COOPERATIVE LEARNING IN A HIGHER EDUCATIONAL SETTING: Realizing high-performing cooperative learning in higher education

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COOPERATIVE LEARNING IN A HIGHER EDUCATIONAL SETTING
Realizing high-performing cooperative learning in higher education

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Abstract:
Cooperative learning approach can be applied in higher education to develop resilience in future generations. Despite the substantial amount of scientific research on cooperative learning, there seems to be an underutilization in the college classroom. Building on the fundamentals of cooperative learning, this research aims to simplify and promote its implementation in a higher educational setting. By means of a content analysis complemented by a case study, characteristics of cooperative learning implementations are identified. These are subsequently transformed into propositions focusing on specific aspects. Results present four important themes: preparation, facilitation, evaluation and climate, as pedagogical suggestions for the amelioration of Information Systems Education and Research.

Keywords: cooperative learning, higher education, future of education

“The central task of education is to implant a will and a facility for learning; it should produce not learned but learning people. The truly human society is a learning society, where grandparents, parents, and children are students together. In a time of drastic change, it is the learners who inherit the future. The learned usually find themselves equipped to live in a world that no longer exists.” — Eric Hoffer

I. INTRODUCTION
Some say that education is overwhelmed with change, while another argues there have been no fundamental changes in education (Fullan, 2001). Practice however suggests that education has evolved greatly over time (Ghilay & Ghilay, 2015), adapting to the world’s or societal needs, one step at the time. Further research by Takács, Abcouwer, and Smit (2018) suggests that these one-step-at-a-time changes are not sufficient and that education should prepare students for an unknown or uncertain future. Traditional education systems must be enriched with methods that facilitate learning for an unknown future (Takács et al., 2018), and eventually develop resilience in future generations. Cooperative learning is a method that can enrich traditional education. Cooperative learning is the comprehension and innovative use of knowledge in a team effort, where all members work together and are actively engaged in the process of maximizing their own and each other’s learning. It is a learning approach tested by many, especially in a higher education or university setting. While fundamental research focused on the process of cooperative learning, these researchers particularly focused on the effectiveness of cooperative learning. Many experiments were conducted, with mainly positive results (Chen & Liu, 2017; Mohammadjani & Tonkaboni, 2015; Prince, 2004; Ruiz-Gallardo, López-Cirugeda, & Moreno-Rubio, 2012; Sugiharto, 2015; Toklucu & Bayram, 2016; Tran, 2014; Yoruk, 2016). We therefore know that applying cooperative learning in an educational setting can yield positive results regarding learning output, knowledge retention and development of resilience. Nonetheless, know-how on how to implement cooperative learning in an educational program is lacking. Faust and Paulson (1998) Buchs, Gilles, Antonietti, and Butera (2016) and others underwrite this and argue that even though cooperative learning is a very well researched pedagogical strategy, its implementation is challenging. This
exploratory research contributes by identifying obstacles or focus points in the implementation of cooperative learning. The aim of this research is to simplify and promote the implementation of cooperative learning in a higher educational setting. To that end, this exploratory research will seek to identify characteristics of cooperative learning implementations in higher education and universities. The identified characteristics will be used to formulate propositions on the implementation of cooperative learning in higher education that can be used 1) as a steppingstone to further research to confirm a positive effect of the propositions on the outcomes of cooperative learning and 2) as guidelines or points of attention when attempting to implement cooperative learning in an educational setting. The leading research question is:

**What are factors for implementing cooperative learning in a higher educational setting?**

II. INNOVATION IN EDUCATION – A NEED FOR SOMETHING NEW

Current form of education

Even though higher education has been the subject of many changes, it is still largely concentrated around the transfer of existing knowledge (Sia, 2015). Moreover, according to Ghilay and Ghilay (2015), in many institutions of higher education knowledge is transferred in a passive way, teacher to student. Takács et al. (2018) describe this as traditional education. In a university setting, research groups share with students the knowledge they gather during their research. Every research group has their own area of expertise in a field, which is depicted in figure 1.

![Figure 1. Education by research groups](image)

This means that a student might think that he or she learns everything there is to know in a field, while only the knowledge within the specific areas of expertise is transferred to the student.

The current form of education is built around the idea of certainty. Figure 2 depicts the phases of problem-solving (Takács, Abcouwer, & Banga, 2019b) in one of the forms of probability that Gigerenzer (2015) identified: certainty. The nature of a problem is known, the knowledge already exists and with that knowledge, a solution can be established. It is assumed that the knowledge we presently possess, will also be relevant in the future. However, this is not the case.

![Figure 2. Phases of problem-solving (Takács et al., 2019b) in a certainty setting](image)

Furthermore, Takács et al. (2018) argue that “education in current practice is mainly organized in terms of learning objectives and end-terms of the curricula and measurability of the effectiveness of our education” (p. 6). Accreditation of educational programs is one of the causes of the current practice of education. There is a need to meet certain standards and reach certain end-terms solely to obtain accreditation for the educational program. This results in standardized curricula where the
societal requirements are presumed, and societal outcomes are predetermined (figure 3). The measures for quality assurance follow from standard curricula and accreditation plays a big part in the process.

The standardization of educational programs results in the mass production of students with more or less the same competencies. Takács et al. (2019b) describe this as the person/job fit, where the focus is on developing well-defined competencies for today’s well-defined problems.

**An uncertain future**


![Figure 4. Forms of probability (Gigerenzer, 2015)](image)

These forms can be combined with the steps to be taken when dealing with a problem (figure 5) (Takács, Abcouwer, & Banga, 2019a). From a society perspective, a shift is noticeable from certainty, where problems and solutions are known, towards uncertainty, where problems and solutions are unknown (figure 4) (Gigerenzer, 2015).

![Figure 5. Steps when dealing with a problem (Takács et al., 2019a)](image)

From a society perspective, the shift from certainty to uncertainty means that society increasingly finds itself in a situation where the future or future problems are unknown. From an educational perspective, this means that people should acquire competencies for a future for which is not established which competencies are relevant. Thus, what we need is education to school people for an unknown future.
The desired form of education

To facilitate students to learn for an uncertain future, and with those uncertain societal requirements, more flexible curricula are required. The focus should no longer be on the simple transfer of existing knowledge, but rather on creativity and adaptability (Takács et al., 2019a; Takács et al., 2018). As discussed earlier, accreditation plays an important role in the standardization of educational programs. To make it possible to organize more flexible curricula, the role of accreditation needs to change. Figure 6 depicts the more desired form of education, innovating education, where curricula are flexible, and focus is on creativity and adaptability.

![Figure 6. Innovating education (Takács et al., 2018)](image)

With a shift towards more flexible curricula, students will be more prepared for an unknown future. Takács et al. (2019b) define this as a person/future fit. It entails that people are more suited for an uncertain future in which unforeseen events will take place. In education, competencies need to be built for a situation that is not yet known. Wells and Claxton (2008) accentuate the importance of this and state that globalization creates uncertainties and demands. This combined with the knowledge economy we live in and the growing ecological responsibility that brings a lot of uncertainty makes the questions about the future of educating for an unknown future more important than ever.

The contribution of cooperative learning

Cooperative learning has been the subject of many experiments and researches. These researches differ in terms of type of implementation of cooperative learning, but prove the benefits of cooperative learning. Sia (2015) shows that cooperative learning will improve intercultural competences. Since globalization is one of the causes of uncertainties in the future, problems will arise globally. Therefore, intercultural competences are needed in order to be resilient on a global scale. Ghilay and Ghilay (2015) demonstrate that cooperative learning improves the learning process of students. Ruiz-Gallardo et al. (2012) corroborate this and argue that cooperative learning, more than traditional education, improves skills of teamwork, self-understanding, communication, decision-making and leadership, which are all regarded as essential for their future professional development and resilience (Ruiz-Gallardo et al., 2012) in an unknown future. Additionally, cooperative learning provides a more student-centered approach (Jackson & Evans, 2017). This is essential to establish more flexible curricula. Sia (2015), Ghilay and Ghilay (2015), Ruiz-Gallardo et al. (2012) and Jackson and Evans (2017) all demonstrate that cooperative learning improves knowledge retention. Tran (2014) amplifies this by showing that cooperative learning broadens the knowledge retention in a certain field of expertise. This means that students actually acquire knowledge from outside the areas of expertise of a research group. Knowledge they would not acquire in traditional education (figure 3). Additionally, cooperative learning is proven to support the creativity of students (Harjono & Sahidu, 2018). Implementing cooperative learning in a higher educational setting results in a more creative start of research processes, resulting in new, innovating results and ideas.

We now know that society finds itself more and more in a situation where the future is or future problems are unknown. The current form of education or traditional education is largely based on
The desired form of education focuses more on creativity and flexibility in order to stimulate innovation. It provides students to be learners (person/future fit) rather than to be learned (person/job fit). Cooperative learning can enrich traditional education to focus more on the development of competencies that are relevant with an unknown future ahead. The next section will go into further detail on the theoretical basis of cooperative learning.

III. Theoretical framework

Learning in literature is largely defined as the comprehension and use of knowledge (Dandy & Bendersky, 2014). Exchanging knowledge between students and faculty members involves cooperation and can be seen as learning together. In the most primary sense, exchanging knowledge can already be seen as cooperative learning. According to Johnson and Johnson (1999), cooperative learning is “the instructional use of small groups so that students work together to maximize their own and each other’s learning”. Important in this research is the distinction between passive learning and active learning. According to Ghilay and Ghilay (2015), in many institutions of higher education knowledge is transferred in a passive way, teacher to student. In cooperative learning, to actually acquire and use knowledge as a team effort, active engagement of all team members is essential. Additionally, to refer back to the unknown future we are facing, cooperative learning must stimulate innovation. Therefore, the definition of cooperative learning that is leading in this research is ‘the comprehension and innovative use of knowledge in a team effort, where all members work together and are actively engaged in the process of maximizing their own and each other’s learning’.

The main contribution to the knowledge on cooperative learning by D. W. Johnson, Johnson, and Smith (1998) has been the basics of cooperative learning. They identify the five basic elements of cooperative learning: positive interdependence, individual accountability, face-to-face promotive interaction, interpersonal and small group skills and group processing (figure 7). In their research, D. W. Johnson et al. (1998) particularly focus on the exchanging knowledge aspect.

Cooperative learning in a university setting

Cooperative learning is frequently compared to learning groups. D. W. Johnson and Johnson (1999) argue that there is an important difference between different kinds of learning groups, which manifests in their effectiveness. Figure 8 depicts the five different learning groups that are distinguished by D. W. Johnson and Johnson (1999).
A pseudo-learning group consists of students that are assigned to work together but have no interest in doing so. On the surface the students are talking to each other, however in reality they are competing, since they believe the evaluation will be individual. The effectiveness of the group is actually less than the potential of the individual members. A traditional classroom learning group consists of students that accept they are assigned to work together. The assignments are structured in a way that little joint work is required. They seek information located at the other members of the group for individual purposes, since they believe they will be evaluated and rewarded as individuals. The effectiveness of the group is higher than the potential of some, but not all of the members. In a cooperative learning group, students work together towards shared goals. Both the individual performance as well as the end result is checked regularly and evaluated. The group is eventually more than the sum of its parts and the students performed better than they individually would have. A high-performing cooperative learning group differentiates from a regular cooperative learning group in the sense that the level of commitment towards the group’s success and to other members of the group is higher. This results in the group achieving above expectations. Naturally, these high-performing groups are the desired outcome of a cooperative learning setup in an educational setting. However, in an educational setting, cooperative learning is often reflected in a traditional classroom group, even though achieving a (high-performing) cooperative learning group is presumed. Evaluation is often based on the end results and generally the work that has to be done can be completed individually by splitting it up.
Figure 9 depicts a literature-based framework of cooperative learning and how it is often applied in an educational setting. In the framework, students are located in knowledge clouds. This is the knowledge they already possess and expand during the process. The knowledge can be used and shared while in the cooperative learning process. The teacher is also located in a knowledge cloud. This is specific knowledge of the area of expertise the teacher is active in. The teacher can share this knowledge with the students. This often takes place separately from the cooperative learning process, in the more traditional, passive lecture form (Ghilay & Ghilay, 2015).

Goals and objectives comprise the start of the cooperative learning process. For students, the goals and objectives will function as guidance throughout a learning period. It might have the shape of a description towards an end-report. Eventually, the results must show that the goals and objectives are met. Tombak and Altun (2016) argue that pre-defining goals and objectives could increase the motivation of students. Hodges, Eames, and Coll (2014) state that student’s performance or competence is generally assessed against some specified behavioural domain, standard or criteria. They argue, however, that this process needs some careful thought, seeing that it is likely that students’ starting points are all different. Hence, standardized goals and objectives do not fit every student. Nonetheless, Hilliard (2012) argues that goals and objectives are an essential element to ensure the effectiveness of a cooperative learning community. Therefore, goals and objectives should be predetermined, yet in a way that considers the differences between students. Jackson and Evans (2017) and Sugiharto (2015) argue that such differentiation is a key aspect in cooperative learning.

The students are connected through one or multiple cooperative learning tools. This can either be a system or setup where knowledge can be exchanged face-to-face, but a technology based cooperative learning tool is more common (Ghilay & Ghilay, 2015; R. T. Johnson & Johnson, 2008) since knowledge can be shared more easily. We now know that cooperative learning is seen as the comprehension and innovative use of knowledge in a team effort. The way cooperative learning is often implemented in an educational setting (figure 9) is also known. There seems to be a slight discrepancy between the two, since the way cooperative learning is often implemented in an educational setting does not actually result in the desired high-performing cooperative learning group. Rather, cooperative learning implementations often result in a traditional classroom group. The next section will go into detail on the methods that are used to identify characteristics of cooperative learning settings and how they are used to formulate propositions that can be used to achieve the desired high-performing cooperative learning.
III. METHODS

Data triangulation has been applied to ensure the validity of the research (Erzberger & Prein, 1997). The data used in this research originates from two different sources, making the methodology of this research twofold. A theoretical component is based on a content analysis and a practical component is based on a case study (figure 10). In both components, the goal is to identify characteristics of cooperative learning implementations.

Figure 10. Two-fold research methodology: content analysis and case study

In the content analysis, three types of research articles are included: original research, case studies and review articles. The practical component is a case study of a group of students working together on a smart city project as a cooperative learning group. The practical component of this research is mainly profitable in terms of identifying possible characteristics that are unidentifiable in existing literature. Additionally, the practical component of this research can be used to test or confirm the characteristics that are identified in the theoretical component.

Theoretical component

A content analysis is performed to identify configurations or subjects based on any kind of content (Hsieh & Shannon, 2005). More specifically, a summative content analysis is performed, since the goal is to explore the usage or implementations of cooperative learning, rather than to infer meaning. The contextual use of the subject can be identified. Three types of articles were used for this research: original research, case studies and review articles.

Original research can provide relevant insights into the theory for appliance of cooperative learning. In the field of cooperative learning, a lot of case studies have been conducted. These often provide insight in the effectiveness of cooperative learning and its positive and negative effects. Additionally, many implicit characteristics of the setting in which the case study was conducted are present. Therefore, including case studies in this research is of significant importance. Review articles are included because they are rich of content in terms of characteristics that are relevant in this research.

Search strategy

Data collection was initiated by performing searches in the selected databases. All of these databases are recognized as comprehensive academic databases and are rich of content in terms

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1 ACM Digital Library, Arts Premium Collection, Directory of Open Access Journals (DOAJ), Elsevier (CrossRef), ERIC (U.S. Dept. of Education), Informa - Taylor & Francis (CrossRef), IngentaConnect, JSTOR Archival Journals, JSTOR Current Journals, Library of Congress Classification, Linguistics and Language Behavior Abstracts, Literature Resource Center (Gale), MEDLINE/PubMed (NLM), New Records, Periodicals Archive Online, Periodicals Index Online, Sage Journals (Sage Publications), Sage Publications (CrossRef), Science Citation Index Expanded (Web of Science), ScienceDirect Journals (Elsevier), Scopus (Elsevier), Social Sciences Citation Index (Web of Science), Springer (CrossRef), SpringerLink, Taylor & Francis Online - Journals
of educational research. Since different researchers often use the terms ‘cooperative learning’, ‘collaborative learning’ and ‘active learning’ interchangeably, the initial search query included ‘cooperative learning’ as well as ‘collaborative learning’ and ‘active learning’. Additionally, the search query focused on locating articles that found or discussed the effect of cooperative learning in a university or college setting. Including ‘implementation’ and synonyms thereof ensures that located articles discuss some implementation of cooperative learning. Including ‘education’ in the search query would exclude articles about cooperative learning in an organizational setting. The search query located 590 articles. The multistage process to locate and further select research articles is depicted in figure 11.

![Multistage research article location process](image)

Figure 11. Multistage research article location process

To identify characteristics that are relevant today and to ensure the validity of the research results, articles over five years old were excluded from this research. This resulted in 180 relevant articles. These 180 articles were manually reviewed focusing on determining the main research subject of the article. Articles of which the main research objective was not cooperative learning or collaborative learning were excluded, leaving 100 articles. Articles that were not peer-reviewed were also excluded. Finally, the abstracts of the remaining 94 articles and sometimes the articles themselves were reviewed in order to apply exclusion criteria to each of them. The next section describes the exclusion criteria that were applied (figure 12).

First, articles where the research field is not higher education (i.e. kindergarten, (pre-)primary school, secondary school or high school) were excluded (n = 27). Second, articles that did not research a traditional cooperative learning method as described in chapter 2 were excluded (n = 9). Third, discussion papers or essays were excluded (n = 4). Fourth, articles with no methodological section were excluded (n = 3). Fifth, retracted articles were excluded (n = 1). Sixth, articles with an organizational focus instead of an educational focus were excluded (n = 2). Seventh, because of their rather limited integration of cooperative learning, articles with a focus on English as a Foreign Language (EFL) or English for Specific Purposes (ESP) were excluded (n = 10). Eighth, articles without any context description were excluded (n = 1). Lastly, one duplicate article in the final sample was excluded (n = 1).
Data analysis

Grounded theory techniques of open coding (Strauss & Corbin, 1990), or topic coping (Richards & Morse, 2012) were applied, initiating data analysis. Analysis was performed using the constant comparison technique, meaning it was an iterative process. LaRossa (2005) specified the constant comparison technique as “while coding an indicator for a concept, one compares that indicator with previous indicators that have been coded in the same way” (p. 841). During the process of coding the articles and identifying characteristics, changes have been made to the codes; new codes or characteristics were developed, and other codes or characteristics were adjusted. Per article, the demonstrated effect of applying cooperative learning was documented. Additionally, basic information was recorded: title, author(s), research objective and publishing journal. After the coding process, the emerged characteristics and main themes were used to formulate propositions for a desirable high-performing cooperative learning implementation.

Practical component

A case study was performed to identify characteristics that are present in a practical cooperative learning setting at the University of Amsterdam. The purpose of the case study was to identify characteristics that may not (implicitly or explicitly) have been identified in the content analysis and to confirm characteristics that were found in the content analysis. It is important to note that the implementation framework for cooperative learning as discussed at the results was not implemented in the study, but it was the framework constructed partly based on the case study. The students were cooperatively working on a project. Observations during the project contributed to a more developed and substantiated framework.

Rather than regular observation, which is a static activity, the data in the case study was recorded using the process observer method (Bales, 1950; Bieschke, Matthews, & Wade, 1996; Bieschke, Matthews, Wade, & Pricken, 1998). Bieschke et al. (1996) describe process observation as an operation in which the observer is incorporated as a member into the group. Therefore, data was collected by observing every meeting with the students. These meetings took place 1 to 3 times per week. The author was both observing the students and guiding the students during the process. Here, the focus was on identifying characteristics of which the students were not aware were present. Additionally, the group members were subject to informal questioning before, during and after the meetings.

The data that was collected during the weekly meetings and informal questioning were analysed using grounded theory techniques of open coding (Strauss & Corbin, 1990), or topic coping (Richards & Morse, 2012). As in the content analysis, the analysis was performed using the constant comparison technique, constantly renewing existing codes or characteristics. Every in practice identified characteristic that was not identified in the content analysis was again sought for in the same body of literature, to ensure accurate research results. The next section describes the results after applying the described methods.
IV. RESULTS

Out of the 48 articles in the content analysis, 60.4% were case studies (n = 29), 22.9% were original research articles (n = 11) and 16.7% were review articles (n = 8). On average, 10.7 characteristics (median = 11, mode = 6) were identified per article. A total of 56 unique characteristics were identified. Appendix I is a frequency table, showing the frequency of every identified characteristic along with the frequencies of the characteristic being associated with a positive, negative or neutral effect on cooperative learning. Characteristics with a frequency less than 5 (<10%) are not included, since these characteristics will not contribute to yielding justified conclusions.

In the data analysis, four themes emerged: preparation, facilitation, evaluation and climate. Figure 13 depicts a cooperative learning implementation model based on these four themes. Preparation is a pre-phase of the cooperative learning process in which the course, teacher and students are being prepared for the actual cooperative learning process. It is important to note that the first part of the preparation phase is focused on preparation of the cooperative learning process by the teacher. The second part of the preparation phase is focused on preparing the student for the cooperative learning process. Facilitation is the main component of cooperative learning and comprises the actual process and the facilitations of the teacher and faculty. Evaluation is the concluding phase of the cooperative learning process, in which assessment plays a major role. It is important to note that the first part of the evaluation phase is focused on student evaluation. The second part of the evaluation phase is focused on evaluation of the cooperative learning implementation. Climate represents the educational climate in which the cooperative learning process takes place. It is about the environment in which the people emerged in the cooperative learning process are situated. It is important to note that this does not only entail the tangible elements, for example space, furniture and tools, but also intangible elements like hierarchy, and aspects related to the feelings of group members. For every theme, characteristic-based propositions to reach high-performing cooperative learning are established (Table 1). Detailed explanations for the propositions can be found in appendix II.

Bringing various aspects from an extensive body of literature together into one conceptual framework yields interesting suggestions or propositions. Nevertheless, their effect on the outcomes of cooperative learning is not validated. Rather, these propositions are steppingstones towards future research in the field of cooperative learning and can be used as guidelines or points of attention when implementing cooperative learning in a higher educational setting.

## Table 1 Proposstions

<table>
<thead>
<tr>
<th></th>
<th>Proposition</th>
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<tbody>
<tr>
<td>1</td>
<td>A cooperative learning implementation in which students are goal oriented will be more likely to result in high-performing cooperative learning.</td>
</tr>
<tr>
<td>2</td>
<td>A cooperative learning implementation in which group composition is carefully thought out will be more likely to result in high-performing cooperative learning.</td>
</tr>
<tr>
<td>3</td>
<td>A cooperative learning implementation in which students receive an introduction to cooperative learning will be more likely to result in high-performing cooperative learning.</td>
</tr>
</tbody>
</table>
A cooperative learning implementation in which part of the cooperative learning process is scripted will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation in which the design of cooperative learning is carefully thought out will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation in which students carefully plan their tasks and activities will be more likely to result in high-performing cooperative learning.

### FACILITATION

A cooperative learning implementation in which the teacher facilitates guidance will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation where communication is computer-supported will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation in which immediate feedback is facilitated will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation in which the teacher is involved in the group process will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation that facilitates decision-making opportunities will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation in which students have dedicated roles will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation in which critical thinking is supported will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation in which the teacher monitors the cooperative learning process will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation in which there is enough time to form strong group dynamics will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation in which no lectures are given will be more likely to result in high-performing cooperative learning.

### EVALUATION

A cooperative learning implementation in which assessment is based on an individual and collaborative element will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation in which the process is part of the assessment will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation in which assessment is criteria-based will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation in which reflection is performed will be more likely to result in high-performing cooperative learning.

### CLIMATE

A cooperative learning implementation that has a climate in which communication is open will be more likely to result in high-performing cooperative learning.
A cooperative learning implementation that has a climate in which there is interaction will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation that has a climate that stimulates face-to-face interaction will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation that has a climate in which people are not afraid to fail will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation that has a climate in which people are respected will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation that has a climate in which people can differentiate will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation that has a climate that stimulates active engagement will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation that has a climate in which there is no hierarchical arrangement will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation that has a climate in which people experience a high degree of trust will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation that has a climate that is student-centered will be more likely to result in high-performing cooperative learning.

A cooperative learning implementation that has a climate in which people feel safe will be more likely to result in high-performing cooperative learning.

The implications of the established propositions from a scientific and practical perspective will be discussed in the next section.

Discussion

Rapid changes in society require resilience. Where the current form of education largely focuses on the transfer of existing knowledge, the desired form of education is more flexible and should prepare students for an uncertain future. There is a need to enrich traditional education to facilitate learning for an uncertain future. Cooperative learning is one approach to enrich traditional education. Despite the substantial amount of scientific research on cooperative learning, there seems to be an underutilization in the college classroom. The aim of this research was to simplify and promote the implementation of cooperative learning in a higher educational setting. To that end, this research sought to identify characteristics of cooperative learning implementations in higher education and universities. The identified characteristics were used to formulate propositions on the implementation of cooperative learning in higher education.

After data analysis, four themes emerged: preparation, facilitation, evaluation (implementation process) and climate (figure 13). Preparation is a pre-phase of the cooperative learning process in which the course, teacher and students are being prepared for the actual cooperative learning process. Facilitation is the main component of cooperative learning and comprises the actual process and the facilitations of the teacher and faculty. Evaluation is the concluding phase of the cooperative learning process, in which assessment plays a major role. Climate represents the educational climate in which the cooperative learning process takes place. For every theme, characteristic-based propositions to reach high-performing cooperative learning are established. See appendix II for detailed explanations for the propositions. It is important to note that the effects of these propositions on the outcomes of cooperative learning are not proven.

Rather, on the one hand, bringing together a significant amount of research on cooperative learning yielded areas of interest or steppingstones to further research. On the other hand, the themes that
emerged and the associated propositions can be used as guidelines when implementing cooperative learning in an educational setting. The three steps of the implementation process indicate to teachers and faculty that 1) preparation is required and precedes the actual cooperative learning process, 2) alongside the facilitation by teacher and faculty, the climate in which cooperative learning is applied is a relevant aspect, and that 3) after the cooperative learning process, an evaluation process is recommended. Both during preparation and evaluation, there is a teacher-only element as well as an element where student-involvement is essential. The first part of the preparation phase is focused on preparation of the cooperative learning process by the teacher. The second part of the preparation phase is focused on preparing the student for the cooperative learning process. The first part of the evaluation phase is focused on student evaluation. The second part of the evaluation phase is focused on evaluation of the cooperative learning implementation. During preparation, facilitation and evaluation and to ensure an optimal climate. The 31 established propositions provide detailed guidance for specific aspects of cooperative learning.

Several opportunities for improvement were identified. 1) The original search query could have been more extensive. If the initial search query would include more synonyms combined with more AND- or OR-statements, potentially additional relevant literature that now has been left out could have been located. 2) The research sample seems rather small. Content analyses commonly include at least a three-figure number of documents. However, these documents are often automatically analysed based on pre-determined methods. The nature of this research, where the usage and implementation of cooperative learning was explored, demands a summative content analysis which is performed by hand. Additionally, even though it was not a goal, saturation was reached. This supports the claim that the research sample was sufficient. 3) The contexts of the case studies were sometimes described rather minimally. That resulted in some articles not yielding the desired amount of data. While this is a shortcoming of this research, not much could have been done to prevent minimal context descriptions, since the articles are what they are. A measure could have been used to quantify the extensiveness of the context descriptions of all articles. Subsequently, a baseline of what is and what is not an insufficient context description could have been established. This way, articles with an insufficient context description could have been left out of the research.

This research identified or proposes several opportunities for further research. 1) The 31 propositions are stepping stones to further research. Their implication to research is two-fold. On the one hand, the interrelationships between the proposed aspects of cooperative learning can be further explored. On the other hand, the effects of the proposed aspects on the outcomes of cooperative learning can be identified, quantified and confirmed or denied. The latter can be achieved by means of case studies with an experimental group and a control group, subjecting the experimental group to changes related to the individual propositions in this research. 2) The propositions resulting from this research are explained and supported, but do not describe the exact implementation methods or -techniques. These need to be further identified to improve the implementation of cooperative learning in a higher educational setting even more. 3) Cooperative learning may not be suitable for every field of study. This is not so much based on the results of this research. Rather it is based on the fact that this research focuses on higher education in general. It therefore implicates that this research is generalizable to all fields of study in higher education, while it may be not. This is something that requires further investigation. 4) While it is suggested that cooperative learning can enrich traditional education, it may not be the only way to improve the shift from traditional education to innovative education. There may be other ways that are also suitable for educational settings. 5) Because the focus of this research was on higher education, the question is raised whether the 31 propositions will also be applicable in a primary school, high school or secondary vocational education -setting. The suggested framework (preparation, facilitation, evaluation and climate) is argued to also be applicable to other educational levels, since these are overarching subjects. However, the 31 propositions are specifically based on higher education and therefore adapted to the ways of working in higher education. Therefore, before attempting to implement cooperative learning on other educational levels, it is recommended to further investigate this topic.
LIST OF REFERENCES


**ABOUT THE AUTHORS**

**Tjomme Schilstra** graduated in the field of Information Studies. Due to his great affinity with education, which is reflected in his numerous teaching assistant jobs at the University, he decided to focus his master thesis on improving higher education by promoting and simplifying the implementation of cooperative learning. His experiences in engaging in teamwork helped him define the current problems with cooperative learning. This quite complex research subject resulted in an extensive exploratory research described in this article.

**Toon Abcouwer** works at the University of Amsterdam. His research interest is on how organizations deal with crisis situations. Especially the different roles that information and information systems play in the various phases of crisis handling has his special interest. It is crucial for management to learn to deal with the problem to integrate that roles in one single Information systems infrastructure. It is his believe that traditional governance approaches only offer a partial solution for that.

**Emőke Takács** works for the European Research Institute and gives lectures with Toon Abcouwer at the University of Amsterdam. She is an expert on EU funds and project management, designs and delivers trainings, eLearning courses, directed several scientific and research projects. Her interest is in efficient knowledge acquisition and management.
## APPENDIX I. - FREQUENCY TABLE IDENTIFIED CHARACTERISTICS

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<th>Characteristic</th>
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<th>Neutral</th>
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<th>Theme</th>
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APPENDIX II. - EXPLANATION AND SUPPORT FOR THE FORMULATED PROPOSITIONS

Propositions for the preparation theme

Proposition 1: A cooperative learning implementation in which students are goal oriented will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if the students work goal oriented. This means that students have (a) clearly outlined predetermined goal(s) before the cooperative learning process begins. Two main themes emerged from the results: project goals and criteria goals. Project goals can be established in the form of assignments or a case to work on (Jackling, Natoli, Siddique, & Sciulli, 2015; Khosa & Volet, 2014; Ruiz-Gallardo et al., 2012; Thoaele, Suhr, & Hofman, 2016). Either the students themselves can establish these goals or the teacher can, as long as they are clearly outlined. It is important to note that the project goals can be far from the learning objectives of the course. van Emst (2002) describes that, if the goal for the students is to go on a holiday, and all they get is a broken car and English car repair manuals, they will learn English even though the original goal (going on a holiday) is outside the scope of the learning objectives. Criteria goals are any goals that the teacher raises in order for students to pass the course. These goals must be communicated in advance of the cooperative learning process for students to know what to focus on during the process in order for them to pass the course. Working goal oriented raises motivation (Sugiharto, 2015) and improves the positive interdependence (Johnson & Johnson, 1999). Results from the case study support this proposition. Before the first meeting, the only goal for the students was to finish their bachelor thesis. From the moment the project goal was clearly defined, the students were motivated to a greater degree than before. Criteria goals were made clear early in the process. The students therefore knew what was expected of them.

Proposition 2: A cooperative learning implementation in which group composition is carefully thought out will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results when the group composition is carefully thought out. Applications of cooperative learning show a wide variation of group compositions: 2-7 people. Group composition highly depends on the project the students are working on and is related to the workload (Almajed, Skinner, Peterson, & Winning, 2016). Smaller groups (2-4) more often occurred than big groups (5-7). Difficulties in communication and discussions were common issues in big groups (Almajed et al., 2016; Jordan et al., 2014; Khosa & Volet, 2014; Lee, Morrone, & Siering, 2018; Neill, DeFranco, & Sangwan, 2017), while smaller groups had more success in discussions, decision-making activities and brainstorming (Hadwin, Bakhtiar, & Miller, 2018; Jackling et al., 2015; D. W. Johnson et al., 1998; R. T. Johnson & Johnson, 2008; Jones & Jones, 2008; Ramirez-Velarde, Perez-Cazares, Alexandrov, & Garcia-Rueda, 2014; Wilson & Narayan, 2016). Results from the case study yield no evidence to confirm or deny this proposition. The group composition was based on convenience, since four students were looking for a project. During the project, the group composition did not affect communication and discussions. The group composition was conveniently used for this project, since there were two main themes: waste and mobility. Two students were responsible for each theme.

Proposition 3: A cooperative learning implementation in which students receive an introduction to cooperative learning will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results when students receive an introduction to cooperative learning before the actual process. It is proposed that this introduction contains at least two elements: an explanation on how
cooperative learning can improve learning outcomes (De Hei, Strijbos, Sjoer, & Admiraal, 2015; Ruiz-Gallardo et al., 2012; Tran, 2014) and an explanation on the application of cooperative learning in the present course and what it means for students (Emerson, English, & McGoldrick, 2015; Ruiz-Gallardo et al., 2012). De Hei et al. (2015) argue that everyone should know and understand the advantages of cooperative learning to make it high-achieving. Ruiz-Gallardo et al. (2012) argue that training students results in a higher efficiency. Ruiz-Gallardo et al. (2012) therefore organized a workshop on cooperative learning where the students received an explanation and could practice the aspects of cooperative learning to improve team organization and efficiency of the group. Results from the case study confirm the importance of an introduction to cooperative learning. Even though the students have engaged in group work before, the goals of cooperative learning, techniques that could have been used and the basic structure of cooperative learning were not clear. The students were not subjected to an introduction to cooperative learning. During the project, and especially at the start of the project, it became clear that with an introduction the intrinsic motivation of the students might have been higher.

Proposition 4: A cooperative learning implementation in which part of the cooperative learning process is scripted will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results when (part of) the cooperative learning process is scripted. With a pre-structured element of the cooperative learning process, where certain tasks and interim goals are established, difficulties with planning, tasks and strategies can be overcome (Hadwin et al., 2018). With scripting, it becomes possible for students to focus on the core task: comprehension and innovative use of knowledge. The supporting articles all applied some form of scripting. Either planning (Hadwin et al., 2018) role assignment (Gašević, Joksimović, Eagan, & Shaffer, 2019; Kaendler, Wiedmann, Rummel, & Spada, 2015) or task structure (Gašević et al., 2019; Kaendler et al., 2015; Saqr, Fors, Tedre, & Nouri, 2018) was scripted to a certain degree. Kaendler et al. (2015) further focused on identifying the relevant phases for students beforehand, to be able to use these in scripting the process. Results from the case study yield no evidence to confirm or deny this proposition. None of the activities or structure of the cooperative learning process were scripted. Planning was one part of the process that was scripted to a certain degree. In consultation with the teacher, a planning was set-up. However, this should be associated with planning (proposition 6) rather than with scripting.

Proposition 5: A cooperative learning implementation in which the design of cooperative learning is carefully thought out will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results when the design of cooperative learning in carefully thought out. This entails that all elements of cooperative learning (e.g. goals, process, tasks, activities, practice, execution and learning objectives) work together, support and build on each other (i.e. are complementary) and do not negatively influence each other (Kim & Lim, 2018; Supanc, Völlinger, & Brunstein, 2017). De Hei et al. (2015) argue that the design of cooperative learning can take a lot of time, and that course organizers or teachers often do not get the time to design cooperative learning to fit their course. If this is the case, it is often better to not implement cooperative learning than to implement it in such a simple way and skipping the design of cooperative learning altogether. Results from the case study yield no evidence to confirm or deny this proposition. Before the process, the elements of cooperative learning were not carefully thought out to work together, support and build on each other.

Proposition 6: A cooperative learning implementation in which students carefully plan their tasks and activities will be more likely to result in high-performing cooperative learning.
Results from the content analysis suggest that a cooperative learning process yields better results if students carefully plan their tasks, activities and deadlines. Planning in cooperative learning starts at the end of the preparation phase. It is however important to note that not everything can be planned beforehand, since outcomes of cooperative learning activities are unknown (Buchs et al., 2016; Kaendler et al., 2015; Schoor, Narciss, & Körndle, 2015). Therefore, it is argued that planning be a continuous process starting in the preparation phase, and continuing during the cooperative learning process where the planning is constantly updated based on the outcomes of cooperative learning tasks and activities (Hadwin et al., 2018; Sugiharto, 2015). Creating, applying and updating such a planning provides a constant during the process, improving the positive interdependence within the group. Results from the case study support this proposition. Before the cooperative learning process, the students prepared a time-planning in consultation with their teacher. Additionally, certain cooperative learning activities were planned with the students (e.g. brainstorming, collective feedback sessions). At the start of their individual research, the students were asked to prepare a planning concerning their activities and progress.

Propositions for the facilitation theme

Proposition 7: A cooperative learning implementation in which the teacher facilitates guidance will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if guidance during the cooperative learning process is facilitated by the teacher. Cooperative learning comes with a lot of obstacles (Buchs et al., 2016; Supanc et al., 2017). To overcome these obstacles, teachers can guide students to use certain cooperative learning-, discussion- or decision-making techniques. It is important to note that the teacher only guides the process, by handing the students techniques or ways of working. Guidance does not entail giving students answers to issues or solutions to problems as it is important for the comprehension and innovative use of knowledge to let students find those answers and solutions themselves (Dirlikli, 2016; Lv, 2014; Tran, 2014; Zhang & Cui, 2018). Guidance entails both guiding the process and steering students in (knowledge-) directions the students may not think about themselves. For the latter, it is important to note that this can also be a direction that the teacher did not explore himself yet (refer to figure 3). Results from the case study support this proposition. Both the teacher and the author of this research guided the students during the process. Both did not have any specific expertise in the field of study. The students were therefore stimulated to gather and use knowledge from fields that both the teacher and students did not know. This stimulated creativity and innovative use of knowledge.

Proposition 8: A cooperative learning implementation where communication is computer-supported will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if it is computer-supported. Gašević et al. (2019) argues that computer-supported cooperative learning can increase the sense of community, creative potential, critical thinking and integration into learning communities. These four areas are all related to communication. Facilitation and improving communication was the main purpose of computer-supported cooperative learning in case studies (Bozanta & Mardikyan, 2017; Chang & Windeatt, 2016; Gašević et al., 2019; Ghilay & Ghilay, 2015; Jackling et al., 2015; Jordan et al., 2014; Kim & Lim, 2018; Kuikka, Laakso, & Joshi, 2016; Lee et al., 2018; Neill et al., 2017; Saqr et al., 2018; Tlhoaele et al., 2016; Wang & Huang, 2016; Wilson & Narayan, 2016). However, students in a cooperative learning implementation that is computer-supported can still engage in face-to-face interaction (proposition 23). In seven articles, computer-support co-existed with face-to-face interaction (Ghilay & Ghilay, 2015; Islim, 2018; Jordan et al., 2014; Kim & Lim, 2018; Tlhoaele et al., 2016; Wang & Huang, 2016; Wilson & Narayan, 2016) to improve and speed up communication and interaction. Two articles identified computer-support as a negative influence...
Proposition 9: A cooperative learning implementation in which immediate feedback is facilitated will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if immediate feedback is facilitated. Facilitation of immediate feedback has two sides to it. On the one hand, it is about the teacher providing feedback about the progress of the cooperative learning group to improve the functioning of the group (Kuikka et al., 2016; Monteiro & Morrison, 2014) (Casey & Goodyear, 2015). On the other hand, it is about facilitating opportunities during the cooperative learning process dedicated to providing feedback student-to-student (Saqr et al., 2018; Sugiharto, 2015; Vaughan, 2014; Zamani-Miandashti & Aleaei, 2015). This feedback can either be about the way of working or about knowledge, content, report, etcetera. It is important that feedback is given immediately, to ensure fast improvement of the group process (and with that, improvement of the results). Even though there was little to no evidence of immediate feedback in the case study, results from the case study support this proposition. In the weekly meetings, feedback on various topics (e.g. written texts, structure, articles) came forward. The person who gave the feedback often already had the feedback in his mind, but did not share it immediately. In the meetings, aspects of the project that were discussed the meeting before was actually discussed again, because of the lack of immediate feedback. This notably slowed down the process, resulting in a delay compared to the initial planning.

Proposition 10: A cooperative learning implementation in which the teacher is involved in the group process will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if the teacher is involved in the group process. In traditional cooperative learning settings, the teacher is often excluded from the process and solely shares his or her knowledge in the form of lectures (refer to figure 9). However, if the teacher is involved in the cooperative learning process as a member, this exchange of knowledge takes place on a smaller scale (Asino & Pulay, 2019; Barra et al., 2014; Bozanta & Mardikyan, 2017), can take place more often (Dirlikli, 2016; Lv, 2014) and is more tailored to fit the needs of the cooperative learning group (Gašević et al., 2019; Lee et al., 2018; Ramirez-Velarde et al., 2014). Buchs et al. (2016) stress the importance of teacher involvement in cooperative learning groups, but also argues that teacher involvement can be very demanding for the teacher. They therefore propose a simpler and lighter intervention for teachers. Results from the case study support this proposition. The teacher has been a part of the process as a regular group member in most of the meetings and participated in brainstorm sessions, discussions and writing. This notably improved the students’ ideas and the way in which these ideas were worked out. Additionally, guidance (proposition 7) was easier facilitated because the teacher was involved in the group’s process.

Proposition 11: A cooperative learning implementation that facilitates decision-making opportunities will be more likely to result in high-performing cooperative learning.
Results from the content analysis suggest that a cooperative learning process yields better results if decision-making opportunities are facilitated. Decision-making is one of the skills that should result from cooperative learning (Emerson et al., 2015; Hadwin et al., 2018). In a cooperative learning setting that facilitates decision-making opportunities, students should be free to make certain choices determining the course of the process. It is suggested that this improves creativity and innovative use of knowledge (Burress & Peters, 2015; Jackson & Evans, 2017; Jones & Jones, 2008; Jordan et al., 2014; Ramirez-Velarde et al., 2014). If no decision-making opportunities are facilitated and students are not free to make choices that determine the course of the process, the outcomes of the process are essentially fixed. It is suggested that this demotivates students (Casey & Goodyear, 2015; D. W. Johnson & Johnson, 1999; Monteiro & Morrison, 2014). Results from the case study yield no evidence to confirm or deny this proposition. No deliberate decision-making opportunities were facilitated. There were however various decision-making moments. First an overarching framework was developed for the Reykjavik project. Subsequently, each student chose where to fit in his own research. This occurred in consultation with the other students, to ensure that every aspect of the overarching framework was covered.

Proposition 12: A cooperative learning implementation in which students have dedicated roles will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if students have dedicated roles in the process. There are two ways in which students can obtain a role: emergent or assigned. Emergent roles are quite common in an educational setting (Gašević et al., 2019). There is often not much attention for the division of roles beforehand. Gašević et al. (2019) argue that emergent roles emerge spontaneously or are unconsciously negotiated by group members. The teacher does not interfere in this process, and roles are often determined by the contributions and participation of group members. The disadvantage of emergent roles is that there might be ‘gaps in group management’ (Neill et al., 2017; Ruiz-Gallardo et al., 2012; Saqr et al., 2018; Wang & Huang, 2016). A dedicated division-of-roles-moment results in more complete group management. When dividing roles, the personalities and strengths and weaknesses of the members should of course be taken into account. Even though there was little to no evidence of the presence of roles in the case study, results from the case study support this proposition. Before, during and after the meetings, the students often found themselves not knowing what to do exactly. Additionally, especially at the start of the process, the contents of the meetings were often forgotten. These two facts exemplify the importance of having clearly defined roles. The case study shows that cooperative learning cannot rely on emergent roles. Rather, the group must consciously assign roles, either independently or in consultation with their teacher.

Proposition 13: A cooperative learning implementation in which critical thinking is supported will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if students are supported in applying critical thinking. Supporting critical thinking in cooperative learning has two purposes: assuring quality and avoiding group think. Cooperative learning is often a process in which students comprehend and use knowledge that is not checked by an expert (teacher). To assure the quality of the outcomes of the cooperative learning process, the students need to engage in critical thinking (Emerson et al., 2015; Islim, 2018; Jordan et al., 2014). This can be facilitated by the teacher or faculty by offering students techniques or methods for critical thinking. One method of quality assurance was discussed in chapter 2. Group think is another aspect that underlines the importance of critical thinking (Almajed et al., 2016; Burress & Peters, 2015; Ghilay & Ghilay, 2015; Saqr et al., 2018). Considering the overarching goal of cooperative learning (the comprehension and innovative use of knowledge), a cooperative learning group must not go with the first idea that comes to mind. To be innovative, one must think outside the box (Dirlikli, 2016) and question others’ arguments, even if they are or seem to
be correct at first. Practice shows that students like to ‘get off easy’, which is why the teacher or faculty must facilitate or support critical thinking. Results from the case study support this proposition. First, during the collection of relevant literature for the project, the students did not engage in (cooperative) activities to ensure the quality of their own and each other’s contributions. This resulted in the use of literature that was not sufficiently relevant for the case, or with an insufficient quality. Additionally, during discussions, the students agreed with each other rather quickly. This resulted in areas of interest not being investigated. These two facts exemplify the importance of critical thinking and the facilitation of methods or techniques by teacher or faculty.

Proposition 14: A cooperative learning implementation in which the teacher monitors the cooperative learning process will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if the cooperative learning process is monitored. The purpose of monitoring is to improve the guidance of the teacher and to provide immediate feedback attuned to the groups’ process. Kaendler et al. (2015) also argue that monitoring is a prerequisite in order for the teacher to support the cooperative learning group. Monitoring is done by the teacher and can take many forms. The teacher can have repetitive conversations with the students during the cooperative learning process (Lv, 2014; Ruiz-Gallardo et al., 2012; Saqr et al., 2018) or the teacher can attend (some of) the meetings of the students (Dirlikli, 2016; Jackling et al., 2015). Another option is to define interim deadlines before which students have to hand in an interim report or progress report (Jones & Jones, 2008). Results from the case study support this proposition. As bachelor thesis supervisor of the four students, the teacher had a monitoring role. Progress of the cooperative learning process was regularly discussed in the meetings. Combined with the interim deadlines, this motivated the students to actually achieve results in order to be able to present it in the meetings.

Proposition 15: A cooperative learning implementation in which there is enough time to form strong group dynamics will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if there is enough time to form strong group dynamics. In educational settings, groups are often left to fend for themselves and just start the project. This highly impacts the cooperative learning process, in which the purpose is to discuss, argue and debate with each other. Without strong group dynamics, the discussions and debates are less developed and results are not as good as was expected (Jones & Jones, 2008). Multiple authors show the importance of providing the students with enough time to form strong group dynamics (Burress & Peters, 2015; Chang & Windeatt, 2016; Monteiro & Morrison, 2014; Sugiharto, 2015; Supanc et al., 2017). For a cooperative learning group to become high-performing, a strong group dynamic is essential (D. W. Johnson et al., 1998). Therefore, it is suggested that enough time is spent on forming strong group dynamics. One way of achieving this is by using team building activities (Monteiro & Morrison, 2014; Neill et al., 2017; Saqr et al., 2018). Results from the case study support this proposition. Before the cooperative learning process, the students were not subjected to team building activities. Rather, they started the process right away. As Jones and Jones (2008) indicated, discussions and debates are less developed and results are not as good as was expected if not enough time is spent on forming strong group dynamics. Based on the case study, the former can be confirmed. At the time of writing this paper, there were no final results of the project yet. However, intermediate results were indeed not as good as expected. Additionally to the delay that was developed, the written texts were not of the expected quality. These two facts suggest the importance of providing enough time to form strong group dynamics prior to the actual cooperative learning process.
Proposition 16: A cooperative learning implementation in which no lectures are given will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if no lectures are given during the cooperative learning process. The main reason for this is that lectures generally focus on transferring knowledge from teacher to student. With many students in one room, the chance of receiving knowledge that does not support the groups’ cooperative learning process is rather good (Casey & Goodyear, 2015; Kuikka et al., 2016). Additionally, transferring knowledge from teacher to student using lectures does not stimulate the process of gathering knowledge and using this knowledge in an innovative way (Ghilay & Ghilay, 2015; Tran, 2014). It is important to note that providing a general introduction on cooperative learning actually is relevant (proposition 3). The proposition on not to give lectures during the cooperative learning process is purely focused on lectures in which knowledge is passively transferred from teacher to student. Results from the case study yield no evidence to confirm or deny this proposition. The implementation of cooperative learning was tailored for a (combined) thesis project, where lectures are not commonly given. The implementation was not associated to a course, where it is common to give lectures. Therefore, no justified conclusions on the presence of lectures can be drawn from the case study.

Propositions for the evaluation theme

Proposition 17: A cooperative learning implementation in which assessment is based on an individual and collaborative element will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if the assessment of cooperative learning is based on an individual and a collaborative element. The collaborative element is commonly present in educational cooperative learning implementations and is often represented by a collaboratively written report, document or presentation (Barra et al., 2014; Buchs et al., 2016; De Hei et al., 2015; Du, Zhou, & Xu, 2016; Gašević et al., 2019; Zhang & Cui, 2018). An individual element is commonly included by examining or testing the knowledge of each student individually by subjecting them to a test (D. W. Johnson & Johnson, 1999; Loes, An, Saichaie, & Pascarella, 2017), selecting the product of one of the students to represent the whole group (Buchs et al., 2016; D. W. Johnson & Johnson, 1999) or by letting each student explain everything they have learned to a fellow student, in company of the teacher (D. W. Johnson & Johnson, 1999; Loes et al., 2017; Ramirez-Velarde et al., 2014). It is suggested that incorporating an individual element in the cooperative learning process improves individual accountability (Johnson & Johnson, 1999). Results from the case study support this proposition. The case study project has been set-up in a way in which students are required to produce an individual product and a collaborative product. The individual product is their own thesis research in which they investigate a specific part of an overarching framework. The collaborative part is a collective report for the city of Reykjavik, in which the four individual theses are incorporated and one general conclusion is drawn. The individual assessment, or grade for their thesis, is based on their individual research. The collaborative assessment is based on the collective results. The individual accountability is improved because establishing the collective report is not possible without the individual thesis researches of the individual students.

Proposition 18: A cooperative learning implementation in which the process is part of the assessment will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if the cooperative learning process is part of the assessment of the students’ learning. Jones and Jones (2008) summarize that grades were composed of both product and process. Including the process in the assessment has two sides. On the one hand this is obviously a collaborative element, which means that the progress of the group, interaction between group members, discussions, findings, etcetera are assessed and evaluated after the process (Jones &
Schilstra, Abcouwer & Tákacs  Cooperative Learning in Higher Education

Proceedings of the AIS SIGED 2019 Conference

Jones, 2008; Kuikka et al., 2016; Lv, 2014). On the other hand, multiple authors also describe the importance of including the individual process participation of group members (Almajed et al., 2016; Jones & Jones, 2008; Kuikka et al., 2016; Supanc et al., 2017). The used methods to assess individual participation is not described in literature, while some authors described the use of rubrics to quantify participation (Jones & Jones, 2008). Results from the case study yield no evidence to confirm or deny this proposition. The assessment of the group is not based on the process. Rather, assessment is based on the individual thesis report (individual assessment) and on the collective end-report (group assessment).

Proposition 19: A cooperative learning implementation in which **assessment is criteria-based** will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if assessment of the cooperative learning process and products is criteria-based. Both the criteria for the product (Gašević et al., 2019; Almajed et al., 2016; Khosa & Volet, 2014; Jackling et al., 2014; Lv, 2014; Casey & Goodyear, 2015; Buchs et al., 2015; Tran, 2014; Sugiharto, 2015; Ruiz-Gallardo et al., 2012; Vaughan, 2014; Johnson & Johnson, 1999; Johnson et al., 1998; Jones & Jones, 2008) as well as criteria for the process must be predetermined (Almajed et al., 2016; Lv, 2014; Casey & Goodyear, 2015; Ruiz-Gallardo et al., 2012; Vaughan, 2014; Johnson et al. 1998; Jones & Jones, 2008). Predetermining the criteria for assessment enables students to focus on the right aspects in order for them to finish the course. It is important to note that these criteria must not limit the freedom of students to gather knowledge and use it in an innovative way. In other words, the criteria must not be established in such a way that it determines the course of the process. Results from the case study yield no evidence to confirm or deny this proposition. The assessment of the individual thesis reports is criteria-based, since criteria are established by faculty. However, these criteria are not even remotely related to the cooperative learning process and the collective end-report that is generated. Therefore, no justified conclusions on criteria-based assessment can be established based on the case study.

Proposition 20: A cooperative learning implementation in which **reflection** is performed will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if reflection is performed after the cooperative learning process. Reflection is two-fold. It is both students reflecting on their goals, ideas, process and results (Hadwin et al., 2018; Monteiro & Morrison, 2014; Supanc et al., 2017; Vaughan, 2014) and teacher reflecting on the implementation of cooperative learning (Kaendler et al., 2015). The former is either performed by the student (self-reflection) (Hadwin et al., 2018; Monteiro & Morrison, 2014), teacher (Kaendler et al., 2015; Lv, 2014) or both. While the latter is performed by the teacher, it can be beneficial to include the students’ perceptions in this process (Kaendler et al., 2015). (Self-) reflection can be performed and documented in written form (Hadwin et al., 2018) or in conversational form (Monteiro & Morrison, 2014). Results from the case study yield no evidence to confirm or deny this proposition. At the time of writing this paper, no (self-) reflection has been performed.

Propositions for the climate theme

Proposition 21: A cooperative learning implementation that has a climate in which **communication is open** will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if it is applied in a climate where there is open communication. Many authors implicitly describe the importance of open communication. This proposition is two-fold. On the one hand, every member of the group must be able to share his thoughts and ideas, in order for the group to make progress in new areas of knowledge or expertise (Burress & Peters, 2015; Emerson et al., 2015; Neill et al., 2017; Ramirez-Velarde et al., 2014; Saqr et al., 2018). On the other hand, every
member of the group must be able to share his thoughts, ideas and criticism on others’ contributions of the group (Bozanta & Mardikyan, 2017; Burress & Peters, 2015; Chang & Windeatt, 2016; De Hei et al., 2015; Neill et al., 2017). In a climate with open communication no potentially useful ideas, knowledge or experience is left out of the process. Both the former and the latter are important in the process of cooperative learning, considering that the overarching goal of cooperative learning includes ‘the innovative use of knowledge’. It is suggested that open communication stimulates the innovative use of knowledge (D. W. Johnson et al., 1998). Results from the case study support this proposition. At the start of the cooperative learning process, the students were not open in their communication. Discussions did not last long, little to no criticism to others’ ideas were shared and ideas mainly originated from the teacher. This resulted in a high degree of group think. As the process progressed, the students were increasingly more open in their communication. Notably, more ideas were shared and discussions yielded more and better results. The importance of the role of the teacher in communication subsided and developed into a ‘regular member role’.

Proposition 22: A cooperative learning implementation that has a climate in which there is interaction will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if there is frequent and regular interaction between the group members. This interaction must be stimulated by the environment in which the cooperative learning process takes place (Jordan et al., 2014; Prince, 2004). It is important to note that this interaction does not necessarily have to be about the project (Buchs et al., 2016; Casey & Goodyear, 2015; Chang & Windeatt, 2016; Zhang & Cui, 2018). It is proposed that the interaction between group members stimulates the group dynamics, which in its turn improves the whole cooperative learning process. Naturally, interaction about the project, assignments, gathered knowledge, etcetera is also relevant (Emerson et al., 2015; Gašević et al., 2019; Ghilay & Ghilay, 2015; Kaendler et al., 2015; Tran, 2014). Interaction can take place in different ways. Based on the literature, there are two main means of interaction: face-to-face (Casey & Goodyear, 2015; Emerson, English, & McGoldrick, 2016; Emerson et al., 2015; Ghilay & Ghilay, 2015; D. W. Johnson & Johnson, 1999; Jones & Jones, 2008; Jordan et al., 2014) and computer supported (Chang & Windeatt, 2016; Gašević et al., 2019; Ghilay & Ghilay, 2015; Jordan et al., 2014; Neill et al., 2017; Zhang & Cui, 2018). Both have advantages, which are discussed in respectively proposition 23 and proposition 8. Results from the case study support this proposition. The author of this research stimulated interaction before, during and after the meetings by bringing up certain subjects to talk about. These topics were mainly, but not exclusively, about the project or subjects related to the project. The interaction enhanced the atmosphere within the group, resulting in more pleasant and dynamic discussions.

Proposition 23: A cooperative learning implementation that has a climate that stimulates face-to-face interaction will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if interaction takes place in a face-to-face setting. Many of the authors describe the importance of interacting face-to-face. The main advantage that emerged from the content analysis is that interaction in face-to-face settings allows for immediate response to questions, statements and remarks (Emerson et al., 2016; Islim, 2018; Kim & Lim, 2018; Schoor et al., 2015; Supanc et al., 2017; Tlhoaele et al., 2016; Vaughan, 2014; Wang & Huang, 2016). This in contrast to digital interaction, where it often occurs that messages are read significantly later than when they were sent (Ghilay & Ghilay, 2015; Islim, 2018; Jordan et al., 2014; Kim & Lim, 2018; Tlhoaele et al., 2016; Vaughan, 2014; Wang & Huang, 2016; Wilson & Narayan, 2016). Results from the case study support this proposition. Meetings with the groups were always held face-to-face, which improved the dynamics of the interaction between members of the group. Students preferred face-to-face interaction to communicate and discuss with each other. The students
indicated that meeting face-to-face was specifically beneficial for the brainstorm sessions. However, the students also initiated face-to-face meetings to cooperatively work on the report.

Proposition 24: A cooperative learning implementation that has a climate in which people are not afraid to fail will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if it is applied in a climate in which people are not afraid to fail. This means that people in the cooperative learning process, including the teacher, realize there is a possibility of failure, and are able to accept any consequences resulting from failure. This is especially relevant considering that cooperative learning is applied to gather knowledge and use it in an innovative way (Almajeed et al., 2016). “By seeking and blundering we learn” is a famous quote by Johann Wolfgang von Goethe. Without blunders, one dares not to seek, and if one does not seek, innovation is hard (Jordan et al., 2014). From a cooperative learning perspective, failures (within a group) are rare, because quite often there are no wrong answers (Hadwin et al., 2018), only (essential) steppingstones to a better idea or answer. Since cooperative learning requires people to take risks and to experiment, instead of opting for the safe choices, the cooperative learning climate must ensure people of the fact that it is okay to make mistakes, and encourage people to test the limits and expand their boundaries (Lv, 2014; Sugiharto, 2015). Results from the case study support this proposition. Meetings regularly took place with the teacher present, especially at the start of the process. In these initial meetings, the students did not share many ideas, which had either or both of two causes: the time they spent on the subject was limited so the students did not have that many ideas yet, and the students wanted to say the right things, but did not know what the right things were. In the meetings where the teacher was not present, the discussions were more divergent. Ideas outside the comfort zone of the students were shared. It must be noted that indeed most of the ideas or arguments that were shared were not pursued. They did however contribute to the outcome of the discussions. The students confirmed hesitation to share an idea or argument if the teacher was present. This suggests that students require a climate in which they are not afraid to fail.

Proposition 25: A cooperative learning implementation that has a climate in which people are respected will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if people are respected. This proposition goes without saying. The supporting articles all describe respect as a vital element in cooperative learning. It slightly overlaps with open communication (proposition 21) and not afraid to fail (proposition 24), since without respect, achieving a climate of open communication and in which people are not afraid to fail is troublesome (Burress & Peters, 2015; Chang & Windeatt, 2016; Du et al., 2016; Monteiro & Morrison, 2014). Respect is also suggested to improve the sense of belonging (De Hei et al., 2015) and peer support (Dirlikli, 2016; Du et al., 2016; Ruiz-Gallardo et al., 2012). Results from the case study yielded no evidence to confirm or deny this proposition. There was no indication that the students did not respect each other, nor was there any signal that the respect they did have for each other directly influenced the cooperative learning process.

Proposition 26: A cooperative learning implementation that has a climate in which people can differentiate will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if people can differentiate in the process. From the perspective of cooperative learning, differentiation results in creativity and innovation (Almajeed et al., 2016; Hadwin et al., 2018). This is accentuated by the fact that in a cooperative learning group, every member has a different speciality, and different strengths and weaknesses (Emerson et al., 2016; Lv, 2014). To ensure optimal effectivity and efficiency of every group member, these specialities and strengths must be
utilized. The climate of a cooperative learning implementation must stimulate students to
differentiate themselves from other students, in order for them to utilize their own strengths and
specialties. Results from the case study support this proposition. The individual element of the
project as described in proposition 17 provided the students with the opportunity to shape their
own contribution to the project in a way to utilize own strengths and specialties and to satisfy their
own interests. Additionally, the students deliberately chose to divide the tasks based on their own
strengths, specialties and interests.

Proposition 27: A cooperative learning implementation that has a climate that stimulates active engagement will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if the climate stimulates active engagement from the students. Based on the theoretical framework (figure 9) can be concluded that active engagement is an essential element for cooperative learning. The support articles all support this statement. Chang and Windeatt (2016), Jordan et al. (2014), Tran (2014), Ghilay and Ghilay (2015) and Sugiharto (2015) all described a form of active engagement stimulating techniques in the cases they studied. Two main approaches emerged. On the one hand, active engagement can be made compulsory (Jordan et al., 2014; Tran, 2014). If this approach is adopted, the students are obliged to make a certain contribution per certain time period. This is checked by either the other group members or the teacher. Working from experience of the author of this paper in applying PeerWise as a cooperative learning tool for students, compulsory active engagement does improve the contribution and engagement rate of students. However, the downside is that the (co-)produced results are of inferior quality. On the other hand, active engagement can be rewarded by offering (indirect) advantages to the groups or individuals that have shown active engagement (Chang & Windeatt, 2016; Ghilay & Ghilay, 2015; Sugiharto, 2015). Results from the case study support this proposition. Active engagement was stimulated on the one hand by organizing meetings with the project manager in Reykjavik. During these meetings, the students were regularly asked to explain elements of their research. Additionally, these meetings motivated the students to keep the momentum, and to avoid coming up empty-handed at a meeting. On the other hand, active engagement was stimulated by regularly checking the contributions of every group member. Every meeting started with a round of updates from every student about their occupations. This improved the general engagement and engagement in the meetings.

Proposition 28: A cooperative learning implementation that has a climate in which there is no hierarchical arrangement will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if there is no hierarchical arrangement. In other words, all members of the group should be equal. It is important to note that this proposition is two-fold. On the one hand, this is about the relationship between the student-members of the group (Burress & Peters, 2015; Chang & Windeatt, 2016; Gašević et al., 2019; Lv, 2014; Monteiro & Morrison, 2014; Sugiharto, 2015; Tlhoaele et al., 2016). On the other hand, this is about the relationship between students and teacher (Burress & Peters, 2015; Gašević et al., 2019; Lv, 2014; Monteiro & Morrison, 2014; Sugiharto, 2015). The equality of all members of the group provides a lower rate of group think (Burress & Peters, 2015) and improves open communication (proposition 21) (Gašević et al., 2019) and people not being afraid to fail (proposition 24) (Gašević et al., 2019). Results from the case study support this proposition. During the cooperative learning process, the teacher was part of the group. Based on observations in multiple meetings, it seemed that the students felt inferior to their teacher. This seems inevitable, since the teacher is assumed to be the one that ‘knows everything’. Additionally, the teacher assesses the performance of the students and grades their work. If this practical finding is connected to the literature, this affected the open communication and the feeling of not being afraid to fail of the students, which were discussed in proposition 21 and proposition 24. These findings exemplify the importance of finding a balance between the role of the teacher as a group member and as ‘the teacher’.
Proposition 29: A cooperative learning implementation that has a climate in which people experience a high degree of trust will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if people experience a high degree of trust. All support articles describe a high degree of trust in a cooperative learning setting. This proposition is two-fold. It proposes that student-members of the group trust each other (De Hei et al., 2015; Du et al., 2016; Jones & Jones, 2008), and teachers trust their students (Burress & Peters, 2015; De Hei et al., 2015). Experiencing trust in a cooperative learning setting is suggested to improve group processing (D. W. Johnson & Johnson, 1999; D. W. Johnson et al., 1998). It is important to note that the importance of trust does not eliminate the relevance of critical thinking (proposition 13). Trust refers to trusting that a person engages in the cooperative learning process with the best of intentions, attempting to maximize their own and each other’s learning. Additionally, trust refers to trusting that a person tells the truth (e.g. about the sources of knowledge, statements, contribution, participation). Therefore, trust has little to do with critical thinking (proposition 13). Results from the case study yielded no evidence to confirm or deny this proposition. There was one finding, however, that suggests there was trust between the group members. At the start of the project, each student gathered articles on the project subject. The lack of quality control on the articles gathered by the other students suggests that the students trusted each other. However, the lack of quality control could also be explained by a lack of motivation or time. Therefore, this finding is inadequate to draw justified conclusions.

Proposition 30: A cooperative learning implementation that has a climate that is student-centred will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if the climate in which cooperative learning is applied is student-centred. This proposition seems self-evident, since the student-centeredness is part of the definition of cooperative learning in many (fundamental) researches. However, cooperative learning is often applied with the sole purpose of transferring the existing knowledge of the teacher to the student. This is reflected in a traditional classroom group. This diminishes the purpose of cooperative learning. The support articles all exemplify the importance of cooperative learning being student-centred. It is suggested to improve the self-reliance and creativity of the cooperative learning group (Asino & Pulay, 2019; Jackson & Evans, 2017; Lee et al., 2018). To ensure the innovative use of knowledge, outside of the limited scope of the teacher (figure 3), the cooperative learning process is suggested to be student-centred. Results from the case study support this proposition. From the beginning of the project, it has been a student-centred project. The students could choose the specific research topics, even if these were outside the (limited) scope of the teacher. Additionally, the students make the decisions during the project. It is important to note that this often happened in consultation with the teacher. The teacher offered guidance and knowledge during the project, but the fundamental ingredients of the project were in the hands of the students. This improved the creativity and motivation of the students.

Proposition 31: A cooperative learning implementation that has a climate in which people feel safe will be more likely to result in high-performing cooperative learning.

Results from the content analysis suggest that a cooperative learning process yields better results if it is situated in a climate in which people feel safe. Since cooperative learning requires people to take risks and to experiment, instead of opting for the safe choices, the cooperative learning climate must make people feel safe and comfortable to go outside their comfort-zone (Almajed et al., 2016; Burress & Peters, 2015; Chang & Windeatt, 2016; Hadwin et al., 2018; Jordan et al., 2014; Lv, 2014; Sugiharto, 2015; Zamani-Miandashti & Ataei, 2015). Results from the case study yielded no evidence to confirm or deny this proposition. The case study yielded no
results related to this proposition. It is likely that this has to do with the fact that the safeness of an environment is intangible, and therefore complicated to identify and quantify in a case study. Additionally, the perceived safeness of a person is highly subjective, making it challenging to establish justified conclusions without proper statistical analysis.