**	**Assessment**
Step 3: Develop			
Step 3a: Develop Instructional Strategies	**Task characteristics**	**Structuring**	**Guidance**
Step 3b: Develop Logistics	**Group constellation**	**Facilities**	
Step 4: Implement	Monitor the instructional process		
Step 5: Evaluate	Evaluate the processes and outcomes		

4.2 Method

4.2.1 Participants

Twenty-three teachers in Teacher Education Programs (primary school) of six Universities of Applied Sciences in the Netherlands volunteered to participate: 13 males and 10 females. Ages ranged from 22 to 63 years (M = 45.9, SD = 11.5), and years of teaching experience ranged from 1 to 23 years (M = 9.8, SD = 6.1). These participants use group learning activities on a regular basis in their face-to-face teaching practice. In the quotations of the results numbers are used for the teacher educators (1-23) and characters for the teacher education departments (A-E).

4.2.2 Data collection

Individual face-to-face semi-structured interviews were administered covering the following topics: (a) the design of GLAs, (b) the implementation of GLAs (the experiences of teacher educators with students working on GLAs), and (c) the evaluation of the implementation of GLAs and the learning outcomes in relation to the designed learning objectives.
The interviewees were not familiar with the GLAID framework, and were not informed about the framework and its components. In Table 2, the interview questions are presented.

4.2.3 Analysis

The interviews were audio-recorded and transcribed. The transcribed interviews were carefully read and reread by the first author. The transcribed interviews were then subjected to selective coding, which was guided theoretically by the components of the GLAID framework. It was also coded whether teacher educators addressed the alignment between those components.

Next, all identified statements that included the specific design component(s) and the kind(s) of alignment between each of the components were summarised. In order to guard against preset interpretations, the second author checked the coding and all results were discussed until agreement (cf., Marble, 1997).

Whether the considerations of teacher educators match the structure of the GLAID framework was based on the proportion of teacher educators describing a particular component, with 50% as a minimum. The GLAID framework only concerns steps 2, 3a, and 3b of the ADDIE model. Therefore, the alignment between the design and the learning environment (step 1), the implementation (step 4), and the evaluation (step 5) was not part of the analyses.

Table 2 Interview questions

Themes	Questions
The design of GLAs	Do you design your GLAs yourself?
	How do you work on those designs?
	Do you include learning objectives regarding the collaboration of students?
	Do you have any questions regarding the design of GLAs?
	The last GLA you designed: how did this design came about? Was it a new design or did student work on this GLA before? If students worked on this GLA before, which adaptations did you make regarding the original design?
The implementation of GLAs	How do you implement GLAs in your lessons?
	How often are students allowed to work collaboratively during your lessons?
	Do you use short term (one lesson) or long-term (more than one lesson) collaborative assignments?
	How do you value the collaboration between students?
	What problems do you experience in the collaboration of students in GLAs?
The evaluation of the implementation of GLAs and the learning outcomes in relation to the designed learning objectives	Why do you use GLAs in your courses?
	Do GLAs lead to the desired learning outcomes?
	How do you value the learning outcomes of students in GLAs regarding domain knowledge or cognition?
	How do you value the motivation of students during GLAs?
	Do you experience a difference in motivation compared to students working on an individual assignment?
	How do you evaluate the conversation of students working on a GLA?

4.3 Results

Table 3 shows how many teacher educators mentioned a particular design component of the GLAID framework.

Table 3 Number of teacher educators who mentioned specific GLAID components

Interaction	22	(96%)
Learning objectives and outcomes	23	(100%)
Assessment	14	(61%)
Task characteristics	22	(96%)
Structuring	18	(78%)
Guidance	18	(78%)
Group constellation	17	(74%)
Facilities	9	(39%)

Seven components were described by a majority of the teacher educators. The component facilities was mentioned by only nine teacher educators. The following section describes the results of the interviews in more detail, and specifically how teacher educators design and implement their GLAs, first per component and then with respect to the alignment.

4.3.1 Components of the GLAID framework

4.3.1.1 Interaction

The interaction between students in GLAs as described by the teacher educators consists of the following: (1) sharing information, such as mathematical procedures, theory they have just learned, opinions, ideas, and arguments; (2) helping and supporting each other, such as giving feedback on each other's lessons to pupils and explaining learning content to others; and (3) interaction about the process of collaboration, such as conversations about how to fulfill agreements, to address free-riders about their behaviour, to divide tasks and responsibilities, to refrain from pushing one's individual needs/ideas, and to give (subtle) feedback on each other's behaviour.

An example of a statement about interaction, such as sharing information using content-related arguments and underpinning feedback with learning content, is the following:

> 'They had to read those articles beforehand about four opinions, so they started using arguments to convince other students from what they learned from those articles. And they asked each other: what makes you think that way? And where does your opinion come from? So then you notice that those conversations arise, and from that a very nice compromise develops. [...] but the idea is that they really exchange what they learned.' (7, A)

A major problem with the interaction between students is stressed by five teacher educators: they observe too little depth in the interaction. Examples given by the teacher educators that could cause this lack of depth are the following: (1) students trying to reach agreement on the division of tasks in as little time as possible, (2) students interacting too little about the task and the learning content (for example, using their interaction time to talk what they did during the weekend), (3) students being too positive in their feedback, being reluctant or afraid to be critical of each other, and (4) students not proceeding with posing further questions to other students, being too easily satisfied with the initial answers given by their peers.

4.3.1.2 Learning objectives and outcomes

In their decisions about learning objectives for GLAs, teacher educators referred to course documents that already exist and have been written in previous years by other teacher educators or educational designers. As a consequence, they do not set the objectives for GLAs themselves; these are predetermined in the curriculum. Some teacher educators formulate objectives they wish students to attain, in addition to the objectives already described in the curriculum. None of the teacher educators indicates that students are involved in the setting of learning objectives.

Teacher educators define group objectives as well individual objectives for GLAs. Examples teacher educators mentioned as group objectives are to work on a final product, such as the group presentation of a lesson cycle for a primary school class, and to work towards shared knowledge construction, such as reading one chapter each from an extensive book on biology education and sharing what they have read and know in order to build shared knowledge on the topic. Teacher educators referred to three kinds of individual objectives: (1) knowledge, (2) social skills, and (3) skills students need for their future profession.

Teacher educators mentioned various learning objectives regarding knowledge: to expand domain-specific knowledge such as mathematical knowledge and skills, to relate knowledge in various domains, to deepen knowledge in a specific domain, to experiment with materials (e.g. to gain insights into physical processes such as the density of liquids), and to link knowledge to educational practice (such as learning styles and teaching in primary school). Social skills as learning objectives were also emphasized. For example, one teacher educator mentioned:

> 'In certain domains, you go beyond just cognition. It [red. collaborative learning] calls for social skills, waiting your turn, learning to respect each other's opinions.' (14, D)

Other specifications of learning objectives regarding social skills were to learn to debate and to discuss, to develop empathic skills, to learn to respect each other's opinions and views, to learn how to give critical and subtle feedback, and to learn to use each other's qualities and skills. The teacher educators disagree on whether objectives regarding social skills should be set explicitly. Three teacher educators reported that they do not set objectives for social skills, but in their guidance of students they do emphasize the importance of acquiring social skills. Another teacher educator mentioned being aware that social skills are learning objectives in the design, but does not pay any attention to those learning objectives when implementing a GLA design.

One teacher educator stressed the importance of considering why students should collaborate:

> 'You have to think that through carefully [red. the kind of learning objectives], and that has a lot to do with the purpose and the reason you want them to collaborate.' (20, E)

The third kind of individual learning objectives are related to the future profession of student teachers, such as acquiring knowledge about how to use GLAs in their practice as student teachers in schools, but also how to participate in teacher team in school and how to develop as a professional. Examples of learning objectives teachers mentioned for the future profession are: students need to learn how to learn and they can learn that, for example, through observing how their peers' learning behaviour differs from their own learning behaviour, to become aware of how you behave in groups, to learn that different solutions exist to adequately solve a problem, and to learn to express one's opinion in a group.

4.3.1.3 Assessment

Teacher educators mentioned several means of assessment, such as students' individual learning journals, individual knowledge tests, collaborative reports, teaching in small groups in primary schools, or presenting products of group collaboration. Three teacher educators used two or more of these forms of assessment.

Four teacher educators reported that they use assessment *for* learning (formative assessment), three reported that they use assessment *of* learning (summative assessment), and one teacher educator combines these. Five teacher educators do not only assess the student work themselves, but use peer assessment as well. Two teacher educators also involve the students in the design of the assessment. For example, one teacher educator mentioned:

> 'In some of our group learning activities students themselves stipulate the appraisal of their task.' (22, F)

One of these two teacher educators requires the students, as part of the collaborative task, to design an assessment form for the presentation of their work. This form is then used for peer assessment.

Teacher educators assess knowledge as well as skills in GLAs. Seven of the teacher educators stated that in GLAs they also assess the collaboration process of the students. One of these teacher educators mentioned as a criterion the quality of the collaboration process, another teacher educator the time students invest in GLAs. Teacher educators differed in their ideas to provide the assessment criteria beforehand. One teacher educator believes that the assessment criteria can influence students' involvement in GLAs and therefore decides on and reveals the criteria before students start working on a GLA, another teacher educator decides on the criteria afterwards.

Group grades are used, sometimes combined with individual grades. Four teacher educators see group grades as problematic as these give the possibility of free-riding. One teacher educator also mentioned that group grades are unfair for high performing students.

4.3.1.4 Task characteristics

Teacher educators mentioned a number of requirements for a collaborative task. The next example is about the meaningfulness of a task, reported by one teacher educator:

> 'Something we always take into account is that it should be meaningful for students. That it has to do with their future profession. That it is a situation they can also use in their school practice.' (1, A)

Several teacher educators stated that the task should be authentic and be closely related to the practice of teaching in schools. For example, they ask students to organize a sports event, develop and perform lessons for primary school classes, prepare a meeting with parents of pupils, or setup a simulation of team working in school. Furthermore, teacher educators mentioned other task characteristics:

1) a task should use of authentic materials;
2) a task should be challenging;
3) a task should stimulate students to discuss and exchange ideas and experiences, and
4) a task should be suitable for collaborative work.

One teacher educator asked her students to produce a stop-motion movie. Those students were asked to write a script and use daily objects to produce a stop-motion movie that could be used in primary education. Another teacher educator mentioned that she/he would like to become more proficient in designing tasks that are suitable for group work and that stimulate all group members to collaborate.

Two teacher educators provide students with some degree of freedom in how they perform a GLA task:

> 'The assignment is usually a broad one. And I want the students to choose from a variety of possibilities. If you design the group assignment very specific, then there is no freedom whatsoever for the students.' (8, B)

Five teacher educators indicated that they design smaller activities within one large GLA, of which some can be individual activities. One teacher educator reported that she/he alternates activities in a GLA, by having students collaborate in a large group and in small groups.

4.3.1.5 Structuring

Following to the GLAID framework, structuring refers to the decisions on how to stimulate students to work collaboratively with the aim of ensuring positive interdependence and individual accountability. Prior to the implementation of GLAs, teacher educators structure the collaboration by (1) appointing roles to students, (2) providing information on the desired level and way of collaboration, and (3) designing activities that require collaboration.

With respect to roles, teacher educators mentioned examples such as students collaborating as in a formal meeting in school, assigning roles like a chair and secretary, role-play in schools with roles as school leader, team leader, teacher, and a parent of a student.

With respect to providing information on collaboration, teacher educators structure student collaboration by instructing students how to collaborate by, for example, giving a lecture on this topic, by stressing the rules and conditions for good collaboration, or by training students in collaboration skills.

The third way teacher educators structure the collaboration is the kind of (sub-) activity they design. They talked, for instance, about 'Jigsaw' or the 'Place-mat' activity. Sometimes they also use assignments that are so difficult or complex that they could not be completed individually, in order to make use of the interdependence between students. One teacher educator ensures interdependence by distributing materials between the students, so that they need each other to gather all of the information. In this assignment, the materials -articles needed to complete the assignment- are split up and the separate parts are made available to particular students in the group. Interdependence between students is sometimes also established by announcing that group grades will be used.

In addition to design activities prior to the GLA, teacher educators can also structure student collaboration during the GLA. Examples teacher educators mentioned are 1) asking questions about the process of collaboration, 2) suggesting students that they can ask for help from others, 3) providing feedback on the (assigned) roles students adopt, and teacher educators taking a role as one of the participants in the collaboration process. Below is an example of a teacher educator's description of how she/he structures the collaboration during an activity:

> 'If Kees stands aside during the game, I say to the students "Guys, come on, maybe it is a nice thing to, for example, add a chameleon to the game. So if there are two battling parties, the chameleon is always part of the attacking party". Then I encourage Kees: "Could you try this?" From that moment on Kees has to play a more dominant role in the group, so he cannot withdraw from the game.' (23, F)

Teacher educators stated that students themselves can also structure the collaboration: for instance, by dividing tasks or roles, or by formulating a script for the task performance together. However, teacher educators mentioned that students distributing the task or workload might mean that students only learn from their own activities and that they do not exchange experiences and knowledge.

Finally, teacher educators not only structure prior to en during the GLA, but also afterwards. Students' reflection on or evaluation of the collaboration can be regarded as part of the structuring and it increases students' awareness of individual accountability and interdependence amongst students. For example, teacher educators schedule feedback moments to discuss with students the roles they had in the collaboration or students write a learning journal on how they individually contributed to the collaboration and the collective product.

A common concern regarding structuring of the collaboration is students' free-riding. Free riding students deliberately ignore their individual accountability for the GLA and do not seem to feel positively interdependent. Teacher educators feel they do not have the design skills to prevent this free-riding behavior.

4.3.1.6 Guidance

> 'I think the guiding teacher educator is crucial in the collaboration process. He is the one that can confront students with their behaviour, guide a group in the right direction, and discuss dilemmas. You cannot just tell students, "Here you are: your group assignment. Please complete it with four students and show us the results in three weeks".' (20, E)

Like the teacher educator who provided this quotation, other teacher educators described their guiding role as significant for the successful implementation of GLAs. Three types of teacher educator roles in guiding GLAs were described: 1) pedagogical role, 2) social role and 3) organisational role. The pedagogical role includes modeling how to ask reflective questions, stimulating an inquisitive attitude, asking probing questions, acting as an expert on the matter, providing help in generating content-related ideas, adjusting guidance to the needs of the groups (differentiating), and getting the most out of students. The social role includes showing students the additional value of collaborative work, being a role model for collaborative work, providing feedback on the collaboration process and evaluating it with students, coaching and supporting students, and motivating students for the collaborative work. The organizational role includes emphasizing the requirements and objectives of the assignment, offering help in the choice of group composition, monitoring the collaboration as a distant observant, and intervening when the interaction is not effective, when students are excluded from the collaboration or when students are free-riding. According to one of the teacher educators, students do not always think positively about the guidance:

> 'I have difficulties in having a group accept my process interventions. [...] I have to convince them that my role is necessary and that they should be open up to this. [...] They need to consider my interventions valuable and they need to trust that I know what is needed.' (16, D)

Four teacher educators stressed the importance of timing guidance: it should be just-in-time, depending on the needs of the students. One of these teacher educators stated that one needs intuition to determine the appropriate moment for interventions in the collaboration.

In the Dutch situation, it is common that two or more teacher educators teach the same GLA in different classes with their own students. This implies that teacher educators have to mutually harmonize their guidance.

4.3.1.7 Group constellation

Most teacher educators reported that they determine the group constellation themselves. Two of the teacher educators use large groups (with ten or more students), in which smaller groups work on sub-tasks of the GLA. One teacher educator stated that large groups are more suitable for collaborative work on projects and small groups for sharing ideas and experiences in a safe environment. Other teacher educators stressed disadvantages of large groups: in large groups, students feel less safe, reaching consensus is problematic and the student engagement is less compared to small groups.

Nine of the teacher educators also decide group composition. Three teacher educators base their group composition on student characteristics, such as students' cultural background, level of expertise or knowledge, gender, educational background, and expertise in collaboration. For example:

> 'I have specific demands regarding the group composition. The students compose the groups themselves, and groups contain students from different educational programs and with a different number of years of experience. I do not want students from the same educational programme working together, because they know each other too well.' (16, D)

One teacher educators determines group composition by testing students prior to the GLA on their ability or interests. This teacher educator composes homogeneous groups. The other teacher educators who compose groups use heterogeneous groups.

Fourteen teacher educators have students compose their groups themselves. Two of them try to prevent the students from choosing the same students to work with. They want to prevent this for two reasons: (1) students get to know each other too well, and (2) high-performing students tend to choose one another, and as consequence do not contribute to higher learning outcomes of low-performing students.

4.3.1.8 Facilities

The facilities component refers to the various resources students can use to work on a GLA. Teacher educators mentioned technology tools for communication and collaboration, such as email, or discussion boards. One teacher educator reported that students should be more aware of technology they can use to communicate:

> 'I think they use too few of the available digital possibilities. [...] for example, how to use the discussion boards in the electronic learning environment.' (20, E)

Another teacher educator stated that teachers need to model the use of the digital facilities. Another teacher educator stated a lack of proficiency in implementing such tools and expressed the desire to learn how digital tools can be implemented to support the collaboration process and the communication of students.

In addition to technology tools to support students' communication and collaboration, other design decision regarding the facilities involves supportive lectures about course-related content, information about how to collaborate in case descriptions and articles, documents to evaluate collaboration process, and software students can use to work on assignments, such as Windows Moviemaker and the discussion board of a digital learning environment. Two teacher educators stressed the importance of (class-) rooms suitable for collaboration purposes:

> 'What we see in classrooms most of the time is that we put the tables in a horseshoe arrangement. Sometimes we rearrange the tables into real group arrangements.' (2, A)

Finally, three teacher educators emphasized that students should have sufficient time for GLAs. It is necessary to ensure that timetables are not overloaded, so that the students have time to work together on the assignment.

4.3.2 Alignment between the components

Alignment implies that (a) decisions made in the design of each of the eight components are related to the design of the other components and (b) all of the steps in the design are attuned with one another.

Twenty of the twenty-three teacher educators referred in one or more of their statements to the alignment of components of the GLAID framework: steps 2 and 3a/b (see table 1). It was examined whether teacher educators aligned the components within each step separately, and whether the alignment between the three steps was described.

The prevalence of alignment between pairs of components is summarised in Table 4.

Table 4 Prevalence of alignment between components.

	1	2	3	4	5	6	7	8
Interaction (1)	-	17	1	12	5	11	7	4
Learning objectives and outcomes (2)		-	2	11	6	10	1	3
Assessment (3)			-	3	2	3	0	0
Task characteristics (4)				-	7	3	2	3
Structuring (5)					-	8	0	2
Guidance (6)						-	3	0
Group constellation (7)							-	0
Facilities (8)								-

Very few teacher educators mentioned the alignment between assessment and the other two components of this step: interaction and learning objectives/outcomes. In step 3a, only three teacher educators described the alignment between guidance and the other two components of this step: task characteristics and structuring. In step 3b, no alignment was reported between the two components of this step: group constellation and facilities. However, the alignment between components of the three different steps was addressed more frequently.

Alignment between interaction and learning objectives/outcomes was frequently mentioned. One of the teachers gave an example that students learn mathematical procedures (learning objective) best when students explain it to each other. Conditional for this is that students are willing to listen carefully to one another and ask questions about the explanation (interaction).

Interaction was also mentioned in relation to task characteristics and guidance. Two teacher educators stressed that the kind of task determines the quality of the interaction; others also referred to structuring (four teacher educators), guidance (one teacher educator), and group constellation (four teacher educator) as determining factors of the quality of the interaction. Three teacher educators mentioned that they find it difficult to design tasks that lead to good collaboration and interaction.

The alignment of learning objectives with task characteristics or guidance was also mentioned. For example, one teacher educator underlined that teachers who guide a GLA need to focus on the learning objectives. In the GLA she/he implemented, this resulted in non-directive guidance, because one of the learning objectives was that students would regulate their learning processes themselves. A final example of alignment between two components stresses the usefulness of alignment between the components. An example is the alignment between assessment (group grades) and interaction:

> 'If I make sure that they [red. students] are interdependent regarding the final results, a certain self-regulatory ability in the group grows. Then they get angry if they do not stick to their agreements. I am not that concerned about the quarrels it causes.' (16, D)

Some of the teacher educators referred to the alignment of more than two components. Teacher educators referred to seventeen alignments between three components and five alignments between four components. The following example illustrates the alignment between facilities, interaction, and learning objectives/outcomes:

> 'I regularly use newspaper and journal articles that are related to the topic, the content of the lecture, and then I ask their opinion: how they think they could use it in practice. And that elicits the exchange of ideas and thoughts. And often they gain new and different insights too.' (14, D)

4.4 Discussion and conclusion

Group Learning Activities (GLAs) do not always yield the desired learning outcomes and the Group Learning Activities Instructional Design (GLAID) framework aims at supporting teachers in their design of GLAs. The aim of the current research was to empirically validate this framework with the self-reported design decisions of teacher educators. The research question of this study was: 'How do teacher educators design and implement GLAs, and to what extent do their considerations match with the GLAID framework?'. The components and the alignment described in the GLAID framework were used to analyse teacher educators' descriptions of their experiences with GLAs. Teacher educators addressed all eight components of the framework. However, the facilities component was only addressed by a minority of the teacher educators. The teacher educators did not report new components of GLAs. Teacher educators referred to the alignment between components, which is an integral aspect of the GLAID framework. Next some remarks will be made about the facilities component and the structuring component.

Two explanations might be considered for the low number of teacher educators who mentioned aspects of the facilities component. First, it is possible that the tasks teacher educators described for GLAs are mainly complex tasks students can work on in various ways. Therefore, it is possibly not predetermined what resources students will use or might need. Second, some teacher educators avoid using computers as a means of communication because of problems they foresee or encounter in their use (Dillenbourg, 2013). However, the facilities component is considered to be important to include in the design of GLAs, because no matter how well a GLA is designed, without the necessary space, time, and supporting tools and materials students will not be able to attain the learning objectives of a GLA(see Chiriac & Granström, 2012; Dillenbourg, 2002; Gros, 2001; Janssen, 2013; Kobbe, Weinberger, Dillenbourg, Harrer, Hämäläinen, Häkkinen, & Fischer, 2007; Strijbos, Martens, & Jochems, 2004).

Furthermore, the interviews revealed that many teacher educators struggle with the structuring component. They consider free-riding to be a major problem in GLAs. 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, but possibly also the most important aspect of GLAs. Structuring student interaction might increase individual accountability and positive interdependence, and as such can prevent students from free-riding (Dillenbourg, 2002; Johnson & Johnson, 2009; Slavin, 1999). According to Janssen (2014), student preparation for GLAs and the level of interdependence between group members (and also the availability of tools, support, and scaffolds) have a positive effect on the interaction, which in turn positively influences learning outcomes.

4.4.1 Limitations

In the GLAID framework, alignment is stressed as an important condition for successful GLAs. Although many indications were found that teacher educators align components, the teacher educators were not specifically asked about alignment between components. Hence, it is possible that, although the teacher educators did not express it, alignments are included in their considerations in the design of GLAs. Another explanation may be that the teacher educators implement existing GLA designs and, therefore, do not decide a priori on the design of the components and their alignment.

4.4.2 Practical implications

A structured approach for the design of GLAs may lead to better student learning outcomes. The teacher educators' design and implementation practices, as extracted from the interviews, contribute to an empirical validation of the GLAID framework that is precisely meant to support such a structured design. The interviews further highlighted teacher educators experience problems with respect to the design of the components interaction, structuring, and facilities. Next will be described how the use of the GLAID framework can support teacher educators to diminish the problems with these design components.

Interaction. Several teacher educators observe too little depth in the conversation of their students. In order to stimulate depth in student interaction, the interaction could be better aligned with other components of the GLA-design. For example, the task type could be designed specifically for student interaction by choosing a task in which students cannot divide the work, but need to interact. An example of such a task is a discussion wherein the resources, such as articles from different authors or different aspects/opinions of a topic, are distributed amongst the students (structuring), and wherein the assessment is focused on assessing the interaction (i.e. the discussion) amongst students. Another example is the alignment between interaction and group constellation. By deliberately composing groups instead of having students compose their own groups, the depth of the interaction could be positively influenced by increasing the variety of perspectives or knowledge levels (when students chose their own groups they are likely to chose group members they know and are more likely to agree with on a specific topic).

Structuring. Structuring of a GLA can help to prevent free-riding of students. Stimulating all students to contribute to the GLA can be accomplished by assigning roles to students, distributing resources that are needed to fulfill the assignment, or instructions on how to collaborate. For example, instructions can focus on prompting students to remind their peers that they are accountable for their contributions to the group work, or to provide feedback on each other's contribution to the discussion or the group product. Also, alignment with the guidance component may diminish the likelihood of free-riding, for example when the guidance is focused on the collaboration process (instead of on the product).

Facilities. Facilities may contribute to the effectiveness of the GLA-design. The use of technological facilities may support the collaboration of students by implementing the GLA-design as a blended learning environment. The use of chat, discussion boards or wiki's may enable students to collaborate from the place and at a time they prefer, without the restriction of physical presence in university. This technology can also enable the guiding teacher to monitor the collaboration and provide feedback in this digital environment; thereby the guidance can be more effectively aligned with the interaction.

4.4.3 Directions for further research

In practice oriented research an intervention could be used, consisting of a professional development activity for teachers during which they learn to design GLAs using the GLAID framework. The designs could be evaluated for their usefulness and be compared with former designs that were designed intuitively.

Future scientific research could focus on the effectiveness of particular design components on learning outcomes assessed with objective quantitative measures such as test scores. For example, using a quasi-experimental design, one or more components could be manipulated, to infer causal explanations.

4.4.4 Conclusion

The twenty-three interviewed teacher educators used the eight components proposed by the GLAID framework in their design and implementation of GLAs. This means that these components are not only grounded in the academic literature (see De Hei et al., 2016), but are used by practitioners as well. This implies that the GLAID framework can be useful as a practitioner guide in teacher education for educators who want to design, implement, and evaluate their GLAs.

— CHAPTER 5 —

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

Chapter 5 Student teachers' evaluation of design components related to perceived learning outcomes [4]

The aim of the study in this chapter was to determine which components of GLAs students perceive as significant for their learning. Teacher education students ($N = 290$) from six Dutch universities completed a survey. Students' perceived task characteristics and group constellation are related to their perceived increase of domain knowledge, and task characteristics and teacher guidance to learning outcomes are associated with their development as primary school teachers. Both relationships were mediated by how students report they interact. Student engagement only mediated learning outcomes related to their development as primary school teachers.

[4] This chapter has been submitted in adapted form as: De Hei, M. S. A., Admiraal, W. F., Sjoer, E., & Strijbos, J. W. *Engagement and interaction as mediating variables of perceived learning outcomes of group learning activities in teacher education.*

5.1 Introduction

Collaborative learning can contribute to the acquisition of a variety of knowledge and skills, including higher order thinking skills and metacognitive skills (e.g., Johnson & Johnson, 2009a), and to the development of prosocial behaviour such as empathy and helping others (e.g., Gillies, Ashman, & Terwel, 2008). In teacher education, the use of collaborative learning has additional goals. For example, teacher educators use group learning activities (GLAs) to model how student teachers can facilitate collaborative learning in their classrooms as teachers in primary or secondary education. Furthermore, the future work setting of student teachers and the continuous professional development of teachers in schools require the skills of collaborative learning and work (Kwakman, 2003; Richter, Kunter, Klusmann, Lüdtke, & Baumert, 2011; Zwart, Wubbels, Bergen, & Bolhuis, 2009). Therefore, it is important that GLAs in teacher education are designed properly and that student teachers consider participating in GLAs to be worthwhile.

However, GLAs are not always successful, and working in groups does not always lead to attainment of the learning goals (Brown & McIlroy 2011; Fransen, Kirschner, & Erkens, 2011; Gros, 2001; Hmelo-Silver, 2004; Janssen, 2014). A possible cause for not attaining the learning goals may lie in the students' resistance to participating in GLAs. To overcome students' resistance to group work, they need to be supported in their group work and they need appropriate scheduling, such as sufficient time to work on group assignments without the stress of other simultaneous courses (Payne, Monk-Turner, Smith, & Sumter, 2006). In addition, teachers in higher education experience difficulties with the design and implementation of GLAs. Teachers consider the design of GLAs a complicated task that often does not lead to the desired learning outcomes, and encounter problems such as free-riding of students, and issues with assessment and grading (Gillies & Boyle, 2010; Ross, Rolheiser, & Hogaboam-Gray, 1998).

Indeed, the design of a GLA is complex because of the pedagogical, interpersonal, environmental, and technological contexts simultaneously, in which various decisions need to be made regarding several GLA design components as well as their alignment (Dennen & Hoadley, 2013). On the basis of a literature review of 14 meta-studies on the design of GLAs, De Hei, Strijbos, Sjoer, and Admiraal (2016) developed a comprehensive framework: the Group Learning Activities Instructional Design (GLAID) framework. The GLAID framework distinguishes eight components for the design: (1) interaction, (2) learning objectives and outcomes, (3) assessment, (4) task characteristics, (5) structuring, (6) guidance, (7) group constellation, and (8) facilities. In addition, the alignment between the various components is stressed as crucial for the design of a GLA. The implementation of instructional designs, such as designs for GLAs, strongly influences students' perceptions of their learning outcomes (Shainkarakas, Inozu, & Yumru, 2010). Hence, the current study examines students' evaluation of GLA design components and their relationships with students' perceived learning outcomes.

5.1.1 Student evaluations and learning outcomes

How students perceive the learning environment is related to how they perceive the learning outcomes, and may be related to the learning outcomes attained. Lizzio, Wilson, and Simons (2002) found that student perceptions of the learning environment are related not only to student satisfaction, but also to academic achievement and the development of key (or transferable) skills. They explain that students' perceptions of the learning benefits of

courses are related to how they value different components of the design, such as task type or assessment. Salomon (1984) already found that students' perceptions of the learning materials affected their actual learning. Furthermore, Sahinkarakas, et al. (2010) found among 142 higher education students (English Language Teaching Department) that their perceptions of the learning outcomes were strongly related to their evaluations of aspects of the curriculum: the lecturer, the classroom, the interaction, and the task-related activities. In order to improve GLA designs so they can contribute to positive student evaluations and better learning outcomes, it is important to understand the relationship between the design components of a GLA and the learning outcomes from the students' perspective. Lizzio et al. (2002) distinguished two kinds of perceived learning outcomes in university students' perceptions of their academic environment: (1) academic achievement and (2) key or transferable skills. In the context of GLAs in teacher education, academic achievement may be described as the attainment of declarative and procedural knowledge about a specific domain or subject (Janssen, 2014; Johnson & Johnson, 2009a). Key or transferable skills could be regarded as learning outcomes related to the future profession that concern the development of social skills (Gillies, Ashman, & Terwel, 2008; Janssen, 2014; Johnson & Johnson, 2009a), the development of skills for implementing GLAs in their future classrooms (Ruys, Van Keer, & Aelterman, 2010), and the development of collaborative skills for professional development purposes (Kwakman, 2003; Richter, Kunter, Klusmann, Lüdtke, & Baumert, 2011; Zwart, Wubbels, Bergen, & Bolhuis, 2009).

5.1.2 Mediators between design and outcomes

The strength of the relationship between an educational design and its (perceived) learning outcomes appears to be related to the extent to which students feel engaged (Martin, 2007). Furthermore, in assignments requiring student collaboration, the quality of the verbal interaction may also influence the strength of the relationship between the design of the assignment and the learning outcomes (Janssen, 2014). This means that both verbal interaction and engagement may mediate the relationship between students' evaluations of the design components of a GLA and their perceived learning outcomes. In the following two sections, each of these possible mediators will be discussed in more detail.

Verbal Interaction. Verbal interaction appears to be an important aspect of the collaborative process of needed to attain the learning goals (Dillenbourg, 2002; Janssen, 2014; Strijbos, Martens, & Jochems, 2004; Wilson, Ludwig-Hardman, Thornam, & Dunlap, 2004). Strijbos et al. (2004) describe interaction as "the heart of the matter": it is the process that influences how students collaborate and can, therefore, affect the learning outcomes of a group learning activity. Janssen (2014) also emphasizes that (a) interaction is the key component in instructional methods aimed at fostering student collaboration, and (b) interaction induces learning outcomes. Gomez, Wu and Passerini (2010) found that students who have positive perceptions of team interaction report greater enjoyment in learning and perceive higher learning outcomes than students with a less positive perception of team interaction.

Engagement. Engagement refers to the behaviour of students when they are motivated to learn, work effectively, and employ their potential (Martin, 2007) and is a second possible mediator between GLA design and learning outcomes. For example, Reyes, Bracket, Rivers, White, and Salovey (2012) found that student engagement was a mediator in the positive relationship between the emotional climate in classrooms and learning outcomes. Ferreira, Cardoso, and Abrantes (2011) found that intrinsic motivation served as a mediator

between students' sense of belonging at school and perceived learning after completing a course: when students evaluated their sense of belonging at the school negatively this had a negative impact on intrinsic motivation and, consequently, on perceived learning. Finally, Figueira and Duartes (2011) implemented an intervention to increase student motivation during a course. This intervention resulted not only in higher motivational outcomes, but also, via student motivation, in increased quality of the learning outcomes that were required in the course. Based on these findings using students' course evaluations, it was expected that student engagement and motivation could also mediate the relationship between the design of a GLA and the perceived learning outcomes of GLAs.

5.1.3 Hypotheses and research question

In the current study, it was investigated which components of implemented GLA designs students considered important for their perceived learning outcomes and to what extent student engagement and verbal interaction influenced this relationship. The focus was on two kinds of perceived learning outcomes: (1) outcomes regarding domain-specific knowledge and (2) outcomes regarding the future profession.

Our first two research questions were focused on the direct relationship between students' evaluations of GLA design and perceived learning outcomes:

(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?

We also hypothesized that verbal interaction and engagement would mediate students' evaluations of the design aspects of GLAs and the two types of perceived learning outcomes. The third and fourth research questions were formulated as follows:

(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?

(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?

5.2 Method

The implementation of GLAs in six teacher education programmes was examined. These GLAs differed in their learning objectives, tasks, and assessment. Retrospective analysis was applied (Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003) to relate perceived learning outcomes to how students value design components and the implementation of those design components.

5.2.1 Participants and research context

The participants in the current study were 290 students from the teacher education programmes of six universities of applied sciences in the Netherlands.Their ages ranged from 16 to 26 years ($M = 20.3$, $SD = 2.0$); 76% were female. Seven GLAs were included in the study. In one teacher education programme, two different GLAs were used in two different academic years of the bachelor's programme. The teacher educators provided course documents related to the GLA and were interviewed about their implementation of the design. This information was used to investigate the implementation of each GLA (see Tables 1 and 2). Table 1 shows for each GLA the numbers of students and teacher educators, study level, duration of the GLA, and the size of subgroups for each GLA. Table 2 provides a brief description of the eight design components for each GLA (De Hei et al., 2016).

Table 1 GLA assignments

	Students *(N)*	Teacher educators *(N)*	Year of bachelor program	Period in weeks the GLA could be worked on	Number of students per subgroup
Assignment 1	23	3	3	6	3 - 4
Assignment 2	69	7	1	8	12 - 13
Assignment 3	60	5	4	12	12 - 14
Assignment 4**	55	1	1	3	3
Assignment 5	16	2	1	10	3 - 4
Assignment 6 */**	41	3	3	1	3 - 6
Assignment 7	26	2	1	8	3 - 4

* Students were allowed to work full-time for an entire week on this assignment

** Assignments in the same teacher education program.

5.2.2 Measures

During the final meeting of the GLA, or in the week immediately after the GLA was completed, the students completed a survey with pre-structured answer options (5-point Likert-type scale with 1 = strongly disagree and 5 = strongly agree). This survey was used to examine their evaluations of the GLAs. This survey was constructed using eight design components of the GLAID framework (De Hei, Strijbos, Sjoer, & Admiraal, 2016). The component learning objectives and outcomes refers to two perceived learning outcomes: (1) perceived knowledge increase (declarative and procedural knowledge) and (2) learning outcomes for the future profession (social skills and preparation for professional development). The component interaction was understood as the verbal representations of students in the collaboration process (such as listening, explaining, and discussing). This component was hypothesized to act as a student variable that mediates the evaluation of GLAs. Engagement with GLAs was hypothesized as a further mediating variable (Martin, 2007).

Together with the two learning outcomes and the two mediators, the remaining six components to design GLAs formed the basis of the survey. The survey consisted of 58 items. A Principal Component Analysis (PCA) with Oblimin rotation (KMO = .858, R^2 = 57.93) was performed on the data from the 290 participants to examine the construct validity of the survey, using as inclusion criterion a factor loading of ≥ .4 on one factor only. This led to the addition of a scale (contribution: the extent to which each individual student of a group contributes to and is responsible for group performance and the group learning product). The facilities scale (students' evaluations of available time, available rooms, and digital support) was left out of the analyses because of low reliability. For each scale, Table 3 provides the number of items, an example item, reliability in terms of Cronbach's α, descriptive statistics, and the number of students for which a scale mean was computed. All of the items of the scales (in Dutch) can be found in Appendix C.

Table 2 GLA assignments as described in the course documents and elaborated by the teacher educators in the interviews

Learning objectives/ outcomes	Interaction	Assessment	Task characteristics
More than 30 learning objectives in the course description focused on three domains (geography, history and biology) and seven competencies	Exchange of ideas and giving peer feedback	Written product containing the lessons and evaluations, group-grade	Designing lesson cycle on the theme "evolution" integrating geography, history and biology
To be able to design lessons for a primary school group	Exchange of ideas and task division	Perform the lessons in groups: group grade, individual grade for individual report	Design an afternoon with lessons for a 3th and 4th grade class of a primary school focused on the theme of a picture book
Gain knowledge on school innovations, develop collaboration skills and present a project	Exchange of ideas and task division	Report about the design of the innovation and possibilities for implementation. Presentation of the report. Group grades.	Design an innovation for a primary school
Develop domain specific skills and collaboration skills	Exchanging ideas and explaining to others	Product: stop-motion movie, presentation of the collaboration process. Peer assessment of the presentation, teacher assessing the group product.	Make a stop-motion movie with the theme "travelling from one point to the other"
Develop communication and social skills, develop lesson plans	Exchange of ideas, task division and giving peer feedback	Perform the lessons in groups, group grade	Design a morning for a primary school class with lessons focused on one theme
Abstracting a theme from information of three domains, formulate learning questions, develop research skills	Brainstorming and task division	Presence during the meeting, presentation of the product, formative peer feedback	Perform practitioner research on a theme and develop lessons that relates to the researched theme
Develop social skills and practitioner research skills	Exchange of ideas, task division, discussing and reaching consensus	Practitioner research report and presentation of the report, group grades	Perform practitioner research within the theme: "the teacher as jack of all trades"

Structuring	Guidance	Group constellation	Facilities
Jointly performing the designed lessons	One time obligatory halfway the GLA and on request, focus on the final product	Self-chosen groups of 3 or 4 students	Format for the design of lessons
Students individually reflect on their role in the collaboration after the GLA is finished	Weekly focus varying per teacher educator (on the process of collaboration and/or the final product)	Students randomly assigned to groups of 12 to 13 students	Electronic learning environment only used to host the course documents: course description, assessment form with criteria
Group evaluation during the GLA of the collaboration process.	Weekly focus on the process of collaboration	Students chose an innovation focus and were assigned to students with the same focus, 12 to 14 students per group	Format for the steps to take in a school innovation
None	Weekly, focus on the final product	Self-chosen groups of 3 students	Electronic learning environment only used to host the course documents Software to produce a 'stopmotion' movie
Students individually reflect on their role in the collaboration after the GLA is finished	Weekly, on request or when the teacher educator found it was necessary	Self-chosen groups of 3 or 4 students	Electronic learning environment only used to host the course documents
None	One time at the start, after that on request	Self-chosen groups of 3 to 6 students	Electronic learning environment only used to host the course documents, supporting lectures regarding domain knowledge
Specific group and individual feedback on the collaboration	Weekly	Students were randomly assigned to groups of 3 or 4 students	Electronic learning environment only used to host the course documents

Table 3 Variables of the study

	N items	Example item	α	*M*	SD	*N* students
Perceived knowledge increase	6	I gained new insights about knowledge I already had by listening to other students during this GLA.	.79	3.59	0.64	288
Learning outcomes for future profession	6	I consider this GLA an adequate activity to prepare for my future profession.	.81	3.56	0.64	290
Verbal interaction	3	Working on this GLA I improved my skills in articulating my ideas towards my fellow students.	.75	3.21	0.80	288
Engagement*	5	During the GLA I am driven to complete the assignment in a good way.	.62	3.91	0.57	288
Contribution	3	In the group I participated in, every group member contributed equally to the final product.	.78	3.40	1.01	289
Assessment Quality	4	It was clear beforehand how the GLA would be assessed.	.72	3.41	0.74	281
Task characteristics	4	The task was suitable to work on in collaboration.	.69	3.72	0.68	289
Structuring*	4	It was clear how we were supposed to collaborate as a group in this GLA.	.61	3.47	0.74	288
Guidance	5	Our teacher was available for us in case we needed him/her.	.85	3.77	0.81	280
Group constellation	5	Knowledge and prior experience of the group members were complementary.	.75	3.83	0.70	288

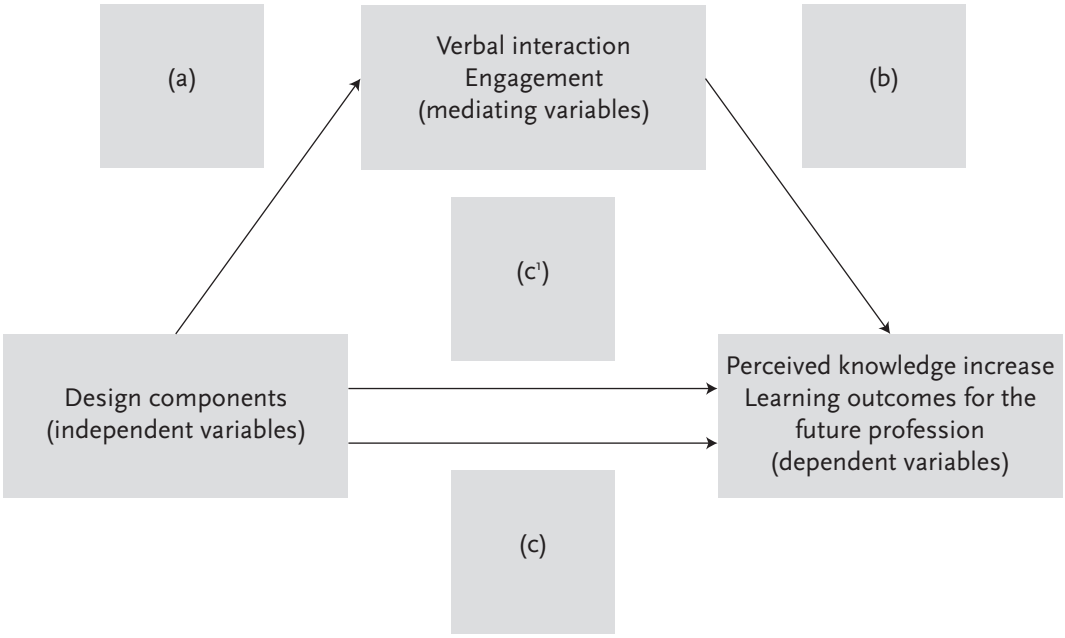
*Reliability after using the Spearman-Brown formula to lengthen the scale to 6 items (Engagement, $\alpha = .66$ and Structuring, $\alpha = .70$).

5.2.3 Analysis

As the student data are nested within seven different GLAs, multilevel analyses were used to test whether the variance at the level of the seven GLAs in both dependent variables differed significantly from zero. This was not the case and consequently the analyses were performed at the student level only.

Two multiple mediation regression analyses, one for each of the dependent variables, were performed using an SPSS macro developed by Hayes and Preacher (2014). The macro uses 5,000 bootstrap resamples to generate 95% confidence intervals for the indirect effect of the mediators on the dependent variables. The two regression analyses are visualised in Figure 1: the c-path represents the relation between the independent variables and the dependent variable in the absence of the mediators (total effect, unmediated model), the c^{1} path represents the same relation taking into account the effect of the mediators in this relation (direct effect, mediated model). In both analyses, verbal interaction and engagement were included as mediators and either perceived knowledge increase or learning outcomes for the future profession as dependent variable. Separate regression analyses were performed for each dependent variable, because this study specifically focused on the relationship between the design components and each of the dependent variables. The following independent variables were included: contribution, assessment quality, task characteristics, structuring, guidance, and group constellation. Students' prior educational level, year of bachelor's programme, and gender were included as covariates (not visualised in Figure 1).

Figure 1 Testing mediation of verbal interaction and engagement



5.3 Results

Before discussing the results of the multiple regression analyses, the correlations are reported between the independent variables, the mediators, and the dependent variables in table 4.

Table 4 Correlations of the independent, dependent and mediator variables

	1	2	3	4	5	6	7	8	9	10
Perceived knowledge increase (1)	-	.65**	.33**	.44**	.22**	.31**	.57**	.34**	.35**	.56**
Learning outcomes for the future profession (2)		-	.45**	.54**	.10	.37**	.65**	.37**	.44**	.34**
Verbal interaction (3)			-	.30**	.03	.19**	.37**	.28**	.21**	.19**
Engagement (4)				-	.14*	.40**	.62**	.54**	.43**	.48**
Contribution (5)					-	.09	.16**	.26**	.05	.49**
Assessment quality (6)						-	.42**	.40**	.42**	.26**
Task characteristics (7)							-	.46**	.43**	.45**
Structuring (8)								-	.39**	.36**
Guidance (9)									-	.21**
Group constellation (10)										-

** p<.01

* p<.05

5.3.1 Perceived knowledge increase

5.3.1.1 Direct relationship with students' evaluation of the design

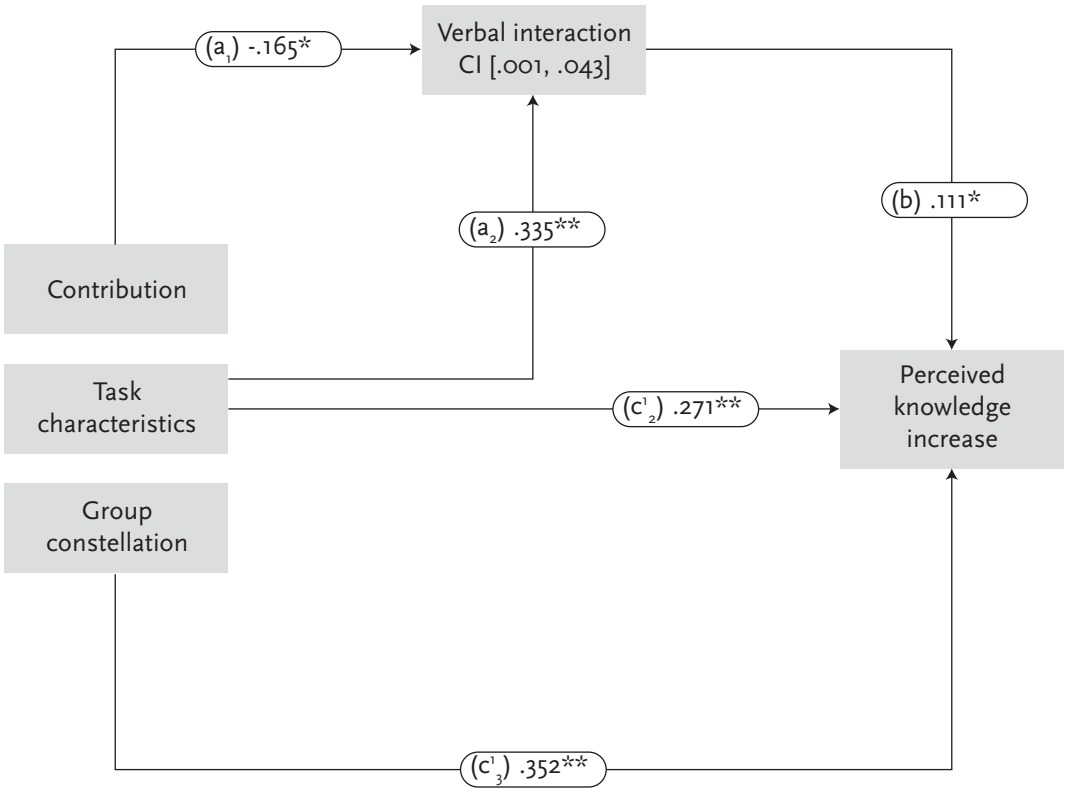
The design components that significantly relate to perceived knowledge increase are task characteristics (B = 0.313; SE = .055) and group constellation (B = 0.367; SE = .055), as shown in Table 1a of the Appendix D (total effects unmediated model: R2 = .457). The findings confirm that there is a positive relationship between students' evaluations of some of the design components and perceived increase in knowledge.

5.3.1.2 Mediation by verbal interaction and engagement

The results of the mediator regression analyses are summarised in Tables 1b and 1c of the Appendix D. Of the two mediators, only verbal interaction was significantly related to perceived knowledge increase (B = .111; SE = .040). Furthermore, it was found that verbal interaction mediated the relationship between students' evaluations of task characteristics and perceived knowledge increase (CI [0.006, 0.089], leading to a smaller but still significant

direct relationship between task characteristics and perceived knowledge increase (B = .271; SE = .060). This means that a complementary mediation was found (Zhao, Lynch, & Chen, 2010) of verbal interaction in the relationship between students' evaluations of the task characteristics of GLAs and their perceived knowledge increase. Furthermore, verbal interaction mediated the relationship between students' evaluations of the contributions of the group members and perceived knowledge increase in the absence of a significant direct relation between evaluation of the design and perceived knowledge increase. This indicates a full mediation (Zhao, Lynch, & Chen, 2010) of verbal interaction in this relationship. The relationship between contribution and verbal interaction was negative, which means that the higher the evaluation of contributions, the lower the evaluation of verbal interaction. Figure 2 visualises the findings on the mediation of verbal interaction.

Figure 2 Verbal interaction partially mediating between students' evaluations of design components and perceived knowledge increase.



* Significant at the .01 level
** Significant at the .001 level

5.3.2 Perceived learning outcomes for the future profession

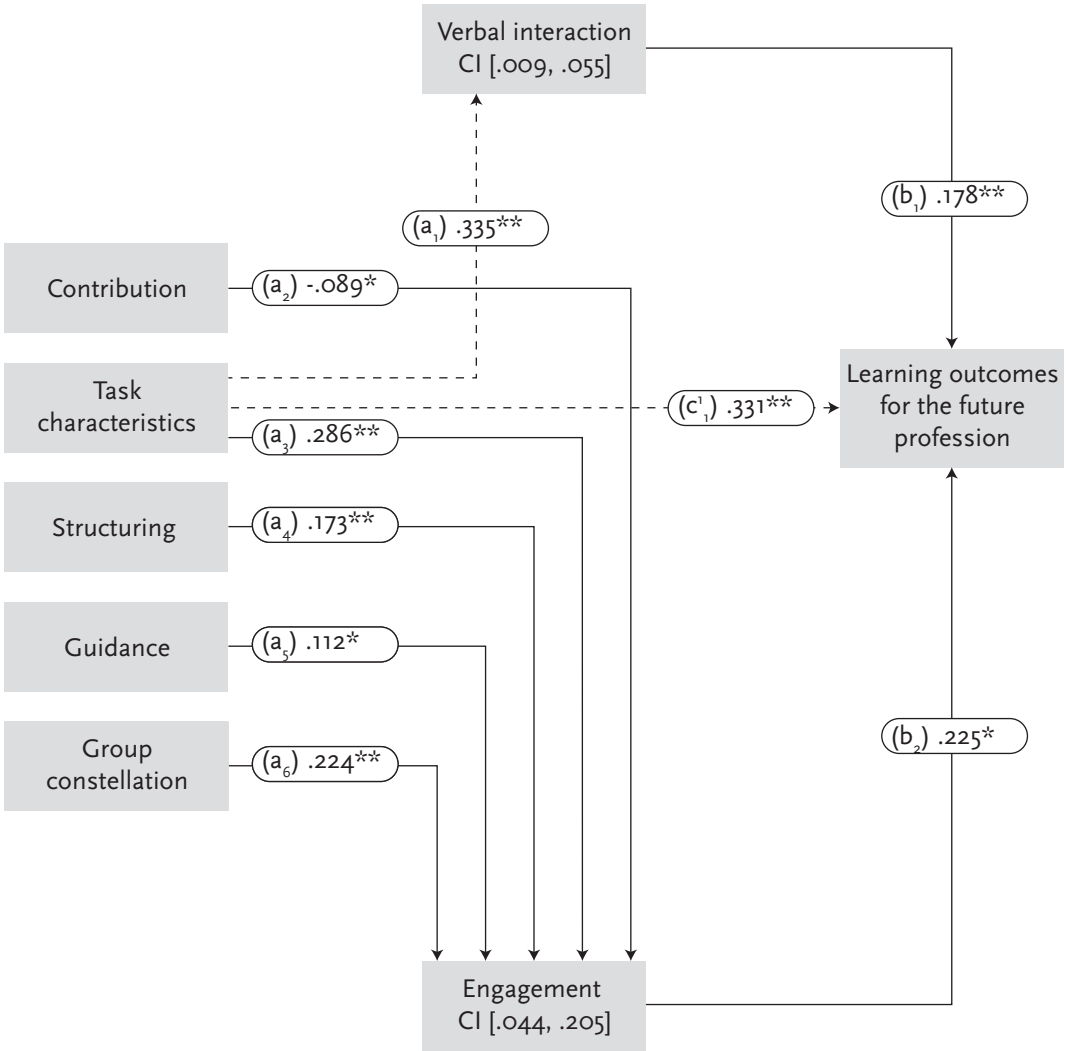
5.3.2.1 Direct relationships with students' evaluations of the design components

The design components that relate to perceived learning outcomes for the future profession are task characteristics (B = 0.455; SE = .054) and guidance (B = 0.119; SE = .044), as can be seen in Table 1d of the Appendix D (total effects unmediated model: R2 = .463). The findings confirm that there is a positive relationship between students' evaluations of the design components and perceived learning outcomes for the future profession.

5.3.2.2 Mediation by verbal interaction and engagement

The results of the mediator regression analyses are summarised in Tables 1e and 1f of the Appendix D. Both verbal interaction (B = 0.178; SE = .038) and engagement (B = 0.225; SE = .073) were significantly related to perceived learning outcomes for the future profession. Students' evaluations of task characteristics had complementary mediation via verbal interaction (CI [0.021, 0.120]) and engagement (CI [.025, .116]), leading to smaller though significant direct relationships (Verbal interaction, B = 0.335; SE = .084 and Engagement, (B = 0.286; SE = .043). Moreover, the results indicate that engagement fully mediated the relationship between the learning outcomes for the future profession and the evaluation of four design variables: contribution (CI [-0.045, -0.052]), structuring (CI [0.015, 0.080]), guidance (CI [0.006, 0.057]), and group constellation (CI [0.016, 0.106]). This means that the evaluation of these design components was only related to the learning outcomes for the future profession through student engagement: the more positive the evaluation, the higher students' engagement and the higher the perceived learning outcomes. Figure 3 visualises the findings for the mediation of verbal interaction and engagement in relation to the learning outcomes for the future profession.

Figure 3 Verbal interaction and engagement partially mediating between students' evaluations of design components and learning outcomes for the future profession.



* Significant at the .01 level
** Significant at the .001 level

5.4 Discussion and conclusion

The relationship between students' evaluations of the design of GLAs and the learning outcomes of those GLAs in teacher education was explored. It was found that students' evaluations of task characteristics and group constellation were positively related to a perceived knowledge increase. Students' evaluations of task characteristics and guidance were positively related to their perceptions of their learning outcomes for their future profession. In addition to these direct relationships, several mediated relationships were found . First, complementary mediation of verbal interaction was found in the relations between students' evaluations of task characteristics and both perceived knowledge increase and learning outcomes regarding the future profession. Complementary mediation indicates the likely presence of another mediator that was not included in the analyses. Second, full mediation of verbal interaction was found in the (negative) relation between students' evaluations of contributions of the group members and the perceived knowledge increase.

Third, full mediation of engagement was found for the relation between students' evaluations of contributions of the group members (the relation between engagement and students' perceptions of contributions of the group members was negative), structuring, guidance, and group constellation, on the one hand, and the perceived learning outcomes for the future profession, on the other hand. Full mediation indicates that a positive evaluation of the design components is not directly related to higher perceived learning outcomes for the future profession, but is only related through students' engagement with GLAs. This means that a positive evaluation was only related to positive learning outcomes because a positive evaluation led to high engagement of students with the GLAs. The main findings will be discussed below.

5.4.1 Importance of evaluation of task characteristics

Students' evaluations of task characteristics were related to both kinds of learning outcomes, directly and indirectly via the mediators verbal interaction and engagement. Evaluation of the design component task characteristics explained the largest proportion of variance in both outcome variables. Therefore, the quality of the task seems to be a dominant variable for explaining the perceived learning outcomes of GLAs. This conclusion is related to the findings of Wieland (2011), who found that students learn more when task characteristics are described in detail. Her findings revealed that students who worked collaboratively on an assignment with precise instructions outperformed students who worked on an assignment with general instructions.

Sockalingam, Rotgans, and Schmidt (2012) describe a validated and reliable quality-rating scale to rate the quality of problems in problem-based learning, which might be useful for the evaluation of task design in group learning activities. They found five aspects that indicate the task quality: the extent to which a task (1) leads to learning objectives, (2) is familiar, (3) triggers students' interest, (4) stimulates students' critical reasoning, and (5) promotes collaborative learning.

5.4.2 Mediating role of engagement and verbal interaction

The findings showed that student engagement played a crucial role in mediating the relationships between evaluations of design components of GLAs and perceived learning outcomes. The results showed that 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 means that the design of GLAs should be aimed first at triggering student engagement and then at other student learning outcomes.

5.4.3 Limitations

Several researchers argue that student self-report data should be interpreted cautiously and that the validity can be debated (e.g., Porter, 2011; Schwarz, 1999). However, Bowman (2010) argues that, although students' self-reported learning gains may not adequately reflect longitudinal gains, they do provide useful information because perceived learning gains are positively associated with student satisfaction. For example, in an online survey study of 110 students participating in an undergraduate online course, Lee, Srinivasan, Trail, Lewis, and Lopez (2011) found that students' perceptions of support (in their study operationalized as instructional support, peer support, and technical support) were significantly related to course satisfaction. Moreover, Lizzio, et al. (2002) found that students' perceptions of the learning environment were related not only to their satisfaction, but also to their academic achievements and the development of key (or transferable) skills. Therefore the use of self-reports for this study was considered to be adequate for answering the research questions.

5.4.4 Implications for GLAs in teacher education

5.4.4.1 Task characteristics and the relationship with engagement.

The evaluation of task characteristics is a dominant variable in explaining differences between students in perceived learning outcomes. This implies that teacher educators need to explicitly select tasks that are aligned with the desired learning outcomes. For example, if the main learning goal of the GLA is to acquire knowledge about a particular topic, the task characteristics should lead to activities that induce collaboration and prevent the students from dividing the work: if each student works on a different aspect of the task, they might not acquire sufficient knowledge about the topic as a whole.

Furthermore, to induce student engagement, authentic tasks are recommended for group learning activities (e.g., Gros, 2001; Hämäläinen & Vähäsantanen, 2011; McLoughlin, 2002). Another important characteristic of the task that is assumed to lead to better achievement is its complexity. In their review of research comparing the effectiveness of individual learning environments and collaborative learning environments, Kirschner, Paas, and Kirschner (2009) argue that the more complex tasks are, the higher the learning outcomes of group learning. Yet, Boekaerts and Minnaert (2006) found that learning tasks that matched the competence level of the students generated topic interest. They argue that a task needs to elicit students' perceived autonomy and feelings of competence to complete the task. It can be concluded that a positive evaluation of task characteristics might be influenced by the alignment of task difficulty and student competence.

Another implication for teacher education is the use of resources that induce intellectual conflict: resources that provide students with information that seems inconsistent with what they already know. Johnson and Johnson (2009b) describe this procedure as constructive controversy. They state that constructive controversy stimulates students' effort to seek further information and to study more and longer. In other words: it fuels their engagement.

5.4.4.2 Engagement related to other design components

The findings stress the important mediating role of student engagement in the design of group learning activities. Therefore, the design of GLAs should first be focused on the extent to which structuring, guidance, and group constellation induce the engagement of students with GLAs.

The component of structuring concerns instructing students in how to collaborate during the task: for example, by appointing roles or distributing the resources among students in order to make them interdependent to complete the task. Roles contribute to student awareness of what they need to do in the collaboration (Strijbos, Martens, Jochems, & Broers, 2004, 2007). It may also lead to more self-efficacy, which in turn may lead to engaged and motivated students (Pintrich, 2003).

How guidance was designed was also related to the engagement of students: the higher they evaluated the guidance of the GLAs, the more they felt engaged. In the design of a GLAs the guidance should describe how the teacher guides the focus of the attention of the students (McGregor, 2008) and as part of the design the guiding teacher should model the behaviour she/he wants the students to learn (Webb, 2010). The latter includes posing questions to elaborate on argumentations or summarizing the contributions of others to check whether the content of the interaction has been understood correctly.

Engagement was also induced by how students valued the group constellation. It was found that the more satisfied students were with the group size and composition, the more engaged they felt. Consequently, teacher educators are advised to deliberately decide on group composition, while keeping in mind what this means for the engagement of the students. For example teacher educators should decide whether the groups will be homogeneous or heterogeneous, and which criteria can be used for group composition, such as age, gender, achievement level, motivation, or personal interests (Dennen & Hoadley (2013). One important consideration in group constellation is how the team characteristics (group size and composition) match the task demands (Fransen, Kirschner, & Erkens, 2011).

For example, in some tasks it is important to reflect on a particular problem from different perspectives in order to stimulate students' broader awareness and understanding of the problem. The teacher educator might compose collaborative groups of students from different educational programmes or with different motivations to work on these particular problems. The different perspectives of these students will stimulate group discussion and reflection, which may contribute to student engagement with the task.

5.4.5 Future research

The mediation analyses showed complementary mediation of verbal interaction and engagement, indicating the existence of another mediator not included. To gain a comprehensive insight into the relationship between the evaluated design components and the perceived learning outcomes, future researchers might explore other mediators. An example of a possible mediator is described by Franssen, et al. (2011): interpersonal trust contributes to the building of shared mental models, which in their turn contribute to effective group work.

To yield more insights into the effectiveness of particular design components, future researchers might examine the relationships of those design components with learning outcome measures using a quasi-experimental design. In such studies, design components could be manipulated and objective learning outcomes could be used as outcome measures (such as test scores and observations).

5.4.6 Concluding remark

The relationship between students' evaluations of the implemented design components and the perceived learning outcomes was explored. The findings show that the extent to which GLAs contribute to positive student perceptions of the learning outcomes largely depends on how students evaluate the implemented design components and whether these evaluations are related to student engagement and student interaction.

— CHAPTER 6 —
Discussion and conclusion

Chapter 6 Discussion and conclusion

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.

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SUMMARY

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

Group learning activities are frequently implemented in higher education. A group learning activity (GLA) can be defined as a curriculum activity that covers a time period that is longer than one lesson in which students learn collaboratively. The central assumption in this dissertation is that collaborative learning can lead to students' learning outcomes, if (1) properly designed and implemented, (2) taking the collaborative premise into account, and (3) grounded in recent scientific research findings about effective collaborative learning. Possible learning outcomes may be (a) knowledge acquisition, (b) motivation and engagement, (c) higher-order thinking skills, (d) metacognitive skills, (e) social/collaborative skills, and (f) preparation for students' future profession, professional development, and participating in the society of networking and sharing information.

However, not all teachers in higher education design and implement GLAs in an effective manner. The central aim of this dissertation is to provide insights 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.

Study 1: Collaborative learning in higher education: teachers' practices and beliefs

With the first study, the practices and beliefs of teachers about collaborative learning were explored to investigate the assumption that there is a need for knowledge about the design of collaborative learning in higher education and for guiding teachers in this complex matter. Teachers' educational beliefs and personal theories of teaching and learning strongly influence their classroom practices and thus their design of collaborative learning. The research questions were: (1) How do teachers in higher education characterise collaborative learning in their educational practices?, (2) What is the relationship between the frequency in collaborative learning practices and teachers' beliefs about collaborative learning?, and (3) What is the relationship between the variety in collaborative learning practices and teachers' arguments for applying collaborative learning in their lectures?.

The respondents were 115 teachers from five faculties of a university of applied sciences in a large city in the Netherlands. They completed a survey on three topics: effort beliefs (i.e. beliefs about the amount of effort students are willing to dedicate to collaborative learning), learning beliefs (i.e. beliefs about the effect of collaborative learning on learning outcomes) and motivational beliefs (i.e. beliefs about the effects of collaborative learning on motivation). Three open-ended questions concerned the way in which teachers applied group learning activities, whether and how students were credited and whether peer-assessment was used. Ten randomly selected teachers participated in follow-up interviews; two from each of the five faculties of Teacher Education, European Studies, Communication Management, Health Care, and Technology, Innovation and Society. The transcribed interviews were used to obtain more detailed information about the practices of the teachers.

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 regarded the design of collaborative learning as 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 design collaborative learning intuitively, based on their own experience. They would appreciate designing collaborative learning in

collaboration with colleagues. Furthermore, they stressed that the time they can spend on the design of GLAs is limited.

The teachers' beliefs about the positive effects of collaborative learning on students' 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 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.

In summary, the results of this study justified further research into collaborative learning and how teachers could be supported in designing effective collaborative learning.

Study 2: A comprehensive framework for the design of group learning activities in higher education

During the second study, the focus of the research narrowed from collaborative learning in general to group learning activities (GLAs), to distinguish between collaborative learning as a teaching method used during lessons alongside other teaching methods and GLAs, in which students work collaboratively on a group assignment during a time period longer than one lesson. The objective of the second study was to develop an approach for the educational design of GLAs by investigating how various components for the design of GLAs could be synthesised into one theoretically informed comprehensive framework. GLAs can be found in face-to-face, online (also referred to as Computer Supported Collaborative Learning) and blended learning environments. Various models for the design of GLAs exist, but they differ in their design components and how the design process is structured. The following research questions were formulated to develop a comprehensive framework for the design of GLAs: (1) How can the components of designing GLAs be synthesised into one comprehensive framework? and (2) How can teachers in higher education use this framework in the design of GLAs?.

In order to answer the research questions fourteen 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 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. If necessary during the implementation, components and their alignment should be adjusted. In step 5, the evaluation of the components and their alignment can help in effective reflection on the processes and outcomes of the designed GLAs and inform the redesigns of GLAs.

The GLAID framework can guide educational designers and teachers in higher education with the complex process of designing GLAs. Additionally, the framework can be used for the monitoring and evaluation of GLAs. Finally, the GLAID framework can be used to interpret the outcomes of research on GLAs.

Study 3: Teacher educators' design and implementation of group learning activities

The aim of the third study was to empirically validate the GLAID framework. Accordingly, the research question of this study was formulated as follows: 'How do teacher educators design and implement GLAs, and 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 train their student teachers to implement collaborative learning in their future classrooms. Consequently, they are considered to be expert educational designers of collaborative learning amongst the population of higher education teachers.

Twenty-three teachers in Teacher Education Programmes (primary education) of six universities of applied sciences in the Netherlands participated in individual face-to-face semi-structured interviews. The transcribed interviews were subjected to selective coding, which was guided theoretically by the (design components of the) GLAID framework. It was also coded whether teacher educators addressed the alignment between those components. The interviewees were not familiar with the GLAID framework, and were not informed about the framework and its components.

Teacher educators addressed all components of the framework, although the facilities component was only mentioned by some teacher educators. It should be stressed that this facilities component is important to include 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. The interviews revealed that many teacher educators encounter problems with the structuring component. Teacher educators did not mention new components in the interviews and underlined the importance of the alignment between the components, which is an integral aspect of the framework. The conclusion was that the components of the GLAID framework are not only grounded in the academic literature, but are used by practitioners as well. Furthermore, it was concluded that the GLAID framework can be useful as a practitioner guide in teacher education and higher education for teachers who wish to design, implement and evaluate GLAs.

Study 4: Student teachers' evaluation of design components related to perceived learning outcomes

The next step was to explore the relationship between student teachers' evaluations of the design GLAs related to the learning outcomes. The research questions that were investigated were: (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 interaction mediate the relationship

between students' evaluation of the design of GLAs and their perceived knowledge increase?, and (4) To what extent do engagement and interaction mediate the relationship between students' evaluation of the design of GLAs and their perceived learning outcomes for the future profession?

The implementation of GLAs in six teacher education programmes was examined. Teacher education students ($N = 290$) from six Dutch universities of applied sciences completed a survey with pre-structured answering options.
The results of the analyses indicated that students' evaluation of task characteristics and group constellation were related positively to a perceived increase of knowledge. Furthermore, a positive relationship was found between students' evaluation of task characteristics and guidance on the one hand, and students' perceptions of benefits of GLAs for their professional development on the other hand. Additionally, the results revealed that students' self-reported verbal interaction mediated the relationship between the evaluation of GLA design and both kinds of perceived learning outcomes. The self-reported student engagement only mediated in the relationship between the evaluation of GLA design and perceived learning outcomes for the future profession.

Regarding the different components, the fourth study provided 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 student engagement with the evaluation of the structuring component, the guidance and the group constellation on the one hand, and on the other hand the learning outcomes for the future profession, and (c) in contrast to what was expected, no relationship was found between the evaluation of assessment and the mediators, or between assessment and the learning outcomes.

General conclusions

Teachers in higher education design and use GLAs, but they regard the design and implementation as a complex task they perform intuitively. They also mention that their efforts mostly do not lead to the desired learning outcomes. Therefore, a theoretically informed framework to support teachers in the design and implementation of GLAs was developed. The components of this 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. 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.

Reflecting on the central aim of this thesis, it can be concluded that the GLAID framework contributes to insights into the improvement of the learning outcomes and teachers in higher education may use it as a support to design, implement and evaluate GLAs. Future research can contribute to developing this framework from a general design tool to a framework that provides specific support for teachers to design, implement and evaluate GLA.

— SAMENVATTING —

Samenwerkend leren in het hoger onderwijs: ontwerp, implementatie en evaluatie van groepsleeractiviteiten

In het hoger onderwijs worden regelmatig groepsopdrachten ingezet. Deze worden in dit proefschrift aangeduid met "groepsleeractiviteiten" en afgekort als GLA. GLA's kunnen worden gedefinieerd als curriculumactiviteiten voor een tijdsperiode die langer is dan één les, waarin studenten leren door samenwerking. De aanname van dit proefschrift is dat deze vorm van samenwerkend leren leidt tot leeropbrengsten bij studenten indien dit samenwerkend leren: (1) op de juiste wijze is ontworpen en geïmplementeerd, (2) uitgaat van de "collaborative premise" (de noodzaak om in samenwerking te leren), en (3) is ontworpen op basis van wetenschappelijke inzichten over effectief samenwerkend leren. Mogelijke leeropbrengsten van samenwerkend leren hebben betrekking op: (a) kennis, (b) motivatie en betrokkenheid, (c) hogere-orde-denkvaardigheden, (d) metacognitieve vaardigheden, (e) sociale en samenwerkingsvaardigheden, en (f) voorbereiding op het toekomstig beroep.

Echter niet alle docenten in het hoger onderwijs ontwerpen en implementeren effectieve GLA's. Het doel van dit proefschrift is het verschaffen van inzicht over hoe docenten in het hoger onderwijs ondersteund kunnen worden bij het ontwerpen, implementeren en evalueren van GLA's door het ontwikkelen van een theoretisch en empirisch onderbouwd raamwerk voor het ontwerp van GLA's.

Studie 1: Samenwerkend leren in het hoger onderwijs: toepassingen door en overtuigingen van docenten

Om te verkennen of er behoefte is aan kennis over en ondersteuning bij het ontwerp van samenwerkend leren onder docenten in het hoger onderwijs, is onderzocht welke overtuigingen docenten hebben over samenwerkend leren en op welke wijze zij samenwerkend leren toepassen in hun lespraktijk. Docentovertuigingen en persoonlijke theorieën over lesgeven en leren beïnvloeden sterk de onderwijspraktijk van deze docenten en derhalve ook het ontwerp van samenwerkend leren. De onderzoeksvragen van deze studie waren: (1) Op welke wijze beschrijven docenten het samenwerkend leren in hun onderwijspraktijk?, (2) Wat is de relatie tussen de frequentie van toepassingen van samenwerkend leren en docentovertuigingen betreffende samenwerkend leren?, en (3) Wat is de relatie tussen de variëteit in toepassingen van samenwerkend leren en de argumenten van docenten om samenwerkend leren in te zetten in hun lessen?

De respondenten waren 114 docenten van vijf verschillende faculteiten van een hogeschool in een grote Nederlandse stad. De docenten vulden een vragenlijst in over drie onderwerpen: (1) overtuigingen over de inzet die studenten tonen tijdens samenwerkend leren, (2) overtuigingen over de leeropbrengsten van studenten door samenwerkend leren, en (3) overtuigingen over de motivationele opbrengsten van samenwerkend leren.
Aan het einde van deze vragenlijst werden drie open vragen gesteld over de wijze waarop docenten samenwerkend leren toepassen, over hoe studenten worden beoordeeld en over het gebruik van *peer assessment* bij de beoordeling. Tien willekeurig geselecteerde docenten namen deel aan vervolginterviews; twee van elk van de vijf deelnemende faculteiten (pabo, European Studies, communicatie management, gezondheidszorg, en Technology, Information and Society). De getranscribeerde interviews werden gebruikt om meer gedetailleerde informatie te verkrijgen over de onderwijspraktijk van de docenten.

Uit de resultaten bleek dat de meeste van de deelnemende docenten samenwerkend leren ontwerpen en gebruiken in hun lessen, maar dat de variëteit aan

werkvormen beperkt is. De docenten beschouwden het ontwerp van samenwerkend leren als een gecompliceerde taak en zij verklaarden dat het geïmplementeerde ontwerp vaak niet leidt tot de gewenste leeropbrengsten. De docenten vertelden dat zij samenwerkend leren intuïtief ontwerpen met hun eigen ervaring als bron voor het ontwerp. Docenten hebben een voorkeur om samenwerkend leren te ontwerpen in samenwerking met andere docenten. Verder gaven zij aan dat de tijd die zij kunnen besteden aan het ontwerp van samenwerkend leren erg beperkt is.

De overtuigingen van docenten over de positieve effecten van samenwerkend leren wat betreft leeropbrengsten en studentmotivatie waren duidelijk positiever dan de overtuigingen dat studenten bereid zijn moeite te doen voor samenwerkend leren. Docenten die aangaven dat ze samenwerkend leren inzetten, zijn positiever over de mate waarin studenten zich inzetten voor samenwerkend leren, dan docenten die samenwerkend leren niet gebruiken in hun onderwijspraktijk. De argumenten die docenten gebruiken om samenwerkend leren in te zetten zijn meer studentgeoriënteerd dan docentgeoriënteerd. De resultaten wezen ook uit dat hoe meer variatie in werkvormen met samenwerkend leren docenten inzetten, hoe meer studentgeoriënteerde argumenten zij aandragen om samenwerkend leren in te zetten.

Samengevat rechtvaardigen de resultaten van deze studie verder onderzoek naar effectief ontwerp van samenwerkend leren en de wijze waarop docenten hierin ondersteund kunnen worden.

Studie 2: Een breed toepasbaar raamwerk voor het ontwerp van groepsleeractiviteiten in het hoger onderwijs

In de tweede studie werd samenwerkend leren in het algemeen vertaald naar het groepsleeractiviteiten (GLA's). Hiermee werd een onderscheid gemaakt tussen samenwerkend leren als lesmethode gedurende lessen naast andere lesmethoden en GLA's waarbinnen studenten samenwerken aan een groepsopdracht gedurende een periode die langer duurt dan slechts één les. Het doel van de tweede studie was het ontwikkelen van een benaderingswijze voor het onderwijskundig ontwerp van GLA's. Hierbij werd onderzocht hoe de verschillende ontwerpcomponenten voor het ontwerpen GLA's samengevoegd konden worden in één theoretisch onderbouwd breed toepasbaar raamwerk. GLAs komen voor in *face-to-face, online* (ook wel genoemd: *Computer Supported Collaborative Learning*) en *blended* leeromgevingen. Er bestaan meerdere modellen voor het ontwerp van GLA's, maar deze verschillen wat betreft de gesuggereerde ontwerpcomponenten en de wijze waarop het ontwerpproces wordt gestructureerd. De volgende onderzoeksvragen werden geformuleerd om een breed toepasbaar raamwerk voor het ontwerp van GLA's te ontwikkelen:
(1) Hoe kunnen de componenten voor het ontwerp van GLA's kunnen worden samengevoegd in een breed toepasbaar raamwerk?, en (2) Hoe kunnen docenten in het hoger onderwijs dit raamwerk gebruiken?

Veertien metastudies die het ontwerp van GLA's beschrijven, werden geanalyseerd. Daaruit kwamen acht essentiële ontwerpcomponenten naar voren:
(1) interactie, (2) leerdoelen en –opbrengsten, (3) beoordeling, (4) taakkenmerken, (5) structurering van de samenwerking, (6) begeleiding, (7) groepssamenstelling, en (8) faciliteiten. Deze acht componenten werden geplaatst in een algemeen model voor onderwijskundig ontwerpen, het ADDIE-model. Door de componenten hierin te plaatsen kon de samenhang tussen de componenten worden vormgegeven en kon worden beschreven in welke volgorde het ontwerpproces kan worden doorlopen.

Dit resulteerde in een nieuw raamwerk dat de naam GLAID (*Group Learning Activities Instructional Design*) kreeg.

In stap 1 van dit raamwerk worden de kenmerken van de studenten, de docenten en het curriculum vastgesteld, net als de noodzaak om studenten in deze GLA te laten samenwerken. In stap 2 begint het ontwerpproces met het simultaan ontwerpen van de interactie, de leerdoelen en het assessment. In stap 3a worden de instructiestrategieën ontworpen, namelijk de taakkenmerken, de wijze waarop de samenwerking wordt gestructureerd en de begeleiding. Stap 3b betreft het ontwerp de logistieke kant van de GLA: de groepssamenstelling en de faciliteiten. Binnen elke stap en tussen alle stappen moeten de componenten in samenhang worden ontworpen om het onderwijsontwerp van de GLA effectief te laten zijn. Er moet sprake zijn van zowel lineaire als cyclische samenhang tussen de componenten. In stap 4 wordt tijdens de implementatie de uitvoering van elke component gemonitord, zowel individueel als in samenhang met de andere componenten. Indien nodig kan tijdens de implementatie het ontwerp van de GLA worden bijgesteld. In stap 5 wordt de gehele geïmplementeerde GLA geëvalueerd voor elke component en de samenhang tussen de componenten. Deze evaluatie kan bijdragen aan effectieve reflectie op het proces en de uitkomst van het geïmplementeerde GLA ontwerp. Deze reflectie kan dienen als informatie voor het herontwerp van de GLA.

Het GLAID-raamwerk kan ondersteuning bieden aan onderwijskundig ontwerpers en docenten het hoger onderwijs bij het complexe proces van het ontwerpen van GLA's. Verder kan het raamwerk worden gebruikt om GLA's te monitoren en te evalueren. Als laatste kan het GLAID-raamwerk worden gebruikt om onderzoeksresultaten over GLA's te interpreteren.

Studie 3: Het ontwerp en de implementatie van GLA's door lerarenopleiders

Het doel van de derde studie was de empirische validatie van het GLAID-raamwerk. De onderzoeksvraag luidde derhalve: 'Hoe ontwerpen en implementeren lerarenopleiders GLA's en op welke wijze komen hun overwegingen overeen met het GLAID-raamwerk?'. Lerarenopleiders ontwerpen en implementeren GLA's regelmatig, omdat dit een belangrijk onderdeel is van het curriculum. Bovendien leren zij hun studenten, in tegenstelling tot andere hogeronderwijsdocenten, GLA's te implementeren in hun toekomstige schoolpraktijk. Om deze reden worden lerarenopleiders beschouwd als experts in het ontwerp van samenwerkend leren.

Drieëntwintig lerarenopleiders van pabo's van zes verschillende hogescholen in Nederland namen deel aan semigestructureerde interviews. De getranscribeerde interviews werden geanalyseerd door selectieve codering, waarbij de componenten van het GLAID-raamwerk en de samenhang tussen de componenten werden gebruikt als coderingseenheden. De respondenten waren niet bekend met het GLAI- raamwerk en werden hier niet over geïnformeerd.

In de beschrijvingen van de lerarenopleiders werden alle componenten van het raamwerk genoemd, hoewel slechts enkele docenten ook de component Faciliteiten betrokken bij het ontwerp en de implementatie van GLAs. Het is echter van groot belang ook de faciliteiten te betrekken in het ontwerp. Want hoe goed een GLA ook wordt ontworpen, zonder de benodigde fysiek ruimte, voldoende tijd en ondersteuning van passende (leer) materialen zullen studenten de leerdoelen niet kunnen behalen.

In de interviews gaven veel lerarenopleiders aan dat zij problemen ervaren met de structureringscomponent. Lerarenopleiders noemden geen nieuwe componenten.

Verder benadrukten de lerarenopleiders dat ontwerpcomponenten op elkaar afgestemd moeten zijn, net als dat in het GLAID-raamwerk wordt beschreven als een integraal aspect van het ontwerp.

Naar aanleiding van deze studie kan worden geconcludeerd dat het GLAI-raamwerk zowel gefundeerd is op wetenschappelijke literatuur als op ervaringen van lerarenopleiders. Daarnaast kan worden gesteld dat het GLAID-raamwerk bruikbaar en nuttig kan zijn als ondersteuning voor docenten van lerarenopleidingen en andere docenten in het hoger onderwijs bij het ontwerp, de implementatie en de evaluatie van GLA's.

Studie 4: De relatie van de ontwerpcomponenten met de door (pabo)studenten gepercipieerde leeropbrengsten

De volgende stap was de exploratie van de relatie tussen de door (pabo)studenten ervaren leeropbrengsten van het ontwerp van GLA's en de leeropbrengsten. De volgende onderzoeksvragen werden geformuleerd: (1) Wat is de relatie tussen studentevaluaties van het ontwerp van GLAs en de gepercipieerde leeropbrengsten wat betreft kennis?, (2) Wat is de relatie tussen studentevaluaties van het ontwerp van GLAs en de ervaren leeropbrengsten voor het toekomstige beroep?, (3) In welke mate mediëren betrokkenheid en interactie de relatie tussen de ervaren leeropbrengsten wat betreft kennis?, en (4) In welke mate mediëren betrokkenheid en interactie de relatie tussen de ervaren leeropbrengsten voor het toekomstige beroep?

De implementatie van GLA's is in pabo's van zes verschillende hogescholen in Nederland onderzocht. Pabostudenten ($N = 290$) van deze opleidingen vulden een vragenlijst in. De resultaten toonden aan dat studentevaluaties van de taakkenmerken en de groepssamenstelling positief gerelateerd waren aan de ervaren kennisvermeerdering door deelname aan de GLA. Daarnaast werd een positieve relatie gevonden tussen studentevaluaties van taakkenmerken en begeleiding aan de ene kant, en de ervaren leeropbrengsten voor het toekomstig beroep aan de andere kant. Verder bleek uit de resultaten dat de door de studenten gerapporteerde verbale interactie medieerde in de relatie tussen de geëvalueerde GLA en beide soorten leeropbrengsten. De door studenten gerapporteerde betrokkenheid medieerde alleen in de relatie tussen de evaluatie van de GLA en de ervaren leeropbrengsten voor het toekomstige beroep.

Wat betreft de verschillende ontwerpcomponenten van GLA's leidde deze vierde studie tot de volgende inzichten. Ten eerste was de evaluatie van de taakkenmerken zowel direct als indirect gerelateerd aan beide soorten leeropbrengsten en de evaluatie van de taakkenmerken verklaarde de grootste proportie variantie van alle ontwerpcomponenten. Ten tweede was er sprake van volledige mediatie tussen studentbetrokkenheid en de evaluatie van de structurering van de samenwerking, de begeleiding en de groepssamenstelling aan de ene kant, en leeropbrengsten voor het toekomstige beroep aan de andere kant. Ten derde bleek, in tegenstelling tot wat verwacht werd, geen relatie te bestaan tussen de evaluatie van het assessment en de mediatoren, en ook niet tussen assessment en de ervaren leeropbrengsten.

Algemene conclusies

Docenten in het hoger onderwijs ontwerpen en gebruiken GLA's, maar zij beschouwen zowel het ontwerp als de implementatie als een complexe taak die zij vooral intuïtief uitvoeren. Docenten benoemen ook dat de implementatie van hun GLA-ontwerpen niet leidt tot de gewenste leeropbrengsten. Om docenten te ondersteunen in het ontwerp en de implementatie van GLA's is een theoretisch onderbouwd breed toepasbaar raamwerk

ontwikkeld. De componenten en de samenhang tussen deze componenten kan worden herkend in de beschrijving van lerarenopleiders. Het GLAID-raamwerk is derhalve ook empirisch onderbouwd. De resultaten van studentevaluaties geven aan dat de componenten van het GLAID-raamwerk bijdragen aan de ervaren leeropbrengsten van GLA's, waarbij de taakkenmerken, de begeleiding en de groepssamenstelling worden geëvalueerd als de belangrijkste componenten die bijdragen aan de leeropbrengsten, gemedieerd door verbale interactie en betrokkenheid.

Reflecterend op het doel van deze dissertatie kan worden geconcludeerd dat het GLAID-raamwerk bijdraagt aan inzichten om de leeropbrengsten van GLA's te verhogen en dat docenten in het hoger onderwijs het raamwerk kunnen gebruiken om GLA's te ontwerpen, implementeren en evalueren. Toekomstig onderzoek kan bijdragen aan de ontwikkeling van dit raamwerk als breed toepasbaar ontwerpmiddel naar een raamwerk dat voorziet in specifieke ondersteuning voor docenten om GLA's te ontwerpen, implementeren en evalueren.

— APPENDIX A —

Scales and items study quantitative part chapter 2 in Dutch.

A. Leeropbrengst

1. Samenwerkend leren is geschikt om complexe problemen te laten aanpakken.
2. Samenwerken tijdens lessen is een relevante voorbereiding voor samenwerken in de toekomstige beroepspraktijk.
3. Samenwerkend leren zorgt ervoor dat studenten leren om verantwoordelijkheid te nemen voor hun leerproces.
4. Samenwerkend leren is een efficiënte onderwijsmethode in het hoger beroepsonderwijs.
5. Groepsopdrachten stimuleren de inhoudelijke betrokkenheid van studenten.
6. Studenten leren effectief als ze met elkaar discussiëren over de leerstof.
7. Samenwerkend leren draagt bij aan de samenwerkingscapaciteiten van een student.
8. Gezamenlijk werken aan complexe taken vergroot de leeropbrengst.
9. Samenwerkend leren levert een bijdrage aan kennisconstructie.
10. Samenwerkend leren levert een bijdrage aan de professionele ontwikkeling van een student.

B. Inzet van studenten

1. Studenten leveren tijdens samenwerkend leren een gelijkwaardige bijdrage aan een groepsproduct.
2. Werken in groepen is uitdagend voor studenten.
3. Studenten tonen meer inzet als zij samen opdrachten maken dan wanneer zij dat individueel doen.
4. Studenten zijn enthousiast als zij mogen werken aan een groepsopdracht.
5. Tijd die studenten investeren in samenwerken komt op een positieve wijze tot uitdrukking in de leeropbrengst.

C. Motivatie

1. Samenwerkend leren draagt bij aan de authenticiteit van de leerervaring.
2. Studenten nemen gemotiveerd deel aan de les als zij met elkaar kunnen discussiëren over de leerstof.
3. Samenwerken heeft een positieve invloed op de leermotivatie van de studenten.

— APPENDIX B —

Second selection (110 articles minus 14 articles used for the comprenhensive framework)

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— APPENDIX C —

Scales and items study chapter 5 in Dutch

A. Kennisvermeerdering

1. Hoe actiever de groepsleden deelnemen aan de discussie hoe meer wij van elkaar kunnen leren.
2. Doordat de groepsleden binnen samenwerkend leren andere kennis hebben dan ik, komen we tot betere oplossingen voor groepsopdrachten.
3. Gesprekken tijdens samenwerkingsbijeenkomsten ervaar ik als opbouwend.
4. Luisteren naar anderen maakt **niet** dat ik een nieuwe kijk krijg op de kennis die ik al heb.
5. Door tijdens samenwerkend leren opdrachten te praten met mijn medestudenten krijg ik een beter begrip van de leerstof.
6. Ik heb ervaren dat samenwerkend leren een geschikte manier is om complexe problemen te leren aanpakken.

B. Leeropbrengsten voor het toekomstig beroep

1. Samenwerkend leren ervaar ik als een passende voorbereiding voor het werk waar ik voor word opgeleid.
2. Samenwerkend leren heeft bijgedragen aan mijn beroepsontwikkeling.
3. Tijdens samenwerkingsopdrachten heb ik in samenwerking met andere studenten aan reële praktijkgerichte vraagstukken gewerkt.
4. Kennis die ik opgedaan heb door samenwerkingsopdrachten dragen bij aan mijn ontwikkeling als basisschoolleraar.
5. Door samen te werken aan opdrachten leer ik beter om verbanden in de leerstof te zien dan wanneer ik alleen werk.
6. Mijn ervaring is dat samenwerkend leren een efficiënte onderwijsmethode is op de Pabo.

C. Verbale interactie

1. Door samenwerkingsopdrachten heb ik geleerd te luisteren naar de mening van anderen.
2. Door samenwerkingsopdrachten ben ik beter geworden in het uitleggen van mijn ideeën aan anderen.
3. Door samenwerkingsopdrachten ben ik beter geworden in het beargumenteren van mijn standpunten naar anderen.

D. Betrokkenheid

1. Ik ben tijdens samenwerkingsopdrachten gemotiveerd om de opdracht goed af te ronden.
2. Ik kan voldoende bijdragen aan samenwerkingsopdrachten.
3. Ik behaal de kennisdoelen die docenten stellen voor samenwerkingsopdrachten
4. Samenwerkingsopdrachten ervaar ik als **on**interessant om te doen.
5. Door groepsopdrachten te maken leren wij als studenten dat wij zelf verantwoordelijk zijn voor ons leerproces.

E. Bijdragen

1. In de groepen waarin ik samengewerkt heb, leverde elk groepslid een gelijkwaardige bijdrage aan het groepsproduct.
2. In de groepen waarin ik samengewerkt heb, was er altijd minimaal één student die het werk voornamelijk aan anderen overliet.
3. Als ik samenwerkingsopdrachten doe, voelen de groepsleden zich allemaal verantwoordelijk voor het slagen van de opdracht.

F. Assessment (kwaliteit)

1. Vooraf was duidelijk hoe de samenwerkingsopdracht beoordeeld zou worden.
2. De beoordelingswijze van de samenwerkingsopdracht was eerlijk.
3. De beoordelingswijze van de samenwerkingsopdracht paste bij de leerdoelen.
4. De wijze waarop de samenwerkingsopdracht beoordeeld zou worden heeft onze manier van werken eraan richting gegeven.

G. Taakkenmerken

1. De opdracht was geschikt om de gestelde leerdoelen te behalen.
2. De opdracht was geschikt om samen aan te werken.
3. De opdracht stimuleerde ons om met elkaar in gesprek te raken over het vak.
4. Het werken aan deze opdracht heeft niet bijgedragen aan mijn ontwikkeling.

H. Structurering

1. We kregen vooraf instructie over de wijze waarop we moesten samenwerken.
2. Het was onduidelijk op welke manier we als groep moesten samenwerken.
3. Deze opdracht bood voldoende houvast om hem tot een goed einde te kunnen brengen.
4. De voorgeschreven manier van samenwerken paste niet bij deze opdracht.

I. Begeleiding

1. Het was duidelijk hoe we de docent konden bereiken als we vragen hadden of ondersteuning nodig hadden.
2. De docent was indien nodig bereikbaar voor ons.
3. De docent heeft geen inbreng gehad in het uitwerken van onze opdracht.
4. De docent heeft een belangrijke bijdrage geleverd aan de samenwerking in onze groep.
5. Het was niet nodig dat de docent zich met onze groep bemoeide.

J. Groepssamenstelling

1. De grootte van de groep paste goed bij de soort opdracht die we kregen.
2. Ik was niet tevreden met de samenstelling van de groep.
3. Kennis en ervaring van de groepsleden vulden elkaar aan.
4. De groepssamenstelling zorgde ervoor dat ieder groepslid kon deelnemen.
5. Door de werkwijze binnen deze opdracht brachten anderen nieuwe ideeën aan waar ik zelf nog niet aan gedacht had.

— APPENDIX D —

Appendix D

The paths referred to in the tables are shown in Figure 1 Chapter 5.

Table 1a Total effects of student evaluations of the design components on perceived knowledge increase mediation model

Paths	**R2**	**Coefficient**	**SE**	***p* (two-tailed)**
Total effect (unmediated model) (student evaluation of design components → perceived knowledge gains = **c path**)	.457			<.001
Constant		.566	.226	<.05
Contribution		-.016	.035	.65
Assessment quality		.014	.046	.76
Task characteristics		.313	.055	<.001
Structuring		.033	.049	.51
Guidance		.057	.044	.20
Group constellation		.367	.055	<.001
Gender		.004	.066	.95
Prior education		.011	.050	.82
Year of bachelor programme		.058	.025	<.05

Table 1a Total effects of student evaluations of the design components on perceived knowledge increase mediation model

Paths	R2	Coefficient	SE	*p* (two-tailed)
Direct effect (mediated model)(c' path)	203			<.001
Constant		.353	.255	.168
Contribution		.004	.036	.916
Assessment quality		.015	.046	.740
Task characteristics		.271	.060	<.001
Structuring		.017	.051	.734
Guidance		.047	.045	.294
Group constellation		.352	.057	<.001
Gender		.003	.065	.965
Prior education		.014	.049	.779
Year of bachelor programme		.070	.026	<.01
Direct effects on mediators	198			<.001
Student evaluation of design components → Verbal interaction = **a paths**)				
Constant		1.715	.346	<.001
Contribution		-.165	.054	<.01
Assessment quality		-.012	.070	.861
Task characteristics		.335	.0.84	<.001
Structuring		.112	.075	.137
Guidance		.075	.068	.269
Group constellation		.115	.084	.172
Gender		.071	.101	.479
Prior education		-.030	.076	.691
Year of bachelor programme		-.102	.039	<.01
Student evaluation of design components → Engagement = **a paths)**	.568			<.001
Constant		1.317	.179	<.001
Contribution		-.089	.029	<.01
Assessment quality		.023	.036	.521
Task characteristics		.286	.043	<.001
Structuring		.173	.039	<.001
Guidance		.112	.035	<.01
Group constellation		.224	.043	<.001
Gender		-.061	.052	.240
Prior education		.030	.039	.451
Year of bachelor programme		-.077	.020	<.001
Direct effects of mediators on perceived knowledge increase (b paths)				
(Verbal interaction → perceived knowledge increase)		.111	.040	<.01
(Engagement → perceived knowledge increase)		.017	.077	.82

Table 1c Indirect effects of student evaluation of the design components on perceived knowledge increase through proposed mediators Interaction and Engagement

Mediator	**Effect**	**SE**	**95% CI interval lowest level**	**95% CI interval highest level**
Verbal interaction	.018	.011	.001	.043
Contribution	-.018	.012	-.50	-.003
Assessment quality	-.001	.011	-.028	.017
Task characteristics	.037	.021	.006	.089
Structuring	.013	.011	-.002	.044
Guidance	.008	.010	-.005	.038
Group constellation	.013	.013	-.006	.049
Engagement	.009	.047	-.082	.104

Table 1d Total effects of student evaluation of the design components on learning outcomes for the future profession mediation model

Paths	**R2**	**Coefficient**	**SE**	***p* (two-tailed)**
Total effect (unmediated model) (student evaluation of design components → Learning outcomes for the future profession = **c path**)	.463			<.001
Constant		.868	.224	<.001
Contribution		-.042	.035	.223
Assessment quality		.050	.045	.272
Task characteristics		.455	.054	<.001
Structuring		.070	.049	.148
Guidance		.119	.044	<.01
Group constellation		.081	.054	.132
Gender		.079	.061	.226
Prior education		-.002	.049	.972
Year of bachelor programme		.000	.007	.994

Table 1e Direct effects of student evaluation of the design components on learning outcomes for the future profession mediation model

Paths	R2	Coefficient	SE	*p* (two-tailed)
Direct effect (mediated model) (c1 path)	.101			<.001
Constant		.267	.242	.271
Contribution		.007	.034	.836
Assessment quality		.047	.043	.278
Task characteristics		.331	.057	<.001
Structuring		.012	.048	.810
Guidance		.080	.042	.058
Group constellation		.011	.054	.845
Gender		.078	.062	.210
Prior education		-.003	.047	.948
Year of bachelor programme		.036	.025	.150
Direct effects of student evaluation of design components on mediators, values identical as in table 1b				
Direct effects of mediators on learning outcomes for the future profession (b paths)				
(Verbal interaction → learning outcomes for the future profession)		.178	.038	<.001
(Engagement → learning outcomes for the future profession)		.225	.073	<.01

Table 1f Indirect effects of student evaluation of the design components on perceived learning outcomes for the future profession through proposed mediators Interaction and Engagement

Mediator	Effect	SE	95% CI interval lowest level	95% CI interval highest level
Verbal interaction	.029	.013	.009	.055
Contribution	-.029	.014	-.063	-.008
Assessment quality	-.002	.016	-.036	.029
Task characteristics	.060	.025	.021	.120
Structuring	.020	.015	-.006	.054
Guidance	.013	.014	-.010	.047
Group constellation	.020	.019	-.015	.062
Engagement	.0122	.042	.044	0.205
Contribution	-.020	.010	-.045	-.052
Assessment quality	.005	.009	-.010	.025
Task characteristics	.064	.023	.025	.116
Structuring	.039	.016	.015	.080
Guidance	.025	.013	.006	.057
Group constellation	.051	.022	.016	.106

PUBLICATIONS AND PRESENTATIONS

Journal articles

De Hei, M. S. A., Strijbos, J. W., Sjoer, E., & Admiraal, W. F. (2016). Thematic review of approaches to design group learning activities in higher education: The development of a comprehensive framework. *Educational Research Review, 18*, 33-45. doi: 10.1016/j.edurev.2016.01.001

De Hei, M. S. A., Strijbos, J.W., Sjoer. E., & Admiraal, W. F. (2015). Collaborative learning in higher education: Lecturers' practices and beliefs. *Research Papers in Education, 30*(2), 232-247. doi: 10.1080/02671522.2014.208407

Manuscripts accepted for publication

De Hei, M. S. A., Sjoer, E., Strijbos, J. W., & Admiraal, W. F. Teacher educators' design and implementation of Group Learning Activities. *Educational Studies*.

Manuscripts submitted for publication

De Hei, M. S. A., Admiraal, W. F., Sjoer, E., & Strijbos, J. W. *Engagement and Interaction as mediating variables of perceived learning outcomes of group learning activities in teacher education*.

Symposia, individual paper presentations and round table sessions

De Hei, M. S. A., Admiraal, W. F., Sjoer, E., & Strijbos, J. W (2015). *Interaction and engagement mediating perceived learning outcomes of group learning activities*. Paper presentation at the EAPRIL (European Association for Practitioner Research on Improving Learning), Luxembourg, Luxembourg.

De Hei, M. S. A., Strijbos, J. W., Sjoer, E., & Admiraal, W. F. (2015). *Conceptual review for the design of group learning activities in higher education*. Paper presentation at the Onderwijs Research Dagen (ORD), at the annual meeting of the Flemish Educational Research Association and the Dutch Educational Research Association, Leiden, The Netherlands.

Hei, M. S. A., de, Sjoer, E., Strijbos, J. W., & Admiraal, W. F. (2014). Samenwerkend leren op Pabo's. *In Innovatieve wegen voor het opleiden van leraren. Digitale congresbundel Velon 2014* (pp. 193 - 194). Zwolle, Nederland: IJsseldelta center.

De Hei, M. S. A., Strijbos, J. W., Sjoer, E., & Admiraal, W. F. (2013). *Collaborative learning: converting beliefs into practices*. Paper presentation at EAPRIL at the invited symposium 'Demands of 21st century for Teacher Education and Teacher Educators' (European Association for Practitioner Research on Improving Learning), Bienne, Switserland.

De Hei, M. S. A., Admiraal, W. F., Sjoer, E., & Strijbos, J. W. (2013). *Collaborative learning: intended, implemented and experienced curriculum*. Paper presentation at the EAPRIL (European Association for Practitioner Research on Improving Learning), Bienne, Switserland.

De Hei, M. S. A., Admiraal, W. F., Sjoer, E., & Strijbos, J. W. (2013). *Collaborative learning in teacher education: the designed, implemented and experienced curriculum*. Paper presentation at the Onderwijs Research Dagen (ORD), at the symposium 'collaborative work and collaborative learning of (future) teachers', at the annual meeting of the Flemish Educational Research Association and the Dutch Educational Research Association, Brussels, Belgium.

De Hei, M. S. A., Admiraal, W. F., Sjoer, E., & Strijbos, J. W. (2012, May 20-22). *Collaborative learning in teacher education*. Roundtable presentation at the Onderwijs Research Dagen (ORD), the annual meeting of the Flemish Educational Research Association and the Dutch Educational Research Association, Wageningen, The Netherlands.

Bookchapter

Hei, M. S. A., de (2015). Samenwerkend leren gaat niet vanzelf. In E. Sjoer, M. de Hei, J. van Helvoort (Eds.), *Onbegrensd leren* (pp. 11-22). Den Haag, the Netherlands: Lectoraat Duurzame Talentontwikkeling.

Curriculum Vitae

Miranda de Hei was born on November 1st, 1965 in Dordrecht (The Netherlands). She studied Speech Therapy at Rotterdam University of Applied Sciences and graduated in 1988. From that year on Miranda worked as a speech therapist in independent practices, in nursing homes and in a school for disabled children. In 2002 she became a student teacher at the Hague University of Applied Sciences at which she graduated in 2003. Subsequently Miranda worked three years as a primary school teacher. In 2004 she also started working as a teacher educator and speech therapist at the teacher education department of the Hague University. In 2008 Miranda started studying Child and Education Studies at Leiden university. In 2011 she graduated cum laude. In the same year she wrote a proposal for her PhD research, which was accepted April 2012. Her PhD research was carried out at the ICLON, the teacher education faculty of Leiden University. Miranda still works as a teacher educator. Furthermore, she works as a researcher in the research group Sustainable Talent Development of The Hague University of Applied Sciences.

Acknowledgements

In 2008, when I was working as a teacher educator at The Hague University of Applied Sciences, my employer offered me the chance to get my Master's Degree in Educational Sciences. I eagerly embraced the opportunity. I really enjoyed studying at Leiden University, especially when I, for my master's thesis, performed my first scientific research. In the final stage of this study, my supervisor, Jan-Willem Strijbos, encouraged me to expand this research and start a PhD trajectory. I was not immediately enthusiastic. During the three years, whilst I was doing my master's education I was also working three days a week as a teacher educator. This combination had a rather large impact on my family life and social life. However, Jan-Willem proved to be very persistent. In each meeting we had to discuss the progress of my master's research, he asked if I had already considered whether or not to start a PhD. As you have noticed his persistency has paid off!

The research for and the writing of this thesis have evolved over the years, and so has the group of people involved. In 2011, immediately after attaining my master's degree, Ellen Sjoer, chair of the research group of Sustainable Talent Development ('Lector') of The Hague University, invited me to join her research group. Jan-Willem from a distance, because he moved to Germany, and Ellen from close by, supported me in writing a research proposal and performing a pilot study. In the mean time, I was allowed to attend the orientation programme at the Leiden University Dual PhD Centre The Hague. In April 2012, my research proposal was approved and Wilfried Admiraal agreed to be my supervisor. From this time on, I was blessed with a team consisting of three very dedicated supervisors.

Wilfried, thank you for always urging me to improve, when I thought I had already done the best I could, for teaching me to write concisely and for all the laughs and jokes that washed away the PhD blues. Ellen, thank you for having faith in my ability to finish this process, for the challenging and analytical questions about my research that encouraged me to think and write more precisely. Jan-Willem, thank you for dragging me into this ☺, for pointing out the positive elements in my drafts whenever I was unsure and for your detailed feedback.

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