Challenging gender stereotypes:

The application of attribution theory for boys and girls when performing a strategic design task

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Graduation thesis

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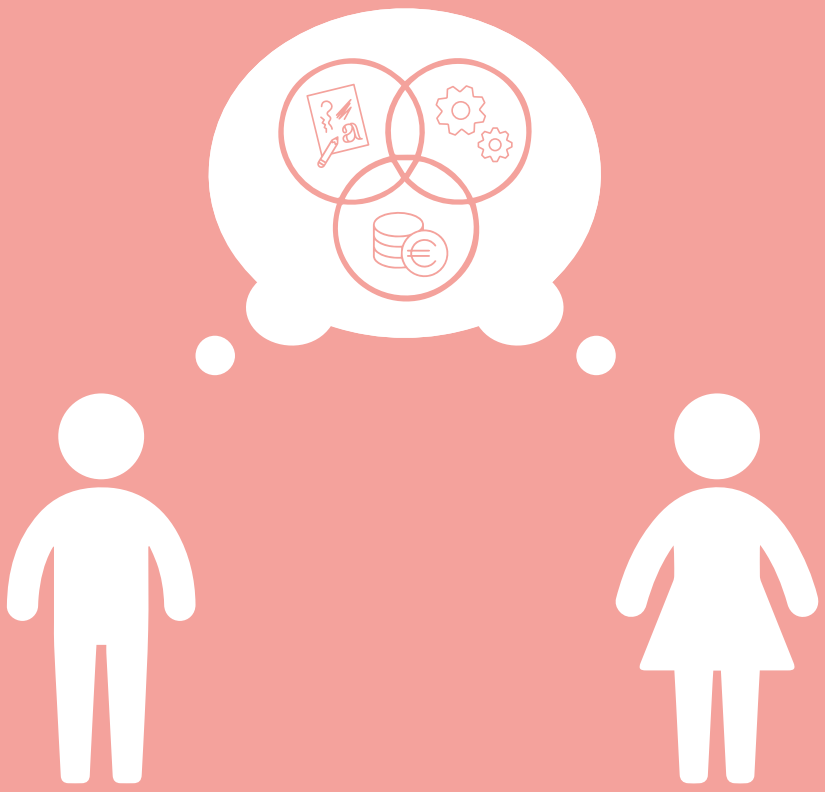
MSc Strategic Product Design



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Abstract

There seems to be a shift in gender stereotypes in general. Concerning school subjects, there are also gender role stereotypes for boys and girls. Boys seem to be more interested in mathematics and natural sciences whereas girls seem to be more motivated for language, arts and writing (Jacobs, 2002). According to the attribution theory (Heider, 1958), the performance of an individual can be attributed to the person themselves (internal) or to the situation in which they are in (external). There might be a link between these existing stereotypes in school subjects and level of self-confidence of boys and girls.

Strategic design tasks entail aspects of business, engineering and design. Therefore, it entails aspects of both stereotypical boys (mathematics, natural sciences) and girls (language, arts, writing) school subjects. It would thus be worth knowing whether there are also gender differences in attribution when dealing with a strategic design task. The goal of this research is to find out how the attribution theory applies for boys and girls when performing a strategic design task. The main research question is:

How does attribution theory apply for boys and girls when performing a strategic design task? In order to answer the main research question, thirteen sub research questions with corresponding hypotheses were formulated. The research consisted of both quantitative and qualitative research methods. A sample of 46 third year high school students was used. The participants were divided in gender equal teams of three. The participants performed a strategic design task as a team. Three questionnaires were conducted among the participants; one before, one after and finally, one after grading the strategic design task. At the end of the research interviews were held to give the quantitative data more body. The data analysis mainly consisted of statistically analysing the effects of independent variables on dependent variables. The dependent variables of this research, in general, are type of attribution, self-confidence and interest (and performance). The independent variable is gender. The moderators are the strategic design task and grading. To create more overview, the results are documented in six variable themes. The results of this research suggest that stereotypes do not exist within this group of participants. Interest and performance in school subjects contradicted the existing gender stereotypes. Furthermore, no differences in interest in the strategic design task were found. Boys and girls both scored high on self-confidence in each measurement, no significant differences were found here. In line with this high self-confidence, both boys and girls attributed success to internal factors and were highly self-confident about performing a strategic design task in the future. This report concludes with a discussion of the results, limitations and recommendations for future research on the subject.

Key words: attribution theory, gender stereotypes, self-confidence, strategic design, design task, high school

Contents

1.

Introduction

1. Introduction

About forty years ago it was quite common for women to stay at home with their children while their husbands made a living for their families. In general, a lot of developments have taken place in society since this time. When looking at society now, people are a lot more individualistic and also more women are making a living for themselves. It seems a shift has taken place in existing gender stereotypes.

Also in school subjects there are also gender role stereotypes for boys and girls. Boys seem to be more interested in mathematics and natural sciences whereas girls seem to be more motivated for language, arts and writing (Jacobs, 2002). There might be a link between these existing stereotypes in school subjects and level of self-confidence of boys and girls. Namely, as described later in the theoretical framework of this research (chapter 2), people tend to attribute their performance to themselves (internal) or to the situation in which they are in (external). This principle is called attribution theory (Heider, 1958). To what exactly they attribute their performance, is connected with their level of self-confidence. The literature about attribution theory is quite dated, as most of this research goes back a few decades.

Attribution theory can be approached as a tool which can be applied to different situations. Generally, when solving problems in, for example, mathematics there is one correct solution. However, in (strategic) design there is never one correct outcome and coming to a solution therefore has a lot of uncertainty. The application of attribution theory to a strategic design task can therefore result in very surprising outcomes, as no research on this subject has been done yet and the basis on the theory is relatively old.

Strategic design tasks entail aspects of business, engineering and design (figure 1.1). Compared to the fields which, stereotypically, interest boys (mathematics, natural sciences) and girls (language, arts, writing), strategic product design entails aspects of both disciplines (e.g. language and mathematics).
Strategic design takes place in the Fuzzy Front End and the Muddy Back End phases of New Product Development (Buijs & Valkenburg, 2005). The Fuzzy Front End is the first phase of New Product Development; the Muddy Back End is the last phase of New Product Development.

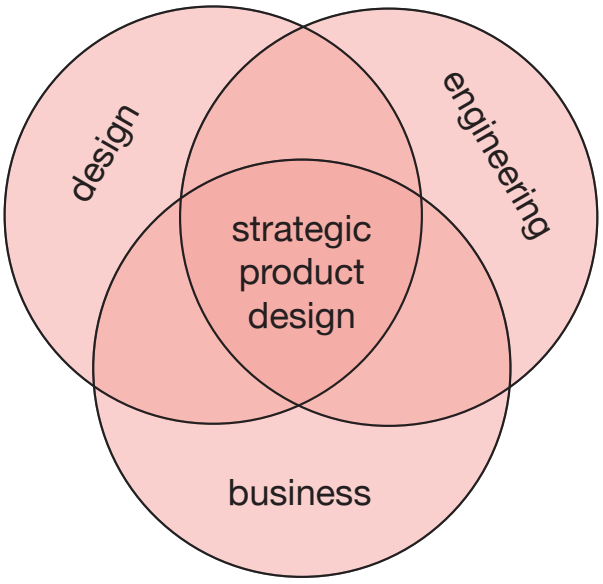

Figure 1.1: Strategic product design

Industrial designers in general are trained to see through complex problems and identify feasible solutions (TU Delft, 2016). The description of the Strategic Product Design master (TU Delft, 2018) states that in strategic product design the focus is on the business context of product and service design. Furthermore, the emphasis

is on translating a company's strategy and market opportunities into a strong product or service portfolio. This is the challenge that is posed to the designers and, in the case of this research, high school students. There is no certainty if a stereotypical pattern of attribution theory is followed. Therefore, it would be worth knowing whether there are gender differences in attribution when dealing with a strategic design task. The goal of this research is to find out how the attribution theory applies for boys and girls when performing a strategic design task. The main research question for this research thus is:

How does attribution theory apply for boys and girls when performing a strategic design task?

2.

Theoretical framework

2. Theoretical framework

This theoretical framework elaborates on what is already known in current literature about the topics that play a key role within this research. The main topics described concern more general results about attribution theory, expectancy principle, self-confidence, gender differences and expectation of success. For these main topics, more specific results are described as well.

2.1 Attribution theory

The first to write about attribution theory was Fritz Heider. Heider (1958) described that people tend to create cause-effect relationships. Wanting to see this relation is the way people try to make sense of the world. Kelley (1973) describes attribution theory as *'a theory about how people make causal explanations, about how they answer questions beginning with "why?"'*. By this he means the way people deal with information necessary to make causal conclusions and answer causal questions.

2.1.1 Performance

According to Zuckerman (1979) Heider (1958) believes that the performance of an individual can be attributed to the person themselves or to the situation they are in. Weiner et. al. (1971) have set up a model which classifies these causal factors in two dimensions, namely: stable and unstable factors in combination with internal and external factors. Internal and external factors refer to whether an individual has control over causes or not. An individual does control internal factors (ability and effort), but cannot control external factors (task difficulty and luck). Stable and unstable factors refer to whether causes change over time or not. Stable factors cannot change (ability and task difficulty), while unstable factors can change (effort and luck).

When combining the described dimensions, the causal factors which influence performance and achievement are: ability, effort, task difficulty and luck (table 2.1).

Table 2.1: Factors of attribution theory

	Internal	External
Stable	Ability	Task difficulty
Unstable	Effort	Luck

Ability is classified as stable and internal. This means that when an individual has a stable internal view he or she is likely to believe that his or her own ability is the causal factor which leads to success or failure. For example, when one succeeds in a task, one could believe that he or she is just really smart and this is the reason for succeeding in the task. On the other hand, when failing a task, one could believe that he or she is not smart enough to be able to succeed in a task. Effort is classified as unstable and internal. This means that when an individual has an unstable internal view, he or she is likely to believe that the amount of effort will determine whether he or she will succeed or fail. For example, when one fails a task, he or she could reason that this is simply because no real effort to succeed was made in the first place. On the other hand, when succeeding in a task, one could reason that the success is because of the effort that was made. Task difficulty is classified as stable and external. This entails that an individual is likely to believe that he or she can fail or succeed due to the difficulty of a task. When one for example perceives a task as too hard, that person might blame the task for being to difficult as the reason for failing. On the other hand, when a task is perceived as too easy, one could reason that this is why he or she

succeeded in the task. Finally, luck is classified as unstable and external. This entails that an individual is likely to think that he or she can fail or succeed due to luck. For example, when one succeeds in a certain task, he or she could reason that this is because he or she was simply in luck with the teacher that graded the task and that it was not because of one's own efforts. On the other hand, when failing a certain task, one could reason that the teacher who graded the task was simply too strict. Therefore, one could believe that it was not because of themselves that the task failed.

2.1.2 Success and failure

As previously described, the attribution theory is about how people try to make sense of the world. According to Dweck (2000) Weiner (1984) states that the type of attribution individuals allocate to success and failure also determines the impact that these successes and failures have on a person.

Dweck (2000) states *'explaining a failure in terms of a more variable factor, like luck of effort, will leave you more optimistic about future success than explaining the failure in terms of a more stable factor, like task difficulty or ability'*. By this she means that when individuals fail and can blame unstable factors they have more trust in succeeding in the future as opposed to when they would feel their failure is due to stable factors. When one thinks their failure is because of stable factors they would probably have less self-confidence when performing a similar task in the future.

Furthermore, Zuckerman (1979) describes a series of studies in which participants worked on tasks and afterwards made attributions to their performance on the task. The question *'Is there a tendency for people to attribute success to internal factors and failure to external factors?'* was attempted to be answered by these studies. This question concerns the term 'self-serving bias'. Self-serving bias (or self-serving attribution) means that when a person succeeds, they will attribute this to their own capacities, while they will attribute failing to external factors. Overall, the outcomes of the studies suggest that performances by participants produce self-serving bias. This is in line with the previously given examples about internal and external and stable and unstable factors in attribution theory.

Furthermore, Zuckerman (1979) states that the different studies suggest that success is more internally attributed as opposed to failure since success is what one intends when performing a task while failure is not. Moreover, once a task is finished and has failed participants are more likely to perceive a task as more difficult (external factor) in contrast to when it would have succeeded. Another insight comes from several studies performed by Schlenker et. al (1975, 1976, 1977) stated by Zuckerman (1979). These studies focused on teams performing a task. When a team performed a task successfully, the different members within a team felt more responsible for the overall team performance as opposed to members of teams that failed. Schlenker and Miller (1977) found that when a team has strong interpersonal bonds between the members, the members are less likely to take credit for success and at the same time blame the other members for failing.

2.2 Expectancy principle

Building on the previously described theory about having trust in future success in a task (Dweck, 2000), it is worth taking a look at the so called expectancy principle. The expectancy principle (Weiner, 1985) is about changes in expectancy of success due to a certain result of a task. Figure 2.1 shows the consequences concerning this principle. When a result is attributed to a stable factor, this result will be

expected with higher certainty in the future. When a result is attributed to an unstable factor, the certainty of such a result has the same level of expectancy. Following this reasoning, it is also possible that the future is expected to be different from the past. Therefore, results attributed to stable factors are expected to occur again with more certainty in the future than those attributed to unstable factors.

Studies have shown (Zuckerman,1979; Feather, 1969) some relevant results concerning performance expectancies. Namely, unexpected outcomes (these can both concern success and failure) were attributed more to luck (external factor) and less to ability (internal factor) than expected outcomes. Furthermore, Feather's research suggests that the expected level of performance on a task is more important in terms of attribution than the actual level of performance. The described results are interpreted according to two different theories. Namely, balance theory and naïve action model (Heider, 1958).

2.2.1 Balance theory and naïve action model

Balance theory explains expectancy of success and failure in terms of internal and external factors. Following balance theory (figure 2.2), when expectation for success is positive success will be attributed to oneself. For example, when an individual is about to perform a task and expects to succeed, he or she will believe that either his or her ability or effort (internal factors) are the reason for this success. However, when the task fails while success was expected, he or she will blame either the task difficulty or not being in luck (external factors). Conversely, when expectation for success is negative (thus one expects to fail), success will be attributed to external factors. For example, when an individual is about to perform a task and expects to fail, he or she will believe either the (lack of) task difficulty or being in luck (external factors) are the reason for succeeding. If one expects to fail a task and indeed fails, the failure will be attributed to oneself. For example, he or she will believe that either his or her ability or effort (internal factors) are the reason for this failure.

Whereas balance theory is explained in terms of internal and external factors, the naïve action model is explained in terms of stable and unstable factors (figure 2.3). The naïve action model considers that when a person's expectancies are confirmed (e.g. succeeding

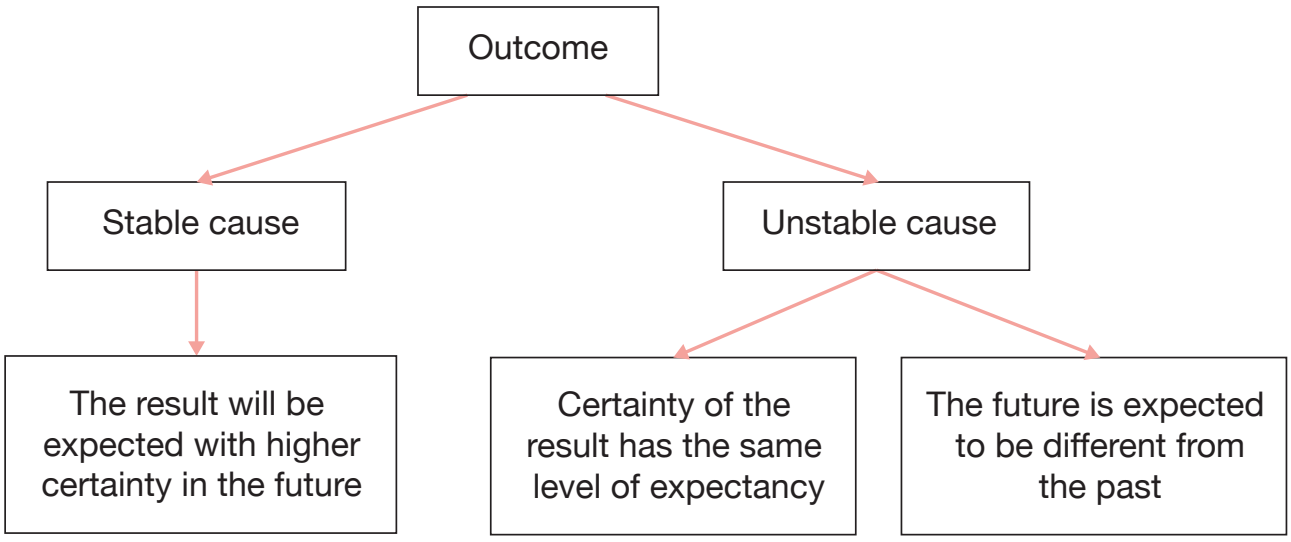

Figure 2.1: Expectancy principle (based on Weiner, 1985)

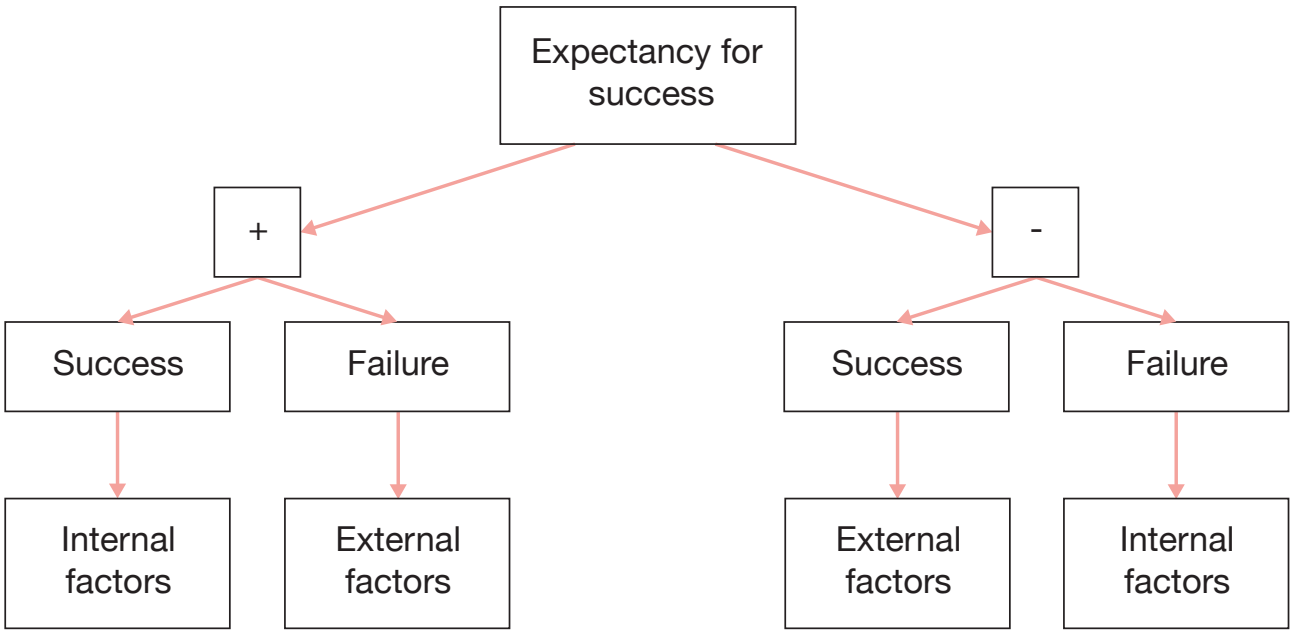

Figure 2.2: Balance theory (based on Heider, 1958)

when success was expected or failing when failure was expected) these expectancies are attributed to stable factors (ability and task difficulty). Similarly, when a person's expectancies are disconfirmed (e.g. succeeding when failure was expected or failing when success was expected) these expectancies are attributed to unstable factors (effort and luck).

When combining the balance theory and the naïve action model, one could conclude the following: When expectancies are confirmed, success is attributed to stable internal factors (ability) and failure is attributed to stable external factors (task difficulty). When expectancies are disconfirmed, success is attributed to unstable external factors (luck) and failure is attributed to unstable internal factors (effort).

2.3 Expectation of success

Nurmi et. al. (2003) also studied success expectation. This was studied in relation to academic achievement and satisfaction. This builds on the previously described literature on expectancy principle, balance theory and naïve action model.

The studies showed that whenever students expected success, academic achievement and satisfaction were predicted. This resulted in increased success expectation in the future. Also, expected success was caused by a low level of anxiety from the students, which resulted in good grades.

Furthermore, the studies showed that expectation of success was positively attributed to internal factors (ability and effort) after success and negatively attributed to internal factors after failure. Expectation of success was also negatively attributed to external

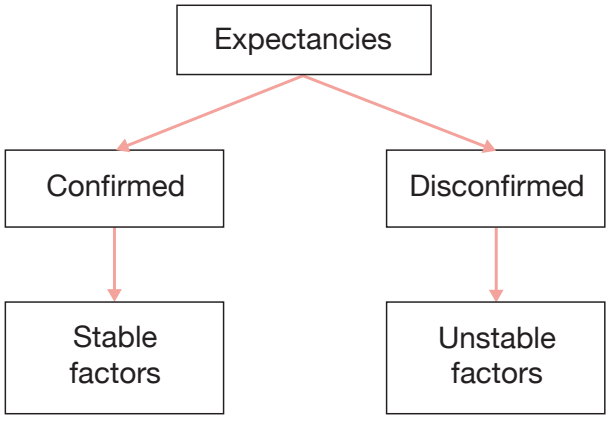

Figure 2.3: Naïve action model (based on Heider, 1958)

factors after success (figure 2.4). These results correspond with the earlier described self-serving attribution (Zuckerman, 1979).

Miller and Ross (1975) stated *'we try to explain our behaviour in terms that "flatter us" and "put us in a good light"'*. This statement corresponds with both the balance theory and the naïve action model as described by Heider (1958). It is in the nature of people to want to maintain their self-confidence. As self-confidence is an important aspect in attribution theory, the following paragraph will elaborate more on this.

2.4 Self-confidence

Apart from the relation between attribution and either failing or succeeding in a task it is worth looking at the relation between attribution and the self-confidence of individuals.

As previously described, multiple studies have been done concerning self-serving bias. Attributing successes to one's own capabilities as well as blaming failure on external factors has a direct relation to one's self-esteem. Riemer (1975) and Nicholls (1975) have found that self-esteem is either protected or enhanced when one attributes success to oneself as well as when failure is attributed to external factors. Moreover, Fitch (1970) found that participants with a low self-esteem before starting the task felt more responsible for failing than respondents with high self-esteem. Interestingly, Fitch did not find any significant difference between both types of participants (high and low self-esteem) concerning attribution to success.

Since this study focuses on high school students in puberty, it is relevant to have a look at what is known about self-confidence as well as succeeding and failing during puberty. Eccles (1999) has researched the relation between self-confidence and failure during puberty. She describes that during puberty boys and girls become less self-confident about their abilities. This might result in avoiding tasks and activities in which they are not likely to succeed at first. Boys and girls are under the impression that failing indicates incompetence in completing a task. They are unlikely to see that by practice it is possible to succeed in such a task. Believing to not have the natural talent to complete a certain task discourages boys and girls in puberty to retreat from the task. Eccles (1999) describes that when boys and girls believe their skills can be improved, it is likely that they can fulfil a task by practicing.

Within this study the participants are asked what they expect of the strategic design task.

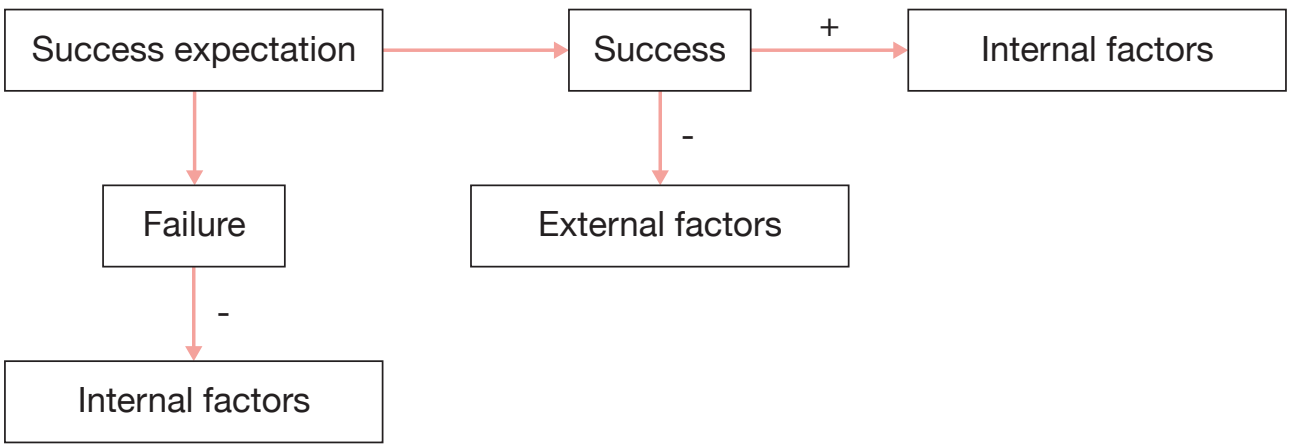

Figure 2.4: Success expectation (based on Nurmi et. al., 2003)

According to Eccles' research the expectations of success can help understand to what extent students are willing to succeed (and therefore engage) in a task. This amount of engagement is related to the interest boys and girls have. Furthermore, the perceived importance or relevance of a task also plays an important role to what extent boys and girls are willing to engage in a certain task.
The research of Eccles shows different types of children in puberty. First, there are students that drop out of school because of academic failure. Second, there are students whose grades decrease during high school. This is related to a drop in intrinsic motivation and self-confidence in their abilities.

2.4.1 Self-efficacy and self-concept

Other terms that give insight into the differences between boys and girls concerning different subjects are self-efficacy and self-concept. By self-efficacy the belief in the ability to succeed in a task is meant. Self-concept refers to belief in one's own abilities. The results of the OECD (2015) study show that girls score lower for both self-efficacy and self-concept concerning mathematics and science. However, girls do tend to have higher motivation to achieve in school and believe that this is important. In addition, girls also tend to want to please other people's expectations more and are more afraid of getting negative evaluations by other people.

The OECD study (2015) shows that students who have a low self-efficacy level concerning mathematics and science also tend to perform worse in tasks of both subjects as opposed to students who have high self-efficacy. Contradicting, there is a big difference concerning gender. Boys and girls might perform just as well, still it is found that girls have less self-efficacy and self-concept for mathematics and science.

2.4.2 Self-confidence in different educational fields

As briefly mentioned in the introduction of this report, stereotypes for boys and girls exist among different school subjects. Jacobs et. al. (2002) have studied differences between boys and girls as they turned adolescent among different domains. The different domains within the study concern stereotypical male and female subjects. Namely, sports and maths (stereotypical male) and language and arts (stereotypical female).

The research showed that across different subjects the self-perceptions of competence and subjective task value (one's beliefs about value of doing a task) decreased as children grew older. Which is in line with what Eccles (1999) described in her study about boys and girls becoming less self-confident about their abilities. One of the reasons which explains the decrease as described by Jacobs et. al. (2002) is the moment where children gain awareness of the competencies of others.

As previously described, boys tend to have more self-confidence when it comes to mathematics. Interestingly, Jacobs et. al. (2002) describe that some studies found that the differences in self-confidence concerning mathematics are only small in adolescence. However, within language and arts the gap between boys and girls in terms of perception of competence has increased. The differences for boys and girls between the mentioned subjects are linked to e.g. gender intensification during puberty. Gender intensification refers to boys doing more stereotypical boy things and girls doing more stereotypical girl things. The findings of the research show that language and arts are clearly gender typed. Studies suggest (Jacobs et. al., 2002; Brush, 1980) that the reason that girls have a preference for language and arts since it has an emphasis on interpretation and

opinions. Furthermore, Jacobs et. al. (2002) state that it could also be linked to other reasons, like reading being a stereotypical girls' activity. Cole (1997) has performed a study on how males and females performed in educational settings. This study showed that the gap between males and females as it was in earlier studies has become smaller. On the contrary, the gap between males and females concerning language has remained unchanged. Females have a large advantage on males concerning language education.

2.5 Gender differences

As this research focuses on the difference in attribution between boys and girls when performing a strategic design task, it is interesting to see what is already known in literature about attribution in relation to boys and girls and their self-confidence.

Zuckerman (1979) states that research has shown that women tend to attribute performance outcome more to external factors as opposed to men. Other research found that women tend to attribute success more to external factors than men whereas they attribute failure more to internal factors. Nicholls (1975) performed a study with 4th graders and found that boys defensively attribute failure to (not having) luck whereas the abilities of the girls were more denigrating to themselves and blamed internal factors.

The Organisation for Economic Co-operation and Development (OECD, 2015) presents a study with some results concerning differences between boys and girls in the engineering work field as well as their performance in mathematics and science.

Within the countries studied, girls are behind in terms of performance in mathematics and science. Moreover, OECD (2015) states that several studies have shown that women are under-represented within occupations in science, technology, engineering and mathematics (STEM). Bae et. al. (2000) describe that *'women continue to lag behind males in mathematics and science achievement in high school and they are less likely to major in these fields in college'*.

Self-confidence plays a big role here, because if someone is self-confident in studying they are also likely to give themselves the freedom to fail (which is essential for learning). Girls tend to have less self-confidence and are more afraid to make mistakes in order to learn compared to boys. Furthermore, they also experience more anxiety towards STEM subjects.

2.5.1 Female role models

Concerning the differences between boys and girls in terms of attribution, performance and self-confidence, it is worth mentioning something about the importance of female role models within the engineering field.

Stout et. al. (2011) have done a study on how female role models influence young women's self-confidence concerning the STEM subjects. Results show that when young women are exposed to successful females in the field of STEM subjects their self-confidence for these subjects will grow. This again results in young women pursuing careers in STEM subjects. Stout's research found that female students performed better and had a positive initial attitude concerning mathematics when they had a female professor. They had a negative initial attitude towards mathematics when their professor was male. For male students no difference was established between the presence of male or female professors. Furthermore, when the professor was female, female students would answer more questions in mathematics class (voluntarily) as opposed

to having a male professor during a semester. However, the same pattern was seen for male students. Moreover, when having a female professor, female students were significantly more confident about their abilities then when they had a male professor. In addition, female students expected to perform better in the course when their professor was female as opposed to having a male professor for the same course. For male students, no difference in confidence in abilities was found in terms of the professor's gender. The findings of Stout et. al. (2011) thus show that female role models in STEM subjects have a positive effect on female students in pursuing a career in STEM subjects.

3.

Research questions and hypotheses

3. Research questions and hypotheses

This chapter elaborates on the formulated sub research questions and hypotheses. The first paragraph describes the sub research questions that help answer the main research question. The second paragraph describes the hypotheses that follow from the sub research questions.

3.1 Sub research questions

In order to answer the main research question: 'How does attribution theory apply for boys and girls when performing a strategic design task?' 13 sub research questions were formulated. The sub research questions were formulated into two sets of questions. The first set of questions (question 1 to 8) mainly focuses on the difference between boys and girls. The second set of questions (question 9 to 13) mainly focuses on the difference in time (thus the differences between the three measurements). This distinction was made in order to be more thorough in answering the main research question. The sub research questions are described below.

Sub research questions about differences between boys and girls

1) What differences in interest for certain school subjects do boys and girls show?
2) What differences in interest for the strategic design task do boys and girls show?
3) What are the differences in self-confidence of boys and girls before starting the strategic design task?
4) What are the differences in self-confidence of boys and girls after completing the strategic design task?
5) What are the differences in self-confidence of boys and girls after receiving a grade for the completed strategic design task?
6) How do boys and girls attribute success and failure after completing the strategic design task?
7) How do boys and girls attribute success and failure after they receive a grade for the competed strategic design task?
8) How self-confident are boys and girls about performing a similar strategic design task in the future?

Sub research questions about differences between the different measurements in time

9) What is the difference in interest of boys and girls in the strategic design task before and after performing the strategic design task?
10) How is self-confidence of boys and girls different before and after performing the strategic design task?
11) How is self-confidence of boys and girls different before and after receiving a grade for the completed strategic design task?
12) What is the relation between self-confidence and the attribution of success after finishing the strategic design task?
13) What is the relation between self-confidence and the attribution of success after receiving a grade for the completed strategic design task?

3.2 Hypotheses

The hypotheses follow from the earlier formulated sub research questions. An overview of which research question corresponds with which hypothesis can be found in table 3.1. Next, each hypothesis will be briefly explained.

It is important to find out what the current interest of boys and girls is in different school subjects. When this is researched, it can be found out if the stereotypes found in the literature are true or not for the students that participated in this research. Hypothesis 1.1 is about interest in 'stereotypical' school subjects, hypothesis 1.2 is about the performance in 'stereotypical' school subjects.

Hypothesis 1.1A:

Ho: Boys and girls show equal interest in mathematics, physics and PE.

H1: Boys show more interest in mathematics, physics and PE than girls.

Hypothesis 1.1B:

Ho: Boys and girls show equal interest in languages and arts.

H1: Girls show more interest in languages and arts than boys.

Hypothesis 1.2A:

Ho: Boys and girls perform equally well in mathematics, physics and PE.

H1: Boys perform better in mathematics, physics and PE than girls.

Hypothesis 1.2B:

Ho: Boys and girls perform equally well in languages and arts.

H1: Girls perform better in languages and arts than boys.

The strategic design task is more related to writing and language than it is related to mathematics and natural sciences. Therefore, it is assumed that girls will show more interest in the strategic design task than boys when first hearing about what the task will entail. Hypothesis 2 is formulated in order to research the interest of boys and girls before and after performing the strategic design task.

Hypothesis 2A:

Ho: Boys and girls show equal interest in the strategic design task before starting it.

H1: Girls show more interest in the strategic design task than boys before starting it.

Hypothesis 2B:

Ho: Boys and girls show equal interest in the strategic design task after finishing it.

H1: Girls show more interest in the strategic design task than boys after finishing it.

The literature states that boys and girls show differences in self-confidence. Girls tend to have less self-confidence and are more afraid to make mistakes in order to learn compared to boys. Therefore, the self-confidence before and after performing the strategic design task and after receiving a grade for it are researched. Thus, hypothesis 3 is formulated.

Hypothesis 3A:

Ho: The self-confidence of boys and girls is equal before starting the strategic design task.

H1: Boys have more self-confidence before starting the strategic design task than girls.

Hypothesis 3B:

Ho: The self-confidence of boys and girls is equal after completing the strategic design task.

H1: Girls have more self-confidence after completing the strategic design task than boys.

Hypothesis 3C:

Ho: The self-confidence of boys and girls is equal after grading the strategic design task.

H1: Girls have more self-confidence after receiving a grade for the result of the strategic design task than boys.

Concerning attribution theory, the literature states that boys are more likely to attribute success to internal factors and failure to external factors. For girls, the exact opposite is seen. Namely, success is more likely attributed to external factors and failure to internal factors. Hypotheses 4 and 5 are formulated in order to find out to which factors boys and girls attribute success and failure.

Hypothesis 4:

Ho: Boys and girls attribute success and failure to equal factors after completing the strategic design task.

H1: Boys attribute success to internal factors and girls attribute success to external factors after completing the strategic design task.

Hypothesis 5:

Ho: Boys and girls attribute a grade to equal factors after completing the strategic design task.

H1: Boys attribute a good grade to internal factors and girls attribute a good grade to external factors after completing the strategic design task.

Following what has been written at hypothesis 3, boys are expected to have more self-confidence overall as opposed to girls. However, the literature also states that when one succeeds in a difficult task one will show less fear in approaching a similarly difficult task in the future as opposed to when they would fail. Therefore, possibly girls will be more self-confident than boys after succeeding in the strategic design task. Therefore, hypothesis 6 is formulated in order to find out to what extent boys and girls have confidence in performing a strategic design task in the future.

Hypothesis 6:

Ho: Boys and girls are equally self-confident about performing a strategic design task in the future.

H1: After succeeding in the strategic design task, girls are more self-confident than boys about performing a strategic design task in the future.

Hypothesis 7 builds on the literature that hypothesis 2 was also based on. Hypothesis 7 is formulated to research if there is a correlation between interest in the strategic design task before starting it and after finishing it.

Hypothesis 7:

Ho: There is no relation between interest in the strategic design task before starting it and after finishing it.

H1: There is a positive relation between interest in the strategic design before starting it and after finishing it.

Hypothesis 8 builds on the literature that hypothesis 3 was also based on. Hypothesis 8 is formulated to research if there is a correlation between self-confidence before starting and after finishing the strategic design task for both boys and girls.

Hypothesis 8:

Ho: There is no relation between self-confidence before starting and after finishing the strategic design task.

H1: There is a positive relation between self-confidence before starting and after finishing the strategic design task.

Hypothesis 9 also builds on the literature that hypothesis 3 was based on. Hypothesis 9 is

formulated to research if there is a correlation between self-confidence after finishing the strategic design task and after grading it for both boys and girls.

Hypothesis 9:

Ho: There is no relation between self-confidence after finishing the strategic design task and after receiving a grade for it.

H1: There is a positive relation between self-confidence after finishing the strategic design task and after receiving a grade for it.

Hypotheses 3 is about differences in self-confidence between boys and girls. Hypotheses 4 and 5 are about differences in attribution between boys and girls after succeeding or failing. Following these three hypotheses, the correlation between self-confidence and success is researched.

Hypothesis 10:

Ho: There is no relation between self-confidence and the attribution of success after finishing the strategic design task.

H1: There is a positive relation between self-confidence and the attribution of success after finishing the strategic design task.

Hypothesis 11:

Ho: There is no relation between self-confidence and the attribution of success after receiving a grade for the strategic design task.

H1: There is a positive relation between self-confidence and the attribution of success after receiving a grade for the strategic design task.

As previously described in this chapter, Table 3.1 shows a structured overview of all corresponding sub research questions and hypotheses. The next chapter will elaborate on the methodological approach and operationalisation of all variables of this research.

Table 3.1: Sub research questions with corresponding hypotheses

Sub research questions	Hypotheses
Sub research question 1: What differences in interest for certain school subjects do boys and girls show?	*Hypothesis 1.1A:* H0: Boys and girls show equal interest in mathematics, physics and PE. H1: Boys show more interest in mathematics, physics and PE than girls. *Hypothesis 1.1B:* H0: Boys and girls show equal interest in languages and arts. H1: Girls show more interest in languages and arts than boys. *Hypothesis 1.2A:* H0: Boys and girls perform equally well in mathematics, physics and PE. H1: Boys perform better in mathematics, physics and PE than girls. *Hypothesis 1.2B:* H0: Boys and girls perform equally well in languages and arts. H1: Girls perform better in languages and arts than boys.
Sub research question 2: What differences in interest for the strategic design task do boys and girls show?	*Hypothesis 2A:* H0: Boys and girls show equal interest in the strategic design task before starting it. H1: Girls show more interest in the strategic design task than boys before starting it. *Hypothesis 2B:* H0: Boys and girls show equal interest in the strategic design task after finishing it. H1: Girls show more interest in the strategic design task than boys after finishing it.

Sub research question 3: What are the differences in self-confidence of boys and girls before starting the strategic design task?	*Hypothesis 3A:* H0: The self-confidence of boys and girls is equal before starting the strategic design task. H1: Boys have more self-confidence before starting the strategic design task than girls.
Sub research question 4: What are the differences in self-confidence of boys and girls after completing the strategic design task?	*Hypothesis 3B:* H0: The self-confidence of boys and girls is equal after completing the strategic design task. H1: Girls have more self-confidence after completing the strategic design task than boys.
Sub research question 5: What are the differences in self-confidence of boys and girls after receiving a grade for the completed strategic design task?	*Hypothesis 3C:* H0: The self-confidence of boys and girls is equal after grading the strategic design task. H1: Girls have more self-confidence after receiving a grade for the result of the strategic design task than boys.
Sub research question 6: How do boys and girls attribute success and failure after completing the strategic design task?	*Hypothesis 4:* H0: Boys and girls attribute success and failure to equal factors after completing the strategic design task. H1: Boys attribute success to internal factors and girls attribute success to external factors after completing the strategic design task.

Sub research question 7: How do boys and girls attribute success and failure after they receive a grade for the competed strategic design task?	*Hypothesis 5:* H0: Boys and girls attribute a grade to equal factors after completing the strategic design task. H1: Boys attribute a good grade to internal factors and girls attribute a good grade to external factors after completing the strategic design task.
Sub research question 8: How self-confident are boys and girls about performing a similar strategic design task in the future?	*Hypothesis 6:* H0: Boys and girls are equally self-confident about performing a strategic design task in the future. H1: After succeeding in the strategic design task, girls are more self-confident than boys about performing a strategic design task in the future.
Sub research question 9: What is the difference in interest of boys and girls in the strategic design task before and after performing the strategic design task?	*Hypothesis 7:* H0: There is no relation between interest in the strategic design task before starting it and after finishing it. H1: There is a positive relation between interest in the strategic design before starting it and after finishing it.
Sub research question 10: How is self-confidence of boys and girls different before and after performing the strategic design task?	*Hypothesis 8:* H0: There is no relation between self-confidence before starting and after finishing the strategic design task. H1: There is a positive relation between self-confidence before starting and after finishing the strategic design task.

Sub research question 11: How is self-confidence of boys and girls different before and after receiving a grade for the completed strategic design task?	*Hypothesis 9:* H0: There is no relation between self-confidence after finishing the strategic design task and after receiving a grade for it. H1: There is a positive relation between self-confidence after finishing the strategic design task and after receiving a grade for it.
Sub research question 12: What is the relation between self-confidence and the attribution of success after finishing the strategic design task?	*Hypothesis 10:* H0: There is no relation between self-confidence and the attribution of success after finishing the strategic design task. H1: There is a positive relation between self-confidence and the attribution of success after finishing the strategic design task.
Sub research question 13: What is the relation between self-confidence and the attribution of success after receiving a grade for the completed strategic design task?	*Hypothesis 11:* H0: There is no relation between self-confidence and the attribution of success after receiving a grade for the strategic design task. H1: There is a positive relation between self-confidence and the attribution of success after receiving a grade for the strategic design task.

4.

Methodological approach

4. Methodological approach

This study was conducted with high school students that follow the course Research and Design. Research and design (R&D) is a course that is taught at Dutch schools. However, not every school is allowed to teach this course. It is necessary for the school to have the Technasium license. A school needs to meet up to requirements that are set by the Technasium Foundation (Technasium, n.d.). R&D is a course in which students work on projects for real clients. The projects always have a beta-technical nature (one of the requirements as set by the Technasium Foundation) and are either a research or a design assignment. What makes the course unique is the fact that each project concerns a real problem a client has at the moment the project is carried out. The role of the teacher is also different than the role a teacher has when teaching regular courses. The teacher is more of a coach as seen in research of design projects at the university. Most R&D teachers also teach other subjects (mostly beta subjects like mathematics, biology, physics or chemistry).

4.1 Research method and task

Both quantitative and qualitative research Both quantitative and qualitative research methods were used in the study, but mainly quantitative. Before and after conducting the study quantitative research in the form of questionnaires has been carried out. Interviews were done afterwards to go more into depth and give the quantitative research more 'body'. For the study, a sample of 46 third year high school students was used. Within this sample, 30 boys and 16 girls participated. The students were around 14 years old and have all followed the course Research and Design (R&D) in the previous two years at the high school. Before starting the assignment, the students had a similar level of experience in researching and designing, which means unwanted variables here are low. The students were split up into gender equal teams of three. The teams were gender equal since the goal of the research was to find out what the differences are between boys and girls concerning attribution theory. The gender equal teams consisted of three students because teams with an odd number of people tend to make correct decisions quicker as opposed to even numbered teams (Intuitor, 2001).

For this research the students have been working on a strategic design task. This task is part of a bigger assignment where students worked on designing the route of a drone race. The task for this research consisted of an internal and external company analysis (company and competitor analysis) and serves as a basis for the final design. The students collaborated together on this task as a team. Appendix A contains the complete written strategic design task.

The students have had no experience with working on a strategic design task so far. Within the course Research and Design (R&D) not much attention is paid to the strategic part of designing. Learning about this topic contributes to the student's current knowledge about design. By performing a strategic design task their understanding about the importance and benefits of strategic decision making (and thus strategic advantage of a company) during designing grows. Later on in the R&D course they could benefit from this newly gained knowledge.

At the start of the school year (week 1) the students received an explanation on what the assignment in total would entail. During this briefing, the students were explained what the strategic design task would entail. In the second week the first questionnaire was conducted (measurement 1). This questionnaire can be found in appendix B. After filling in this questionnaire, the students started on the strategic design task. The strategic design task had to be handed in at the end of week 3. In week 4 the second questionnaire was conducted (measurement 2). This questionnaire can be found in appendix C. During week 5 the strategic design task was graded by the teachers, appendix E shows the assessment rubric used for grading. In week 6 the third questionnaire was conducted (measurement 3). This questionnaire can be found in appendix D.

4.2 Data collection method

A workflow model (figure 4.1) has been set up in order to make clear how and when the different measurements were performed throughout the study. In total, three different moments of measuring data will be done; before performing the strategic design task, after performing the strategic design task and after receiving a grade for the strategic design task. After these three main measurements also interviews with the participants were conducted (week 7). The goal of these interviews was to get more in depth information about the results from the quantitative analyses.

The data for this research was collected by conducting three questionnaires followed up by interviews. During conducting each questionnaire some notes were made when necessary. The questionnaires (appendix B-D) were not made too long. This was done because the students are adolescents and are not yet able to keep concentration for a long period of time. By keeping the questionnaires short, the data is more valid and reliable. Filling in the questionnaire took the students 5-10 minutes. Within the questionnaires no double denying questions were used. Although this is quite common when setting up questionnaires this was not done here on purpose. The participants are only adolescents and this can be confusing for them, resulting in falsely answered questions and thus less valid and reliable data. However, reverse scaling was used in the questionnaires. This was done in order to see if the participants would still give the same kind of answers. Furthermore, for the subjects that were the same in the different questionnaires, the same formulation for questions was used. This was done on purpose in order to see clearly if the opinions of the participants would change a lot or not in each measurement. The follow up interview was done in order to give more body to the conducted (quantitative) questionnaires, but also in order to assess the found data of the questionnaires. The interview consisted of only a few questions, keeping again in mind that the students are adolescents. The questions were about what kind of grade they had received, if they were pleased with this grade and agreed on it, their opinion on the strategic design task and what could be better about the task if it were to be done again next year (appendix F). The students were interviewed as a team; each interview took about 5-10 minutes.

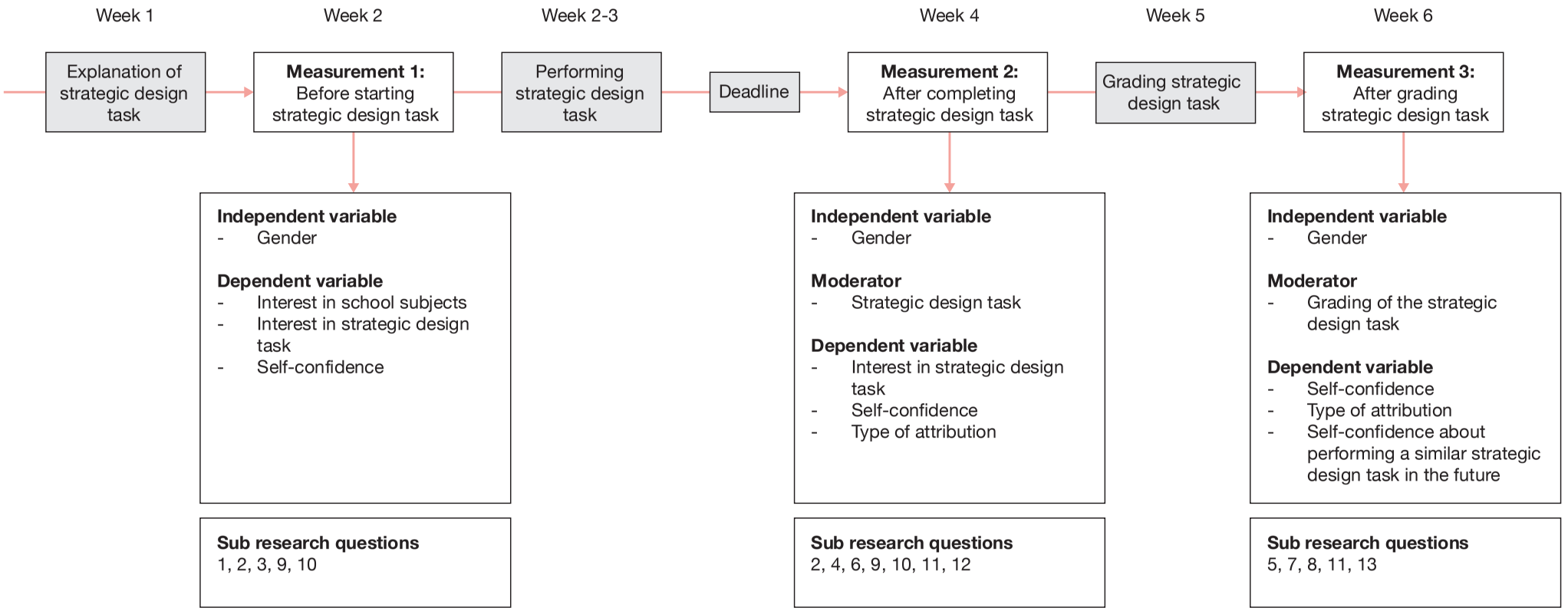

Figure 4.1: Workflow model

4.3 Operationalisation of variables

Appendix G shows a structured overview of the hypotheses per 'variable theme'. All hypotheses that concern the same overarching variable theme will be discussed in the same paragraph to prevent possible confusion between the different hypotheses that are tested. Appendix G also shows during which measurement each hypothesis was tested.

The data analysis mainly consisted of statistically analysing the effects of independent variables on dependent variables. The dependent variables of this research, in general, are *type of attribution*, *self-confidence* and *interest*. For *interest* there is a distinction between *interest (and performance)* in school subjects and *interest in strategic design task*. For *self-confidence* there is a distinction between *self-confidence* in general and *self-confidence about performing a similar strategic design task in the future*. The independent variable is *gender*. The moderators are the *strategic design task* and *grading*. The dependent variables will be measured before (measurement 1) and after (measurement 2) performing the strategic design task and after grading (measurement 3) the result of the strategic design task (figure 4.1). For each questionnaire the participants had to scale from 1 to 5 to what extent they agreed to the given statements. The higher the score for the scale, the more the participants agreed with the statement. The lower the score for the scale, the less they agreed tot the statement. What the statements entailed and what kind of scale was used will be explained in the following paragraphs.

In order to perform the statistical analyses, SPSS was used. The hypotheses tested with independent t-tests have also been tested with Mann-Whitney tests. The Mann-Whitney test is an alternative way to compare the means of two groups (Bartlett, 2014). By testing with both methods there is more certainty in the results for these hypotheses.

Correlations have been done in addition to the MANOVA's, independent t-tests and Mann-Whitney tests because for some hypotheses only comparing the means did suffice to draw conclusions. Apart from looking at the differences between boys and girls, with the correlations differences between the three measurements (before starting, after finishing and after grading the strategic design task) were also analysed for boys and girls separately. Next, the method for analysing each hypothesis will be described. The hypotheses are clustered per variable theme (appendix G). This is done to create more overview. The exact description of the variables as used in SPSS can be found in appendix H.

4.3.1 Interest and performance in school subjects

Within the first questionnaire the students were asked how interested they were in the different school subjects that are taught (table 4.1). According to what Jacobs et. al. (2002) describe, the school subjects were divided as a stereotypical 'boys subject' or 'girls subject'. The students had to answer on a 1 to 5 point Likert scale to what extent they were interested in the subject and how well they performed on the subject (appendix B).

Table 4.1: Stereotypical school subjects

Subject	Stereotypical gender
Culture and Communication	Girls
Dutch	Girls
English	Girls
Film and Photography	Girls
French	Girls
German	Girls
Mathematics	Boys
Physical Education	Boys
Physics	Boys

Questions were also asked about biology, economics, geography and history. However, these are not tested within this hypothesis since for these subjects no stereotypes for boys and girls are described in the literature. Chemistry was left out of the questionnaire since the students are new to this course and do not know exactly what it entails yet. Following the same argumentation, it was decided to include courses Culture and Communication and Film and Photography since they have had these courses last year and both are creative courses. However, now these students do not have these courses anymore since they have chosen to follow the course Research and Design.

Within SPSS new variables were computed by taking the average score for the interest and performance for the different languages and arts courses (appendix H). These newly computed variables were all tested with MANOVA in SPSS.

4.3.2 Interest in the strategic design task

Within the first and second questionnaire six statements (table 4.2) were set up concerning aspects of a strategic design task. The students had to answer on a 1 to 5 point Likert scale to what extent they agreed on each statement (appendix B and C).

Table 4.2: Statements concerning aspects of a strategic design task

I like being creative.
I like designing products.
I like it if design challenges result in more than one solution.
I like to solve design challenges for a company.
I like to choose my own approach in solving design challenges.
I like to work on challenges of which the outcome is unsure.

Within SPSS two new variables were computed by taking the average score for the six statements about the interest in the strategic design task during measurement 1 and 2 (appendix H). These newly computed variables were both tested with an independent t-test and Mann-Whitney test in SPSS. In order to answer hypothesis 7, a correlation test in SPSS was done between the same two newly computed variables for measurement 1 and 2 (appendix H).

4.3.3 Self-confidence

Within all three questionnaires (appendix B-D) twelve statements were set up concerning aspects of self-confidence (based on Heatherton, 1991 and Rosenberg, 1965) about the R&D course and the strategic design task (table 4.3). Students had to answer on a 1 to 5 point Likert scale to what extent they agreed on each statement.

Table 4.3: Statements concerning aspects of self-confidence

I feel that I have a number of good qualities.
I am able to do things as well as most other people.
I feel useless at times. (*)
I take a positive attitude toward myself.
I feel confident about my own abilities.
I am worried about whether others think I am a success or failure. (*)
I feel that others respect and admire me.
I feel as smart as others.
I feel good about myself.
I feel confident that I understand things.
I am worried about what other people think of me. (*)
I feel like I'm not doing the assignment well. (*)

The statements in table 4.3 which are marked with an asterisk are reverse scaled. This means that the scores for these statements were reverse scaled in SPSS.

Within SPSS three new variables (one for each measurement) were computed which are the average of the twelve variables that indicate the level of self-confidence during each measurement (appendix H). These newly computed variables were all tested with an independent t-test and Mann-Whitney test in SPSS. In order to answer hypothesis 8, a correlation test in SPSS was done between the two newly computed variables for measurement 1 and 2. In order to answer hypothesis 9, a correlation test in SPSS was done between the two newly computed variables for measurement 2 and 3 (appendix H).

4.3.4 Type of attribution

Within the second and third questionnaire (appendix C and D) statements were set up concerning succeeding and failing the strategic design task in general (table 4.4). Furthermore, statements (based on Weiner, 1971) were set up concerning internal and external factors to which the participants attribute their success and failure (table 4.5-4.8). Students had to answer on a 1 to 5 point Likert scale to what extent they agreed to each statement.

Table 4.4: Statements concerning success and failure in general

I think my team and I have performed the strategic design task well.
I feel satisfied with the final result of the strategic design task.
I think my team and I have not performed the strategic design task well.
I feel dissatisfied with the final result of the strategic design task.

Table 4.5: Statements concerning aspects of ability

I have enough knowledge to perform a strategic design task.
I possess the right skills to perform a strategic design task.
I know enough to perform a strategic design task.

Table 4.6: Statements concerning aspects of effort

I feel like I tried my best for this strategic assignment.
I feel like working hard has resulted in achieving a good result for this strategic design task.
I feel like I made an effort to achieve a good result for the strategic design task.

Table 4.7: Statements concerning aspects of task difficulty

I found the strategic design task harder than earlier tasks within the R&D course.
I have had to think a lot about how to perform the strategic design task.
I found the strategic design task difficult to solve.

Table 4.8: Statements concerning aspects of luck

Luckily I was in a good team during performing the strategic design task.
I feel that the result of the strategic design task is a coincidence and I am not sure if next time it will go as well.
I feel like I have had little influence on the final result of the strategic design task.

Within SPSS new variables were computed which represent the average of the different variables that indicate the levels of success, failure, ability, effort, task difficulty and luck during measurement 2 and 3 (appendix H). These newly computed variables were used to answer hypothesis 4 and 5 and were all tested with MANOVA in SPSS.

4.3.5 Self-confidence in the future

Within the third questionnaire (appendix D) five statements were set up concerning the aspect of self-confidence (based on Heatherton, 1991 and Rosenberg, 1965) when performing a strategic design task in the future (table 4.9). Students had to answer on a 1 to 5 point Likert scale to what extent they agreed on each statement.

Table 4.9: Statements concerning aspects of self-confidence in the future

I feel convinced I can successfully perform a strategic design task next time.
I feel that performing this strategic design task has given me more self-confidence about performing a strategic design task a next time.
I feel confident about performing a similar strategic design task a next time.
I am not sure if I can successfully perform a strategic design task next time. (*)
I am worried about performing a strategic design task a next time. (*)

The statements in table 4.9 which are marked with an asterisk are reverse scaled. This means that the scores for these statements were reverse scaled in SPSS.

Within SPSS a new variable was computed which is the average of the five variables that indicate the level of self-confidence (appendix H). This newly computed variable was tested with an independent t-test and Mann-Whitney test in SPSS.

4.3.6 Self-confidence vs. attribution of success

The same computed variables for self-confidence as used in analysing hypothesis 3B and for success as used in hypothesis 4 (paragraph 4.2.4) are used in order to answer hypothesis 10. A correlation test in SPSS was done between both variables.

The same computed variables for self-confidence as used in analysing hypothesis 3C and for success as used in hypothesis 5 (paragraph 4.2.4) are used in order to answer hypothesis 11. A correlation test in SPSS was done between both variables.

5.

Results

5. Results

In this chapter the results for each hypothesis are provided. The results per hypotheses are again structured using per 'variable theme', as introduced in chapter 4 (appendix G). These results form an answer to the sub research questions introduced in chapter 3. The complete statistical analysis for each hypothesis can be found in appendix I. Table 5.1 at the end of this chapter shows a summary overview of the results for each hypothesis.

5.1 Interest and performance in school subjects

For hypothesis 1, some significant differences were found, the results are described below.

A significant difference in interest in mathematics, physics and PE between boys and girls was found ($F(3,42)=3.361$, $p<0.05$). Separate univariate ANOVAs on the outcome variables revealed both significant and non-significant results. Boys ($M=4.33$) show significantly more interest in physics than girls ($M=3.81$), ($F(1,44)=2.831$, $p<0.05$). Non-significant differences between boys and girls were found for interest in mathematics ($F(1,44)=1.278$, $p>0.05$) and physical education ($F(1,44)=1.776$, $p>0.05$). No significant difference in interest in languages and arts between boys an girls was found ($F(2,43)=2.908$, $p>0.05$). Separate univariate ANOVAs on the outcome variables revealed both significant and non-significant results. Girls ($M=3.19$) show significantly more interest in languages than boys ($M=2.68$), ($F(1,44)=2.652$, $p<0.05$). Non-significant differences between boys and girls were found for interest in arts ($F(1,44)=.055$, $p>0.05$).

A significant difference in performance in mathematics, physics and PE between boys and girls was found ($F(3,42)=6.699$, $p<0.05$). Separate univariate ANOVAs on the outcome variables revealed both significant and non-significant results. Boys ($M=4.23$) perform significantly better in physics than girls ($M=3.50$), ($F(1,44)=5.612$, $p<0.05$). Non-significant differences between boys and girls were found for performance in mathematics ($F(1,44)=.142$, $p>0.05$). Boys ($M=4.07$) perform significantly better in physical education than girls ($M=3.13$), ($F(1,44)=9.253$, $p<0.05$). A significant difference in performance in languages and arts between boys and girls was found ($F(2,43)=3.752$, $p<0.05$). Separate univariate ANOVAs on the outcome variables revealed both significant and non-significant results. Non-significant differences between boys and girls were found for performance in languages ($F(1,44)=.578$, $p>0.05$). Boys ($M=3.60$) perform significantly better in arts than girls ($M=3.06$), ($F(1,44)=3.015$, $p<0.05$).

With the results for hypothesis 1, sub research question 1 *'What differences in interest for certain school subjects do boys and girls show?'* can be answered:

Boys and girls show equal interest in PE and mathematics. Boys show significantly more interest in physics. Boys and girls show equal interest in arts. Girls show significantly more interest in languages than boys.

Boys and girls perform equally well in mathematics. Boys perform significantly better in physics and PE than girls. Boys and girls perform equally well in languages. Boys perform significantly better in arts than girls.

5.2 Interest in the strategic design task

For hypothesis 2 no significant differences were found, therefore H1 was rejected.

On average, boys (M=3.61, SE=.102) showed more interest in the strategic design task before starting it than girls (M=3.51, SE=.126). This difference was not significant (t(44)=.600, p>0.05). On average, boys (M=3.76, SE=.111) showed more interest in the strategic design task after finishing it than girls (M=3.52, SE=.107). This difference was not significant (t(44)=1.397, p>0.05).

With the results for hypothesis 2, sub research question 2 *'What differences in interest for the strategic design task do boys and girls show?'* can be answered:
Boys and girls show equal interest in the strategic design task both before and after starting it. This result suggests that all students show more or less the same amount of interest in the strategic design task, thus: there are no differences in interest for the strategic design task between boys and girls.

For hypothesis 7, the results are: For boys there is a significant, positive relation between the interest in the strategic design task before starting and after finishing it (r=.636, p<.05). For girls there is no significant relation between the interest in the strategic design task before starting and after finishing it (r=.341, p>.05).

With the results for hypothesis 7, sub research question 9 *'What is the difference in interest of boys and girls in the strategic design task between before and after performing the strategic design task?'* can be answered:
Boys show about the same amount of interest in the strategic design task before and after performing the strategic design task. For example, boys who showed high interest before performing the strategic design task also showed high interest after performing the strategic design task. Respectively, boys who showed low interest before performing the strategic design task also showed low interest after performing the strategic design task.
The result for girls is surprising. As the means, as seen in hypothesis 2, were almost the same (difference of 0.01). This means that individual girls for example showed high interest before performing the strategic design task and low interest after performing the strategic design task, or the other way around.

5.3 Self-confidence

For hypothesis 3 no significant differences were found, therefore H1 was rejected.
On average, boys (M=3.61, SE=.078) had more self-confidence before starting the strategic design task than girls (M=3.45, SE=.125). This difference was not significant (t(44)=1.148, p>0.05). On average, boys (M=3.84, SE=.086) had more self-confidence after completing the strategic design task than girls (M=3.77, SE=.072). This difference was not significant (t(44)=.590, p>0.05). On average, boys (M=3.76, SE=.087) had more self-confidence after receiving a grade for the result of the strategic design task than girls (M=3.56, SE=.142). This difference was not significant (t(44)=1.276, p>0.05).

With the results for hypothesis 3, sub research question 3 *'What are the differences in self-confidence of boys and girls before starting the strategic design task?'*, sub research question 4 *'What are the differences in self-confidence of boys and girls after completing the strategic design task?'* and sub research question 5 *'What are the differences in self-confidence of boys and girls after receiving a grade for the completed strategic design task?'* can be answered:
Boys and girls have similar self-confidence both before starting and after completing the strategic design task. Also, self-confidence is similar after receiving a grade for the result of the strategic design task.

For hypothesis 8, the results are:
For boys there is a significant, positive relation between self-confidence before starting and after finishing it (r=.653, p<.05). For girls there is a significant, positive relation between self-confidence before starting and after finishing it (r=.755, p<.05).

With the results for hypothesis 8, sub research question 10 *'How is self-confidence of boys and girls different between before and after performing the strategic design task?'* can be answered:
Both boys and girls show about the same amount of self-confidence before starting and after finishing the strategic design task.

For hypothesis 9, the results are:
For boys there is a significant, positive relation between self-confidence after finishing the strategic design task and after receiving a grade for it (r=.756, p<.05). For girls there is a significant, positive relation between self-confidence after finishing the strategic design task and after receiving a grade for it (r=.741, p<.05).

With the results for hypothesis 9, sub research question 11 *'How is self-confidence of boys and girls different between before and after receiving a grade for the completed strategic design task?'* can be answered:
Both boys and girls show about the same amount of self-confidence after finishing the strategic design task and receiving a grade for it.

5.4 Type of attribution

For hypothesis 4 no significant differences were found, therefore H1 was rejected.
No significant difference in attribution of success and failure between boys and girls was found after completing the strategic design task (F(2,43)=.478, p>0.05). No significant difference in attribution to internal factors (effort and ability) between boys and girls was found after completing the strategic design task (F(2,43)=.088, p>0.05). No significant difference in attribution to external factors (task difficulty and luck) between boys and girls was found after completing the strategic design task (F(2,43)=.364, p>0.05).

With the results for hypothesis 4, sub research question 6 *'How do boys and girls attribute success and failure after completing the strategic design task?'* can be answered:
Boys and girls attribute success and failure to similar factors after completing the strategic design task. Boys and girls both felt like they had succeeded in the strategic design task. Moreover, boys and girls both felt like internal factors had an influence on this success. In addition to this, boys and girls both felt like external factors did not really have an influence on their success.

For hypothesis 5 no significant differences were found, therefore H1 was rejected.
No significant difference in attribution of success and failure between boys and girls was found after they receive a grade for the strategic design task (F(2,43)=.146, p>0.05). No significant difference in attribution to internal factors (effort and ability) between boys and girls was found after they receive a grade for the strategic design task (F(2,43)=.131, p>0.05). No significant difference in attribution to external factors (task difficulty and luck) between boys and girls was found after they receive a grade for the strategic design task (F(2,43)=.144, p>0.05).

With the results for hypothesis 5, sub research question 7 *'How do boys and girls attribute success and failure after they receive a grade for the competed strategic design task?'* can be answered:

Boys and girls attribute success or failure to similar factors after they receive a grade for the strategic design task. Boys and girls both felt like they had succeeded in the strategic design task. Moreover, boys and girls both felt like internal factors had an influence on their grade. In addition to this, boys and girls both felt like external factors did not really have an influence on their success (and thus their grade).

5.5 Self-confidence in the future

For hypothesis 6 no significant differences were found, therefore H1 was rejected.
On average, girls (M=3.66, SE=.129) had more self-confidence in performing a strategic design task in the future than boys (M=3.63, SE=.126). This difference was not significant ($t(44)=-.148$, $p>0.05$).

With the results for hypothesis 6, sub research question 8 *'How self-confident are boys and girls about performing a similar strategic design task in the future?'* can be answered:
Boys and girls are equally self-confident about performing a similar strategic design task in the future. The results also show that both boys and girls have confidence in performing a similar strategic design task in the future (means are both above 3.6).

5.6 Self-confidence vs. attribution of success

The results for hypothesis 10 are:
For boys there is a significant, positive relation between self-confidence and the attribution of success after finishing the strategic design task ($r=.670$, $p<.05$). For girls there is no significant relation between self-confidence and the attribution of success after finishing the strategic design task ($r=.132$, $p>.05$).

With the results for hypothesis 10, sub research question 12 *'What is the relation between self-confidence and the attribution of success after finishing the strategic design task?'* can be answered:
For boys there is a relation between self-confidence and the attribution of success after finishing the strategic design task. For example, boys who showed high self-confidence after finishing the strategic design task also showed a high attribution for success. For girls there is no relation found between self-confidence and attribution of success. This result is surprising as the means, as seen in hypothesis 4, were almost the same (difference of 0.01). This means that individual girls for example showed high self-confidence after finishing the strategic design task and low attribution for success, or the other way around.

The results for hypothesis 11 are:
For boys there is a significant, positive relation between self-confidence and the attribution of success after receiving a grade for the strategic design task ($r=.456$, $p<.05$). For girls there is a significant relation between self-confidence and the attribution of success after receiving a grade for the strategic design task ($r=.536$, $p<.05$).

With the results for hypothesis 11, sub research question 13 *'What is the relation between self-confidence and the attribution of success after receiving a grade for the completed strategic design task?'* can be answered:
For both boys and girls there is a positive relation between self-confidence and the attribution of success after receiving a grade for the strategic design task.

Table 5.1: Hypotheses results and remarks

Hypotheses	Remarks
Hypothesis 1.1A: H0: Boys and girls show equal interest in mathematics, physics and PE. *(rejected)* H1: Boys show more interest in mathematics, physics and PE than girls. *(accepted)*	*Boys show significantly more interest in physics than girls.*
Hypothesis 1.1B: H0: Boys and girls show equal interest in languages and arts. *(rejected)* H1: Girls show more interest in languages and arts than boys. *(accepted)*	*Girls show significantly more interest in languages than boys.*
Hypothesis 1.2A: H0: Boys and girls perform equally well in mathematics, physics and PE. *(rejected)* H1: Boys perform better in mathematics, physics and PE than girls. *(accepted)*	*Boys perform significantly better in physics and PE than girls.*
Hypothesis 1.2B: H0: Boys and girls perform equally well in languages and arts. *(rejected)* H1: Girls perform better in languages and arts than boys. *(accepted)*	*Boys perform significantly better in arts than girls.*
Hypothesis 2A: H0: Boys and girls show equal interest in the strategic design task before starting it. *(accepted)* H1: Girls show more interest in the strategic design task than boys before starting it. *(rejected)*	
Hypothesis 2B: H0: Boys and girls show equal interest in the strategic design task after finishing it. *(accepted)* H1: Girls show more interest in the strategic design task than boys after finishing it. *(rejected)*	

Hypothesis 3A: H0: The self-confidence of boys and girls is equal before starting the strategic design task. *(accepted)* H1: Boys have more self-confidence before starting the strategic design task than girls. *(rejected)*	
Hypothesis 3B: H0: The self-confidence of boys and girls is equal after completing the strategic design task. *(accepted)* H1: Girls have more self-confidence after completing the strategic design task than boys. *(rejected)*	
Hypothesis 3C: H0: The self-confidence of boys and girls is equal after grading the strategic design task. *(accepted)* H1: Girls have more self-confidence after receiving a grade for the result of the strategic design task than boys. *(rejected)*	
Hypothesis 4: H0: Boys and girls attribute success and failure to equal factors after completing the strategic design task. *(accepted)* H1: Boys attribute success to internal factors and girls attribute success to external factors after completing the strategic design task. *(rejected)*	*Boys and girls both attribute success to internal factors.*
Hypothesis 5: H0: Boys and girls attribute a grade to equal factors after completing the strategic design task. *(accepted)* H1: Boys attribute a good grade to internal factors and girls attribute a good grade to external factors after completing the strategic design task. *(rejected)*	*Boys and girls both attribute success to internal factors.*

Hypothesis 6: H0: Boys and girls are equally self-confident about performing a strategic design task in the future. *(accepted)* H1: After succeeding in the strategic design task, girls are more self-confident than boys about performing a strategic design task in the future. *(rejected)*	
Hypothesis 7: H0: There is no relation between interest in the strategic design task before starting it and after finishing it. *(accepted for girls, rejected for boys)* H1: There is a positive relation between interest in the strategic design before starting it and after finishing it. *(accepted for boys, rejected for girls)*	*There is no relation found for girls.* *There is a positive relation found for boys.*
Hypothesis 8: H0: There is no relation between self-confidence before starting and after finishing the strategic design task. *(rejected)* H1: There is a positive relation between self-confidence before starting and after finishing the strategic design task. *(accepted)*	*There is a positive relation found for both boys and girls.*
Hypothesis 9: H0: There is no relation between self-confidence after finishing the strategic design task and after receiving a grade for it. *(rejected)* H1: There is a positive relation between self-confidence after finishing the strategic design task and after receiving a grade for it. *(accepted)*	*There is a positive relation found for both boys and girls.*

Hypothesis 10: H0: There is no relation between self-confidence and the attribution of success after finishing the strategic design task. *(accepted for girls, rejected for boys)* H1: There is a positive relation between self-confidence and the attribution of success after finishing the strategic design task. *(accepted for boys, rejected for girls)*	*There is no relation found for girls.* *There is a positive relation found for boys.*
Hypothesis 11: H0: There is no relation between self-confidence and the attribution of success after receiving a grade for the strategic design task. *(rejected)* H1: There is a positive relation between self-confidence and the attribution of success after receiving a grade for the strategic design task. *(accepted)*	*There is a positive relation found for both boys and girls.*

6.

Discussion

6. Discussion

In this chapter the previously described results will be discussed and interpreted. The results will be discussed per 'variable theme', as introduced in chapter 4 (appendix G). In the discussions, first the results are shortly repeated. Next, the results are compared to the relevant literature from the theoretical framework. When relevant, the results of the statistical tests are compared to the results from the interviews. Finally, at the end of the chapter some general discussion points are described.

6.1 Interest and performance in school subjects

Interest of boys and girls in different school subjects might give some insight into if the existing stereotypes are still true. This research's results show that boys show significantly more interest in physics and girls show significantly more interest in languages. One might thus conclude that some of the stereotypes concerning interest in typical 'boys' and 'girls' courses are true. However, no significant differences in interest in mathematics, PE and arts were found. Which one might consider as unexpected results.

Concerning performance, the results show that boys perform significantly better in physics and PE. This again corresponds with the existing stereotype as these are typical 'boys' courses. However, boys also perform significantly better in arts than girls do. This is interesting, since arts is a typical 'girls' course. In addition, no significant differences in performance for mathematics and languages were found. Which again might be considered as unexpected results. This seems contradicting, since the current stereotype is about girls having more interest and also performing better in both languages and arts. One explanation for these results could be that the boys within this research have higher self confidence and therefore think they perform better in certain school subjects. However, the results of the study point out that boys and girls are equally self-confident throughout the entire study.

The study performed by OECD (2015) showed that girls score lower for both self-efficacy and self-concept concerning mathematics and science. Furthermore, OECD (2015) states that girls are behind in terms of performance in mathematics and science. However, the results of this research do not entirely correspond with this.

The OECD (2015) study also states that women are under-represented within occupations in STEM and that they are behind in terms of performance in mathematics and science. This is partly in line with this study, since girls within this group of participants were also under-represented (16 out of 46 participants in total). However, this study found no difference between boys and girls in performance in mathematics. Bae et. al (2000) describes that women continue to lag behind males in mathematics and science achievement in high school and that women experience more anxiety towards STEM subjects. However, looking at the results of this study this does not entirely seem to be the case. In both interest and performance, boys indeed scored significantly higher. However, as previously mentioned, for mathematics no significant differences were found. Therefore, perhaps there is already a shift in this existing stereotype.

Jacobs et. al. (2002) state that the differences in self-confidence concerning mathematics are only small in adolescence. This is in line with the findings of this study, since no significant differences in interest and performance for mathematics were found. Furthermore, no significant differences in self-confidence about the strategic design task throughout the entire study were found. It could be interesting for future research to look at self-confidence for different school subjects.

Concerning the other subjects, Jacobs et. al. (2002) state that for language and arts the gap between boys and girls in terms of competence perception has increased and that language and arts are clearly gender typed. This does not correspond with the findings of this study since some contradicting results were found. Namely, girls show significantly more interest in languages than boys, but boys perform significantly better in arts than girls.

6.2 Interest in the strategic design task

The results of the study show that boys and girls show no significant difference in interest in the strategic design task before they have started it. Also no significant difference in interest in the strategic design task is found after they have completed it. These results might be surprising. It was expected that girls would show more interest in the strategic design task since it is more related to writing and language than it is to mathematics and natural sciences (Jacobs, 2002). However, when looking at the discussion of the results in paragraph 6.1, the results here seem to correspond with those results. When no real stereotypes exist among boys and girls, it would make sense for there not to be big differences in interest of the strategic design task. Even though the strategic design task shows more aspects of 'girls' subjects.

Furthermore, all participants in this study chose to follow the R&D course instead of other art courses which they did follow in their previous years at the school. These results therefore make sense since the students that participated within the research probably do not fall into the stereotypical situation anyway, even if there was one. As will be discussed in paragraph 6.7, the students that participated within this study do not fit the profile of average high school students.

When looking at only boys before and after performing the strategic design task, a positive relation in interest was found. When looking at only girls before and after performing the strategic design task, no relation was found. This result suggests that boys show about the same amount of interest in the strategic design

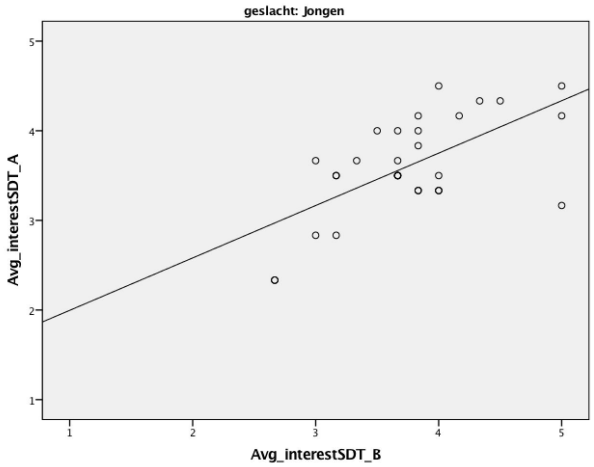

Figure 6.1: Scatterplot interest strategic design task boys during first and second measurement

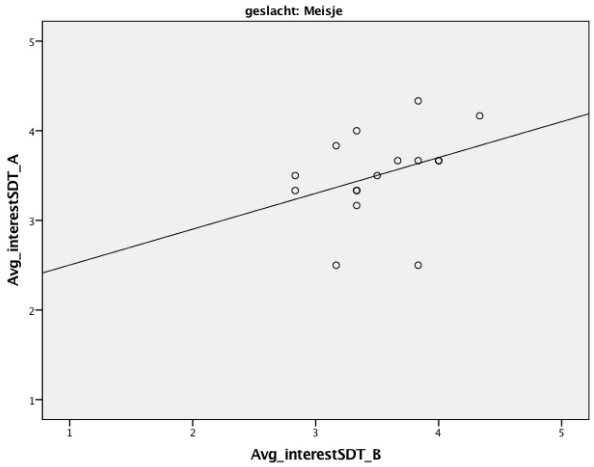

Figure 6.2: Scatterplot interest strategic design task girls during first and second measurement

task before and after performing the strategic design task. This result for girls suggests that the interest before and after performing the strategic design task is quite different (paragraph 5.2).

One explanation for these results could be that overall, girls had more variation in their answers. Figures 6.1 and 6.2 show more scattering in the dots for girls than for boys. However, the figures also show that, as previously mentioned, far less girls than boys participated in the study. The surprising result for girls therefore could simply be caused by the relatively small amount of girls within this study.

Within the interviews, conducted after the strategic design task was graded, the students were asked about what they thought about the strategic design task. Of all the different teams within the study, the opinions about the strategic design task are quite diverse. Some teams liked performing the strategic design task, some did not. Five (three girl teams and two boy teams) out of 13 teams explicitly indicated that they felt that the strategic design task was quite hard. In particular finding information online was hard in this assignment. Three teams (one girl team and two boy teams) indicated that they did not particularly liked the assignment, but did see the added value for the rest of the assignment. Interestingly, two teams (one girl team and one boy team) indicated that they did not see the use of the assignment. These teams did not use the strategic design task as a basis for the final design of the assignment. These different results do not show extreme outcomes for only teams of boys or girls. The interview results therefore correspond with the results from the statistical analyses.

Furthermore, the results are in line with what Eccles (1999) describes. She states that the perceived importance or relevance of a task also plays an important role to what extent boys and girls are willing to engage in a certain task.

6.3 Self-confidence

Following the literature (Nurmi et. al., 2003) expectation of success (thus being self-confident) is positively attributed to internal factors (ability and effort). The results of this study show no significant differences in self-confidence between boys and girls before starting and after completing the strategic design task. Also, no significant differences were found after receiving a grade for the strategic design task. Furthermore, possible correlations in self-confidence between before and after performing the strategic design task for both boys and girls separately were analysed (paragraph 5.3). A significant positive relation for both boys and girls was found between self-confidence before starting and after finishing the strategic design task. Also, a significant positive relation for both boys and girls was found between self-confidence after finishing the strategic design task and receiving a grade for it.

Following the literature, differences in self-confidence between boys and girls were expected. The theory (Bae et. al., 2000; OECD, 2015) states that girls tend to have less self-confidence and are more afraid to make mistakes in order to learn compared to boys. This does not correspond with the findings of this study, as no significant differences were found in self-confidence, which is an interesting result.

It seems as if performing the task does not have any influence on the level of self-confidence that the participants show. Perhaps this has to do with the fact that relatively the strategic design task is only a small part of the entire assignment

(both in time and effort). Furthermore, receiving a grade for the strategic design task also does not seem to have an influence on the level of self-confidence. Reasons for this could either be that students are very well in knowing what to expect of their deliverables, or they do not care much about the grade since it is just a part of their entire project. As previously described, it could also have to do with quickly filling in the questionnaires without full attention, not fitting the stereotypical high school student profile or the unequal division of boys and girls within this study.

In addition to this, Eccles (1999) describes that both boys and girls are expected to have a lower self-confidence in adolescence than before adolescence. It would have been relevant to know how self-confident the students were before going to high school. Then, a comparison between these two phases could have been made, as the students seem quite self-confident overall (both boys and girls). However, no conclusions on this can be drawn now.

6.4 Type of attribution

The results show that boys and girls attribute success and failure to equal factors after completing the strategic design task and after receiving a grade for it. Moreover, boys and girls both attribute success to internal factors. Zuckerman (1979) suggests that success is more internally attributed as opposed to failure since success is what one intends when performing a task while failure is not. This theory is therefore in line with the findings from the study. Zuckerman (1979) also states that women tend to attribute performance outcome more to external factors than men. The results of the study do not correspond with this, as the participants (both boys and girls) all felt like they succeeded in the strategic design task and attributed this success to internal factors.

As described in paragraph 5.4, both boys and girls felt like external factors did not really have an influence on their success and thus on their grades. This is an interesting finding which could be explained by the relatively high self-confidence the participants had. However, it is premature to draw hard conclusions about this since there is no frame of reference here.

The fact that no significant difference is found between boys and girls concerning attribution theory could be explained by the previously mentioned possibility that the existing stereotypes are no longer true.

Self-serving bias as described by Zuckerman (1979) seems to apply within this study. As success is attributed to the students' own capacities and the level of self-confidence of the students did not significantly change (paragraph 5.3) over time (before, after and after grading). This finding also corresponds with the combination of naïve action model and balance theory (paragraph 2.2.1). The literature states that when expectancies are confirmed, success is attributed to stable internal factors (ability).

According to Eccles (1999), the expectations of success can help understand to what extent boys and girls are willing to succeed (and therefore engage) in a task. This amount of engagement is related to the interest boys and girls have. The results (paragraph 5.2) of the study show that both boys and girls are quite interested in performing a strategic design task. Boys and girls both feeling successful at the task is therefore in line with what is written in the literature by Eccles.

6.5 Self-confidence in the future

Following the literature (Bae et. al., 2000; OECD, 2015), boys were expected to have more self-confidence overall as opposed to girls.

However, the results of the research showed that this is not the case. Boys and girls have the same amount of self-confidence throughout the whole study (paragraph 5.3). Also no significant difference in self-confidence in performing a strategic design task in the future was found between boys and girls.

Therefore, the results partly correspond with what is written in the literature. When succeeding in a strategic design task (paragraph 6.4), people are expected to show less fear in approaching a similarly difficult task in the future. The research of Nurmi et. al. (2003) states that whenever students expected success, academic achievement and satisfaction were predicted. This resulted in increased success expectation in the future. This is in line with this study, because the participants (both boys and girls) showed self-confidence in advance (paragraph 5.3). Therefore, success was expected and thus there is self-confidence for the future.

Furthermore, Nurmi et. al. (2003) describes that expectation of success was positively attributed to internal factors (ability and effort) after success. As previously described in paragraph 6.3 (and 5.3) within this study success was also attributed to internal factors. The results of this study also show that boys and girls are self-confident about performing a similar strategic design task in the future (paragraph 6.5). The results are therefore in line with what is written in the literature by Nurmi et. al..

As previously described, self-confidence was quite high throughout the entire project for both boys and girls. It is possible that the students within this group are simply quite self-confident. Another explanation might be that the students just quickly filled in the questions of the questionnaire without thinking to hard and long about it, just because they wanted to be done with the questionnaire quickly.

Furthermore, all students felt as if they succeeded in the strategic design task and that this was due to internal factors (paragraph 6.4), so there are no results for students that felt as if they failed the strategic design task. Therefore, it is hard to say something about if the participants have more self-confidence for a future task now than in the case if they would have failed it.

6.6 Self-confidence vs. attribution of success

As described in paragraph 5.4, both boys and girls attributed their success to internal factors. The results of the research show a significant, positive relation between self-confidence and the attribution of success after finishing the strategic design task for boys. However, the results do not show a significant relation for girls here. It is quite surprising that for girls no significant relation between self-confidence and the attribution of success was found, since the results show no significant differences in self-confidence throughout the research and both boys and girls feel like they succeeded in the strategic design task.

As previously described in paragraph 6.2, an explanation for these different results between boys and girls could be that overall, girls had more variation in their answers. The scatterplots in figures 6.3 and 6.4, show that the dots for girls have a more horizontal line than the dots for boys. However, the figures also show that, as previously mentioned as well, far less girls than boys participated in the study. The result for girls therefore could simply be caused by the relatively small amount of girls within this study.

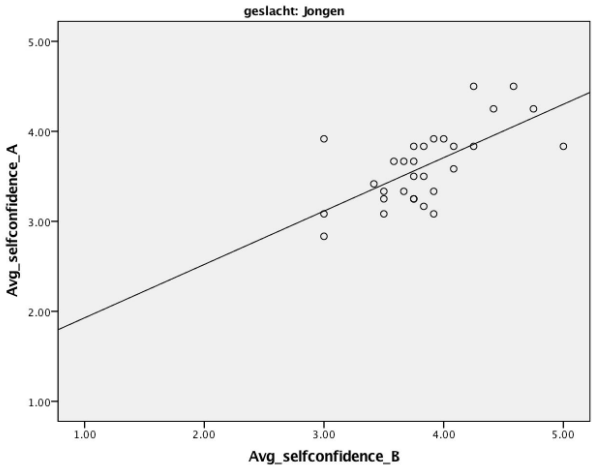

Figure 6.3: Scatterplot self-confidence and success boys

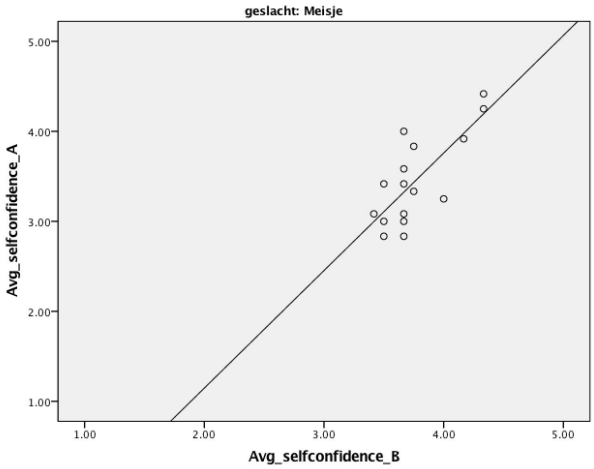

Figure 6.4: Scatterplot self-confidence and success girls

After receiving a grade for the strategic design task, for both boys and girls a positive, significant relation was found between self-confidence and the attribution of success. These results meet the expectations. Still it is interesting to dive deeper into what success means for boys and girls.

The interviews within the study showed that quite some of the grades are between 6 and 7 (six out of thirteen teams). The rest of the teams (seven out of thirteen) has above a 7. So what can be said about the concept 'success'? Some of the students might think that a sufficient grade (a 6) is enough en therefore feel like they have succeeded. Other students might feel like only a grade above an 8 is a success. 'Success', therefore is a relative concept. In the interviews all the teams were asked if they were satisfied with their grade and if they agreed on the grade they had received from their teacher. In total, 30 students (9 girls and 21 boys) were satisfied with their grade and 16 students (7 girls and 9 boys) would have preferred a higher grade.
33 students (7 girls and 26 boys) agreed on the grade they had received from their teachers, 13 students (9 girls and 4 boys) disagreed and felt like they should have received a higher grade for their efforts.
These results are interesting; they almost suggest that boys are easier satisfied by simply getting a sufficient grade in order to pass the assignment. Girls however, seem to disagree to their grade sooner. Perhaps this means that they are more keen on getting higher grades.

6.7 General points for discussion

One of the reasons for the unexpected results within this study could be the type of school the participants are in. The school in this research is a Technasium school (chapter 4). This means that the students attending this school made a decision for beta oriented education. The initial interest in beta courses is possibly already higher on average at this school since these students chose for this school because of the R&D course. It might therefore be possible that the students might not fit the profile of average high school students in the Netherlands.
Furthermore, all participants in this study chose to follow the R&D course instead of other art courses which they did follow in their previous years at the school. These results therefore make sense since the students that participated within the research probably do not fall into the stereotypical situation anyway, even if there was one.

Another reason for these results might be the division between boys and girls within the participants. Almost twice as much boys (n=30) as opposed to girls (n=16) participated

in the study. Possibly, with a larger group of girls attending R&D the results would have been different.

Finally, the existing stereotypes described in the literature are quite old. Perhaps the results are not surprising at all and simply a new standard where boys and girls are more alike in interest and performance of school subjects is discovered.

7.

Conclusion

7. Conclusion

Concluding this research, the main research question *'How does attribution theory apply for boys and girls when performing a strategic design task?'*, can be answered:

The results for interest and performance in school subjects contradicted the existing gender stereotypes. Also, boys and girls did not show differences in interest in the strategic design task, which was expected beforehand. Throughout the entire study, high self-confidence for both male and female participants was found. In line with this high self-confidence, both boys and girls attributed success to internal factors and were highly self-confident about performing a strategic design task in the future. Therefore, one could conclude from this study that stereotypes do not exist within this group of participants.

Attribution theory for boys and girls when performing a strategic design task thus does not apply in the expected way. It seems like times have changed since the previous research findings on attribution theory from decades ago, as quite some unexpected outcomes for boys and girls were found in this research. This would make sense, as a lot of developments in society in general have taken place since these previous studies on attribution theory. Maybe, the known division in in gender stereotypes is fading and males and females are becoming more and more equal.

8.

Limitations

8. Limitations

The initial plan for this research was to form teams of three participants. Unfortunately, due to a miscommunication between the researcher and the teachers of this group of students, some teams ended up consisting of four students and some of three students. This means that for this research, the boys are in teams of four and girls are in teams of three. This could have an unwanted influence on the results of the research.

Within the research there were far less girls than boys. As previously mentioned within the discussion, this could have an influence on the results. The ideal situation would have been that the number of boys and girls was equal. More specific, it would have been better to have more girls within the study. With more girls in the study, there are more results. When there would have been more results the conclusions drawn on those results would have been more valid and reliable.

During conducting the second questionnaire, participants commented that part of the questionnaire was the same as the first questionnaire. This was on purpose; to see how they would answer the questions after performing the strategic design task in order to find differences in their answers. However, it is possible that students might take the second questionnaire less serious since they did not feel like answering the same questions for a second time. Furthermore, during the questionnaires a few students asked what was meant by the strategic design task. These students did not read the explanation between the questions well before filling in the questions. It is possible that these students did not fill in the correct answers at some questions.

Usually, it is common to put double denying questions into questionnaires in order to see if participants give the same kind of answers to these questions. This makes a research more reliable. However, for adolescents this can be quite confusing. Therefore, the decision was made not to put double denying questions into the questionnaires for this research.

Naturally, the results of the study follow from the questions that were asked in the questionnaires. This means that there is a possibility that some of the participants quickly filled in the questions just to be done with it. Especially since the participants were adolescents there is a chance this happened. Therefore, it is possible that the participants simply take the questionnaire less serious in comparison to having adults as participants within a research.

Finally, the timespan for this research might have been a limitation as well. The total period in which the study was conducted only consisted of seven weeks, which is not very long for an academic research.

9.

Recommendations for future research

9. Recommendations for future research

The participants used for this research were divided into small teams of either three or four persons. However, within this study the focus was not on testing anything about group effect. Schlenker (1975, 1976, 1977) and Schlenker and Miller (1977) have looked at interpersonal bonds within teams and how those have strengthened when there was success. It would therefore be interesting to do a follow up research which focuses more on the effect of groups in attribution theory. This is especially relevant since these researches are already quite dated.

As can be read in chapter 6, the participants of this study might not really fit the profile of 'average' high school students due to the beta oriented education they get at the high school of this study. Therefore, it might be interesting to do a follow up research at a non-Technasium school, where there is no extra focus on beta oriented education.

As previously described, the division between boys and girls within this study was not equal. A follow up study where there are as much boys as girls participating might give other results and therefore new insights. Also, this study focused only on gender equal teams. For future research it could be interesting to analyse the combination between boys and girls instead of only the differences between boys and girls separately.

Two main 'themes' within this research were success and self-confidence. However, it was not researched if success has an influence on self-confidence, or the other way around. Only correlation research was done between the two variables for this study. For future research it could be interesting to look at regressions as well. When only having studied correlations, like in this study, no real conclusions about the influence of both variables on each other can be drawn. Concerning these variables studied, it might also be interesting to look into other topics or themes that might be very different between boys and girls.

Within this research, the main focus was on the effect of internal and external factors. However, it could be interesting to look at the influence of stable and unstable factors on success and failure. As can be read in the theoretical framework, (chapter 2), Weiner (1985) namely describes that when a result is attributed to a stable factor, this result will be expected with higher certainty in the future. When a result is attributed to an unstable factor, the certainty of such a result has the same level of expectancy. Furthermore, within the theoretical framework it is suggested that when expectancies are confirmed, success is attributed to stable internal factors (ability) and failure is attributed to stable external factors (task difficulty). This suggestion is based on combining the balance theory and naïve action model. Perhaps this suggestion is too easily made, further research should point out if this is really the case.

The OECD (2015) describes that girls tend to have higher motivation to achieve in school and believe that this is important. In addition, girls also tend to want to please other people's expectations more and are more afraid of getting negative evaluations by other people.

This research did not focus on this, however, it might be interesting to further research this in the future.

Within this research no significant difference in self-confidence between boys and girls was found. Perhaps in the future it could be interesting to research more in the same context about self-efficacy. This topic is related to self-confidence, but is not exactly the same. The OECD study (2015) namely shows that students who have a low self-efficacy level concerning mathematics and science also tend to perform worse in tasks of both subjects as opposed to students who have high self-efficacy.

Within the theoretical framework, some literature (Stout et. al., 2011) about how female role models influence young women's self-confidence concerning STEM subjects is described. The results of Stout et. al. (2011) showed that when having a female professor, women tend to be more self-confident, perform better, have a positive attitude toward STEM subjects and participate more in class. However, in this study there was no room to further analyse this influence. Within this study, although not described in detail, the students had a male and a female teacher whom graded the strategic design task and gave feedback to the students. It would be very interesting to do a research in the future which focuses on the influence of groups of girls having female teachers and male teachers for the beta oriented school subjects. In addition, it would be worth knowing what kind of study these students will pursue after their high school career. The theory does not say anything about boys for this matter, it is interesting to research it for both boys and girls (instead of only girls).

10.

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