

MASTER'S THESIS

The Effect of the Gamification Element; Badges on Students' Motivation in Special Education.

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The Effect of the Gamification Element; Badges on Students' Motivation in Special Education

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The effect of the gamification element; badges on students' motivation in special education**Summary**

Students with special needs tend to display less of a desire for participation in classroom activities, as well as completion of assignments, for a number of reasons. This is especially the case for students with autism and ADHD. A low level of motivation can, consequently, have an immense impact on their learning. For this reason, it is important to look for ways to increase students' motivation in special needs education. The use of gamification elements, such as badges, could provide a partial solution to the problem of low motivation in special education students. Various higher education institutions in The Netherlands and abroad have examined the possibilities of implementing badges. Researchers have found that badges could have an effect on students' learning experience and their attitude towards the lessons where badges were implemented. The results of this study show that badges have a positive effect on the intrinsic motivation of students. However, badges have no effect on the extrinsic motivation of students in this study.

Keywords: badges, gamification, intrinsic motivation, extrinsic motivation

Related Theme Welten Institute / External institution

This study is related to research conducted within the research line of ‘Technology Enhanced Learning Innovations for teaching’ (TELI) by the Welten Institute. Earlier research has investigated the effects of gamification in online learning environments and in a MOOC platform. One of the most recent research studies examined the effect of the gamification element, specifically badges, on the intrinsic motivation of students attending a programming academy. This current study also focuses on the effect of badges on students’ motivation, but it will be conducted in a different setting, namely, in special education.

1. Introduction

1.1 The research problem and purpose

Currently, educational institutions give a diploma or paper certificates to confirm an individual has completed a course or learned a skill (Rimland & Raish, 2019). Moreover, these diplomas and paper certificates are recognizable forms of academic achievement. With the rise in popularity of the internet and online learning in the 1990s, came also the digital credentials. As a result, diplomas and paper certificates are made digital as well (Rimland & Raish, 2019). In December 2015, the House of Representatives of the Netherlands passed a motion to explore the certification of smaller and separate modules (Mohandis & Duisenberg, 2015). Most educational institutions currently only provide bachelor’s and master’s degree when students complete their education. However, additional courses taken alongside the courses of their regular curriculum should also be validated with credits or exemptions (Mohandis & Duisenberg, 2015). Badges or micro-credentials are described as an educational module divided into smaller units and each unit is separately certified (Rimland & Raish, 2019).

Learning is an active process, and it requires motivation to both begin and sustain the process of learning (Glover, 2013). Also, motivational beliefs seem to play a crucial role in students’ educational achievement (Robbins et al., 2004). Motivation is defined as the drive or energy that moves an individual to do something (Deci & Ryan, 2000). Factors that may contribute to increasing students’ motivation are, for instance, providing more challenging educational materials, providing students with more choice, promoting self-determination and perceived autonomy, among others (Deci, 1972; Deci & Ryan, 2000). Research has shown that adolescents’ academic motivation declines over time (Anderman & Maehr, 1994). Furthermore, students with a wide range of disabilities showed a reduced desire in participating in activities simply with the purpose to complete an assignment or for the reason to participate (Kemp, Kishida, Carter, & Sweller, 2013), which can have an impact on their learning (Dearden, Emerson, Lewis, & Papp, 2016). Moreover, research showed that students with autism spectrum disorder (ASD) tend to show little interest in schoolwork and they show disruptive behavior when tasks are given (Koegel, Singh, & Koegel, 2010). This behavior is used to escape or avoid the

academic assignment (Koegel et al., 2010). Children with attention deficit/hyperactivity disorder (ADHD) also struggle with an immature self-regulation of motivation (Raggi & Chronis, 2006). These children show an extensive degree of inattentiveness, impulsivity, and hyperactivity. As the school demands rise, it becomes increasingly challenging for a student with ADHD to complete activities and follow through with instructions (Raggi & Chronis, 2006).

Studies show that rewards given by the teacher to the students have a positive and significant effect on the students' learning motivation (Lang, Hemita, & Antosa, 2019). Also, students with ADHD react positively to rewards when they are delivered instantly and consistently (Modesto-Lowe, Chaplin, Soovajian, & Meyer, 2013). Another study showed that students with ASD and ADHD perform better when receiving a monetary reward (Demurie, Roeyers, Baeyens, & Sonuga-Barke, 2011). Recent studies have shown that, badges in education may influence students' motivation (Abramovich, Schunn, & Higashi, 2013; Denny, 2013). Sitra, Katsigiannakis, Karagiannidis, and Mavropoulou (2017) studied the effect of gamification, specifically the effect of badges, in special education and found that students enjoyed the gamification courses. Moreover, badges seem to have an effect on the students' learning experience and their attitude towards the gamified courses (Sitra et al., 2017). Various higher education institutions in The Netherlands and abroad looked into the possibilities of implementing badges (Kerver & Riksen, 2016), but there is little information on the implementation of badges in special secondary education. Although researchers have studied the effect of motivation on students with no special needs, there is less information on motivation of students in special needs education and the effect of a badge system on their motivation. This paper looks at the effect of a badge system in addressing student motivation in a computer science course in special secondary education.

1.2 Theoretical Framework

1.2.1 Badges. Today's students have grown up with digital technologies, therefore they have different attitude towards the learning process, and have different learning styles, preferences, needs, and requirements (Kiryakova, Angelova, & Yordanova 2014). Consequently, the learning process that is being offered is not consistent with students' preferences, needs, and requirements. The major problems in today's education are linked to the lack of motivation and engagement of students to actively participate in the learning process. Because of that, teachers are often looking for new and innovative methods and approaches to stimulate students' motivation to take part in classroom activities (Kiryakova et al., 2014). Therefore, ICT can be used in the classroom to serve this purpose. Various results from empirical studies have shown the positive effects of gamification on user motivation (Hamari, Koivisto, & Sarsa, 2014). Gamification can best be defined as, "the process of game-thinking and game mechanics to engage users and solve problems" (Zichermann & Cunningham, 2011). The most popular gamification elements are points, badges, narration, leader

boards, levels, and challenges (Sitra et al., 2017; Zichermann & Cunningham, 2011). This research will focus on badges. This has to do with the amount of time and resources available to perform this study.

Badges are interesting in an educational institution or in a context where students obtain knowledge and skills from different sources (Kerver & Riksen, 2016). Through a badge, students can show what knowledge they possess. They have something to demonstrate that they have the necessary competencies to proceed to the next module (Kerver & Riksen, 2016). In short, badges are insignia or images that showcase certain knowledge or skills that the student has acquired. It shows that the student has obtained the certification in question (Blanc & De Werk, 2018; Kerver & Riksen, 2016). The images contain digital information that cannot be copied or customized without the publisher, and it also includes the value of the badge (Blanc & De Werk, 2018). Besides containing information of what a student had to do to obtain the badge, the badge also holds information about the issuer and possibly an expiry date (Kerver & Riksen, 2016). This makes it easier for educational institutions to verify the badge, and it increases the trustworthiness of a badge (Kerver & Riksen, 2016).

Badges are small digital or non-digital files (Kerver & Riksen, 2016). The Open Badges Standard describes the content and the anatomy of these files. Furthermore, the Open Badges Standard is a group of technical standard and specification, which was developed by Mozilla in 2012 and since 2017 IMS Global has been in charge of this standard. A badge consists of two parts, a metadata description and an image. The metadata description is defined in the form of a statement about an achieved skill. The statement described to whom a badge is assigned, who issued the badge, and what the badge represents. For instance, badge holder, badge name, badge description, badge criteria, badge issuer, date, expiry date, and standards (Kerver & Riksen, 2016).

Badges serve a certain purpose; this is one of the first things to be considered when designing a badge (Facey-Shaw, 2019). Badges can be designed to recognize the achievement of a specific goal and completing a specific task (Pedro, Santos, Aresta, & Almeida, 2015), to encourage students' motivation (Abramovich et al., 2013; McDaniel, Lindgren, & Friskicks, 2012), behavior change (McDaniel et al., 2012), participation (Barata, Gama, Jorge, Gonçalves, 2015; Denny, 2013), and motivate students to learn (Boticki, Baksa, Seow, & Looi, 2015). This study will focus on how badges motivate students. Educational institutions can use badges in three different ways (Blanc & De Werk, 2018). Firstly, a badge can be granted to a student who has completed an accredited unit of the study with success. Secondly, a badge can be awarded for informal or non-accredited education, to acknowledge a student for obtaining soft skills, such as the ability to work in a team and presentation skills. Finally, a badge can be used as a game element. The teacher can give a badge to students who submit all their assignments on time (Blanc & De Werk, 2018).

Badge systems require certain structural features in order to achieve its purpose for which the badge was developed. A badge system is a “structure of symbols (badges) that people can earn through accomplishing various tasks that illustrate their knowledge and skills” (“Structure,” n.d.). Facey-Shaw (2019) identified 10 structural features for a badge system in the literature. These structural features are progressive/milestone badges, outcomes-based badges, levelled badges, categorized badges, hidden/locked badges, complex connection badges, course section badges, nominated custom and starter badges, negative badges, and contribution to student grades badges. Also, the way that students interact with the badge, the interaction features, can also have an impact on students’ motivation. Anderson, Huttenlocher, Kleinberg, and Leskovec (2014) suggested that making the earned badges and the yet to be earned badges more noticeable for students increased their participation. In other studies students were notified of earned badged through a link to view badges (Denny, 2013), or a system dialog box (Abramovich et al., 2013). Badges can also be displayed via a dashboard (Holman, Aguilar, & Fishman, 2013), or via a badge leader board (McDaniel et al., 2012). A method to motivate students to go after the badges and to make the badges more attractive is by displaying students’ badges to each other (Haaranen, Ihanola, Hakulinen, and Korhonen, 2014). In other words, the social aspect that accompanies badges can motivate students (Haaranen et al., 2014). Part of the current research will investigate which of the above-mentioned structural features of badge system and which interaction features with badges are suitable to motivate students in the secondary special education.

As mentioned before, researchers found that gamification has a positive effect on students’ motivation (Hamari et al., 2014). Moreover, in students’ learning process gamification can increase students’ motivation (Sitra et al., 2017). Sitra et al. (2017) found that students enjoyed gamified courses and expressed that they prefer these kinds of lessons. Researchers also found that a single gamification element seemed enough for a lesson to be seen as more enjoyable and to make the lesson look more like a game. Moreover, Sitra et al. (2017) found that the use of badges has an influence on the learning experience of students and on students’ attitude towards the lesson (Sitra et al., 2017). An important factor supporting badges as a motivational tool in students’ learning process is, students need to be in control of their own learning (Davis & Klein, 2005). For that reason, the design of a badge, the focus of a badge, and how a badge should be granted shall be discussed in the research question.

In short, individuals use badges in their everyday life as a sign of social status or to exhibit their achievements (Sitra et al., 2017). Furthermore, badges are used as part of the reward system for when students achieve a specific goal or set of skills and are also considered a game element (Zichermann & Cunningham, 2011). Badges also seem to have an effect on students’ motivation and attitude towards the lesson where they are implemented (Sitra et al., 2017). Technology-rich environment provide

certain qualities such as challenge, control, and engagement, which are inherently motivating (Housand & Housand, 2012).

1.2.2 Motivation. Ryan and Deci (2000) describe motivation as to be moved to do something. A person who is excited and energized for the end result is considered motivated, whereas if someone is not excited, or has no inspiration to act, he or she is characterized as unmotivated. The researchers suggested that there are different types of motivation, and different amount of motivation. In other words, people not only vary in how much motivation they have, the level of motivation, but also in the type of motivation or, the orientation of their motivation. The orientation of motivation described the reason someone is motivated to do something. An example of the orientation of motivation is when a student is motivated to do an assignment out of curiosity and interest, or a student is motivated to do an assignment because he or she wants to obtain a good grade and all the benefits that a good grade offers. In the previous examples the nature of motivation is different, whereas the amount of motivation does not necessarily change (Ryan & Deci, 2000).

The self-determination theory (SDT) distinguishes between two different types of motivation, which is based on the cause or reason that someone has for an action. The two types of motivation are intrinsic motivation and extrinsic motivation (Ryan & Deci, 2000). Intrinsic motivation refers to a behavior that comes from within an individual, because he or she is genuinely interested or entertained. When someone is intrinsically motivated, he or she will do something for the fun or challenge entailed rather than rewards, external push or pressure. In contrast, extrinsic motivation refers to a behavior that is led by external factors because it leads to a reward or avoiding sanction. For example, a student who does his or her homework because he/she fears punishment from his/her parents for not doing it is extrinsically motivated (Ryan & Deci, 2000). This paper will look at whether there will be changes in students' intrinsic motivation and extrinsic motivation during the ICT course when he or she receives an extrinsic reward, such as a badge, after doing an activity.

1.2.3 Intrinsic Motivation. An individual has the need to be autonomous and engage in activities because they want to (Schunk, Pintrich, & Meece, 2007). In order to be self-determining someone has to decide how to act on his or her environment and it requires someone to accept his or her strengths and limitations. People will not be satisfied if all their needs were automatically fulfilled without them having choices and deciding how to attain those choices. Ryan and Deci (2000) suggested that there are three basic psychological needs that motivate someone to initiate a behavior. These include the needs for competence, autonomy, and relatedness (Schunk et al., 2007). The need for competence refers to the need to feel competent and be competent in their activities, task, and interaction with others. Autonomy refers to the need to have a sense of control. People need to experience their behavior to be self-determined and feel competent in order for intrinsic motivation to be maintained, or enhanced (Ryan & Deci, 2000). At last, relatedness refers to the need to belong to a

group or culture with the same goal. Sometimes relatedness is also referred to as a need for belongingness. In short, intrinsic motivation is the need that humans have to be competent and self-determining in relation to their environment. Moreover, the process of self-determining is intrinsic motivation, and intrinsic motivation is fulfilled when someone acts wilfully.

The self-determination theory makes an effort to cover the range of all human behavior, but recognizes that only a subset of all behavior is actually intrinsically motivated (Ryan & Deci, 2000). Therefore, Ryan and Deci (2000) introduced the Cognitive Evaluation Theory (CET), in order to explain the intrinsic motivation side of human behavior. Intrinsically motivated students seek out challenges, and they also seek to master the challenges, this will satisfy their needs to be competent and self-determining (Schunk et al., 2007). The challenges are ideally within students' reach. Moreover, students will seek out a more complicated challenge, if the challenge is too simple. However, if the challenge is too difficult, students may abandon their work. In other words, intrinsic motivation will diminish when students cannot practice self-determination (Schunk et al., 2007). CET is referred to as a sub theory of the self-determination theory, and it argues that using external motivators, or interpersonal events that lead an individual to feel competent during an activity, can enhance intrinsic motivation, because it allows for satisfaction of the basic psychological need for competence (Ryan & Deci, 2000). Predictors to facilitate intrinsic motivation are feedback, optimal challenge, rewards, and communication, among others. However, students not only need to feel competent in order to enhance intrinsic motivation, but they also need to experience a sense of autonomy (Ryan & Deci, 2000).

Research has shown that rewards offered to individuals for doing something that they enjoy might decrease their intrinsic motivation (Schunk et al., 2007). This conclusion needs to be carefully interpreted, however. The way the reward is presented is important, not necessarily the action of receiving an award. Otherwise, high paid athletes or actors would retire after 1 year, or an honors student would drop out of school. There are certain conditions that determine the effect of rewards on intrinsic motivation (Schunk et al., 2007). Deci (1972) suggests that every reward has two aspects, a controlling aspect and an informational or feedback aspect. The controlling aspect of rewards tends to change someone's perceived locus of causality, which as a result, will decrease the intrinsic motivation. However, by contrast, the informational aspect of rewards tends to increase intrinsic motivation by increasing an individual's feeling of competence and self-determination (Deci, 1972).

As mentioned before, one way to encourage intrinsic motivation is by providing feedback (Deci, 1972). Individuals don't experience interpersonal rewards as conditions that control his or her behavior. Instead, these rewards will strengthen their sense of self-determination and competence, which consequently, will increase the individual's intrinsic motivation (Deci, 1972). The effect of positive feedback on intrinsic motivation was found to increase individuals' behavioral persistence and

self-reported interest across age groups (Deci, Koestner, & Ryan, 1999). Positive feedback holds information indicating that someone has performed well (Mabbe, Soenens, De Muynck, & Vansteenkiste, 2018). Badges can also be used in education as a rewarding system to acknowledge students' effort and to encourage their learning. Abramovich et al. (2013) reports that students' desire to earn a badge could be compelled by students' motivation. Furthermore, the use of badges could have a positive effect on students' motivation (Abramovich et al., 2013). Facey-Shaw, Specht, van Rosemalen, and Bartley-Bryan (2019) report in their quantitative findings that badges do not increase intrinsic motivation. However, the qualitative data shows particularly positive results for motivating students. Hakulinen, Auvinen, and Korhonen (2015), also found that achievement badges have a positive effect on students' behavior and motivation. Earning badges is an indication of competence, encourage connectedness, and promotes autonomy, which enhances intrinsic motivation, and motivates students' participation (Cavusoglu, Li, & Huang, 2015). Badges also have two aspects, the controlling aspect and the informational aspect (Hakulinen et al., 2015). As mentioned before, the informational aspect of a badge will enhance students' intrinsic motivation. Students' motivation, through badges, depends entirely on the way students interpret their received feedback.

1.2.4 Extrinsic Motivation. Extrinsic motivation is described as doing an activity in order to earn an external reward, such as passing grades, status or to avoid sanction (Ryan & Deci, 1978). In school or classrooms there are rewards, extrinsic structures, and controls, which are not suitable for the student' self-determination and intrinsic motivation, but instead, help to stimulate desirable behaviors and social functioning (Schunk et al., 2007). The use of badges has also been identified as an extrinsic motivational activity (Hanus & Fox, 2015). Eventually, these extrinsic motivators may become internalized. Ryan and Deci (2000) recognize that not every important behavior is intrinsically motivated. For that reason, they developed a second sub-theory within the larger SDT, referred to as Organismic Integration Theory (OIT), where they introduced the different forms of extrinsic motivation.

Extrinsic motivation consists of a set of four different extrinsic motivated behaviors that are completely extrinsically motivated (Ryan & Deci, 2000; Schunk et al., 2007). The four extrinsic motivations are *external regulation*, *introjected regulation*, *identified regulation*, and *integrated regulation*. In the first type of extrinsic motivation, external regulation, students participate in an activity or work on an assignment only to obtain a reward or to avoid punishment. These students do not show high interest, are not intrinsically motivated, there is no self-determination on part of the student, and they react well on extrinsic rewards, threats or punishment. The second type of extrinsic motivation, introjected regulation, is illustrated in students who participate in a task because they feel pressured, or because they think they should, in order to avoid feeling guilty or discomfort. In other words, students may be doing a task or activity only to please others. At the next level, the identified

regulation, students participate in a task or activity because it is personally important to them. For example, a student wants to achieve good grades in math because he or she sees math as a relevant course to his future college studies. In this specific scenario the student has a goal that is important to him or her. The student wants to do the assignment because he or she has identified with the value of the activity. Moreover, the student has a more utilitarian reason to do the assignment, rather than intrinsic interest in the assignment. The fourth type of extrinsic motivation is integrated regulation. In this type of extrinsic motivation students create their own self-schemes by integrating different internal and external sources of information. Furthermore, the integrated regulation is the most autonomous form of extrinsic motivation and it can be compared to intrinsic motivation because it represents a form of autonomous and self-determination. Students show a certain behavior because of its importance to their own values and needs. However, integrated regulation is still instrumental and is not autotelic as in intrinsic motivation. The behavior driven by integrated regulation is done for its results that are separate from the behavior, even if the students choose to do the activity and identified with the value of the activity. After a certain amount of time extrinsic motivation will become intrinsic motivation. The extrinsic motivators will become more and more internalized, which will then lead these extrinsic motivators to become self-determined and part of the self-regulation process (Ryan & Deci, 2000; Schunk et al., 2007).

Students' motivation is not fixed, which means that it can change over time (Deci, 2000). A student can start at any stage of a regulatory style of the extrinsic motivation and does not have to progress through each stage in order to adopt a new behavioral regulation. Some behavior could start as external, and others as introjects. For instance, students might initially complete an assignment because of an external regulation, such as a badge. If the badge is not perceived as too controlling, the student might experience the assignment as intrinsically interesting, which will result in a regulation orientation shift. Regarding the badges, the type of extrinsic motivation of students is determined by the degree of autonomy that students experience (Deci, 2000). Badges can provide a connection to a selection of clues or information needed in order to pass a unit, or to complete a program (Gibson, Ostashewski, Flintoff, Grant, & Knight, 2013). It can be a mechanism to showcase student achievement. Acquiring badges can also provide status recognition to students, in addition to assisting students in establishing and formalizing their identity in the group (Gibson et al., 2013). Participatory badges can also be awarded to students. Students might perceive these types of badges as external motivators (Abramovich et al., 2013). Part of this research will investigate the effect of the use of badges on the extrinsic motivation of students during the ICT lessons, where a badge system is implemented.

1.3 Research questions

Research question:

“To what extent can gamification and reward instruments (badges) affect students’ motivation in special secondary education?”

Sub questions:

1. *How can badges be awarded in order to motivate students in the secondary special education?*
2. *What interaction features of badges fit to motivate students in the secondary special education?*
3. *What is the effect of a badge system on students’ intrinsic motivation for the computer science course?*
4. *What is the effect of a badge system on students’ extrinsic motivation for the computer science course?*
5. *What is the perspective of a special education teacher about using badges in the classroom to motivate the students?*

2. Research Method

2.1 Research Design

The current study uses the design-based research (DBR) approach to implement badges in the computer science course. DBR is defined as a methodology that is situated in the real world setting and it seeks to understand the learning process, improve educational interventions, and has the ability to connect theory with design (Anderson, 2005; Anderson & Shattuck, 2012). The use of DBR in educational settings is increasingly growing (Anderson & Shattuck, 2012). Researchers, educators, and participants collaborate with each other to understand and adapt the intervention in order to boost learning (Anderson & Shattuck, 2012). There are different stages of design-based research. First, an analysis of the practical problem is conducted. In this explorative stage the researcher uses literature, theories, and expert input to create a clear image of the practical problem. Secondly, the intervention is developed and implemented. After the implementation, or enactment, the intervention will be evaluated and refined as needed. Finally, the researcher has to reflect on and document the tools that were used to understand the context, design principal, and to improve designed intervention, and generalizability of the design, among others (Anderson, 2005; Wang & Hannafin, 2005).

DBR approach is in line with the needs of current studies. It is theory-driven and grounded in relevant research, and it deals with an educational problem situated in a real-world setting (Wang & Hannafin, 2005). The theory used in this research study is the self-determination theory, and the educational problem in a real word setting is a decrease in students’ motivation. DBR allows the researcher to design, implement, evaluate, and redesign the badge implementation if needed. Furthermore, the design is validated after implementation of both cycles. Each cycle consists of design, enactment, analysis, and redesign (Wang & Hannafin, 2005). Mixed methods designs were

applied for the evaluation of the research design. The type of mixed method design that was used is the exploratory sequential design (Creswell, 2014). The combination of quantitative and qualitative data provides a better understanding of the research problem (Creswell, 2014). A pre- and post-test was included to evaluate students' intrinsic and extrinsic motivation level at the start and at the end of the badge implementation. During the process of badge implementation, qualitative data was collected in order to evaluate student experience with the badge-design, which can lead to new ideas for the badges. However, the emphasis was on the quantitative data. The badge design, the focus of a badge, and how a badge should be granted, shall be discussed by answering the research questions.

2.2 Participants

In this study the badges were applied at a secondary special education school in North Holland. The school is a cluster 4-school and provides secondary special education to young people with behavioral and psychiatric problems (four girls, thirty boys, $M_{age} = 14.53$ [$SD = 0.748$], between the ages of 13 and 16). See Table 1.

Table 1

Descriptive Statistics

	<i>n</i>	Minimum	Maximum	<i>M</i>	<i>SD</i>
Students' Age	34	13	16	14.53	.748

Special education is offered to students who are unable to complete their schooling in a regular education system setting. This particular school offers education on three different tracks, vmbo, havo, and vwo. This school is part of a larger institution for youth and parenting support, and has approximately 185 students who are divided into 15 groups. The current study will focus on four of these groups, which consists of 34 students in total that follow the computer science course in havo 3. The participants are between the ages of 13 and 16 years old and are mostly boys: 30 boys and 4 girls. All participants took part in cycle 1 and cycle 2. Each cycle consists of two lessons of 45 minutes of the computer science course. This will be elaborated on in section 2.4. The sample size is based on the estimate that an educational researcher needs in each group in an experiment, which is 15 participants (Creswell, 2014). A power analysis was conducted (Creswell, 2014) using a two-tailed test to test the difference between two independent group means, with a significance level of alpha 0.05, and a total sample of 68 participants with two equal sized groups of $n = 34$. Results showed a power of $d=0.529$, which is a medium effect size (Thalheimer & Cook, 2002).

The computer science course is taught by one teacher, who gives face-to-face classes to the students. The teacher sets goals for each lesson, and based on these goals the teacher makes a lesson

plan and prepares her lessons. Additionally, the teacher plans, compiles, administers, corrects, and discusses test with the students. The method used to teach computer science classes is “Digit”.

2.3 Instruments

For this study, the Intrinsic Motivation Inventory (IMI), which is based on the Self-Determination Theory of Ryan and Deci (2000), was used to collect data about the intrinsic motivation of the students (see Appendix A for the IMI). This instrument aims to assess the motivation level of students in relation to the computer science course. McAuley, Duncan, and Tammen (1989) found strong support for the validity of the IMI. The IMI that was used in this study is composed of six subscales, which are *interest/enjoyment*, *perceived competence*, *perceived choice*, *pressure/tension*, *effort/importance*, and *value/usefulness*.

The first category, interest/enjoyment, is the only category that measures self-reported intrinsic motivation directly (Monteiro, Mata, & Peixoto, 2015). The result of this category reflects the intrinsic motivation experienced by the respondent himself. Moreover, this category evaluates the interest and intrinsic pleasure when students are doing a specific activity. The categories that measure the perceived competence and perceived choice, are related to the SDT basic psychological needs of competence and autonomy. Moreover, these two categories are hypothesized as positive predictors of intrinsic motivation. The perceived choice category assesses how students feel about their engagement in a specific activity since they choose to execute it. The perceived competence category evaluates how effective students feel while completing an assignment. The pressure/tension category is theorized as a negative predictor of intrinsic motivation. Moreover, it measures the pressure students feel to succeed when performing a task. Effort is a different category. This category is crucial when measuring motivation in specific context and issues. Moreover, effort gives an indication of how hard the respondent is willing to work and is therefore linked to the value/usefulness category. Students will want to work hard for computer science if they see this course as valuable. Finally, the value/usefulness category measures how much the student considers the activity valuable and useful for them (Monteiro et al., 2015).

The demographic information of students is also collected at the top of the survey, such as course, gender and age. The IMI consist of a pre-test and a post-test. The IMI pre-test is composed of 35 items ($\alpha = .908$) and the IMI post-test is composed of 37 items ($\alpha = .924$) (see Appendix B). Both tests measure the six different sub-scales as elaborated on in the previous paragraph. The category interest/enjoyment includes six items such as “I would describe this activity as very interesting” and “this activity did not hold my attention”. The category perceived competence includes items such as “I think I am pretty good at this activity” and “I was pretty skilled at this activity”. The category perceived choice includes seven items such as “I did this activity because I wanted to” and “I believe I had some choice about doing this activity”. The pressure/tension category includes items such as “I

felt very tense while doing this activity” and “I was very relaxed in doing these”. The effort category includes items such as “I put a lot of effort into this” and “I didn’t try very hard to do well at this activity”. Finally, the value/usefulness category includes items such as “I believe this activity could be of some value to me” and “I believe doing this activity could be beneficial to me”. The students can choose each item from a 7-point Likert scale, where the two extremes and the middle have a specific meaning: 1= *not at all true*, 4=*somewhat true*, and 7=*very true*.

Besides the IMI, the Motivated Strategies for Learning Questionnaire (MSLQ) was also used to collect data about the extrinsic motivation of the students. This is a self-report instrument to evaluate students’ motivation orientation and learning strategies in high school and higher levels (Pintrich, Smith, Garcia, & McKeachie, 1991). This questionnaire consists of one subscale designed to measure the extrinsic motivation of students. The reliability coefficient for this subscale is .62. Students can rate themselves on this MSLQ Extrinsic Motivation (EM) subscale on a seven-point Likert scale where only the two extremes have a specific meaning: 1= *not at all true of me*, and 7= *very true of me*. Questions included in the MSQL-EM are “Getting a good grade in this class is the most satisfying thing for me right now” and “I want to do well in this class because it is important to show my ability to my family, friends, employer, or others” (Pintrich et al., 1991).

Qualitative research techniques were also used in this research to collect data via a semi-structured interview (see Appendix C for interview questions). Open-ended questions were asked so that the teacher could voice his/her experience with badges without being influenced by the researcher’s point of view (Cresswell, 2014). The interview questions focused on the teacher’s experience and perspective as it relates to the use of badges in the computer science course. See Appendix E for the interview questions. The interview will be audiotaped and transcribed in order to facilitate the data analysis.

2.4 Procedure

Before the research could take place, one student in the Open University’s Educational Science program approached and provided the school with information about the research. After the school agreed to participate in this study, the researcher approached the computer science teacher for her consent. The parents of the participants were also contacted and informed about this research, and were asked for their permission for their child to participate in this study. The parents, who agreed to this study, were asked to sign a written informed consent form. Before starting the pre-test about motivation, the participants also received a verbal explanation regarding the purpose of this study. Then the researcher asked the participants who agreed to be involved in the research to give their consent. Afterwards, participants engaged in a pre-test, which measures the intrinsic motivation level of students through the use of the Intrinsic Motivation Inventory (Ryan, 1982). The extrinsic motivation will be measured through the use of the Motivated Strategies for Learning Questionnaire

Extrinsic Motivation. The pre-test and the post-test lasted approximately 20 to 30 minutes and were conducted at school during the computer science course. Due to covid-19, the pre-test was taken online.

Participants took part in two design-based research cycles. Each cycle consists of two lessons lasting 45 minutes of the computer science course, where students followed a lesson plan prepared by the teacher. The teacher used the teaching method “Digit” to prepare her lessons and the lessons were about ‘Spreadsheet’. During these lessons students had to read the material, watch short videos, answer multiple-choice questions, and open questions, and create a Google Spreadsheet. The purpose of the lessons of the first cycle is twofold: firstly, students learn how to insert and delete columns and rows in Spreadsheet. Secondly, students learn how to format a cell in Spreadsheet and can change a number format. In addition, the second cycle has a twofold purpose as well. Firstly, students learn how to change the date format and insert special characters. Secondly, students can copy and paste a formatting into Spreadsheet. After achieving the required skills during each lesson, students receive a badge for the acquired skill. Students also receive a badge for participation (see Figure 2). Further details about the structural features and interaction features of a badge were examined and will be elaborated on later in the research. After receiving the first badge, the researcher asked the student what his or her thoughts were about the badge. The researcher used the received information to refine or adapt the badges to be used in cycle 2. In cycle 2 students again took part in two lessons of 45 minutes of the computer science course and were once more offered a program prepared by the teacher. After achieving the required skills students received a badge for the acquired skill. After cycle 2 students participated in a post-test, which measured their intrinsic and extrinsic motivation. At the end of the experiment the computer science teacher answered some questions regarding her view about the use of badges in the classroom.

2.5 Data Analysis

The quantitative data collected during this research, which consists of questionnaires and an interview transcript and observations from the interviewer, will be scored, coded and then analyzed. The quantitative data will be analyzed using SPSS.

The first step in the process of analyzing the collected quantitative data was to organize the data for analysis and creating a codebook. Afterwards, the quantitative data was scored, which means a value was assigned to each response for each question. The reversed items in the questionnaire were reversed before being computed. The data was entered into the statistical program and the dataset was inspected for errors and missing data. The data was analyzed according to their type in order to answer the research questions. Summed scores were given for each participant over several questions that measure the same variable and net or difference scores were computed, which represent the change for each participant between the pretest and the posttest. Descriptive statistics were computed.

Furthermore, the data was also analyzed using paired sample T-test, in order to determine whether there is a difference between the mean of the pre-test and post-test.

The qualitative data was transcribed, and then analyzed to better understand the view of the special education teacher about using badges in the classroom.

3. Findings

3.1 Badge system; the awarded badges

This section will discuss the first sub-question: How can badges be awarded in order to motivate students in secondary special education? There are various factors that can be taken into consideration when designing badges for educational purposes. Facey-Shaw (2019) identified three core design dimensions for badge systems. The three dimensions are the specific function of badges, the structure of badges, and the different types of interaction with badges. In this section the focus is on the first and second dimension.

3.1.1 The specific function of badges. The purpose for which a badge is used is the primary decision that needs to be made when designing a badge system. Badges can be designed to serve a single purpose, such as motivation (Abramovich et al., 2013), engagement (Anderson et al., 2014), or participation (Barata et al., 2015), and provide recognition of achievement, skill accomplishment and assessment (Haaranen et al., 2014). Besides the single purpose, badges can also be designed to serve dual purposes (Botha, Herselman, & Ford, 2014) for multiple purposes (Pedro et al., 2015). The badges in this research were designed with the purpose to motivate students.

3.1.2 The structure of badges. Once the purpose of the badge has been determined, the badge system needs to then be structured in a particular way to achieve its purpose. Which means that the badge system could combine different linear or non-linear badges to provide students with a way to progressively earn more badges after they accomplish a certain goal. One way is to give students a badge when they achieve mastery of skill (Abramovich et al., 2013), or a learning goal (Botha et al., 2014). Also, a participatory badge can be awarded. Abramovich et al. (2013) found that participatory badges affected critical learners' motivation. Furthermore, the researchers suggested that systems, which include badges, could have a positive effect on the motivation of critical learners. This study includes progressive badges, which means that badges are granted based on student's progress and mastery of skills (Abramovich et al., 2013). Students receive a badge when they master certain goals. Students can also earn a participation badge, which can be earned when students actively participate in the class.

3.2 Interaction features of badges

This section will discuss the second sub-question: What interaction features of badges fit to motivate students in secondary special education? This study examines three different aspects as it relates to the interaction of badges, the visual appeal of badges, the information on earned badges, and

the social consideration. The visual appeal of badges can have an impact on how students interact with the badge system (Facey-Shaw, 2019). Cucchiara, Giglio, Persico, and Raffaghelli (2014) used red, green, and blue colors badges, which were similar to the module in the badge system. While Börner, Kalz, Ternier, and Specht (2013) also used different colors and forms to distinguish the different kind of badges.

The information on earned badges can be provided through a status screen (Massung, Coyle, Cater, Jay, & Preist, 2013) or through a badge ladder presentation of earned badges (Anderson et al., 2014). A badge ladder presentation of earned badges shows all the earned badges, those not yet earned and how to obtain the badges. Anderson et al. (2014) suggests that a badge ladder keeps users engaged by clearly showing how the next badge can be earned. Massung et al. (2013) used a leader board in their study as a source of extrinsic motivation. Participants desired to achieve a high position on the leader board.

As students interact with the badge system, they are able to compare themselves with others. This is related to social consideration. Moreover, this can be achieved by showing the progress that is being made throughout the course by individual students and by the class as a whole, by showing peer achievements (Santos et al., 2013). Students can be encouraged by displaying peer achievements, competition and social feedback (Massung et al., 2013; Melville, 2014), which as a result, can motivate students. Haaranen et al. (2014) suggests that displaying student's badges could enhance the social aspects of badge systems. Moreover, it could make badges more desirable and can motivate students to seek after them.

The badges in this research were developed based on the above-mentioned information. The badges were developed using the website; www.accreditable.com. The colors used for the student's achievements badges were green, red, blue and yellow, see Figure 2 for an example of a student's achievements badge. The red, blue, and yellow were similar to the method used during the computer science course. The green was based on the program offered, which is Spreadsheet. Besides the student's achievements badge, students also received a participation badge every time they were present in the computer science class (see Figure 2). The participation badge has a different form than the student's achievement badge.

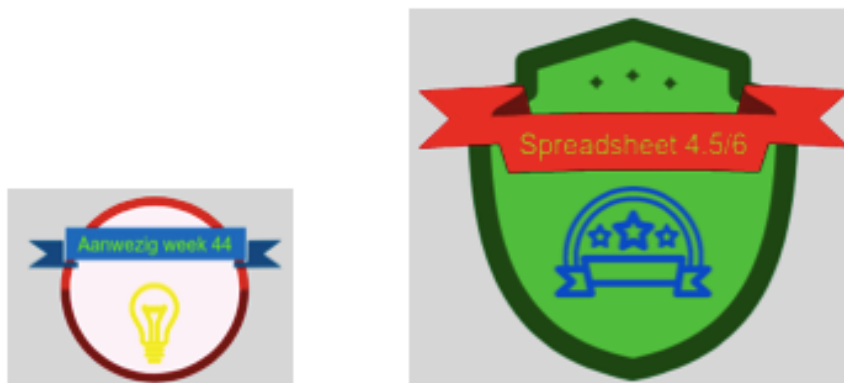


Figure 2. Example of a participation badge and a student's achievements badge

The information on earned badges was provided through a status screen. An overview of the students who participated in this research and their earned badges was created in Google documents (see Figure 3). This document was placed in Google Classroom for the students. The status screen showed the participation and the achievement badges earned. In this way the badges were also visible to peers. The badge leader board was not used in this badge system, but through the status screen students were able to compare their progress to other students. The badges included in this research were used to help track student's progress. The students were notified at the beginning of each class that they received a badge.

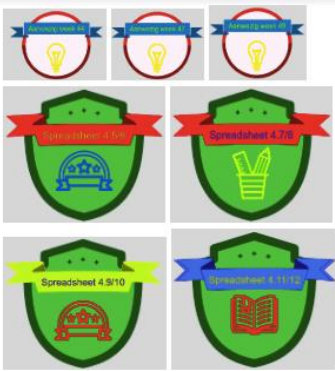
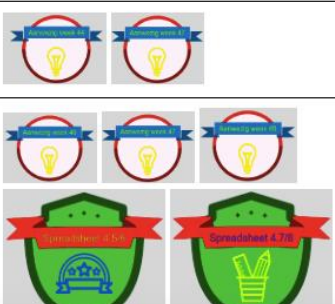

1	Student name + last name	
2	Student name + last name	
3	Student name + last name	

Figure 3. Badges and status green in this badge system

3.3 The effect of a badge system on students' intrinsic motivation

This section will discuss the third sub-question: What is the effect of a badge system on students' intrinsic motivation for the computer science course? A paired sample T-test analysis was conducted in order to determine whether the mean score of the students' intrinsic motivation before applying the badges is statistically significantly different from the mean score after applying the badges. The post-test ($M = 4.21$, $SD = .68$) reported significantly higher levels of intrinsic motivation than the pre-test ($M = 3.58$, $SD = .80$), $t(33) = -4.64$, $p < 0.05$. See Table 2. There is enough evidence to suggest that the difference between the two mean scores of students' intrinsic motivation is statistically significant. The magnitude of the difference in the mean scores ($M = 0.632$, 95% CI [0.909, .355]) is fairly large ($d = 0.85$). The effect size for this analysis was estimated between Cohen's (1988) convention for small ($d = 0.20$), medium ($d = 0.50$) and large effect ($d = 0.80$).

Table 2

Paired Sample t-Tests Results For Intrinsic And Extrinsic Motivation

	$M (SD)$	SEM	95% CI of the Difference		t	df	Significant (two-tailed)	Cohen's d
			Lower	Upper				
Intrinsic Motivation	-.632 (.794)	.136	-.909	-.355	-4.640	33	.000	.850
Extrinsic Motivation	.191 (1.300)	.223	-.262	.645	.858	33	.397	.168

The six subscales of the IMI were also analyzed. The results showed that five of the six subscales were found to be significant. Starting with the interest/enjoyment subscale. The post-test ($M = 4.42$, $SD = 1.28$) reported significantly higher levels of interest/enjoyment than the pre-test ($M = 3.94$, $SD = 1.26$), $t(33) = -2.18$, $p < 0.05$. See Table 3. The magnitude of the difference in the means ($M = .485$, 95% CI [0.938, .033]) was small ($d = 0.38$).

Students also reported a significant higher level of perceived competence in the post-test. The post-test ($M = 4.99$, $SD = 0.99$) reported significantly higher levels of perceived competence than the pre-test ($M = 4.50$, $SD = 1.12$), $t(33) = -2.07$, $p < 0.05$. The magnitude of the difference in the means ($M = .488$, 95% CI [.967, .009]) was fairly medium ($d = 0.46$).

The effort/importance was also found to be significant. The post-test ($M = 4.99$, $SD = 1.05$) reported significantly higher levels of effort/importance than the pre-test ($M = 4.52$, $SD = 1.09$), $t(33) = -2.14$, $p < 0.05$. The magnitude of the difference in the means ($M = .465$, 95% CI [.906, .023]) was fairly medium ($d = 0.44$).

The pressure/tension was not significant. The post-test ($M = 4.75$, $SD = .774$) did not reported significantly higher levels of pressure/tension than the pre-test ($M = 5.02$, $SD = .801$), $t(33) = 1.76$, $p < 0.05$. The magnitude of the difference in the means ($M = .276$, 95% CI [.043, .596]) was small ($d = 0.35$).

Also, the perceived choice was found to be significant. The post-test ($M = 3.45$, $SD = 0.97$) reported significantly higher levels of perceived choice than the pre-test ($M = 2.84$, $SD = 1.11$), $t(33) = -2.74$, $p < 0.05$. The magnitude of the difference in the means ($M = .609$, 95% CI [1.062, .157]) was medium ($d = 0.59$).

At last, the value/usefulness subscale was also significant. The post-test ($M = 4.90$, $SD = 1.17$) reported significantly higher levels of values/usefulness than the pre-test ($M = 3.61$, $SD = 1.56$), $t(33) = -4.40$, $p < 0.05$. The magnitude of the difference in the means ($M = 1.290$, 95% CI [1.886, .694]) was large ($d = 0.94$).

Table 3

Paired Sample t-Tests Results For IMI subscales

	<i>M (SD)</i>	<i>SEM</i>	95% CI of the Difference		<i>t</i>	<i>df</i>	Significant (two-tailed)	Cohen's <i>d</i>
			<i>Lower</i>	<i>Upper</i>				
Interest/enjoyment	-.485 (1.30)	.222	-.938	-.033	-2.182	33	.036	0.38
Perceived Competence	-.488 (1.373)	.235	-.967	-.009	-2.074	33	.046	0.46
Effort/Importance	-.465 (1.265)	.217	-.906	-.023	-2.143	33	.040	0.44
Pressure/tension	.276 (.915)	.157	-.043	.596	1.763	33	.087	0.35
Perceived Choice	-.609 (1.297)	.222	-1.062	-.157	-2.740	33	.010	0.59
Value/usefulness	-1.290 (1.709)	.293	-1.886	-.694	-4.402	33	.000	0.94

3.4 The effect of a badge system on students' extrinsic motivation

This section will discuss the fourth sub-question: What is the effect of a badge system on students' extrinsic motivation for the computer science course? A paired sample T-test analysis was conducted in order to determine whether the mean score of the students' extrinsic motivation before applying the badges is statistically significant in comparison to the mean score after applying the badges. The post-test ($M = 4.73$, $SD = 1.28$) did not report significantly higher levels of extrinsic motivation than the pre-test ($M = 4.92$, $SD = 1.00$), $t(33) = .858$, $p > 0.05$. See Table 2. There is not enough evidence to suggest that the difference between the two mean scores of students' extrinsic motivation is statistically significant. The magnitude of the difference in the means ($M = 0.191$, 95%

CI [0.262, 0.645]) was small ($d = 0.17$). The effect size for this analysis was found to not exceed Cohen's (1988) convention for small effect ($d = 0.20$).

3.5 Teacher's point of view about using badges in the classroom

This section will discuss the fifth sub-question: What is the view of a special education teacher about using badges in the classroom to motivate the students? It was the first time that the teacher worked with badges in her lessons. She was asked to describe her experience regarding the badges during the lessons. Her first reaction in regard to the badges was very positive. The teacher said, "The badges is a very easy and innovative way for students to show that they possess certain knowledge or skills. The teacher also quickly gets an overview of what skills and knowledge a student possesses."

The teacher was asked if she sees an advantage for using badges in her lessons. She answered yes. The teacher said, "Besides that I could quickly see which skills the student had acquired; I saw that the students were intrigued about the badges. Moreover, the students were asking a lot of questions about the badges at the start of each lesson." The teacher also said that most of the time it took a while before students could get to work after they received their assignments. Since the badges were implemented in each of lesson, it seems like students got to work on their assignment faster than before.

The teacher was asked if she sees a disadvantage for using badges in her lessons. She answered yes to this question. The teacher said, "There is a chance that students will work too fast on their assignment only to receive a badge." She continues, "Also, the use of badges in the lesson will require extra planning each time, which badge do I want to distribute, what knowledge or skill do I attach to each badge? Additionally, I will need to design and create the badges. At the beginning, a lot of extra time will be added to my to do list." Regardless of the before mentioned disadvantages, the teacher still wishes to implement the badges in her lessons, and also in the other grades.

The teacher was asked how she feels about the use of badges at school. The teacher said, "I absolutely see the possibility to implement badges at our school. It could be a way to motivate students for school." She wishes to implement badges in the other lessons and in the different grades. In short, the teacher is enthusiastic about the badges. Even though the badges will be an extra task for her, she still wishes to implement badges in her lessons.

4. Conclusion and discussion

4.1 Discussion

As outlined previously, the purpose of this study is to examine to what extent can gamification and reward instruments (badges) affect students' motivation in special secondary education. In short, this study shows that badges have a positive effect on the intrinsic motivation of students. Moreover, badges also had a positive effect on the interest/enjoyment, perceived competence, effort/importance, perceived choice and value/usefulness. However, badges had no effect on the extrinsic motivation of

students in this study. There was also no effect found for feeling pressure/tension during this study. For this study, students received a participation badge and an achievement badge, and the badges were designed with the purpose to motivate students. The information on the participation and the achievement badges was provided through a status screen. The status screen was visible to peers, so students were able to compare their progress to other students.

4.1.1 Intrinsic Motivation. The first aim of this study was to examine to what extent can gamification and reward instruments (badges) affect students' intrinsic motivation in special secondary education. The findings show that gamification and reward instruments (badges) have a positive effect on students' intrinsic motivation. Students' intrinsic motivation refers to a behavior that comes from within (Ryan & Deci, 2000). This behavior is exhibited, because he or she is genuinely interested or entertained (Ryan & Deci, 2000). This is consistent with the results in this study. The findings show a statistically significant result for students' interest and enjoyment. These findings suggest that students were intrinsically motivated, because students were more likely to be genuinely interested. Moreover, the subscale of the Intrinsic Motivation Inventory (IMI) that measures interest/enjoyment is the only category that measures self-reported intrinsic motivation directly (Monteiro, Mata, & Peixoto, 2015). The results of this category reflect the intrinsic motivation experienced by the students themselves. Additionally, this category evaluates the interest and intrinsic pleasure when students are doing a specific activity (Monteiro et al, 2015).

There are three basic psychological needs that motivate someone to initiate a behavior (Schunk et al., 2007). These include the need for competence, autonomy, and relatedness. The findings of this study show a statistically significant result for students' perceived competence and perceived choice, which relates directly to self-determination theory (SDT) and its basic psychological needs of competence and autonomy (Monteiro et al., 2015). These two categories are hypothesized as positive predictors of intrinsic motivation. The perceived choice category assesses how students feel about their engagement in a specific activity, since they choose to execute it. The perceived competence category evaluates how effective students feel while completing an assignment (Monteiro et al., 2015). In this study the findings show that students chose to work on their tasks because they wanted to. Students felt that they had a choice in the activity. Also, students reported that they were satisfied with their task performance and thought they are pretty skilled at the activity. The students not only need to feel competent in order to enhance intrinsic motivation, but they also need to experience a sense of autonomy (Ryan & Deci, 2000).

This study shows that earning achievement badges have a positive effect on students' intrinsic motivation. Hakulinen et al. (2015), also found that achievement badges have a positive effect on students' behavior and motivation. Earning badges is an indication of competence, encourage connectedness, and promotes autonomy, which enhances intrinsic motivation, and motivates students'

participation (Cavusoglu, Li, & Huang, 2015). Badges have two aspects, the controlling aspect and the informational aspect (Hakulinen et al., 2015). The informational aspect of rewards tends to increase intrinsic motivation by increasing students' feeling of competence and self-determination (Deci, 1972). Furthermore, one way to encourage intrinsic motivation is by providing feedback (Deci, 1972). Students' motivation through badges rest on the way students interpret the received feedback and the information aspects of the badges. This may explain the reason that the results of this study show that badges have an effect on the intrinsic motivation of the students.

4.1.2 Extrinsic Motivation. The second aim of this study is to examine to what extent gamification and reward instruments (badges) are able to affect students' extrinsic motivation in special secondary education. The findings show that gamification and reward instruments (badges) had no effect on students' extrinsic motivation. This result is consistent with the theory. Extrinsic motivation consists of a set of four different extrinsic motivated behaviors that are completely extrinsically motivated (Ryan & Deci, 2000; Schunk et al., 2007). The four extrinsic motivations are external regulation, introjected regulation, identified regulation, and integrated regulation. Introjected regulation is illustrated in students who participate in a task because they feel pressured, or because they think they should. Moreover, it measures the pressure students feel to succeed when performing a task (Ryan & Deci, 2000; Schunk et al., 2007). The findings of this study suggest that students didn't feel pressured or tension while doing the tasks. Moreover, students reported feeling relaxed, felt no anxiety while doing the activity, and felt they had a choice. Additionally, the pressure/tension category is theorized as a negative predictor of intrinsic motivation. Thus, the negative predictor of intrinsic motivation was minimally present.

The findings show that students identified with the value and usefulness of the tasks. Based on the theory of Ryan and Deci (2000) this might suggest that students have a more utilitarian reason to do the assignment, rather than intrinsic interest in the assignment. The aforementioned findings describe the students' identified regulation of extrinsic motivation (Ryan & Deci, 2000; Schunk et al., 2007). The behavior driven by integrated regulation is done for its results, which are separate from the behavior itself, even if the students choose to do the activity and identify with the value of the activity. After a certain amount of time extrinsic motivation will become intrinsic motivation (Ryan & Deci, 2000; Schunk et al., 2007). This study does not provide enough evidence to support the integrated regulation of extrinsic motivation. The data available is not enough to examine if students first experienced integrated regulation and after a while it switched to intrinsic motivation. The statistically significant results found in this study for the effort students exhibited, and the importance they placed on earning their badges indicates how hard the students are willing to work for the computer science course, because they see the course as valuable.

4.2 Limitation

This study is the first to examine the extent to which gamification and reward instruments (badges) can affect students' motivation in special secondary education, which provides knowledge of the use of badges in the special secondary education. There are several limitations that should be taken into consideration when interpreting the results. In the process of filling out the questionnaires, the researcher found that some students did not fill in the questionnaire, or students did not fill in a few questions. They had different reasons for not filling in the questions, such as overlooking a question, or simply not wanting to fill in the questionnaire at that time. These students took more time to fill in the questionnaire. Furthermore, some students needed some help understanding the questions. It may be possible that the findings in this study are not based on the true feelings of the students. However, the researcher chose to use this data notwithstanding, because the students still took the time to fill in the questionnaire and asked questions if something was unclear. Future research can use the face-to-face interview as an alternative to the paper-and-pencil questionnaire. Face-to-face is often used when there is reason to believe that prospective research participants either would not be motivated to complete a paper-and-pencil questionnaire or would encounter difficulty understanding how to indicate responses (Hoyle, Harris, & Judd, 2002).

Another limitation in this study was the study sample. This study was conducted in one special secondary school in the Netherlands. Moreover, this study was conducted in one subject, with only 3rd grade students and with one teacher responsible for the instruction. Also, the sample group consisted of more boys than girls. As a result, generalization can occur, and it is difficult to know if the results can be replicated in other special secondary education in the Netherlands. Future research may focus on a more diversified study sample by using other quantitative sampling strategies, such as probability sampling (Creswell, 2014).

4.3 Recommendation

Every student in this study received a badge. They either received a participation badge, an achievement badge, or both badges. Through a badge, students can show that they possess the necessary competencies for them to proceed to the next module (Kerver & Riksen, 2016). In short, badges are insignia or images that show that the student has acquired certain knowledge or skills and has obtained the certification in question (Blanc & De Werk, 2018; Kerver & Riksen, 2016). The badges in this study hold information about specific knowledge or skills students have acquired. However, students couldn't use the badge to proceed to the next module. In other words, the badges had minimum value for the students. It would be ideal to create badges that students could use to enter the next module or the next grade. Thus, future badges should have a more meaningful value for students in secondary special education and should be implemented school wide.

4.4 Conclusion

The purpose of this study is to examine to what extent gamification and reward instruments (badges) affect students' motivation in special secondary education. The results show that badges had a positive effect on students' intrinsic motivation. However, badges had no effect on the extrinsic motivation of students. The IMI is composed of six subscales, which are interest/enjoyment, perceived competence, perceived choice, pressure/tension, effort/importance, and value/usefulness. There was a statistically significant effect found for the interest/enjoyment, perceived competence, effort/importance, perceived choice, and value/usefulness subscales, but not for the pressure/tension subscale.

The interest/enjoyment subscale is the only category that measures self-reported intrinsic motivation directly from students. Furthermore, the perceived competence and perceived choice are hypothesized as positive predictors of intrinsic motivation. Students not only need to feel competent in order to enhance intrinsic motivation, but they also need to experience a sense of autonomy (Ryan & Deci, 2000). These findings provide evidence that badges have an effect on students' intrinsic motivation. The results found for the effort/importance and value/usefulness subscales indicate that students are willing to work hard for the computer science course, because they see the course as valuable. The results found for the pressure/tension subscale suggest that students didn't feel pressure or tension while doing the tasks. The pressure/tension category is theorized as a negative predictor of intrinsic motivation. It can be concluded that badges have a positive effect on students' motivation in special secondary education, and badges could be a great addition to lesson planning in special education to aid in fostering higher student motivation.

5. Relevance

5.1 Scientific Relevance

This research is possibly the first research to investigate the effect of badges on students' motivation in special needs education. There are other studies regarding gamification and motivation, but few of these studies are conducted in special education settings. This study contributes to the existing scientific knowledge regarding this topic.

5.2 Social Relevance

This study may result in a method to increase students' motivation in special education by implementing badges. In addition, this study may encourage other teachers and other special education schools to implement badges in their courses.

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Appendix A

Nameting

Leeftijd: _____

Klas: _____

Geslacht:

- ☐ **Man**
- ☐ **Vrouw**
- ☐ **Neutral (X)**
- ☐ **Anders** _____

Geef voor elk van de volgende uitspraken met een cirkel aan hoe waar het voor je is met behulp van de volgende schaal:

1	2	3	4	5	6	7
Helem	Oneens	Enigszi	Niet	Enigszi	Mee	Sterk
aal mee		ns oneens	mee eens	ns mee	eens	mee eens
oneens			en niet mee	eens		
			oneens			

1. Ik vond deze activiteit / opdracht erg leuk om te doen.

1 2 3 4 5 6 7

2. Deze activiteit / opdracht was erg leuk.

1 2 3 4 5 6 7

3. Ik dacht dat dit een saaie activiteit / opdracht was.

1 2 3 4 5 6 7

4. Deze activiteit / opdracht hield mijn aandacht totaal niet vast.

1 2 3 4 5 6 7

5. Ik zou deze activiteit / opdracht omschrijven als erg interessant.

1 2 3 4 5 6 7

6. Ik dacht dat deze activiteit / opdracht best wel leuk was.

1 2 3 4 5 6 7

7. Terwijl ik met deze activiteit / opdracht bezig was, dacht ik eraan hoe leuk ik het vond.

1 2 3 4 5 6 7

8. Ik denk dat ik best wel goed ben in deze activiteit / opdracht.

1 2 3 4 5 6 7

9. Ik denk dat ik best wel goed was in deze activiteit / opdracht, vergeleken met andere leerlingen.

1 2 3 4 5 6 7

10. Na het afronden van deze activiteit / opdracht, voelde ik mij best wel competent.

1 2 3 4 5 6 7

11. Ik ben tevreden met mijn prestatie op deze taak.

1 2 3 4 5 6 7

12. Ik was best wel vaardig in het uitvoeren van deze taak.

1 2 3 4 5 6 7

13. Dit was een activiteit / opdracht die ik niet zo goed kon doen.

1 2 3 4 5 6 7

14. Ik stak veel moeite in deze activiteit / opdracht.

1 2 3 4 5 6 7

15. Ik probeerde niet heel erg om deze activiteit / opdracht goed te doen.

1 2 3 4 5 6 7

16. Ik deed erg mijn best om deze activiteit / opdracht goed te doen.

1 2 3 4 5 6 7

17. Het was voor mij belangrijk om het goed te doen in deze taak.

1 2 3 4 5 6 7

18. Ik stak er niet veel energie in.

1 2 3 4 5 6 7

19. Ik voelde mij niet nerveus terwijl ik bezig was.

1 2 3 4 5 6 7

20. Ik voelde mij zeer gespannen terwijl ik met deze activiteit / opdracht bezig was.

1 2 3 4 5 6 7

21. Ik was erg ontspannen tijdens deze activiteit / opdracht.

- 1 2 3 4 5 6 7
22. Ik voelde mij bezorgd toen ik met deze taak bezig was.
- 1 2 3 4 5 6 7
23. Ik voelde druk tijdens deze activiteit / opdracht.
- 1 2 3 4 5 6 7
24. Ik geloof dat ik enige keuze had in het uitvoeren van deze activiteit / opdracht.
- 1 2 3 4 5 6 7
25. Ik voelde dat het niet mijn eigen keuze was om deze activiteit / opdracht te doen.
- 1 2 3 4 5 6 7
26. Ik had niet echt een keuze om deze activiteit / opdracht te doen.
- 1 2 3 4 5 6 7
27. Ik voelde dat ik werd verplicht om het te doen.
- 1 2 3 4 5 6 7
28. Ik deed deze activiteit / opdracht omdat ik geen keuze had.
- 1 2 3 4 5 6 7
29. Ik deed deze activiteit / opdracht omdat ik het graag wilde.
- 1 2 3 4 5 6 7
30. Ik deed deze activiteit / opdracht omdat ik het moest.
- 1 2 3 4 5 6 7
31. Ik geloof dat deze activiteit / deze opdracht mij iets zou kunnen opleveren.
- 1 2 3 4 5 6 7
32. Ik denk dat het doen van deze activiteit / deze opdracht nuttig is.
- 1 2 3 4 5 6 7
33. Ik denk dat het doen van deze activiteit / deze opdracht belangrijk is.
- 1 2 3 4 5 6 7
34. Ik zou bereid zijn om het opnieuw te doen als deze activiteit / deze opdracht iets van waarde voor mij heeft.
- 1 2 3 4 5 6 7
35. Ik denk dat het doen van deze activiteit / deze opdracht mij ergens in helpt.
- 1 2 3 4 5 6 7

36. Ik denk dat het doen van deze activiteit / deze opdracht gunstig is voor mij.

1 2 3 4 5 6 7

37. Ik denk dat dit een belangrijke activiteit / opdracht is.

1 2 3 4 5 6 7

Deel 2

1	2	3	4	5	6	7
Helem	Niet	Enigszi	Neutra	Enigszi	Waar	Helem
aal niet	waar	ns niet	al	ns waar		aal waar
waar		waar				

1. Een goed cijfer halen voor dit vak is een belangrijke beloning voor me.

1 2 3 4 5 6 7

2. Het meest belangrijkste voor mij is om mijn cijfergemiddelde te verbeteren, dus mijn grootste zorg is een hoog cijfer halen voor dit vak.

1 2 3 4 5 6 7

3. Als het me lukt, wil ik graag een hoger cijfer dan mijn klasgenoten.

1 2 3 4 5 6 7

4. Ik wil goed zijn in dit vak, want ik wil dat mijn familie, vrienden en docent zien wat ik kan

1 2 3 4 5 6 7

Appendix B

Pre-Test

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
→ Cases	Valid	34	100.0
	Excluded ^a	0	.0
	Total	34	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.908	.907	35

Post-Test

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	34	100.0
	Excluded ^a	0	.0
	Total	34	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.924	.924	37

Appendix C

Interview Questions Teacher

Interview vragen

Demografisch

Leeftijd: _____

Geslacht:

- ☐ **Man**
- ☐ **Vrouw**
- ☐ **Neutral**
- ☐ **Anders** _____

Dienstjaren: _____

Perspectief van de docent

1. Kan je je ervaring met het gebruiken van badges beschrijven?
2. Is het de eerste keer dat je met badges hebt gewerkt in de les?
3. Zie je een voordeel voor het gebruik van badges in jouw lessen?
 - a. Welke voordelen zie je?
4. Zie je een nadeel voor het gebruik van badges in jouw lessen?
 - a. Welke nadelen zie je?
5. Hoe staat je tegenover het gebruik van badges in jouw lessen?
6. Hoe staat je tegenover het gebruik van badges op school?
7. Zie je de mogelijkheid om de badges te blijven gebruiken in je lessen?

Appendix D

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Leeftijd v Leerlingen	34	13	16	14.53	.748
Geslacht van de leerlingen	34	1	2	1.12	.327
Valid N (listwise)	34				

Frequencies

Statistics			
		Leeftijd v Leerlingen	Geslacht van de leerlingen
N	Valid	34	34
	Missing	0	0

Frequency Table

Leeftijd v Leerlingen

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	13	2	5.9	5.9	5.9
	14	15	44.1	44.1	50.0
	15	14	41.2	41.2	91.2
	16	3	8.8	8.8	100.0
	Total	34	100.0	100.0	

Geslacht van de leerlingen

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Man	30	88.2	88.2	88.2
	Vrouw	4	11.8	11.8	100.0
	Total	34	100.0	100.0	

Appendix E

T-test Intrinsic Motivation

T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Voormeting_Interne_motivatatie	3.9723	34	.79887	.13701
	Nameting_Interne_Motivatatie	4.5319	34	.76384	.13100

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Voormeting_Interne_motivatatie & Nameting_Interne_Motivatatie	34	.400	.019

Paired Samples Test

		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Voormeting_Interne_motivatatie – Nameting_Interne_Motivatatie	-.55966	.85622	.14684	-.85841	-.26091	-3.811	33	.001

Appendix F

T-test Extrinsic Motivation

T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Voormeting_Externe_Motivat	4.9191	34	.99567	.17076
	Nameting_Externe_Motivat	4.7279	34	1.28270	.21998

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Voormeting_Externe_Motivat & Nameting_Externe_Motivat	34	.371	.031

Paired Samples Test

		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Voormeting_Externe_Motivat - Nameting_Externe_Motivat	.19118	1.29985	.22292	-.26236	.64472	.858	33	.397