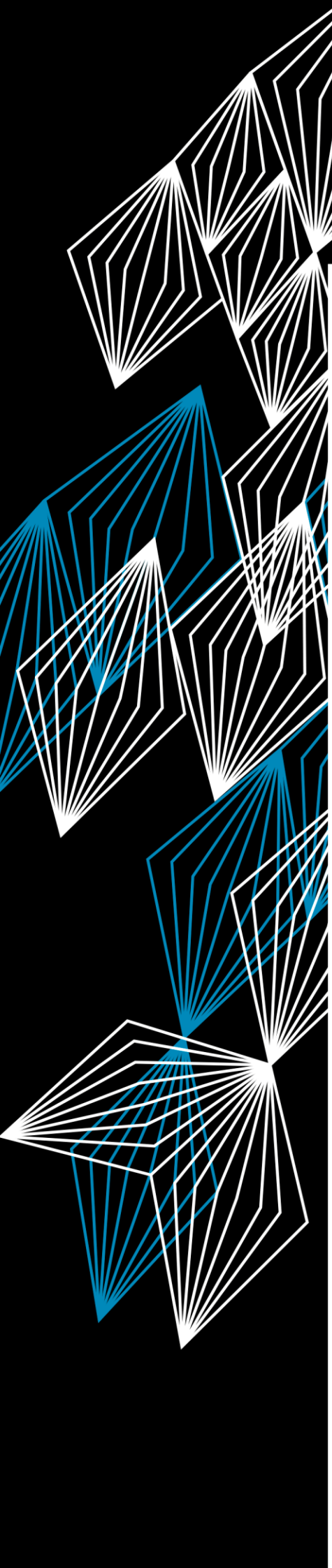

Master thesis

Exploring task interest, flow, mood and perceived cooperation in a scripted cooperative learning activity

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Summary

The purpose of this study was to explore the effects of the phases of a cooperative learning script and what influence it has on students' mood, flow and the cooperative process. The research design for this study was quantitative, using questionnaires before (interest), during (mood) and after the activity (flow and perceived cooperation). 90 primary school students (sixth grade) were heterogeneously grouped based on their science interest and were instructed to cooperatively build an energy efficient house out of crafting material. Results showed that with a scripted cooperative learning activity, students were positive about their cooperation, experienced a positive flow and a positive mood. The mood of students, measured after each phase, did not significantly change over time, and stayed positive during the activity. There was a positive correlation between task interest and flow, so students that had interest within the topic were more likely to experience flow in the process. Flow also positively correlated with perceived cooperation, which indicates that a higher flow will show a higher perceived cooperation or vice versa, a higher perceived cooperation will result in a higher flow. Furthermore, mood was positively correlated to flow and the perceived cooperation of the students. It can be concluded that during a scripted cooperative learning activity when students feel positive, they are more likely to experience a higher flow and a higher perceived cooperation. This study showed that a thoroughly considered scripted cooperative learning environment ensures that students are immersed and less likely to be distracted. Also, the students are able to be motivated and their mood is positively constant over the course of the activity.

Keywords: cooperative learning, cooperative learning script, mood, flow, task interest

1 Introduction

1.1 Problem statement

Nowadays, teachers often group students with the task to work on an activity together, while under the impression that students engage in productive cooperative processes (Dillenbourg, 2002; Woods & Chen, 2010). However, working in small groups does not always imply cooperation between students and also it may not provide a learning experience due to challenges that can arise caused by socio-emotional, interpersonal and/or motivational reasons (Järvelä, Volet & Järvenoja, 2010; Näykki, Järvelä, Kirschner & Järvenoja, 2014; Siemon, Becker, Eckardt & Robra-Bissants, 2019).

Some examples that cause unproductive cooperation are difficulty in understanding another's thinking or perspective but also students' different priorities or expectations (Näykki, et al., 2014). Conversations in cooperation can become unproductive or even off-task as it may not always be clear to students what they are ought to do or how to contribute to the process (Mercer, Dawes, Wegerif & Sams, 2004). Also, students are not always familiar with how to communicate properly in a cooperative setting (Gillies & Haynes, 2011). Another challenge is that one person may end up doing most of the work, because of uneven distribution or the contribution may not be appreciated or valued by other members (Slavin, 1983; Cohen & Lotan, 2014).

Furthermore, mood may influence cooperative behaviour and decision making, in the sense that when students have a negative mood it could lead to insecurity and decision making requires more time and effort (Hertel, Theuer & Kerr, 2000). A positive mood ensures that students feel more secure which leads to more efficient and quicker decision making. When cooperation is well structured and is provided with scaffolds also on interaction and emotion regulation, students are more positive which eventually might lead to efficient cooperation (Hertel, Theuer & Kerr, 2000; Näykki et al., 2014). Also, the structure ensures that students have a common goal, clear expectations of the assignment and of their group members which leads to productive task-oriented communication (Johnson & Johnson, 2008; Woods & Chen, 2010; McInnerney & Roberts, 2004).

Guidance and structure in interaction and cognitive processes can be provided by scripts with instructions that assign roles to students, distribute the activities, manage the interaction and explain how students achieve towards the common goal through a sequence of activities (Dillenbourg, 2002). Through the use of a script students are more aware that they have

responsibilities and are ought to interact to complete the task they are assigned to which eventually guides the social process in cooperation (Stegmann, Weinberger & Fischer, 2007).

There has been research on scripts in cooperative learning. However, less is known about possible differences between the phases in the script or occurrences during the scripted cooperative learning activity. There is still much to be researched during cooperative learning when it is scripted. Social, cognitive and emotional functions influence the cooperation process. It might therefore be interesting to explore possible changes in mood after each phase of the script and if the overall mood of students is related to their perceived cooperation. Furthermore, it is explored if students might experience a state of flow during a scripted activity, which may occur when they are interested in the topic and they feel challenged by the activity. Subsequently it is explored if the flow state is related to the overall mood students have experienced.

The focus of this study is to understand more about the effects of the phases of a cooperative learning script and what influence it has on students' mood, flow and the cooperative process. Therefore, it is explored if there are differences between the phases of the script and possible connections between task interest, mood, flow and students' perceived cooperation that might be influenced by the cooperative learning script.

2 Theoretical framework

2.1 Cooperative learning

In the context of traditional learning, a teacher provides the learning information, students learn individually and focus on their own achievement. In cooperative learning there is a shared learning experience in which the students have one common goal (Förrer, Kenter & Veenman, 2000; McInnerney & Roberts, 2004; Siemon et al., 2019). When learning cooperatively, students learn from and with each other and share resources to attain a common goal, confirmation and appreciation with the responsibility for their own and their group members' learning (Förrer, Kenter & Veenman, 2000; Abrami, Poulsen & Chambers, 2010). By using each other's skills, they are able to attain the common goal which eventually leads to learning and developing their skills and knowledge (Panitz, 1999; McInnerney & Roberts, 2004, Laal & Ghodski, 2012). This can be done by students that individually focus on an expert area and eventually they share and combine the information (Sharan, 2014).

Although cooperative learning methods aim to provide in active student participation, there are also skills needed for students to effectively work together such as social skills and learning skills (Sharan, 2014). Therefore, if students are not prepared and are not taught the social and learning skills for cooperative learning it could lead to inefficient situations or even conflicts in the cooperative learning process and these situations need to be recognised and responded to as they might compromise the learning process (Näykki et al., 2014). It might even be that there is an absence of communication, or poor quality of communication such as misunderstanding or off-task communication (Topping, 2007). However, it is not always apparent if the students already acquired the social and learning skills which are necessary. Furthermore, if cooperative learning is not properly structured it might leave space for freeriding or no participation by students or a student even might end up doing all of the work (Förrer, Kenter & Veenman, 2000; Topping, 2007). Also, students might end up disagreeing over the steps to reach a goal and not progress in the cooperative process (Tjosvold, 1998; Mercer, Wegerif & Dawes, 1999).

In cooperative learning the groups may be heterogeneous or homogeneous. A benefit of heterogeneous grouping may be that students learn to work with different peers with different skills and knowledge (Förrer, Kenter & Veenman, 2000). Furthermore, differences in interests, skills and abilities could be beneficial for the learning experience as a group with students includes multiple skill sources and their individual skills could help problem solving (Sharan, 2014). However, the differences in skills or cognition among students might also be a reason

for disturbances within the cooperative process. For example, students might have a different understanding of the task and develop individual goals (Cohen & Lotan, 2014). Therefore, it is important to help students to gain a shared understanding of the goal and to guide them in the social process. Assigning roles or individual expert areas, clear expectations, assignments and guidance on interaction might be beneficial to the learning process and provides students more direction. A cooperative learning script may provide this structure.

2.2 Cooperative learning scripts

Social, cognitive, emotional and other external factors are of influence during cooperation and therefore, merely working together on a shared goal might not always provide effective cooperation (Weinberger, Stegmann and Fischer, 2010). Enhancing the effectiveness of the social process and improved knowledge gain can be done by scripting the cooperative learning process (Dillenbourg, 2002; van Dijk, Gijlers & Weinberger, 2014).

A cooperation script is a guideline structured into phases to instruct students on interacting, organizing and planning in the process of the activity (Dillenbourg, 2002). Through the script students are guided on how to communicate and which activity to perform, it describes that tasks should be distributed and what is expected of the students to solve the problem (Dillenbourg, 2002). Through the sequencing by a script, learners are assisted in their interaction with each other and are encouraged to take responsibility in the group process (Weinberger, Ertl, Fischer and Mandl, 2005). Interactions can be enriched to improve learning outcomes and the quality of argumentation and cognitive processes (Dillenbourg & Hong, 2008).

There are two different approaches that share the term ‘script’ which are micro- and marco scripts (Dillenbourg & Hong, 2008). Micro- scripts are designed to enhance only dialogues, as Macro-scripts are designed for groups to sequence activities and the activities may activate argumentation or critical thinking (Dillenbourg & Hong, 2008). Some examples of cooperative scripts are the MURDER script, ASK to THINK – TELL WHY, structured Academic Controversy and Reciprocal Teaching and all of them support learners in their learning process to acquire knowledge and learning strategies (Kollar, Fischer & Hesse, 2006).

Most studies aim to explore or compare learning strategies with a scripted strategy on knowledge acquisition or effectiveness. Although a lot of research has been done to the learning outcomes or the quality of the process, there is little known about the effects of the different phases of a script. Many factors may influence the cooperative learning process and an example is state of mood and if students are captivated by the content that is offered in the activities.

Mood or emotions can be regulated by students with the help of scripts if they are designed to provide social support (Näykki et al., 2014; Polo, Lund, Plantin & Niccolai, 2016).

2.3 Mood

When students are able to self-regulate their emotions during an activity it might improve their learning processes and learning outcomes (Näykki et al., 2014; Näykki, Isohätälä, Järvelä, Pöysä-Tarhonen, & Häkkinen, 2017). Students might be able to modify the group process when feelings and emotional experiences are visible (Näykki et al., 2014). Therefore, structure on emotion regulation could be offered during a cooperative activity, for example making feelings and thoughts visible through tasks or interaction scaffolds. By providing social support, for example within a script, students might be able to self-regulate their emotions (Näykki et al., 2014). Improving the mood of students leads to confidence and improved and efficient decision making (Hertel, Theuer & Kerr, 2000). Furthermore, when the mood is positive students are less likely to withdraw from an assignment or the group process (Näykki et al., 2014). When the script is structured so students are able to regulate their emotions, it could reflect their mood and the emotion stimulates students to act (Gross & Thompson, 2007). A positive mood drives students to act which motivates them during the cooperation (Gross & Thompson, 2007).

2.4 Flow

According to Csikszentmihalyi (2004), motivation can be induced by the feeling to achieve a challenging goal and achieving that goal brings enjoyment to people. The state of this process is called flow and becomes an almost automatic state without effort and in which the person is utmost concentrated in their task (Csikszentmihalyi, 2004). During this state a student loses sense of time and awareness and is only focused on the task (Nakamura & Csikszentmihalyi, 2009; Walker, 2010). It can be induced when there is enough learning motivation, a clear end goal, immediate (self)feedback, concentration on the task and sense of control (Schüler, 2007; Walker, 2010). To achieve flow it requires a balance between challenge and ability which means that the activity ensures a challenge that is not too difficult (frustration) and not to easy (boredom) (Csikszentmihalyi, 2004). Only when the level of the task is within the abilities of the students, flow can be achieved (Schüler, 2007; Nakamura & Csikszentmihalyi, 2009).

According to Walker (2010) a discussion in a group or with a peer can induce a flow experience (Walker, 2010). Working together appeared helpful when the balance between challenge and ability was not appropriate for the learner which eventually still evoked flow

experience. As a group member could provide help with a challenging activity if it was too difficult, but also provide options to make an assignment more challenging when it was too easy (Custodero, 2002). Students experience a higher flow when the quality of cooperation was also high (Raphael, Bachen & Hernandez-Ramos, 2012).

After a flow state a student becomes more positive about their self-reflection as they achieved their goal that induces a sense of fulfilment and one can admit to a sense of enjoyment and the activity was worth spending time on (Csikszentmihalyi, 2004; Admiraal, Huizenga, Akkerman & ten Dam, 2011). Flow does not immediately affect learning outcomes but was shown to have an effect on performance (Admiraal, Huizenga, Akkerman & ten Dam, 2011). Eysink, Gersen & Gijlers (2015) found that when there was a lower flow, it indicated that students found themselves not in complete control of the task and therefore an assignment could be too difficult or too easy to their skills or abilities. While students are in a flow they experience the activity as a goal and because they are completely concentrated (Csikszentmihalyi, 2004). Therefore, it might be that when the assignment is challenging enough and/or regulated by group members and flow is apparent, there should be less distractions during the cooperative learning process. However, the challenge of flow during cooperation is when students lose sense of time and they spend too much time on one task which can be prevented by giving them specific time boundaries (Cohen & Lotan, 2014). When cooperative learning is scripted, there is more guidance in terms of an explanation every phase of what is expected of the students and how much time they can actually spend on the task. During a challenging assignment it can be explored if there is a relation between flow and cooperative learning when it is scripted.

2.5 The present study

This study aims to explore what effect the phases of a cooperative script has on students' mood, flow and students' perceived cooperation. First, mood will be studied on recurring times after each phase of the script and will be analysed if there is a change in mood over time. Furthermore, it will be analysed if the overall mood relates to students' perceived cooperation. Also, when students have experienced flow it could lead to a positive mood. Therefore, this relation will also be analysed. Second, task interest will be analysed if it relates to flow as higher interest in the topic might indicate a higher flow experience. Third, the relation between flow and the students' perceived cooperation might give insight if flow occurs during a scripted cooperative activity.

The main research question of this study will be: *To what extent do the phases of a cooperative learning script affect mood, flow and perceived cooperation?* The following sub-

questions aim to answer the main question: a) To what extent does mood change over time after each phase of the scripted process, b) To what extent does mood relate to the perceived cooperation, c) To what extent does flow relate to the students' experienced mood, d) To what extent does task interest relate to students' experienced flow, e) To what extent does flow relate to the perceived cooperation.

3 Research design and methods

3.1 Research design

This study explored the effects of a cooperative script on task interest, mood, flow and students' perceived cooperation during a science activity in primary education. Firstly, the goal was to identify if mood changes during the phases of a scripted cooperative learning activity. Furthermore, it is explored how the overall mood correlates to the overall flow and if it is correlated to how students perceive their cooperation. Secondly, flow is measured after the scripted activity and correlated to task interest and students' perceived cooperation. Third, the task interest and students' perceived cooperation correlation is analysed.

3.2 Participants

The study was conducted among four Dutch primary schools in a rural area of the Netherlands. In total 97 students participated in this study. Seven participants of whom data of the session were missing were excluded from the data file. The remaining ninety students were between 10 and 13 years of age (M = 11.13, SD = 0.50), consisting of 37 boys and 53 girls and participated in a science activity that focused on the design of an energy efficient house. Parents actively consented for their child participating in this research as the students are under the age of 18.

Students worked in groups of three to five students on the assignment. These heterogeneous groups were formed by the researchers based on *task interest* through a questionnaire in which students score high, medium or low. This high, medium or low score was determined to rank the scores from highest scoring student to lowest scoring student and this scale was divided by three to create three levels of an equal number of students. The intention was to have groups of four students. The class size was divided by four to determine the number of groups to be created. Then, the high scoring students were divided over the number of groups. Second, the middle scoring students were randomly divided over the number of groups. Finally, the lowest scoring students were randomly divided over the number of groups. The groups were communicated towards the teachers, but at the day of the experiment

changes were also made due to organizational reasons of the school schedule or students that withdrew from participating. Eventually, there were groups containing three, four or five students. In the experiment six groups consisted of three group members, sixteen groups consisted of four group members and two groups consisted of five group members.

Parents actively consented for their child participating in this research as the students are under the age of 18.

3.3 Instrumentation

3.3.1 Materials

Introductory information. An introductory presentation was given to inform the students about the concepts of *Heat Energy*. It started with the rules the students had to comply with for building the house description and then what materials were available to the students. Additionally, information on thermal energy and atoms, different states of matter, radiation, reflection and absorption were explained to the students. The phases of the cooperative learning script were incorporated with an explanation of the assignments and timers in the form of videos were added. This gave students a visual support on the time they were able to spend on each of the assignments.

Cooperative learning script. The cooperative learning script was designed to structure the assignment. The script consisted of two parts: 1) individual part and 2) a cooperative part

In the individual part, students were provided with two assignments in which students individually prepared for designing the house. The first assignment was to write down what was important for an energy efficient house. What makes a house energy efficient and what did the students remember from the text they have read (that included information about heat conduction, convection and heat capacity of different materials e.g. metals, water, air, rubber etc.). Furthermore, students were asked what is important on energy and heat and to create a first sketch of the intended house. The students received fifteen minutes for this assignment.

In the cooperative part, students were first asked to *brainstorm* in their cooperative group about what was important for an energy efficient house. They created a list with things they did not want to forget while designing the house. The students received ten minutes for this assignment. Second, the students had to create a *sketch* of their house design. The students were able to combine their ideas into one visual image of the house. The students received twenty minutes for this assignment. Finally, students were asked to *build* the house from the available crafting materials. It was made clear that every student was expected to participate in building the house. With the materials there was also a sheet with the rules, so that students

were able to check these if necessary. There was also room in the sheet for students to make notes during the designing and building part to explain better to others what they did.

3.3.2 Measurements

Task interest questionnaire. Task interest in science was measured with a questionnaire. The questionnaire consisted of six statements that measured students interest levels in science learning (e.g., I like learning things in the science lessons'). The students rated their answer on a 5-point Likert scale with 1 = Totally not agree and 5 = Totally agree. The reliability of the scale (i.e., Cronbach's α) indicated that the scale reached a sufficient reliability level of $\alpha = 0.80$. Deleting one item from the test increased reliability to $\alpha = 0.86$. This item did not contribute to the reliability (not even after recoding) and it is expected that the students misinterpreted the question as it was in a negative formulation in contrast to the other questions (positively stated). Therefore, this item was deleted and not used in the analysis as it was possible it measured something different.

Flow short scale. Flow was measured with a Dutch version of the Flow Short Scale (Rheinberg, Vollmeyer & Engeser, 2003; Eysink, Gersen & Gijlers, 2015). The questionnaire consisted of nine statements that measured students flow during the cooperative process (e.g., 'I felt like I was in control.'). Students had to rate their answer on a 7-point Likert scale varying from 1 = true and 7 = not true. For reasons of readability, all items were transformed in which a higher score indicated more flow. The reliability of the scale (i.e., Cronbach's α) indicated that the scale reached a sufficient reliability level of $\alpha = 0.87$.

Cooperation questionnaire. Students' perceived cooperation was measured through a nine-statement questionnaire (e.g., 'In our group we helped each other during cooperation'). They had to rate the perceived quality of their groups' cooperative process on a 5-point Likert scale varying from 1 = Totally not agree to 5 = Totally agree.

One item of the questionnaire was recoded as it was negatively stated instead of positive. The reliability of the scale (i.e., Cronbach's α) indicated that the scale reached a sufficient reliability level of $\alpha = 0.85$. Even after recoding, deleting that item increased the reliability, deleting a second item from the test increased reliability to $\alpha = 0.89$. The two items did not contribute to the reliability and it is expected that the students interpreted the questions differently than intended, these questions did not measure the intended construct as they were misinterpreted.

Emotion Awareness tool. The Emotion Awareness tool (EMA), corresponding with the Experience Sampling Method, intends to measure students' mood after every assignment

part in the process (Larson and Csikszentmihalyi, 1987). Students are asked to answer two questions by means of the Smiley-o-meter (Read, 2006): 1) How do you feel at this moment? and 2) How do you feel about the task at this moment? The students can choose a smiley that corresponds with their current emotion. The five smileys range from negative to positive mood. To measure if there were relations between average mood and the other variables the items were combined and reliability of the scale (i.e., Cronbach's α) indicated that the scale reached a sufficient reliability level of $\alpha = 0.75$.

3.4 Procedure

Within the week before the actual data collection students filled in the task interest questionnaire. The score of interest was computed and the students were ranked from a low to high interest score (see participants section for more information).

At the location of the experiment, students could find their place with their name on stickers placed on the tables and were categorised into their groups. In case there were students missing, groups were slightly reorganised.

Information about heat energy was presented by the researcher. The students received handouts with the individual expert areas (heat capacity of different materials, convection and heat conduction). Students received 15 minutes to read their material and made notes of the material they read. After reading the information, the students received information on the smiley EMA-tool and filled this in for the first time.

For ten minutes students were ought to brainstorm on the important aspects of an energy efficient house. In the first group assignment the students created a list on important aspects and their reasoning on it. After brainstorming the students were asked to fill in the EMA-tool again for the second time.

Then, students were expected to sketch how the house should be build and what materials should be used in 20 minutes time on the second group assignment. After five minutes students received additional information about the wind and angle of the sun during the summer and wintertime. After sketching the students were asked to fill in the EMA-tool again.

Finally, the students received approximately 60 minutes to craft the house with the available materials. They were allowed to write additional information on their houses, to visualize their ideas when they were not apparently crafted. When the time was up, students were asked to write their names on the houses and on their sketches and brainstorm forms.

Unfortunately, not in every situation the full 60 minutes were possible as the daily schedules of the schools differed.

The students received the EMA-tool and were asked to fill this in for the final time. After the activity the cooperation questionnaire and short flow scale was filled in by the students.

4 Results

The data that was generated by this experiment is of quantitative nature and was processed and analysed in SPSS. Because the groups comprised out of three to five students, if was also interesting to see if there were differences between the groups. This measurement was also of importance to analyse if the variables could be measured with all of the groups in one dataset.

4.1 Data distribution and outliers

Task interest, flow, overall mood and perception of cooperation. The data on task interest, perception of cooperation and flow is considered normally distributed as it appeared that the data was close to the diagonal line in the Q-Q plot. There were two outliers in the task interest questionnaire with a low science interest score. One outlier was observed in the cooperation data with a low score and one outlier with a very low score in flow. Table 1 gives mean scores and standard deviations for learners in each condition on the task interest questionnaire, flow short scale, mood and perception of cooperation scales. The task interest that was measured before the experiment indicated that students were on average positively interested in the topic that was used in the experiment (3.66 on a scale of 5). Second, the results show that the overall mood of the students was positive (4.09 on a scale of 5). Third, the students indicated that they have experienced a positive flow during the cooperative activity (5.21 on a scale of 7). Finally, the cooperation that was experienced by the students was on average positive (3.71 on a scale of 5).

Table 1

Average mean scores and standard deviations for the task interest, flow, mood and perception of cooperation scale.

	N	*M*	SD
Task interest (max. 5)	90	3.66	0.82
Overall mood (max. 5)	87	4.09	0.58
Flow short scale (max. 7)	86	5.21	1.21

Cooperation scale (max. 5)	87	3.71	0.83

4.2 Perceived Cooperation

Due to organisational reasons of changing the originally groups of four to also groups of three or five, a one-way measured analysis of variance (ANOVA) was conducted to analyse if there were any differences between the groups in the average perceived cooperation. Levene's test showed for the average cooperation, the variances were not equal, $F(2, 84) = 5.96$, $p = .004$. Because it was not possible to measure significant differences between the conditions with the ANOVA, a Kruskal-Wallis test was conducted. It showed that there was no significant difference between the groups in perceived cooperation $H(2) = 1.30$, $p = .521$. Third, results show that after a Pearson product-moment correlation coefficient it can be concluded that there was no positive correlation between task interest and perceived cooperation $r = .138$, n = 87, $p = .202$.

4.3 Mood

To answer the question, *to what extent mood changes over time after each phase of the scripted cooperation process*, a one-way repeated measured analysis of variance (ANOVA) was conducted to evaluate change in participants' mood when measured after the individual expert phase, after the phase Brainstorming in a group, after the phase Sketching in a group and after the building group phase in a science activity ($N = 88$). After conducting the repeated measures Mauchly's Test of Sphericity indicated that there was a significant violation ($p = >.001$). Because there is a violation in Sphericity we interpret the data with Greenhouse-Geisser in which can be concluded that the scores on mood did not significantly change over time: $F(2, 185) = 0.788$, $p = .465$.

Table 2

Mean scores and standard deviations for mood after each phase of the script

	N	*M*	SD
Mood after phase 1	90	4.03	0.66
Mood after phase 2	90	4.09	0.71
Mood after phase 3	89	4.19	0.85
Mood after phase 4	88	4.10	1.05

Note. Phase 1: individual expert phase, phase 2: brainstorm phase, phase 3: sketching phase, phase 4: building phase.

A one-way measured analysis of variance (ANOVA) was conducted to analyse if there were any differences between the groups in the overall average mood. Levene's test showed for the average mood, that the variances were equal, $F(2 , 84) = 0.274$, $p = .761$. After analysing possible differences between the groups it showed that there was a significant difference between groups in mood, $F(2 , 84) = 4.909$, $p = .010$. Pairwise comparisons using the Bonferroni procedure show that there is a significant difference in mood between groups of four and groups of five ($p = .043$) in which the group of five shows on average a more positive mood than the group of four (see Table 3).

Table 3

Mean scores and standard deviations for average mood between the different groups

	N	*M*	SD
Triad	18	4.31	0.54
Four	59	3.97	0.58
Five	10	4.45	0.43

To answer the question, *to what extent does mood relate to the perceived cooperation,* a Pearson product-moment correlation coefficient was computed between the overall mood of students and their perceived cooperation. Results show a positive correlation between overall mood and perceived cooperation, $r = .337$, n = 84, $p = <.001$ (see Table 4). Which indicates that when mood positively increases, the students' perceived cooperation increases as well.

Table 4

Summary of Pearson product-moment correlation

Measure	*1*	*2*	*3*	*4*
1. Task Interest	-			
2. Flow Short Scale	.235*	-		
3. Perceived Cooperation Scale	.138	.397**	-	
4. Overall Average mood	.172	.565**	.337**	-

**. Correlation is significant at the 0.01 level (1-tailed)

*. Correlation is significant at the 0.05 level (1-tailed)

4.4 Flow

To answer the question *to what extent does flow relate to the students' experienced mood,* the Pearson product-moment correlation coefficient was conducted. It showed that there was a positive correlation between students' flow and their overall mood, $r = .565$, n = 83, $p = <.001$ (see Table 4). These results show that when flow increases, the students' mood is likely to increase as well.

A one-way measured analysis of variance (ANOVA) was conducted to analyse if there were any differences between the groups in the average flow. Levene's test showed for the average flow that the variances were equal for groups existing of three, four or five students, $F(2 , 83) = 1.53$, $p = .22$. After analysing possible differences between the groups it showed that there was no significant difference between groups in flow $F(2 , 83) = 1.022$, $p = .364$ (see Table 5).

Table 5

Mean scores and standard deviations for average flow between the different groups

	N	*M*	SD
Triad	17	5.43	1.38
Four	59	5.08	1.20
Five	10	5.55	0.84

To answer the question, *to what extent does task interest relate to students' experienced flow*, the Pearson product correlation coefficient was also used here. There was a positive correlation between task interest and flow, $r = .235$, n = 86, $p = .029$. Which indicates that task interest might influence the flow. Students with a higher interest in the topic seem to have a higher flow.

Finally, the final question, t*o what extent does flow relate to the perceived cooperation.* After the Pearson product-moment correlation coefficient, there was a positive correlation between flow and perceived cooperation, $r = .397$, n = 83, $p = < .001$ (see Table 5). Which indicates that when flow increases cooperation might increase as well.

5 Discussion

Former research has been done to the learning results and outcomes of cooperative scripts or with qualitative measurements on the cooperative process (e.g. Kollar, Fischer & Hesse, 2006; Dillenbourg & Hong, 2008). However, the effect of the phases of the script on

students' mood have not been researched before. Furthermore, the effect of scripting and students being in flow is also discussed here, whereas flow has formerly been compared to cooperation in game-based learning but there is little research on flow in cooperative learning in education. Therefore, this research shares some insight on the mood of students during the scripted cooperation process and their perceived flow and cooperation.

The purpose of this study was to understand more about the effects of the phases of a cooperative learning script and what influence it had on students' mood, flow and the cooperative process. Therefore, it was explored if there are differences between the phases of the script and possible connections between task interest, mood, flow and students' perceived cooperation that might be influenced by the cooperative learning script.

5.1 Perceived cooperation

Overall, the students perceived their cooperation during this experiment positively. As this activity was scripted and divided into phases to ensure that students have a clear goal, guidance on interaction and know what is expected of them, it is shown that it leads to students perceiving their cooperation as positive. Questions on students' perceived cooperation need to be carefully designed for the age group and the social climate of the students as these factors might endanger comprehensibility of the questions. This research was performed on multiple schools, but they have their own policy and education progress and students grow up in different environments which may affect their vocabulary. Nevertheless, the reliability of the scale used in this research was deemed sufficiently high.

There was no significant difference in perceived cooperation between the groups of three, four or five. According to former research students can easily be controlled in a smaller group opposing to larger groups (Alencar et al., 2008; Boyd & Richerson, 1988). In this experiment the assignment was scripted, and it might therefore be that students were more aware of their role, distributing the tasks and the time left to finish the assignment, so that monitoring other group members was therefore not frequently necessary. Nosenzo, Quercia & Sefton (2015) showed that there can be a positive effect of group size on cooperation and this depends on the environment or context the students are in. A larger group size can have both positive and negative effects. It might depend on the structure and design of the script used in the cooperation whether it is beneficial to the group size but further research is needed.

Furthermore, it was shown that a positive relation exists between the perceived cooperation and the mood. As mood was also shown to be positive throughout the whole process, it can be said that during this scripted cooperative learning activity the students were

quite satisfied about the cooperation which lead to a positive mood or even vice versa, the positive mood could have improved the cooperation.

Moreover, it was shown that there was a positive relation between cooperation and flow which indicates that either the flow positively affects the students' perceived cooperation or vice versa, the positive cooperation affects the students' flow positively. While students are in a state of flow it would mean they are immersed in the task. A script should provide support so that students are guided in interaction as well as support on the task (Kollar et al., 2006). It might indicate that students are more immersed in the task, when they are less likely to be distracted and more guided in the process. The script also provides a time limit and therefore students are pressured to finish a task within the time. More research is needed to understand the cause or variance of flow within the cooperative process.

5.2 Task Interest

Results show that there was a positive relationship between task interest and flow in a scripted cooperative learning setting. This is in line with the theory on flow (Csikszentmihalyi, 2004) in which it is discussed that when someone is fairly interested in a topic, the person is more likely to achieve flow. In future research an experiment with homogeneous groups based on task interest can be compared based on the amount of flow they have experienced to predict if the amount of interest within a topic has an effect on the amount of flow. In this research, according to the measurements, the students were able to reach a state of flow when they were in heterogeneous groups and their interest in the topic varies. This might be due to the different abilities and skills of the students such as different viewpoints, alternative thinking or learning styles (Sharan, 2014). Furthermore, a cooperative learning process also requires critical thinking e.g. interpreting, analysing, explanation skills, evaluation skills and creative solution skills are skills in combination with social skills such as argumentation etc., which may differ in strengths among students (Silva, Lopes & Dominquez, 2018). However, further research needs to be done to specific group processes to analyse if their diverse knowledge and skill backgrounds leads to a different effect in flow and cooperation.

5.3 Mood

It was shown that students' mood was positive after each phase of the script. The analysis showed that there was no significant change in mood over time after each phase of the script. Which means that on average the (positive) mood of the students appeared constant during the entire cooperative learning activity. When a script ensures that students are supported in social and interaction skills it could provide a chance of improving mood or continuance of

the already positive mood (Näykki et al., 2014). The script used in this experiment was structured so that students used interaction forms to support them in the learning process. Therefore, these results might show that during the whole process students maintained positive which eventually led to what Hertel et al. (2000) state, when students have a positive mood, they are feeling more secure and leads to efficient decision making. It might indicate that during a scripted cooperative learning activity when the mood is positive and does not change over time, decision making is more efficient. When the mood becomes negative by for example frustrations in a group, it might lead to extensive information processing (Schwarz and Skurnik, 2003). When an activity is over-scripted it endangers the students' own problem solving processes which eventually leads to demotivation of the students (Dillenbourg, 2002). A positive mood ensures that students are able to recall information or content more easily (Hettena & Ballif, 1981). Therefore, if a cooperative activity is purposely structured so that students' mood stays positive, it would ensure that the content within this assignment is easier remembered.

It was measured that there was a significant difference between the group size in mood. The groups that consisted of five students had on average a more positive mood than the groups consisting of four students. Mutual cooperation is more likely in smaller groups than in a larger group due to a possibility of e.g. free-riding, but this is more likely when cooperation is not structured (Alencar, Siqueira & Yamamoto, 2008; Boyd & Richerson, 1988). An explanation for this mood difference between the groups can not immediately be stated. Therefore, further research needs to be done as this might also be caused by e.g. the topic or design of the task or social reasons.

Lastly, between mood and flow there was a positive relationship. According to Csikszentmihalyi (2004) enjoyment of a task could bring us into a state of flow. However, presence of enjoyment is not relevant during a flow state and may be absent. A feeling of happiness might appear after the activity as people can eventually give into the emotions (Csikszentmihaliyi, 2004). It makes sense that there is a relationship between flow and mood, but in this study it cannot be concluded when (during or after the activity) these variables have an effect on each other.

5.4 Flow

First, the results showed that overall the students experienced a positive flow in a scripted cooperative learning activity. Furthermore, our results showed that flow was not significantly different if students were in a group of three, four or five. It might indicate that

during a scripted cooperative learning activity, students experience flow and that group size had no effect in this situation. Furthermore, our results showed that there was a positive correlation between flow and cooperation which indicates that they are apparent at the same time in the same situation and that there is significant evidence that a positive relationship between flow and cooperation in a scripted cooperative learning activity. In a research of Raphael, Bachen & Hernández-Ramos (2012) it was shown that flow and cooperative learning were compatible in game-based learning and that flow ensures that students learn from the learning experience. Also flow with others appears to be more enjoyable than solitary flow and being interdependent might enhance the joy (Walker, 2010). The script in this study was organised so that interdependence should occur by dividing expert areas among the group members. Which makes it interesting that mood and flow positively correlated to each other as well as flow and cooperation. Although the relation between flow and cooperation is measured, it does not imply that flow causes an improved cooperation. Therefore, for further research it might be interesting to investigate how much difference in flow is shown between a scripted and non-scripted cooperative learning activity and what it means to cooperation if flow increases during the activity. A regression with multiple measuring moments might give an indication how flow affects cooperation over time.

Based on the task interest questionnaire heterogeneous groups were formed and it can be concluded that with a higher task interest, students experience a higher flow. Which means for the cooperative process that if the topic matches the interest of the students, they are likely to reach a flow state which might improve their learning outcomes. It was also found that there was a positive relation between flow and the perceived cooperation of students which indicates that with a higher flow, students might experience a higher cooperation. It means that the level of immersion (flow) might be positive within a scripted learning activity. Furthermore, on average the students had a positive mood which did not change during the activity and flow and cooperation were both perceived as positive. If this was caused by scripting the activity is not measured within this research, however it does show that more research is needed to compare a scripted and non-scripted activity with these variables.

5.5 Conclusion

With this study it is implied that theoretically a well-designed scripted cooperative learning activity is beneficial for student's mood and their ability to regulate so that their mood stays positive. The phases of the script should be carefully designed so that it leaves enough opportunity for problem solving, as over-scripting (too much guidance or structure) may cause

demotivation. A positive cooperation may improve students' mood and it will leave students with a positive feeling about their assignment which may cause that they are more likely to recall the content.

Furthermore, students are able to reach a state of flow in a scripted cooperative learning activity and this flow might increase if students are more interested in the topic which leads to a positive mood with students. Therefore, a topic that fits the age and interest of the students ensures that students are immersed in a task and less likely to be distracted. Task interest influences flow within heterogeneous groups in a scripted activity but further research is needed on homogeneous groups based on interest if they experience flow as well. Also, specific group processes could be analysed if students' diverse knowledge and skill backgrounds leads to a different effect in flow and cooperation.

The effect of mood on group size is shown within this study, but there may be underlying reasons for a positive mood which are yet to be analysed. There was a positive connection between flow and mood, perhaps with physiological measures it might be able to analyse if there are differences of arousal or state of mood during the activity or afterwards when the activity is finished to understand more about this connection between flow and mood.

The results of this study point to implications for practice. A carefully designed scripted cooperative learning environment ensures that students are immersed and less likely to be distracted. Also, the students are able to be motivated and their mood is positively constant over the course of the activity. To succeed in their future careers, students need skills, e.g. critical thinking, cooperation, communication, social skills. In a cooperative learning activity, they are able to practice these skills. Therefore, it is important that the phases of a script are well structured to effectively learn these skills and teachers should avoid randomly placing students in a group without any guidance, structure or clear goal.

6 Reference list

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