# STEM Programs for Students with High Learning Potential in Norway and California, USA.

*A multiple-case study exploring how two educational programs work towards meeting students' educational and social needs*

Mathilde Fostervoll Lange

Master of Philosophy in Comparative and International Education

Department of Education, Faculty of Educational Science

UNIVERSITY OF OSLO

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# Abstract

This multiple-case study explores how two educational programs in Norway and California, USA, work towards meeting the educational and social needs of students with high learning potential. Gifted education has a long tradition in the U.S., while it is only in recent years that education provision for students who need extra challenges has been put on the agenda in Norway. These different traditions in providing education to students with high learning potential made for an interesting case study, comparing the two programs in their unique contexts. As the needs of these students are complex and different from regular students, this study serves the purpose of exploring how these students' needs are met through the programs. The exploration is done through interviews with teachers and students in a Tech Program in a suburb in southern California and a Talent Center in a big city in Norway. The findings revealed that the programs largely meet the students' needs, when looking at it through the theoretical framework and additional literature. Through an argument on acceleration, enrichment and provision of creativity training, the programs met the students' educational needs, although it indicated that the Talent Center did meet the students' needs to a larger degree than the Tech Program. Through social environments, preference for group work and meting similar minded peers, the programs met the students' social needs in different ways. The informants reported invested families that contributed to the students' participation in the programs, although the students in the Talent Center reported more pressure and stress when it came to their families and educational achievement. The differences between the programs in the ways in which they work towards meeting the students' needs can be attributed to structural differences, gender and cultural differences. In providing special programs for these students, there should be some set standards for themes and social aspects, although the assignments and content should allow for fluidity according to students' interests and personalities. This thesis sheds light on the subject of educational provision for students with high learning potential, which will hopefully inspire Norwegian legislation and improve the conditions for students in both programs. As the Norwegian literature has provided information on how the students with high learning potential's needs not being met in the regular classroom, the results from this study differs from other research projects in the field. This study shows that students attending special programs suited for their needs are effective. This should argue for a stronger focus on these students, further research on and provision of special programs for students with high learning potential.

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Mathilde Fostervoll Lange

# Figures, tables and appendices

# Acronyms

| | |
|---|---|
| CSDPG | Council of State Directors of Programs for the Gifted |
| NAGC | National Association for Gifted Children |
| OECD | Organization for Economic Co-operation and Development |
| TC | Talent Center |
| TP | Tech Program |

# Table of Content

# 1 EDUCATING STUDENTS WITH HIGH LEARNING POTENTIAL

## 1.1 Relevance

Gifted education provides gifted students with appropriate educational provisions that suit their needs, needs that often cannot be met in the traditional classroom (Renzulli & Renzulli, 2010). The topic of gifted education is highly relevant when discussing education today, as we are dependent on the most promising talents for developments and innovations in a world that is increasingly globalizing and pushing for more worldwide competition. Countries succeeding in helping individuals reach their full potential, are more likely to ensure social, cultural, scientific, and economic progress. Conducting research on gifted students is an important step towards improving the education opportunities for our most able children (Ziegler, 2009).

Gifted education is important on the national level, but also at the individual level (Norwegian Ministry of Education and Research, 2016b). Individuals have the right to develop their potential talents to the highest level through schooling (Nissen, Kyed, Baltzer, & Skogen, 2012). Lack of adjusted learning to fit the needs of gifted students might lead to underachieving, which is not fulfilling the individual's potential and results in loss of academic motivation (Idsøe, 2014). If the gifted students are provided with support and adapted education suited to their needs, they are able to perform better than non-gifted students. Academic success is also intertwined with the students' social needs. In order to develop gifts and succeed academically, the environment surrounding the individual needs to be nurturing and supportive (Idsøe, 2014). Special programs are regarded as one important element in providing students with appropriate challenges that meets the educational and social needs of gifted students. Special programs can be described as incubators of talent development (Subotnik, Almarode, & Lee, 2016). Improving the Science, Technology, Engineering and Math (STEM[1]) competencies is central to a country's competitiveness (OECD, 2016b) . Specialized STEM programs are one way of meeting the needs of the gifted

[1] In this study this abbreviation is used to describe the American concept of Science, Technology, Engineering and Math (STEM), and the Norwegian concept of *realfag*, which includes Math, Science and Technology.

students who are interested in STEM and for the nation to increase the overall level of competencies within the field.

This study aims at exploring how two educational programs for gifted students work towards meeting the students' educational and social needs. The study is a multiple case study (Yin, 2014), comparing two STEM programs at a Talent Center in Norway and a Magnet Tech Program in California. Exploring how the programs meet their students' needs can give us information on how gifted students experience their education provision in these special programs, which gives us valuable information on how to adapt and provide education that meets these students' needs.

## 1.2 Definitions of giftedness

There are several definitions and terms that cover the term *gifted students* in Norwegian and international literature. Numerous definitions of giftedness are used in the field (Renzulli, 2002), which makes a wholesome comparison of definitions difficult to proceed with in the present thesis. The variety reflects the diversity and the complexity that these students show. The literature poses several terms and definitions of the students, and these includes: gifted students, academic talent, exceptional students, talented students, high achieving students, students with high learning potential and giftedness. Perhaps, the most common is the term "gifted students" in English and "evnerike elever" in Norwegian. For this study, I chose to use a more inclusive term in order to address who these students really are. In an Official Norwegian Report initiated by the Norwegian Ministry of Education and Research on "high achieving students" from 2016, the committee chose the term "students with higher learning potential" (Norwegian Ministry of Education and Research, 2016b). This term describes the student group appropriately for this thesis, as it covers the diversity and heterogeneity of the student group. While several of these students are performing at a high level, there are also students who underachieve and are not fulfilling their potential. Thus, the term covers the students that are high performers, but also the students that have high potential for learning but have not necessarily fulfilled their potential. The term is not limited to giftedness, talents or other skills as it is open to different sets of skills and the potential of achieving it. This wide and descriptive definition makes the term most suitable for this thesis, as the informants fit this description. In the following sections and chapters, I will refer to this student group as

"students with high learning potential", regardless of the terms used by authors and scholars cited in this thesis.

## 1.3 Purpose and knowledge gap

The purpose of this study is to explore how the two STEM programs work towards meeting the educational and social needs of students with high learning potential through the lens of the multifactor model (Mönks, 1992). The multifactor model aims to visualize the central factors that determine development of giftedness through two dimensions. The two dimensions, a personality dimension and a social dimension, work together and determine the development of the individual's potential. There are three categories in each dimension. The personality dimension includes high ability, motivation and creativity, and is based on Renzulli's 'Three-Ring Conception Model' (Renzulli, 2005). The social dimension includes family, peers and school. The six factors in the two dimensions are regarded as "needs" that the students with high learning potential have, which requires stimulation in order for the students to academically succeed (Mönks, 1992). The model is used as a lens to explore how the two programs meet the educational and social needs of the students with high learning potential. What makes this model useful is that is diverges from other models in the field of gifted education, models that only look at characteristics of the individual and exclude the social aspect. Additionally, the model is broad in how it regards developing giftedness. For an individual to be able to develop and stimulate their potential, there are elements in the environment that also determines the development of potential (Mönks & Katzko, 2005). The interplay of personality traits and social environment is why this model is used as the main theoretical perspective in this study.

In USA, there are several options for students with high learning potential. With options to have students in Gifted and Talented programs (GATE), honors classes, Advanced Placement classes (AP), or magnet programs there are alternatives to regular classes and schools for the academically strong students (California Department of Education, n.d.-a, n.d.-b; Davidson Institute, n.d.). In Norway, there are no fulltime special programs suited especially for these students. However, in 2016 four Talent Centers created for students with high learning potential with interest in STEM opened in four cities (Norwegian Ministry of Education and Research, 2016a). These centers are a part of a pilot project that continues until 2019. The

Talent Centers provide in-depth learning in the four subjects of STEM one or two days a month. The recent opening of the Talent Centers suggests that there is no published research on the experience of the students participating in this program. Although there is limited literature on students' experiences in Norwegian special programs there are great amounts of English literature on students' experiences in special programs in the U.S. (Almarode et al., 2014; Subotnik et al., 2016; Young & Balli, 2014). While the Norwegian government has intensified the work to improve the education for the students with high learning potential, this study touches on a highly relevant agenda in the Norwegian school system and for politicians.

The comparison of two programs in California and Norway will fulfill a knowledge gap and possibly inspire Norwegian educational policies. While Norway has not traditionally promoted talent in the way that the United States has, the comparison of how the two programs work is relevant in providing information on how the students experience that their needs are met in the two different school systems. An extensive search for research on the topic suggested that the comparison has not been conducted. There are dense amounts of literature on gifted students in English, however the field of gifted education has been neglected in Norway (Børte, Lillejord, & Johansson, 2016). This is why it is of special relevance to take a closer look at Norwegian students and how their education program meets their educational and social needs. Having a contrasting case in California provides valuable information as this is a school system that has dealt with talent promotion for decades, but might also need further research on the subject to provide the best possible education for its students. This cross-cultural study will provide new understandings on how the programs respond to their educational and social needs in two different school systems. The two programs are situated in two unique education systems, which make it likely for the programs to meet different needs of the students with high learning potential through their particular approaches to general education. The contrasting approaches to gifted education make for a relevant comparison, where new insights and knowledge can provide valuable information on how to meet the students' needs through development of successful programs. The findings from this study can provide valuable information for the program managers in both countries and hopefully, policymakers in Norway.

## 1.4 Research questions

The previous section has established the research problem and purpose, however it is valuable to have research questions to guide the project. In this study, there are two broad research questions that guide the project:

1. Research Question 1: How do the educational STEM programs work towards meeting the educational needs of the students with high learning potential?

2. Research Question 2: How do the educational STEM programs work towards meeting the social needs of the students with high learning potential?

## 1.5 Outline of the thesis

Following an introduction of the topic, establishing the purpose and the research questions, it is relevant to present the outline of the thesis to get a clear picture of the content. The second chapter of the thesis will include a background section with a brief introduction to Norwegian and Californian cultural aspects that is related to attitudes of high ability and the most relevant policies when it comes to developing educational provision for students with high learning potential. In a cross-cultural study, it is important to situate the topic in the national contexts. The third chapter situates the topic through theoretical perspectives. The chapter is separated into three sections. The first section includes two models that describe the conceptions of giftedness, 'the Three-Ring Conception of Giftedness' and 'the Multifactor Model of Giftedness'. Following up from the second model is an explanation and justification on how the model will be used as the main theoretical framework. The second section highlights aspects of educational provisions for students with high learning potential through motivation theory and how it relates to these students' school work, the most relevant pedagogical strategies to meet the students' needs, and the important role of the teacher. The following fourth chapter, Design and Methods, an introduction to multiple case study design and interview method will follow. The fifth chapter presents the findings of the comprehensive material collected in the field. In the sixth chapter, the findings will be discussed and analyzed through the lens of the multifactor model and additional relevant literature. The thesis will conclude with some final remarks on the findings of this research, and suggestions for further research on this subject.

# 2 AMERICAN AND NORWEGIAN CONTEXT

Situating the cultural and political context is important when looking at aspects of two different education systems. These aspects points to the values of education in any cultures: "The content of what is taught through socialization or education reflects the basic value orientations of any culture" (Masemann, 2013, p. 116). Situating the values of education for students with high learning potential through aspects of the culture and relevant educational policies is necessary, as schools are an institution that reflects the society's values. However, a central aspect to understand how the schools regards the students with high learning potential is the general society's attitude to development of learning potential. To situate the two cultural contexts, a brief presentation of the American dream and conflicting views on high intelligence is presented. A brief historical introduction to relevant policies in the field of gifted education follows. The next section focuses on Norwegian society's social norms of egalitarian ideologies. These social norms can seem to have influenced the limited options for the students with high learning potential, which are also introduced in a brief historical context.

## 2.1 The U.S.

This section will situate gifted education in the U.S. and more specifically in California. The types of educational provision for the students with high learning potential and relevant policies on national and state level is introduced. Concluding this section will be relevant attitudes to high ability on the cultural level. This is relevant to understanding the context in which the Tech Program is situated.

### 2.1.1 Provision and policies for gifted students

The American education system includes early childhood education, elementary school (grade 1-4), middle school (grade 5-9), high school (grade 9-12) and tertiary education (U.S. Department of Education, n.d.-c, n.d.-a). The U.S. Department of Education establishes federal policy and administers and coordinates the federal assistance for education. Each state has its own Department of Education. The California Department of Education oversees the

state's public school system, which includes over 7 million children and young adults in over 9000 schools (California Department of Education, n.d.-d).

In the U.S. there is a long tradition of focusing on individualized education (Nissen et al., 2012). It is widely understood that 'The National Defense Education Act' of 1958, which is considered the start of gifted education in the United States, emerged as a reaction to the Russian Sputnik program. This sparked the Cold War and the two nations' race to scientific programs (Heuser, Wang, & Shahid, 2017). The Marland Report was published in 1978 as the first report on the state of the art, and served as catalyst for the states to develop plans that would turn into gifted education policy in the 1970s and 1980s (VanTassel-Baska, 2018). By 1990, the federal government and all the 50 states had some form of legislation regarding gifted education. There is no federal legislation on talent promotion in the USA, and each state can determine how to identify their students as gifted, as long as it follows a set of federal guidelines (VanTassel-Baska, 2018). Although the U.S. has focused on these students for decades, these efforts are not clearly visible in international assessment such as the Programme for International Student Assessment (PISA). In PISA 2015 the share of American "top performers" (level 5 and 6) were 8,5% in science and 5,9% in math (OECD, 2016a). The OECD average in math is 10,7%, which indicates a considerably lower number for the U.S. Although the U.S. have higher percentage of top performers than the OECD average in science, with 7,1%, it is still far from the leading countries such as Singapore with 24% top performers in science (OECD, 2016a, 2018). A report on the states provision of suited education for students with high learning potential stated that the country has failed to address the need of these students (NAGC & CSDPG, 2015). The report states that there has been progress in some states, but that overall high ability learners are expected to fend for themselves and success regardless of the lack of attention and understanding of their needs. This is largely due to the lack of federal guidance or requirements of gifted services (NAGC & CSDPG, 2015).

In California the gifted education is not mandated, however the service is partially funded by the state (Davidson Institute, n.d.). At the elementary school level there are Gifted and Talented Programs (GATE), which were enacted in 1980 as an expanded service to the intellectually gifted students (California Department of Education, n.d.-b; Davidson Institute, n.d.). At high school level there are several options for gifted students. Early college high schools, Advanced Placement courses (AP) and International Baccalaureate programs (IB)

some examples of options for accelerated secondary level students (California Department of Education, n.d.-a). There are also summer programs available which also lay the groundwork for developing extraordinary skills (Cross & Coleman, 2005). Through special educational provisions and programs, appropriate education can be provided for the students.

Another option available for students with skills within a field is magnet schools or magnet school-within-a-school programs. Both magnet options operate in public schools and have a special area of study. The special area of focus can be science, math, performing arts or career education (California Department of Education, n.d.-c). A magnet school is an entire school with a special area of focus while the magnet program is a school-within-a-school which usually focuses on a special area of study. The purpose of the magnet programs and schools is to attract students from across a district. This can lead to a more balanced and diverse student population, to offer educational choices for the students and to provide specialized instruction in the school (California Department of Education, n.d.-c). Specialized magnet programs in STEM have increased in popularity in recent years (Thomas & Williams, 2009). The U.S. Department of Education states that through a strong STEM education, the nation's competitiveness will increase (U.S. Department of Education, n.d.-b). The increased focus on STEM subjects is important for the country's development; however, there are other benefits to the increased popularity. The specialized STEM programs are a way for interested students to intensively focus on these subjects: "Specialized schools, though not always explicitly intended for students who are gifted and talented, are designed to meet the needs of students who have interests and abilities in a particular academic domain" (Thomas & Williams, 2009, p. 18). Although these programs are not specifically designed for gifted and talented students, the specialized STEM programs/schools are based on choice and the schools can actively engage the students in their natural interests. This keeps their motivation sustained and offers possibilities for intense coursework in the STEM subjects (Thomas & Williams, 2009). This is an important element in regards to supporting the interests of the students whose needs are not met in a traditional school setting.

### 2.1.1 Attitudes to high ability

First of all, the U.S. is a large and diverse society, which makes even an attempt to portray 'the American society' as a whole, a rather complicated process. However, in an attempt to portray a somewhat brief understanding of how Americans relate to developing gifted

education and high ability, two central, but conflicting elements that seem to have a rather profound impact for most Americans are proposed.

The first concept, which is relevant when looking at the cultural context, is the American Dream. Many Americans share the belief in the American Dream, which is that all people can pursue success in order to achieve one's dream. Using the gifts and talents through hard work is the central element in achieving success, and if one fails, it is the person's own responsibility (Hochschild & Scovronick, 2003). One can argue that the belief in the American Dream can create feelings of wanting success and the pursuit of it, is something to be proud of. One way of reaching one's dream is through the education system. Many Americans regard their freedom as essential to the right to develop the individual abilities to the fullest. At the same time, the second aspect is that many Americans also have negative attitudes towards people who have developed high levels of intelligence. Many people think it is unfair for certain people to gain positions where they are regarded as smarter or cleverer than others (B. Clark, 2013). A national report on national excellence reported a mismatch between the distrust of the intellect and the assumption that people should be allowed to fully develop their potential, have impacted the efforts to provide quality education for the most promising students in the nation (Ross, 1993).

## 2.2 Norway

In this section, Norwegian provision and policies for students with high learning potential will be presented. Cultural aspects that are relevant when it comes to attitudes of high ability are introduced. Situating the provision, policies and attitudes is important to understanding the context of the Talent Center program.

### 2.2.1 Provision and policies for students with high learning potential

The Norwegian education system is divided into pre-school, primary school (grade 1-7), secondary school (grade 8-10), upper secondary school (grade 11-13), higher education and adult training. The Norwegian Department of Education and Research has the overall responsibility for determining the different sections of the system. The new curriculum reform in Norway from 2006 'The Knowledge Promotion', led to several changes on multiple levels

in the Norwegian Education system. Compared to the previous curriculum, there was an increased focus on learning and goal attainments. An increased focus on learning was also introduced at the kindergarten level, through the White Paper on "Quality in Kindergarten" from 2008 (Norwegian Ministry of Education and Research, 2009). The increased focus on learning and preparing the children for school, has been regarded as a threat to "free play", which traditionally has had an important position in Norwegian kindergartens (Sundsdal & Øksnes, 2015). The concept of 'individually adapted education' was added to the Norwegian Educational Act (Opplæringslova, 1998, paras. 1–3). All students should receive individually adapted education (tilpasset opplæring), which includes education that is adapted to every child's abilities, preconditions and learning level (Opplæringslova, 1998, paras. 1–3). The purpose of 'individually adapted education' is to ensure education that fits the individual's abilities, skills and premises. In order to do this, the teachers have to be aware of the students' academic level, learning capacity and learning style (Nissen et al., 2012).

Besides a few high schools for elite athletes, there are no special schools or full-time educational programs for students with high learning potential in Norway. In the Norwegian Educational Act (Opplæringslova) from 1998 and the Regulations to the Educational Act (Forskifter til Opplæringslova) from 2006, there are paragraphs that are relevant for the educational provision for students with high learning potential. Grade-based acceleration is facilitated through early school start if an assessment team approved, the students might accelerate and skip grades if necessary and age appropriate (Opplæringslova, 1998, paras. 2–1). Students in middle school with sufficient competencies can take classes at upper secondary school (Forskrifter til Opplæringslova, 2006, paras. 1–15). The teacher cannot separate the students into groups based on skill level, gender or ethnicity on a regular basis. However, the teacher can separate into groups when needed (Opplæringslova, 1998, paras. 5–1), which can facilitate group work for students with similar abilities. These legislative rights provide the students with high learning potential options of individually adapted education, acceleration and ability grouping.

There are few special options for students with high learning potential in Norway, and there exists limited research on programs for these students in Norway. The literature on Norwegian students with high learning potential has mainly focused on how the students' schools are providing individually adapted education, and whether the students' needs are met in school. The research has revealed that students with high learning potential in Norway are

not given sufficient education suited for their needs (Nissen et al., 2012; Skogen & Idsøe, 2011). An increased focus on individually adapted education and the need for differentiated instruction are the main issues for the students. Lie (2014) argues that it is difficult to identify the gifted students in the early years, as there are no traditions or competencies in the Norwegian kindergarten or school on this subject. This could be due to the long tradition of an inclusive school system, with a fear of elitism that an extra education effort given to gifted students could pose.

A Norwegian research project from 2010, interviewing five students with high learning potential, highlighted how the students were not satisfied with their education (Skogen, 2010). The informants described how their discontent with school increased as they grew older. Being students with high learning potential led to several negative consequences for the students: they experienced bullying teachers, performing worse on purpose to blend in, and lack of educational challenges. The lack of individually adapted education suited for their level, led to discontent and three of the students dropped out of school, although they overall performed well (Skogen, 2010). Other relevant aspects that can describe the general state of meeting students' needs in Norway, is the White Paper on the quality of Norwegian schools (Norwegian Ministry of Education and Research, 2008). The White paper estimated that 25% of all Norwegian students lack academic challenges and are bored in school. This can indicate that the students with high learning potential in Norway need closer follow-up in order to meet their needs.

Since 2010, the Norwegian government has put these students on the agenda through official white papers, reports and national strategies from the Norwegian Ministry of Education and Research. The efforts propose several initiatives to improve the education for the high achieving students and the students with potential of performing on a high level (Norwegian Ministry of Education and Research, 2011, 2013, 2014, 2015, 2016b, 2016c). Central is the strategy to increase the teachers' competencies in several subjects, although mainly in math. As teachers lack specialization in the main subjects and there are low minimum standards in the admission process to teacher education, the Norwegian Ministry of Education and Research put in place a strategy that aims to provide high quality teachers, attractive teacher education and continuing education for the teachers (Norwegian Ministry of Education and Research, 2014). Initiatives aimed specifically for students with high learning potential are 'the National Strategy on Mathematics, Science and Technology' (Norwegian Ministry of

Education and Research, 2015) and a 'National Report on High Achieving Students in Norway' (Norwegian Ministry of Education and Research, 2016b). The strategy for Math, Science and Technology focuses on improving the learning and competencies within these subjects. The aim of the strategy is to get more students perform at a high/advanced level, while also further challenge the already high performer (Norwegian Ministry of Education and Research, 2015). As a part of the strategy, the Ministry publishes a document annually with initiatives for the high achieving students and the potentially high achieving students (Norwegian Ministry of Education and Research, 2016c). The strategy is a part of the increased effort to get more students to perform on higher levels in STEM. Increased teacher-competencies, especially in math has also been in focus.

The rationale to increase the Norwegian students' competencies in STEM and to get more students on a higher proficiency level, is grounded in the international assessment test Programme for International Student Assessment (PISA) (Norwegian Ministry of Education and Research, 2015, 2016b). The initiatives argued for a need to increase the level of top performers, as the general tendency was that there were too few Norwegian students performing on the higher levels (level 5 or 6) in the STEM related subjects in PISA. As the share of top performers in the first years of PISA were 12% in math in 2003[2] and 6,1% in science in 2006[3] and this was lower than the OECD average in both subjects (Kjærnsli, Lie, Olsen, & Turmo, 2004; OECD, 2007, 2010, 2010, 2014b) the initiatives introduced by the Norwegian government's were an attempt to increase awareness and provide improved opportunities for students with high learning potential. When the first results from PISA 2000 were presented, the numbers were lower than the Norwegian people, politicians and educators expected, which is why the first presentation of the results is often referred to as "the PISA shock" (Haugsbakk, 2013). This shock initiated changes in the Norwegian education system to increase the focus on outcome-oriented learning and implementation of national testing systems (Karseth & Sivesind, 2010). With the changes that were legitimized through the perceived "low performance level" of Norwegian students, criticism of the test appeared. Most prominently, there were critique of how the test actually measure "real-life" situations with "authentic texts" in a variety of countries, cultures and languages (Sjøberg, 2016). Another concern is the one-sided method of comparing countries based on economic effectiveness (Krejsler, Olsson, & Petersson, 2014). Nevertheless, PISA creates engagements

[2] 2003 was the first year the share of top performers in math was measured.
[3] 2006 was the first year the share of top performers in science was measured.

and discomfort for the economies participating, as it is highly valued to be ranked among top economies.

The report on 'High Achieving Students in Norway", states that the options available for high achieving students in the Educational Act are not easily feasible and often not used (Norwegian Ministry of Education and Research, 2016b). The report highlights how "knowledge capital" is the most important resource in the society. By not adapting to the students needs to fulfill their potential, we risk loosing competencies that could result in value making and societal development. As a part of the initiatives to get more students to perform on a higher level and provide extra challenges to the already high performers, four Talent Centers for math, science and technology opened in the fall of 2016 in Bergen, Oslo, Tromsø and Trondheim (Norwegian Ministry of Education and Research, 2016a). The purpose of the centers is to provide academic tasks and activities for the students that need extra challenges, and to contribute to more students performing at a high level in the subjects. Another central aim for the Talent Centers is to provide networks to high achieving students, in order for them to connect with other high achieving students.

### 2.2.2 Attitudes of high ability

There are several factors that influence the views of high intellectual ability in Norway. In a highly egalitarian society, the ideology of inclusion is an important pillar of the Norwegian school system. Inclusion involves social, cultural and academic components that aims for a feeling of unity for all students, where all students are treated equally (Nissen et al., 2012). Skogen and Idsøe argue that the Norwegian education system is influenced by fear of elitism (2011). If the teachers provide adapted education that meet the needs of the strong students, the fear is that the students will take responsibility of the collective and have reduced social skills (Skogen & Idsøe, 2011).

The fear of elitism could be linked to 'the law of Jante' (janteloven), which was introduced in the Danish writer Aksel Sandemose's novel from 1933. The central idea of the 'law of Jante' is that people should not think that they are better than anyone else (Sandemose, 2000). The fear of individualism is something most Norwegians share (Avant & Knutsen, 1993). This fear could lead to diminishing talents: "Creative and inventive talents may not be encouraged, particularly when these talents are seen as a threat to overall equality" (Avant & Knutsen, 1993, p. 452). Providing special education to students with high learning potential is in the

center of an excellence-egalitarian dilemma, which not only exists in Norway but is universal (Tannenbaum, 2000). How to appropriately adapt the education to suit the students' needs while not threatening the equality and democratic principals is a dilemma for educators. Subsequently, in Norway the education for students with high learning potential has not been a priority of teachers, principals and even politicians as this could threaten the inclusive and equality-driven education system.

## 2.3 Summary

There are similarities and differences in the two countries when it comes to provision, policy and attitudes to students with high learning potential. As the U.S. has focused on providing students with high learning potential educational options to fulfill their potential for decades, Norway has recently increased their attention to this student group. International assessments have contributed to this process, in which the Norwegian policy-makers have become aware of the low share of top performers in the process. The process has subsequently led to an increased effort to improve the educational provision to students with high learning potential. However, the U.S. does not portray an ideal context either. For a country that focuses on talent development, having a percentage of top performers just below or just above the OECD average does indicate that the students' are not fulfilling their potential. In addition, both countries have dilemmas when it comes to the attitudes of students with high learning potential. Norway has long traditions in diminishing talents through the 'law of Jante', and in the U.S. there are conflicting views of regarding people of high intelligence negatively and the American Dream where one should pursue their dreams. The cultural context of the two cases gives valuable insights to the context of the programs when it comes to history, policies and attitudes concerning students with high learning potential.

# 3 THEORETICAL FRAMEWORK

The first section of this chapter includes a brief introduction to models on giftedness, with a special emphasis on the two models most relevant for this thesis. 'The Three-Ring Conception Model of Giftedness' introduces the three personality traits (Renzulli, 2005). Following up is 'the Multifactor Model of Giftedness' (Mönks, 1992), which adds a social dimension to highlight how the environment interacts with the personality traits in order to promote development. This section includes a justification of how the model is used as the main theoretical perspective. The second section includes an introduction to motivation theory as it relates to students with high learning potential and a section on pedagogical strategies to provide proper education opportunities for the students with high learning potential. The last section of the chapter is an introduction to relevant research on how the social environment including peers and family can support students with high learning potential.

In the field of gifted education, there is a dense amount of literature. Research about giftedness often is grouped into two categories: research about the characteristics of gifted people and research about appropriate interventions for gifted students (Kitsantas, Bland, & Chirinos, 2017). The educational and social needs of the students with high learning potential are complex, which can account for the many models trying to explain the characteristics of giftedness and the dense literature on educational provision. To situate the following research and provide relevant theoretical perspectives, it was necessary to include literature from both categories described above.

## 3.1 Models of giftedness

Traditionally, giftedness has been regarded as genetically determined and was revealed through IQ tests. More recent work on students with high learning potential have identified other factors that influence development of giftedness, such as Sternberg's work on cognitive factors and Renzulli's work on non-cognitive factors such as motivation and creativity (Mönks & Mason, 2000). Some still assume that all students with high learning potential are predetermined to succeed in certain domains, however research on underachieving gifted students has shown that this is not always the case (Reis & McCoach, 2000; Rubenstein, Siegle, Reis, McCoach, & Burton, 2012). As the identification process is not always sensitive

to different cultural and socio-economic differences, students from same minority group or from lower socio-economic families are underrepresented in gifted education in the U.S. (Olszewski-Kubilius & Thomson, 2010). The students with high learning potential succeed when the potential is fulfilled. Interactional models regard this process as dependent on an interaction between internal factors or a mix of internal and external factors (Mönks & Mason, 2000). The two models presented in the following chapters are chosen based on their open and inclusive views on giftedness. The models are open as they regard other performance areas than the traditional measurement through ability tests, in characteristics that define gifted behavior. The models include cognitive, non-cognitive and social factors as determinants to developing giftedness. 'The Three Ring Conception Model of Giftedness' lays the groundwork with three personality factors, and the second 'the Multifactor Model' adds a social dimension to its understanding of giftedness.

### 3.1.1 'The Three Ring Conception Model of Giftedness'

'The Three-Ring Conception of Giftedness' defines giftedness through three interrelated components, which describes gifted behavior as a cluster of three traits: above average ability, high levels of task commitment, and high level of creativity (Renzulli, 2005). The model focus on gifted behavior, which is the individual's capability to manifest or individuals that are capable of applying the components of traits to any area of potential valuable area of performance (Renzulli & Renzulli, 2010). Giftedness is not regarded as a unitary concept, as there are several ways and areas to be gifted in. In the description of the three traits, the interaction among the components is central. In "above average ability" the model defines this as performing on the upper range of potential within the specific area (Renzulli, 2005). The model separates between general and specific ability, whereas general ability can be applied in all domains, such as the capacity to process information, integrate experience that results in appropriate and adaptive responses to new situations and capacity for abstract thinking. Specific ability is the individual's capacity for acquiring knowledge and skills and the capacity to perform in special kinds of activities within a specific range. This includes abilities in certain school subjects or other activities such as photography or painting. "Task commitment" is a specific commitment to a particular problem or task, not just general motivation.

Task commitment can be described as perseverance, endurance, hard work, dedicated practice, self-confidence, a belief in one's ability to carry out important work, and action applied to the area of interest. Intrinsic motivation is relevant to task commitment, as this describes individuals who are engaged in the task for the learning itself. Extrinsic motivation can undermine the individual's sense of autonomy. However, the two types of motivation can work well together, if the extrinsic motivation supports the student's sense of competence and enables a deeper engagement in the context (Renzulli, 2005). The model regards creativity as a central, but complex part of giftedness. Renzulli regards creativity through divergent thinking or creative accomplishments (Renzulli, 2005). Teachers are an important element in providing education to the students who foster creativity. Teachers that allow the students greater choice in the selection of topics, welcomes unorthodox views, rewards divergent thinking among other things fosters creativity (Renzulli, 1992). The complexity makes testing creativity difficult. Some argue that judgment on creativity is possible through an analysis of creative products, and others argue that self-reports about creative ability suffice. Regardless of the difficulties in creating an objective creativity test, creativity is an important aspect of giftedness (Renzulli, 2005). Individuals who manifest or are capable of developing the interaction between the traits, require educational services that are not provided in the traditional classroom (Renzulli & Renzulli, 2010).

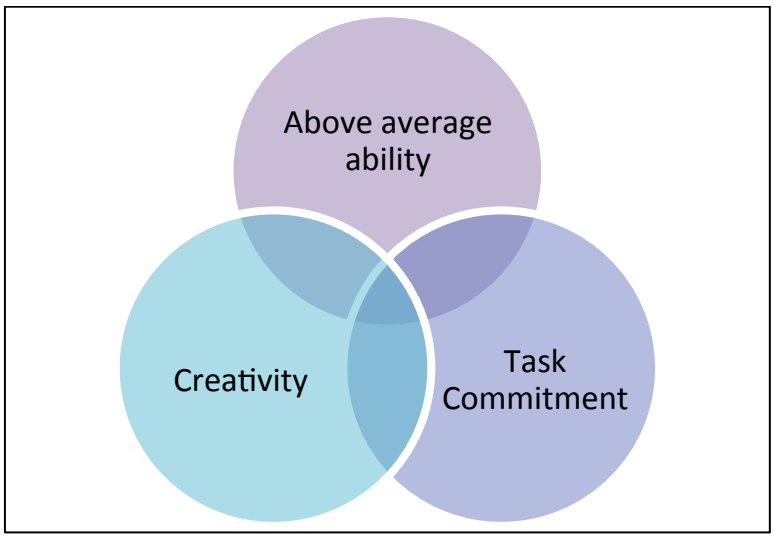


**Figure 3.1:** 'The Three-Ring Conception of Giftedness'. Compiled by the author, after Renzulli and Renzulli (2010).

### 3.1.2 'Multifactor Model of Giftedness'

'The Multifactor model' visualizes six categories, which determine the development of giftedness (Mönks & Katzko, 2005). The model's first three categories are based on the Three-Ring Conception Model's three personality components: high intellectual abilities, motivation and creativity. Additionally, the multifactor model includes three environmental categories: family, school, and peers (Mönks & Katzko, 2005). The model is based on the assumption that the lifelong interaction between an individual's personality and the environment influence the development of human potential. The potential's foundation is the genetic factors that give shape to behavioral characteristics, like aptitude and personality. The development of these genetic factors is dependent on environmental aspects like social environment, family, politics and geography (Mönks & Katzko, 2005). Consequently, human potential is dependent on several factors that need to be nurtured to fulfill its potential.

'High intellectual abilities' include performance in the specific domains exceeding the 10% most able individuals, or intelligence, measured by an IQ test, which is significantly above average. This is a rather liberal threshold compared to other models on giftedness (Mönks, 1992). Motivation replaces task commitment in this model. 'Motivation' includes task commitment, risk taking, future time perspective and anticipation. The central element to motivation is that it drives, selects and directs behavior. Additionally, it has an emotional component as a task has to be meaningful or attractive in order to motivate. 'Creativity' refers to the capacity to work on a task and solve the problem in an independent, productive and original way. Working creatively can be described as the opposite of reproduction (Mönks, 1992). The model defines 'family' and 'school' as given settings for the children, although it also points out while children cannot choose their family, they may have some influence in the choice of school. 'Peers' are developmental equals, which provide the opportunity to share experiences, solve and cope with problematic issues and to exchange ideas. Most importantly, peers provide a learning environment for regulation and integration of behaviors. Acceptance by peers can create positive self-esteem and self-concept. If an individual has a supportive environment with intellectual peers it positively influences their social and psychological development (Mönks & Mason, 2000). Giftedness develops when there is a productive interaction between the elements in the model. Mönks (1992) regards early identification as central to the possibilities for the students to produce outstanding performance. Serving the child at their individual level of ability and pace of progress is at the

core of educational provision for gifted students (Mönks, 1992). It is central to meet these students' needs in such a way that they develop according to their abilities. The educational goal is to optimize the individual performance based on the individual's potential, as this is the most prevalent and obvious measure of students' abilities (Mönks & Katzko, 2005).

Choosing this model as the main theoretical perspective is based on the interactional nature of the model. The interaction between educational and social factors influences the development of high learning potential. The model's categories are presented as components that interact to promote potential development, which work as a lens to understand how the students with high learning potential experience that their needs are met in the two programs. The six categories were the basis of the interview guide, and were thus explored through interviews with the informants, the students and teachers associated with the two programs. When exploring the categories through the informants' perceptions and experiences, assumptions were made on how the programs work towards meeting the students' educational and social needs. These assumptions were based on to what degree the informants perceived the students' needs were met in the programs, looking within and beyond the categories. By using this model as a framework, the intention is not to assume that all students with high learning potential have the same needs. The group of students is as diverse as any other group of people. However, the model is based on previous research, which argues for these central elements that must interplay in order for students with high learning potential to succeed academically. The six categories concentrate on broad aspects of an individual's life and environment, in which the model sets out to cover the whole process of giftedness development. As the descriptions of each component is rather limited, additional literature will be used complimentary to the model to understand the implications of the programs.

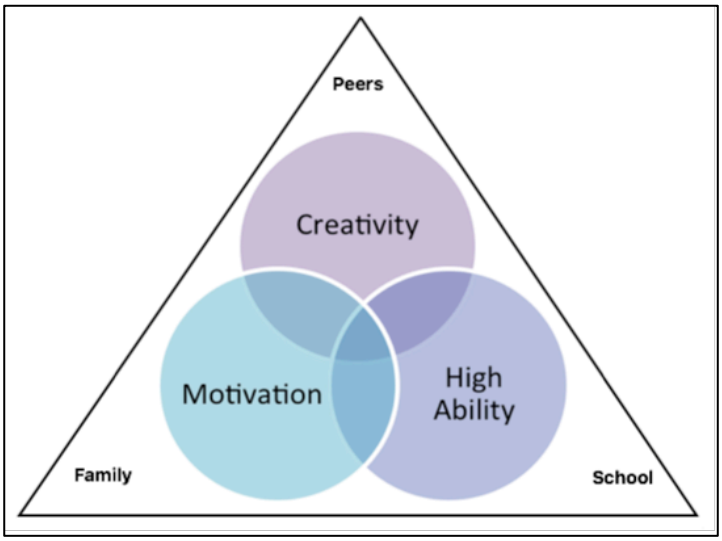


**Figure 3.2**: 'The Multifactor model'. Compiled by author, after Mönks and Katzko (2005).

### 3.1.3 Summary

The two models portray several ways to describe the gifted individuals. 'The Three-Ring Conception Model of Giftedness' describes gifted behavior through three personality traits. 'The Multifactor model' adds a social dimension, as there is an interplay of personal characteristics and the environment to develop gifted behavior. This interactional nature of the model makes it useful as a lens to understand how the programs work towards meeting the students' educational and social needs. In the following section, a presentation of motivation theory relevant for students with high learning potential, pedagogical strategies and the role of the teacher is presented.

## 3.1 The school – Educational provision for students with high learning potential

The main arena for developing potential is in school (Cross & Coleman, 2005), which makes the school a central location to research how the students perceive that their educational programs meet their needs. To understand how the school can participate in meeting the students' needs, there are central elements in the students' motivation that needs to be accounted for as well as pedagogical strategies and the role of the teacher. This section is divided into three sections, starting with motivation and how it relates to students with high learning potential, after is a section on the most relevant pedagogical strategies for these

students, and the final section features how the teachers can support the students to reach their potential.

### 3.1.1 Motivation theory and students with high learning potential

In order to explore the students' motivation it is necessary with a wider explanation through motivation theory and how it relates to the students with high learning potential. In both The 'Three-Ring Conception of Giftedness' and the 'Multifactor Model of Giftedness' motivation, or task commitment, is a central feature to result in gifted behavior (Mönks, 1992; Renzulli, 2005). Motivation is thus a central aspect for students with high learning potential to fulfill their potential.

#### Intrinsic motivation

Research shows that students with high learning potential show greater signs of intrinsic motivation to school than regular students (Clinkenbeard, 2012; Vallerand, Gagné, Senécal, & Pelletier, 1994). Intrinsic motivation is doing something because the activity or action is inherently interesting. Extrinsic motivation is the opposite, where the individual does something because it will lead to a separable outcome that is not the joy of doing the activity in itself (Ryan & Deci, 2000a). Intrinsic motivation is important to upkeep: "the maintenance and enhancement of this inherent propensity requires supportive conditions, as it can be fairly readily disrupted by various nonsupportive conditions" (Ryan & Deci, 2000b, p. 70). In order to be intrinsically motivated, there are factors that interplay in the motivation process. Motivation processes are influenced by self-concept and self-efficacy. Research had suggested strong relations between academic self-concept and self-efficacy in academic motivation and performance (Skaalvik & Skaalvik, 2004). Both constructs are important aspects of perceived competence and self-perceptions. Where self-concept is the overall view a person has about oneself (Bong & Skaalvik, 2003), self-efficacy is the perceived understanding of how well one can execute actions in prospective situations (Bandura, 1982). There are differences between an individual's general self-concept and academic self-concept. Self-concept theory has highlighted the multi dimensionality of self-concept, where academic self-concept is one construct (Marsh, 2009). Students with high learning potential generally have higher academic self-concept compared to non-high potential students (McCoach &

Siegle, 2003). Perceived competence seems especially important in students' motivation in the complex variations in school related self-concepts (Bong & Skaalvik, 2003). For students with high learning potential this is also the case (Dai, Moon, & Feldhusen, 1998). Providing the students with attainable and academic challenges that meet their ability level can develop the students' motivation and thus positive academic self-concept and self-efficacy. Being intrinsically motivated yields several benefits for students through "more interest, excitement, and confidence, which in turn is manifest both as enhanced performance, persistence, and creativity" (Ryan & Deci, 2000b, p. 69).

### Negative outcomes of lack of motivation

For students who are not sufficiently challenged, several negative consequences can occur. Boredom and lack of motivation are potential outcomes of insufficient challenges in school (Idsøe, 2014). Boredom is one of the most reported negative emotions reported by students with high learning potential (Baker, Bridger, & Evans, 1998; Gallagher, Harradine, & Coleman, 1997). Special programs for these students are considered as initiatives that will decrease the level of boredom through provision of appropriate academic challenges (Coleman, Micko, & Cross, 2015; Rogers, 2007). Boredom can lead to underachieving, which is the students' failure to perform at hers or his level of potential. Underachievement is a complex phenomenon and is complicated due to the difficulties of revealing hidden potential in students (Borland, 2005). Having methods to identify these students are central to avoid underachievement.

Motivation is linked to self-efficacy and academic self-concept, as the former can predict the latter (Skaalvik & Skaalvik, 2004). When students with learning potential are placed in high ability groups, it can create complicated thoughts concerning their academic standings. When we look at the external frame of reference in academic self-concept, students use the social membership group as a frame of reference and potential negative self-concepts can occur if the comparison includes more able students in the membership group (Skaalvik & Skaalvik, 2004). Students who are used to being the top performer and suddenly being among other top performers can experience a decrease in the academic self-concept. This is often called the big-fish-little-pond-effect (BFLPE) (Marsh, 2009). As academic self-concept is often based on school performance, it indicates that a student's lowered academic self-concept can occur as a result of the high ability grouping. In addition, female students are more vulnerable to the

BFLPE. Females have more sensitivity to external cues and they have a drop in self-esteem in their adolescent years (Catsambis et al., 2001). This makes the BFLPE more evident in female students as academic self-perception is influenced by social comparison. However, research has suggested that the students with high learning potential can experience decrease in self-concept in the beginning of the ability grouping, but that their academic self-concept increases over time (Dai & Rinn, 2008; Moon, Feldhusen, & Dillon, 1994). The potential negative consequences argue for why the students' need sufficient challenges that maintains their intrinsic motivation.

### 3.1.2 Pedagogical strategies for students with high learning potential

The literature on appropriate interventions in meeting the educational and social needs of students with high learning potential is substantial. In the following section, an introduction to relevant and widely used strategies for students with high learning potential is presented through their effects on the students' performance and socio-emotional development. Teachers have a central role when it comes to students with high learning potential as they have the opportunity to adapt the content and pace to suit the student's individual level. There are different pedagogical practices schools and teachers can initiate for the students to adapt to their needs. Several studies have found positive effects of enrichment and acceleration for students with high learning potential's academic performance and socio-emotional development (Kim, 2016; Nissen et al., 2012; Young & Balli, 2014). In addition, research has presented both positive and negative effects on specialized programs and high ability (Cross, Stewart, & Coleman, 2003; Marsh, 2009; Rogers, 2007; Stein, Ostrander, & Lee, 2016).

#### The teacher

Teachers with knowledge and information about their students' needs are important for all children. Students with high learning potential are especially vulnerable when it comes to being challenged in the classroom. If a student with high learning potential has completed an assignment and the teacher provides similar assignments repeatedly, it could lead to the students losing their motivation. In addition, the student can develop unhealthy working habits, as they never need to work hard. In order for the students to be provided with education suited for their needs, they need to have teachers who are aware of their potential

and provide support and encouragement for the students with high learning potential (Idsøe, 2014). The teachers are central to contributing and establishing a positive learning environment in their classroom. Good learning environments challenge and support students, and can contribute to developing a passion for lifelong learning (Idsøe, 2014). If schools and teachers are unable to provide a good learning environment, students with high learning potential might feel isolated from their environment through lack of challenge and support. Another central element to the teachers' role is in the identification of these students. The teachers are central in discovering students with different types of high learning potential as this might not always be evident (Baldwin, Vialle, & Clark, 2000). When these students show unusual behavior they are in danger of being wrongfully diagnosed with behavioral issues (Hartnett, Nelson, & Rinn, 2004). Creating a 'student portfolio' is one way of assessing the students' background and subsequent needs. If the 'student portfolio' contains information about the individual student's interests, abilities, motivation and learning style and pace, it can provide the teachers and programs coordinators information on how to best stimulate and develop the students' potential based on their individual characteristics (Idsøe, 2014). Renzulli's "Total Talent Portfolio" is a way to assess the students' learning styles and interests (Renzulli & Renzulli, 2010). The major purposes of the Total Talent Portfolio are to assess the students' strengths on a regular basis, collect information about the students' abilities, interests and learning styles, to regularly review and analyze the opportunities for enrichment and to use the subsequent information to make decisions about enrichment and acceleration (Renzulli & Renzulli, 2010, p. 147). Thus, the teachers can adapt the education to the students' needs based on their portfolio. However, it is important to mention that for the teachers to be able to identify students with high learning potential and to nurture their needs, there is a necessity for teaching standards (VanTassel-Baska & Johnsen, 2007). A standards-based approach is suggested: "To ensure equity and systematic talent search and programming, it is essential that teachers are educated in the relevant theory, research, pedagogy, and management techniques important to developing and sustaining classroom-based opportunities to learn for these students" (VanTassel-Baska & Johnsen, 2007, p. 182). The teachers are essential in meeting the students' needs through support and understanding the individuals' needs, which is why students' portfolios can be used in addition to teacher standards when it comes to teacher education.

## Specialized programs

The literature and research available on the purposes and effects of specialized programs for gifted students in the U.S. is rich. The purpose of these programs is to place the students based on ability (Skogen & Idsøe, 2011). In Norway, it is against the law to permanently place the students in groups based on ability, which makes fulltime programs for students with high learning potential non-existent. However, there are other structures to specialized programs such as pullout programs, special classes or classes with extra challenging assignments (B. Clark, 2013; Skogen & Idsøe, 2011). In the U.S., STEM programs were established to meet the needs of academically strong students and to meet the needs of future scientific demands in a competitive global world (Almarode et al., 2014). There are several benefits to attending a special program. Studies have shown positive effects on long-term achievement and socio-emotional well-being when students with high learning potential are placed in programs suited for gifted and talented students (Kulik & Kulik, 1982; Steenbergen-Hu, Makel, & Olszewski-Kubilius, 2016). This can be explained through how the programs can provide students with the rigor and content that suits the students ability level through developing special skills and abilities and meet similar-minded peers that can stimulate learning processes (Almarode et al., 2014; Skogen & Idsøe, 2011). These elements can contribute to increasing motivation and interest in school. The special programs can be regarded as talent incubators, as students can identify and be served domain-specific ability potential into expert competencies (Subotnik et al., 2016). Research has shown that magnet programs that provide the students with rigor in their provision of enriched STEM instruction, are likely to be successful (Stein et al., 2016). In a review of a magnet program the success is attributed to the program's curriculum, which includes specialized coursework that engages the students, through an intense focus on the students' interests. In addition to an interdisciplinary approach and focus on research, the students were prepared for a future in the STEM field (Stein et al., 2016).

Although the purpose of special programs is to meet the students' needs, there are issues that can emerge from attending these programs. Students might feel stress and anxiety related to the pressure and expectations from them attending the programs (Cross et al., 2003). For adolescents, this is central as they experience more daily stressors in this developmental period. These stressors include friendships, romantic relationships, conflicts with parents, school pressure and transition to adulthood (McNamara, 2000). Students experiencing

performance anxiety in specialized programs can be accounted for by a combination of factors. These factors include higher teacher and peer performance standards, uncertainty in reaching academic goals, competition among the students and a strong fear of failure (Zeidner & Schleyer, 1999). Research on coping mechanisms has revealed gender differences. Girls more often than boys seek support in social relationships when dealing with academic stressors (Preuss & Dubow, 2004). In addition, girls are more likely to cope with stress through expressing their emotions to others (Tamres, Janicki, & Helgeson, 2002). Another implication of attending a special program is pressure and high expectations. When students with high learning potential experience having high expectations to excel academically, or others have these expectation for them, it can lead to perfectionism. Perfectionism is often observed as a personal characteristic in students with high learning potential (B. Clark, 2013). Perfectionism can lead to feelings of fear that includes that unless one is perfect, one is worthless (B. Clark, 2013). Speirs Neumeiser (2007) focused on two forms of perfectionism. The self-oriented perfectionism, which can be described as high standards and expectations to one's work, or the socially oriented perfectionism, defined as perceiving others as having high expectations for one's work. In order to prevent or restructure the cognitive manifestation of perfectionism, teachers can make their classrooms safe places with an atmosphere that allows for mistakes and failures. When mistakes are seen as informative and a part of a process, and the teachers are willing to share their mistakes and share coping mechanisms, it can contribute in the students' self evaluation and cognitive manifestation of perfectionism (Speirs Neumeister, 2007).

## Acceleration

One of the most used strategies in education provision for students with high learning potential is acceleration. Acceleration is a broad term and includes a variety of ways of how students can complete the learning material faster than average. There are several ways and options in acceleration, and some of the options include skipping grades, starting school early, accelerating specific subjects or taking advanced placement courses (AP) (Skogen & Idsøe, 2011). Acceleration can be subject-based, where the students are provided with material that is on a higher level than the student's grade, or grade-based, where the student finishes school faster than normal (Rogers, 2007). The different forms of acceleration let the student work with material that is suitable for their knowledge level. There are parents, students and other educators who express concerns about the students' social wellbeing if the students' grade-

base accelerates. However, this does not take into consideration that a student's well being is often connected to academic performance. The social needs are more likely to be met when the students feel that they master their schoolwork and feel confident about this. Another aspect is that humans connect with other people that share the same interests and attention (Porter, 2005). Students who are separated from their class in subject-acceleration are not likely to be separated by their peers for longer periods of time (Southern & Jones, 2004). However, for the students to choose to change schools to participate in programs for students with equally high learning potential some have to leave their friends on a permanent basis in the school context. In general, the literature highlights the positive effect of acceleration, and the consensus among researchers is that acceleration mostly benefits the students with high learning potential (B. Clark, 2013; Mayer, 2005; Southern, Jones, & Fiscus, 1989). There are positive effects of acceleration on academic achievement and social-emotional development (Robinson, 2004; Rogers, 2007). Acceleration thus provides the students with appropriate challenges that can motivate and maintain interests in the area of interest, with a peer group of equally mature classmates. In addition to the immediate effects of acceleration, the long-term effects of acceleration are also positive. Compared to equally strong students, the students who accelerated in their school career are twice as likely to be in a STEM career in their 20's and 30's (Lubinski & Benbow, 2006). This can explain why students with high learning potential mostly benefit from acceleration.

### Ability grouping

Closely linked to acceleration is ability grouping. Ability grouping can be defined like this: "Ability grouping is defined as any school or classroom organization plan that is intended to reduce the heterogeneity of instructional groups" (Slavin, 1990, p. 471). Facilitating ability grouping can be done in a range of ways, and the students benefit from a variety of grouping options like ability grouping in full-time programs (Tech Program) as well as pullout programs (Talent Center) (Rogers, 2007). Research suggests that students with high learning potential benefit from working in groups with similarly mature learners (Steenbergen-Hu et al., 2016). The ability grouping has powerful effects on academics and moderate effects on the social dimension and academic self-esteem (Rogers, 2007). Having similar minded peers can lead to social confidence by students being accepted for who they are (Porter, 2005). It is important to notice that even when the programs consist only of students with high learning potential, the group of students will still be a heterogeneous group (B. Clark, 2013). Their

abilities are never at the same level, as these students might not be gifted in all subjects, but have different competencies in the different subjects. Having domain-specific giftedness is an important element to remember when talking about this group of students. Students might have domain specific giftedness, where the learning potential is especially high in specific subjects (VanTassel-Baska, 2005).

As mentioned above in section 3.1.1, studies have showed negative effects of ability grouping on motivation and academic self-concept (Marsh, 2009). In addition, placing the students in different classes based on abilities is a debated topic. In Norway, it is against the law to place the students in groups based on ability. The teachers are allowed to put the students in ability groups occasionally, but not as a permanent solution (Opplæringslova, 1998). A common notion in Norway is that everyone deserves the same education, which indicates that ability grouping works as a disruption of the democratic principles. In USA ability grouping is common, as most students take placement tests as early as elementary school to determine the student's academic level and are tracked into the proper academic path. In high school students are placed into classes based on academic goals; college oriented or vocational (Steenbergen-Hu et al., 2016). These practices are used to provide the appropriate instruction for the student. Much critique has been voiced about this method, as school and teacher bias has led to unfortunate practices that hurt students of ethnic minorities and/or with lower socioeconomic status (Hochschild & Scovronick, 2003). For the students tracked in low ability groups the labeling can lead to limited expectations and limited opportunities, which ultimately can lead to negative attitudes towards school (Hallam & Ireson, 2009).

### Group work

A central part of ability grouping is group work for students with high learning potential. Much research on the subject has suggested that gifted students prefer working alone or in small groups in mixed ability classrooms (C. Clark & Shore, 1998; French, Walker, & Shore, 2011). When students with high learning potential are placed in groups, sometimes they do the majority of the work, as the other group participants are not willing to put in the effort or do not grasp the challenge at hand (Gallagher et al., 1997). The students can end up doing a disproportionate amount of the work, to guarantee that the outcome meets the student's standard. This can make students create negative attitudes towards group work. Allowing the students to choose their partners is one way of making group work a positive experience (C.

Clark & Shore, 1998). When it comes to homogenous grouping for students with high learning potential research has shown that when a task is sufficiently difficult, the students seek interaction with peers for cognitive or affective support (Diezmann & Watters, 2001). This indicates some differences for students with high learning potential when it comes to group work and how it depends on the peer group.

### Enrichment

Enrichment activities are often based on the student's interests (Idsøe, 2014). Learning beyond what the normal classroom has to offer is an important element in this strategy. Enrichment can be valuable for students with high learning potential as they get to develop their interests further and gain knowledge in specific areas. As children are different, so are their interests, needs and abilities. By enriching the students within topic of their interests, it can lead to positive effects on their motivation and continuing interests to learn (Skogen & Idsøe, 2011). Central to enrichment is to provide the students with advanced content situated in a real-life context (Rotigel & Fello, 2004). This can ensure that students who find traditional instruction not relatable to their everyday lives, increase interest and find meaning working with the subjects (Callahan, 2005). Renzulli's 'Enrichment Triad Model' is central to the enrichment perspective. The model was designed to encourage creative productivity by introducing the students to a range of topics, areas of interests and fields of study (Renzulli & Reis, 2000). In this model it is also central to provide the students with real-world problems that promote higher order thinking skills, applied to creative and productive situations. Further, the model seeks to train the students in applying advanced content, process-training skills and methodology training to self-selected areas. The model consists of three types of enrichments, that introduce the student to a variety of disciplines, topics, persons, places, and hobbies that were not in the original curriculum on an advanced level, which can develop to the students' doing independent research (Renzulli & Renzulli, 2010). The model promotes engaging in different types of challenges through enrichment experiences that are enjoyable, challenging and based in the student's interests. Through these activities the students can grow by providing them with creative and self-selected work. Hopefully this will make the students seek similar work later, which can ultimately increase our world's pool of talent in every field of interest (Renzulli & Renzulli, 2010).

## 3.2 Social environment

The social environment impacts children's development. The ability to develop the potential is possible when the environment demands development (B. Clark, 2013). All individuals need to feel that they belong in their families, neighborhoods, schools, wider community and culture. A healthy self-esteem requires that children feel accepted and loved by others. In the following section, the role of the family and peers will be situated in relation to the students with high learning potential. For these students it is necessary that the environment allows the potential to be developed and fulfilled. Having a supportive family and close ties with peers are important to all individuals and especially for the students with high learning potential.

### 3.2.1 The family

Research shows strong links between the parents' involvement and students' achievement and attitudes towards school, both in Norway and in USA (Bakken, 2004; Freeman, 2000). An interested and invested family creates an environment where the child gets to develop their potential (B. Clark, 2013). Many children who show signs of giftedness in toddlerhood, do not achieve at an outstanding level later in life. This discrepancy between potential and fulfillment can be ascribed to family background and educational opportunities. "Consequently, the development of giftedness is a function of individual characteristics, environmental experiences, and the interaction between both factors" (Perleth, Schatz, & Mönks, 2000, p. 308). If we regard children's ability as malleable, they can be developed. This can be linked to the belief in a "growth mindset", where the person's abilities are not fixed from birth. The family's role is relevant when talking about the traits that allow high level of competencies to be fulfilled (B. Clark, 2013). A set of traits that includes willingness to do great amounts of work, determination to perform the best way possible and the ability to acquire knowledge rapidly emerges from early socialization and attitudes at home. Additionally, exposure to a variety of opportunities and activities and experiences is beneficial. As children's abilities are flexible, they can be developed. Helping children grow and to make the most of the child's potential should always be a concern to the first caretakers of the child, the family. Healthy, open, highly functional, well-integrated children come from nurturing families where the parents are realistic, responsible and use their common sense. These parents show their uniqueness and share their abilities through understanding, kindness and affection for their children (B. Clark, 2013). However, some families have difficulties

accepting their child's high learning potential. Some parents discount the child's intellectual abilities, and would rather them focus on emotional skills, relationships and people skills, or be more well rounded rather than excelling in one domain (Porter, 2005). This could harm the further development of the child's potential.

On the other end of the scale, some parents pressure their children with high learning potential to excel in their academic work. There might be several reasons for this parental pressure. Parents might feel obligated to the society to fully develop the potential of their children. Knowing that their children can become important in future technological advancements and economic development, can lead to the parents pressuring their children to perform (Mudrak, 2011). While others might perceive the pressure as an obligation to their children if the school or the curriculum fails to meet the students' educational needs (Garn, Matthews, & Jolly, 2010). Achievement oriented parents that use pressure-filled methods to communicate the need for high academic performance to their children can be linked to fear of academic failure (Garn & Jolly, 2014). Parental pressure can lead to several negative consequences for the students. Parental pressure can lead to socially prescribed perfectionism, insecure parent-child interactions and unrealistic expectations for their children to achieve (Garn & Jolly, 2014; Mudrak, 2011).

Campell and Verna (2007) describe "effective parenting" as behavior of the parents that leads to their children being successful. In this context, measuring success is through grades, getting into a good college and/or a good job. Having an 'academic home climate' is important for the children to develop their potential and includes factors that promote the potential of their children. An 'academic home climate' generates curiosity and encouragement in following the students' interests. This can also promote positive behaviors, attitudes, values and beliefs that lead to high achievement. Through over 500 "recipes" of elements that describe an academic home climate there are several ways to be an effective parent. The top elements that are included in most recipes include expectations, work ethic, communication, homework and commitment (Campbell & Verna, 2007). When 'academic home climates' match the students' school, the students have greater possibilities to prosper academically.

### 3.2.2 Peers and friendships

Friendships are important for developmental and emotional functions for children. Friends guide children in learning social skills, self-control and language training, and allows for

interplay of skills and information between the children that they do not necessarily learn from the adults in their lives (Porter, 2005). On an emotional level, friendships provide reassurance, promote healthy self-esteem, enhance confidence in stressful situations, prevent loneliness and provide fun and happiness for children. Children put high values in friendships: "Friends also offer practical and emotional support through giving information, advice and counsel" (Porter, 2005, p. 79). Most people tend to form close ties with other people that share similar skills, interests and values. Students with high learning potential have restricted access to companions like themselves, which makes the gifted students at risk of being lonely (Porter, 2005). Some students with high learning potential have difficulties in creating peer relations (Feldhusen, 2005). Many gifted students feel different, which can lead to difficulties in adjusting socially. Gifted students might also find the other children's less mature behavior confusing and sometimes upsetting which makes it difficult to make lasting, caring bonds with other people (Porter, 2005). Research has also suggested that the students with high IQ can feel alienated from their surroundings. This makes students with high learning potential vulnerable to feeling alienated from their peers. The students might feel that their skills are hindering them in being accepted by their peers and creating lasting friendships. The students might feel that their high skills are creating conflict and anxiety. Most students with high learning potential do not have social and emotional problems, and many have the same emotional development as their peers. However, some students with high learning potential have some difficulties in their social and emotional development which makes it important for the students to get appropriate support in order for the social and emotional development to not hinder their social life and friend groups (Idsøe, 2014).

Friendships are important for children, however friendships often are most important when the students reach adolescence. When students with high learning potential reach adolescence, many are torn between acceptance within their peer group and achievement (B. Clark, 2013). Research has suggested the 'social handicap' of being identified as a student with high learning potential. Being identified and labeled have made other people treat the students differently, thus feeling stigmatized and stereotyped as a 'nerd'(Cross, Coleman, & Terhaar-Yonkers, 1991) (Cross, Coleman, & Terhaar-Yonkers, 1991). Some students end up denying their abilities in fear of peer rejection. When students change schools or programs during this time, they might have to reassess their competencies in relation to the new environment. And as this period the self-concept is influenced by social comparison and desire for social acceptance, academic competence might drop due to increased focus on social acceptability.

Finding intellectual peers in specialized programs can benefit the students socially and emotionally (Brody & Stanley, 2005).

## 3.3 Summary

This chapter included some of the most relevant work on the subject of educational provision and social support for students with high learning potential. Literature on these students is often divided into characteristics of students with high learning potential and proper educational provision. The former were presented through 'the Three Ring Conception of Giftedness' and 'the Multifactor Model'. The models presented three personality traits, and the multifactor model added a social dimension to how to develop the potential. The following section focused on ways in which motivation is central to students with high learning potential and how educational provision for these students can meet their educational and social needs. The last section focused mainly on social needs through the family and peers' role for the students' development of their potential. The next chapter will describe the design and methods used in this study.

# 4 RESEARCH DESIGN AND METHODS

In this chapter, the research design and method used in this study are presented. The chapter opens with situating the paradigmatic stance of the research and thus the choice of a qualitative strategy. Following up is the multiple-case design and a justification for why this was the most desirable design for this study. The next section is a description of the embedded design through the comparative aspect and the data collection method of qualitative interviews. The following section describes the selection and the characteristics of the cases including a section on how the fieldwork took place. After this is an analysis of the data, and concluding the chapter is a section on how the quality of the data was ensured through ethical considerations and the project's reliability and validity.

## 4.1 Paradigmatic stance and strategy

The research is guided by the interpretivist paradigm, where knowledge and the social world are understood as socially constructed. Within the interpretivist paradigm, the epistemological understanding is that the social world can be understood through the examination and interpretation of the participant's experiences (Bryman, 2012). This perspective suits the purpose of this research, as it aims at understanding how the informants experience and perceive that the students' educational and social needs are met in the two programs. Following this paradigmatic stance, the project has a qualitative research strategy. Qualitative research focuses on understanding the social world and phenomena through the examination and interpretation of the participant's experiences (Bryman, 2012). This strategy is the preferred strategy for this study, as the informants are the ones who shed light on the issues and will answer the research questions.

## 4.2 Multiple-case study design

In this research, a multiple-case study design is applied (Yin, 2012). The case study design favors collecting data in a natural setting where the researcher seeks deep understandings of the cases (Yin, 2012). Using this design is preferable for this research as this research aims at answering two "how" questions, the investigator has no control over the programs, and the

focus is on the contemporary phenomena of education for students with high learning potential. These are central elements of case studies (Yin, 2014). This multiple-case study has two cases placed in different cultural contexts. The cases are examined through perceptions and experiences of the research informants, which will allow for a comparison of the differences and similarities between the cases (Yin, 2014). When comparing phenomena that take place in different geographic entities, it is important to look at the cultural context in order to examine the similarities and differences in the cases (Manzon, 2007). This has been done in chapter 2 (see p. 6) above, in order to situate the two contexts to make a justified and informed comparison of the two programs.

The study is an exploratory case study. In exploratory case studies, the goal is to discover new understandings of a phenomenon in its natural form (Yin, 2014). Exploratory case studies are useful as pre-studies to bigger research projects and are often open and undetermined before fieldwork and data material (Yin, 2014). I found exploratory case study to be suitable for this study due to the scope of this paper and the original comparison of the programs, although there were some decisions that were made based on theoretical understanding prior to the fieldwork. Thus, this study can be used as a premise for further research on this type of comparison and particular topic. Through the interviews the categories presented in the multifactor model were explored and considerations of new themes emerging from the data were conducted. Through the exploration of the categories, the students and teachers reported themes that were important to them through how the programs worked towards meeting the students' educational and social needs. Some of the new themes that emerged from the data were the stress and perfectionism for the students in the Tech Program, the preference for practical approach in both programs and how this was largely conducted in the Talent Center and the important role of the teacher in both programs. These themes focused on aspects not covered in the multifactor model, however additional literature and theories were used as a supplement to understand these findings.

### 4.2.1 Qualitative interviews

The research method in this study is qualitative interviews. Interviews are one of many methods that are used in case studies (Yin, 2012). In qualitative interviews, the interviewee's point of view is essential to obtaining deep understanding of what is important and relevant to them. Focusing on the interviewee's point of view was important to understanding how the

programs worked towards meeting the students' educational and social needs. Doing qualitative interviews allows for a flexible structure, as the researcher can adjust the questions if necessary based on the informants' detailed contributions (Bryman, 2012). However, to be able to do a comparison between the informants and the differing locations I ensured that the structure did not diverge too much in the different cases. The interviews conducted in this study were 'shorter case study interviews' that lasted from 20 minutes to an hour. The interviews were semi-structured, which allowed for a set of predetermined questions, in addition to supplementary questions when concepts or topics that need a more thorough coverage (Bryman, 2012). The interview questions were based on the multifactor model's six categories: 'motivation', 'creativity', 'high ability', 'family', 'peers' and 'school'. Having the theoretical perspective in the interview guide was the best way to guarantee that the informants answered the research question of the thesis. There were two interview guides, one for the teachers and one for the students. Each guide has an English and a Norwegian version. The two guides covered the same topics; however they were adjusted to suit the participant group. In the exploration of how the students' needs were met, there were specific questions that initiated yes or no answers. This was to get an understanding on whether the informants regarded that the students' needs were met, and additionally, the interview guides provided follow up questions that probed for an explanation for the initial answer. This method allowed the researcher to acquire the informants' view on how the informants experienced and perceived that the students' needs were met and how they reasoned for why or why not the program managed to meet their needs. When interviewing, the interviewer was aware of the impact one can have on the interviewee. In qualitative research there is always a chance that the interviewer impacts the data, in which case the researcher have to be aware of these issues (Bryman, 2012). During the interviews with the informants, I had this in mind and tried to be as neutral as possible, while remaining friendly towards the informants.

### 4.2.2 Comparative dimensions – Embedded units

Looking at the comparative aspect of the cases in this study, there are three dimensions in this study that locates the "where", "who" and "what" (Manzon, 2007). The first dimension is 'geographical', as the two cases are located in separate countries Norway and the U.S., the second dimension is the 'grouping', which in both cases are students and teachers, and the third is the 'phenomena' being studied, the programs for students with high learning potential. Using several sources within a case to get better insight into the phenomena is called

embedded design (Yin, 2014). An embedded design involves several single units of analysis, which is smaller than the main unit of analysis (Yin, 2014). This research has several units of analysis. The main two units of analysis are the programs; the single units of analysis are teachers and students in the programs. Several units of analysis lead to multiple sources of evidence, which can strengthen the quality of the research, when several sources produce the same findings and arrive at the same conclusions (Yin, 2014). This study used triangulation techniques in order to converge the data from the cases. Triangulation is used when looking at the data collected from the multiple sources, to determine the consistency of the findings (Yin, 2014). It is a useful strategy that explores the phenomena from multiple perspectives and can determine the consistency of the findings (Baxter & Jack, 2008). Having an embedded multiple-case study enables the data to be triangulated. Using the data collected from the students and teachers in both programs made it possible to converge the data and draw conclusions and assumptions based on their statements. In this study, all the interviewees were asked questions covering the same topics and concepts. Thus, the informants provided valuable information to the topics and concepts covered in the interviews, which made it possible to converge the data from the informants. The triangulation occurred in the analysis of the data, where the multiple sources made it possible to draw conclusions on how the two programs met the students' needs. Although there were some differences both between the informants in each case and across cases, there were several similarities in how the programs worked towards meeting the students' needs. The findings were strengthened as the triangulation presented the data from multiple sources providing similarities between how the two units of analysis perceived that their programs met the students' needs.

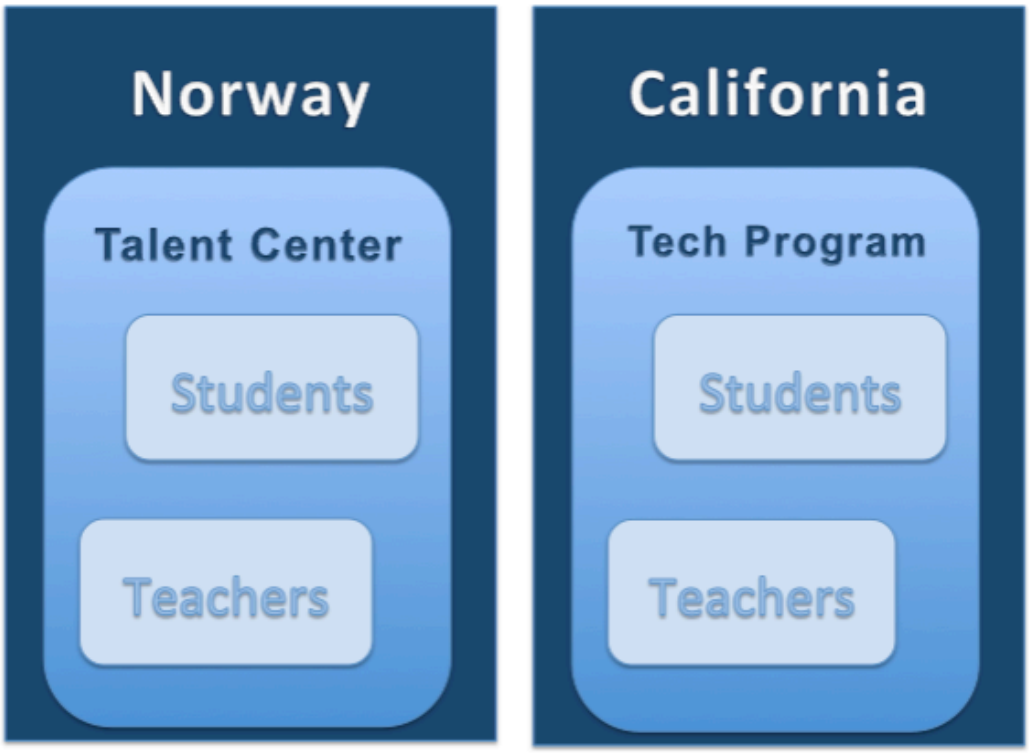


**Figure 4.1:** Levels in units of comparison at the macro (national or state level), meso (program unit) and micro (subunits) level. Compiled by the author.

## 4.3 Research sites – Selection and descriptions

The choice of California and Norway as research sites was theoretically and empirically grounded. As previously mentioned, the U.S. is one of the leading countries in the West at talent promotion, and the increased interest in students with high learning potential in Norway made this research relevant when exploring the cases. The findings from this research provide new understandings of how the students and teachers experience the two STEM programs and can contribute to the field and topic of how to construct and modify programs for students with high learning potential. As the programs are situated in two unique cultures and educational systems, this research provides cross-cultural data to the field. The two programs in this research were selected as they are intended for students with high learning potential. This follows the selection of informants in qualitative research, as the selection process is based on who can provide insight, discovery, and understanding to the phenomena being investigated (Merriam, 2009). Having two programs that are intended for students with high learning potential follows the replication logic in multiple case study design, where the cases investigated must include the same conditions (Yin, 2014). The Norwegian program is a Talent Center; a program initiative aimed at students with high learning potential, while in

California a magnet Tech Program, situated in a local high school was selected. Both programs are intended to provide STEM education to interested students with high learning potential; however, the programs do have some unique characteristics, however the characteristics does not differ in a way that makes the programs non-comparable (see Table 4.1. on p. 40).

### Tech Program in California

The program in California is a top ranking, highly selective, competitive STEM magnet program that draws students from many school districts. The program is located in a public high school situated in a suburb of a big city in southern California. The program fits the description of a school-within-a-school program, where the students take classes in their program as well as other classes with the other students in the school (Almarode et al., 2014). The students attend the program all four years of high school. The students who apply for the program take an achievement test, which decides whether they get into the program. The achievement test also function as a placement test, placing the students in different class-levels based on their test performance. Thus, the program places the students in ability groups, dominated by high ability students. Most students attending the Tech Program take multiple honors or AP (Advanced Placement) classes. In ninth grade all students take AP computer science, and in the three following years they choose from six Tech related pathways.

### Talent Center in Norway

The Talent Centers are located in four big cities in Norway. The programs at the Talent Centers in Norway are a pilot project administered by the Directorate of Education and Training, assigned by the Norwegian Ministry of Education and Research. The program aims at providing students with high learning potential educational input to the STEM subjects to students who need more academic challenges, contribute to make more students perform on a high level in the STEM subjects, and contribute to creating a social network based on meeting like-minded students. Students and teachers from one Talent Center participated in this study. The program offers the students two full days of class every month for a year, thus the students participating were enrolled in the program for the school year 2017/2018. The students attending the program are exempted from their regular classroom education to

participate in the in-depth learning in STEM courses at the Talent Center. The students apply by providing letters of recommendations from two teachers, one letter from the parents and one application form written by the student. No report card is provided in this application process. The selection criteria are up to the program manager, who makes an informed decision based on research on students with high learning potential. The students do not have to be high performers in order to participate in the program, but they have to show high learning potential.

| Characteristics of the programs | | |
|---|---|---|
| | Talent Center (TC) | Tech Program (TP) |
| Only high performing students | | X |
| Students with high learning potential | X | X |
| Segregation, program outside of school | X | |
| Ability grouping | X | X |
| School-within-a-school | | X |
| Subject-based Acceleration (advanced placement, acceleration of the syllabus/curriculum) | X | X |

**Table 4.1:** Overview of the programs' characteristics. Compiled by the author.

### 4.3.1 Fieldwork – Access to informants

The research questions guided the selection of units in a way that ensures that the research questions are answered (Bryman, 2012). As the research questions aimed at exploring how the two programs meet the educational and social needs of students with high learning potential, it was essential to find informants who could provide information about this student group. Thus, the purposive sampling strategy guided this study, where the informants were

selected in a strategic way in order to answer the study's research questions. Both the generic purposive sampling and the snowball technique were used to find suitable informants that could provide information on how to meet needs of students with high learning potential in two STEM programs (Bryman, 2012). The criteria for participating in the research was attending the programs as students or working in the programs as teachers. Thus, the students' intelligence or abilities were not measured in order to participate in the project. This was possible due to the multifactor model's definition of "high ability" as the 10% most able within the topics, and the term chosen for this thesis describing the students; students with high learning potential. As the theoretical framework focus on the most able students within the field and the term describing the students were inclusive, this allowed for using the program participation as the criterion for participation. How the strategic samplings were conducted in each case, is presented below.

### California

The fieldwork in California lasted for six weeks, where I lived with an American family, which provided me with valuable insights and knowledge about the American educational system as well as the program being investigated. Before arrival, contact had been made with the principal of the participating high school. I was dependent on the principal's approval to get in contact with their students and teachers for ethical reasons. After arrival, the principal sent out an invitation letter to the students, their parents and the teachers. Six students and two teachers responded and I scheduled interviews with all of them. One of the students did not end up participating, and I interviewed one additional teacher after being introduced by one of the teachers that participated. In addition, unrecorded informal conversations were made with the staff at the school to provide information about the program. The student informants consisted of three 9$^{th}$ graders, one 10$^{th}$ grader and one 12$^{th}$ grader, with three boys and two girls. The project would have benefited from having older students with more experience in the program, however the principal indicated hectic schedules allowed little time for students in the higher classes to participate in this study. The ethnicity and socioeconomic background was not recorded, as this was not relevant to this study. All the teachers had long experience teaching in the program. The interviews were conducted without many difficulties, and I ended up with five student interviews and three teacher interviews.

### Norway

The interviews in Norway were conducted over a four-week period, and did not require the researcher to travel far to the research site. I contacted the manager/coordinator of one of the Talent Centers, who accepted my request to interview students and teachers at the program. Preliminary conversations were done with the program coordinator to provide useful practical information about the program. The coordinator sent out the invitation letter and consent form to the students and their parents, and six students responded and indicated their interest in participating in the study. The teachers were more than willing to be interviewed. In this group of informants, the research would also have benefitted from having students who had completed the course, or would have attended the program for a longer period of time. However, getting in contact with these students proved to be difficult and for the time scope of the fieldwork for this thesis, the selected participants were chosen as they could provide valuable information to the research during this time. All the interviews were completed by mid-December and I ended up with six student interviews and two teacher interviews. This fits well into the purpose of this qualitative case study.

## 4.4 Data analysis

The interviews were conducted in English in California and in Norwegian in Norway. I chose to conduct the interviews at the Talent Center in Norwegian to guarantee that the students understood my questions and allowed them to speak more freely in their native tongue. This was also important to accurately determine the meaning of statements made during the interviews, as acronyms or other language specific aspects sometimes occurred. All the interviews were recorded with a tape recorder and a backup on an iPhone. Shortly after the interviews were conducted, they were transcribed and the Norwegian interviews were also translated into English. As half of the interviews were conducted in Norwegian I found it necessary to translate them to simplify the analysis process. In the translation process, I tried to use similar words and construction of sentences; however, alterations were made in order to attain similar meaning in English. When transcribing and translating interviews it is important that the researcher ensures that all the elements that might be relevant are included (Hammersley, 2010), which was something I has in mind during this process. The software program NVivo 11 (NVivo, n.d.) was used when coding the interviews. To explore the categories in the framework, a thematic analysis was used in the process of analyzing the data

(Bryman, 2012). The thematic analysis included use of abductive methods, with elements of both inductive and deductive processes. Although the major themes were based on the theoretical framework, new themes and topics occurred during the data collection process. The coding process started with the six categories of the multifactor model, which were the theoretical base for the interview guide. However, in the exploration of the categories the data required several subcategories, which allowed for use of inductive methods. Some of the subcategories were *prior motivation*, *practical work* and *challenging assignments* under 'motivation', *examples of program providing challenges* and *program difficulty* under 'high ability' and *positive social environment* and *negative experiences with group work* under 'peers'. The thematic analysis allowed for an exploration and analysis of the themes in order to conduct a well-informed comparison of the informants perceptions and experiences in the programs.

## 4.5 Quality of the data

### 4.5.1 Ethics

This research is supported by and has ethical clearance from the Data Protection Official at the Norwegian Social Science Data Services [NSD] (see Appendix 2, p. 102). Including ethical clearance, there were ethical considerations made during the entire research process. Prior to the interviews, all informants had to sign a consent form, agreeing to be interviewed and having it audio recorded. The students had to sign their own document agreeing to participate, and their parents had to sign a parental consent allowing their child to participate. It was important to establish a trusting environment with the interviewees. As I was interviewing the informants in their known environment I wanted to show respect for their time and their hospitality. I was flexible to conduct the interviews according to the informants' schedules and I was also aware of the private nature of some parts of the interviews. I was especially sensitive to the youths I interviewed, where I was open to all their questions and curiosities, explaining the study before we started the interview, and willfully answered all their questions regarding the research.

### 4.5.2 Reliability and Validity

Ensuring quality in research is often described through reliability and validity. As case studies can include multiple sources of evidence through quantitative and qualitative data, Yin (2014) suggests use of reliability and validity in judging the quality of the research. However, it is argued that these standards are not applicable to qualitative research (Bryman, 2012). To encompass the qualitative nature of this case study, inclusion of alternative judgments of quality are used, through Guba and Lincoln's (1994) 'trustworthiness' and Yin's (2014) understanding of the traditional 'reliability' and 'validity'.

Through the whole case-study process I have been attentive to the standards of qualitative research. Trustworthiness comprises credibility, which is parallel to internal validity, transferability parallel to external validity, dependability parallel to reliability and confirmability parallel to objectivity (Guba & Lincoln, 1994). Credibility/internal validity stresses the importance of understanding the social world presented by the informants, which can be done through triangulation and pattern matching. In this study, this technique is used through multiple sources of evidence and making inferences between the findings and the theoretical understanding. Triangulation through the multiple sources, findings and the theoretical understanding was done throughout the research process to guarantee the credibility/internal validity. Judgments of transferability/external validity are ensured in this study through a replication logic, where the phenomena is being investigated for differences and similarities based on theoretical judgments. The two programs share characteristics, as they are programs for students with high learning potential. As this study aims to provide generous descriptions of the two cultures in which the programs are situated, it provides understandings of the contexts in which the research was conduced (Schwandt, Lincoln, & Guba, 2007). This can allow for cross-case generalizations, albeit with some caution. It is suggested that case studies allow for analytical generalizations, through relevant theoretical concepts that allow for generalizations outside the original case study (Yin, 2014). This study does not intend to statistically generalize in any way, however as the analysis corroborates previous research findings, an analytical generalization can be made to other situations. This case study allows for analytical generalizations to other similar situations, when the theoretical framework is applicable to other situations providing STEM programs to students with high learning potential. Dependability/reliability entails having all the complete records accessible throughout the research process, where peers can browse all the documents

concerning all the facets of the research. The use of a supervisor and use of case study protocol in the process has ensured that the proper procedures have been followed. Complete objectivity is not possible in social research, however confirmability seeks to ensure that the researcher has acted in good faith. In conducting the research I have been considerate and, to the best of my ability, not added personal values or impacted the research or the findings.

# 5 RESULTS

The following chapter aims at exploring the categories through the informants' perceptions and experiences, which will provide material to answer the two research questions. The chapter follows the structure of the model, where there are two main sections divided by each dimension of the model, thus the research questions, and the six components of the model serve as the subheadings. A summary of the main findings concludes each section. The two programs are compared simultaneously throughout the chapter, through the perceptions and experiences of the informants, which serves as the main body of research. As mentioned above in Chapter 4 (p. 34), the embedded design will be applied (Yin, 2014), where the experiences and perceptions of the teachers and the students in the two locations are presented separately. A pseudonym is created for each of the informants, which is used when there are direct quotes (see 'Research Informants' in Appendix 8.3, p. 109). An abbreviation of the program is also included in the quotes, with a 'TP' for the Tech Program and 'TC' for the Talent Center.

## 5.1 Educational needs

In using the multifactor model when investigating the educational needs of the students, the three categories describe the personality characteristics of the students: high ability, motivation and creativity (Mönks, 1992). These categories or personality traits need to be nurtured in order for the students to keep developing their high learning potential. Investigating how both programs work towards meeting the educational needs of these students within each category generated interesting findings.

### 5.1.1 High ability students

As mentioned above, this study did not test the students' abilities. In the multifactor model, high ability is described as being among the top 10% performers in a specific area (Mönks, 1992). In this case the students' high abilities are verified though being enrolled in the programs. Related to the students' high abilities are the two programs' efforts to meet the students' educational needs. The students and teachers were asked questions regarding how they perceive the levels of academic challenge in the program. The students were asked

whether they felt special participating in a special program, as this is an interesting aspect of how the students perceive their abilities and their participation in the programs.

### Academic challenges

One of the central components of understanding how the programs meet the students' educational needs is through investigating the informants' experiences of educational challenges in the program and whether they feel that the level of instruction suited their academic level. Overall, the students felt that they were challenged in the two programs. A majority of the Norwegian students and all the American students felt that the programs provided them with the knowledge and skills that suited their level:

> Jessica (TP): Yeah, challenged definitely. I feel like compared to what I was used to in middle school, we just memorized and filled them out. Now we have to thoroughly understand it and apply it in a new situation or else you fail the class.

One student reflected over how the Tech Program challenged the students on a high level after talking to friends in other schools and looking at their assignments and curriculum. The students mentioned numerous benefits of participating in the challenging programs. The students in the Tech Program reported that the program prepared them for college. One student pointed out how her experience gives her an advantage in her college applications:

> Cara (TP): Now on my college apps that I am working on right now, it is like, I was doing bad my freshman year, my senior year I got it together though, but it is like "No! I have also had an internship" and I have taken classes that most kids do not take. Most kids do not take computer science freshman year.

The students in the Talent Center also reported that they profited from the knowledge and skills they got at the Talent Center in their regular school. Although the majority of the students felt challenged in a way that suited their level, one student in the Talent Center reported that the program was too hard for her level:

> Synnøve (TC): I feel that sometimes, and I think it is because of my level, I am on a lower level than some of the others, that I am just sitting there, and I do not know if I have enough theoretical knowledge that I should have to be able to really do and understand what we are doing.

While the students in the Tech Programs did not report that they perceived the program as too challenging, a general tendency was that the students feel overwhelmed by the academic level in their program. Two female students and two teachers reported that the program were demanding for the students, to the point where students reported stress, anxiety and hard work

in order to perform on their preferred level. One student reported when getting into the program, she had difficulties with the high academic level of the program:

> Cara (TP): It took me a while to adapt to be honest. And my parents wanted to take me out of [name of school], because I have always been a straight A student and then I come here, and I am not doing as well. I come here and we are all smart. So you are taking honor classes and stuff, but yeah I am not the smartest in the class, so that actually defeated me for a while.

The other female student elaborated on all the work she had to do:

> Abigail (TP): everyone is so stressed because like it's a hard program. I am in the marching band, I have to do three hours certain days after school, and then I have to go home and have to eat and then I do all my homework. Like I know people that do not go to bed until midnight, and that is just because of the workload and sports.

Perhaps as a consequence of this stress, one student and two teachers in the Tech Program mentioned the importance for the students of finding a 'balance' that helps them to manage everything they have going on. While several students and teachers focused on the hard work in the program, one male student talked about how his peers were stressing over the academic workload and not caring about anything else:

> Daniel (TP): The students they are all so strict about their grades, if they do not get straight A's you are not going to get into a good college and they are all focused on like the good college without actually doing something. They want to become a doctor, finish, do not have any student loans, or anything, get married and die. They do not care about anything else.

Overall, the students were challenged in their programs. One student in the Talent Center expressed feeling too challenged, while a majority of the students in the Tech Program felt overwhelmed by the amount of work.

### Perceptions of students' abilities

A general tendency in all the interviews, were the positive attitudes the students had towards attending the program. All the students in the Tech Program and two students at the Talent Center reported that the participation in the program made them feel special. One student attributed feeling special to being allowed to focus on subjects that interested her, while others reported feeling an advantage over other students not attending the program:

> Alexander (TP): It gives me an advantage over people even in my district. Because [hometown] does not have a Tech Program at all, and that just puts me at an advantage during college. So I feel like, yes it does.

Other students in the Tech Program attributed feeling special attending the program because of the program's difficulty level. One student talked about how being in the difficult program made her feel better than other people:

Cara (TP): I think personally when I say I am in [the Tech Program], I think I am a lot better than other people because I worked hard to be in [the Tech Program] and it is like, not easy.

There were six students who reported not feeling special attending the program, five Norwegian students and one American. One student reported that he did not want to "brag" about being in the program to his peers, which made him not talk about the program at all:

Adrian (TC): Even though I do not mean to brag about it, it can be perceived as bragging, and like "he is so much better than us, he's attending the Talent Center".

Instead of feeling special, several students reported feeling lucky attending the programs. Additionally, one student in each program had mixed feelings about their participation. The student in the Tech Program had attended GATE (gifted and talented program) programs her entire school career, and reported feeling special through the recognition she got from peers not attending the program, however she did not feel special at times when she received negative attention from her peers for being "too smart". The student at the Talent Center had previously been given possibilities to participate in extra activities, which her parents had said no to, expressed her mixed feelings about getting "special treatment" through the program:

Synnøve (TC): I am a little bit critical to the whole thing, because I do think that, and that is the reason my parents said no to all those extra activities, and it is that everyone should get the same education. And I do not feel good about me getting special treatment, but at the same time I do not think everyone would have enjoyed being here. I am here because I do think it is fun and so are the others here. It is kind of complicated, because I don't know what I feel about it yet.

### 5.1.2 Motivation

Motivation is the first category of the multifactor model, and is one of the personality traits of a student with high learning potential. Motivation can be described as a construct that drives, selects and directs behavior (Mönks, 1992). Motivation needs to be nurtured in order for the students to stay motivated. Investigating how the students were motivated in the programs was conducted through inquiries about the students' and teachers' perceptions and experiences on whether the students' motivation to continue in the STEM field had improved after participating in the programs, their perceptions on future careers in STEM and their experiences of motivating assignment and teacher methods in the program. Additionally, the teachers were asked if they facilitated for the students to focus on a special area that they are interested in, and the students were asked if the teachers allowed them to focus on special areas of interests. These questions aimed at investigating the programs' efforts to keep the students motivated in the STEM field.

### STEM focus and topic of interest

The first question concerned whether the students felt more motivated by participating in the program. In general, the majority of the students in the Tech Program responded feeling more motivated to STEM, while the students at the Talent Center felt that the motivation was the same. The students who were more motivated attributed this to the STEM focus of the program, while the students who regarded their motivation as the same, attributed it to their prior motivation to STEM. Although the students in California did not express prior motivation, the teachers pointed out the need for a prior motivation before participating in the program. They have to make a conscious decision to let their high school experience be about STEM:

> Leslie (TP): They choose to apply, so both them and their parents, hopefully both parties, make that decision. But there is a motivation there to take the test. And then they have to, if they are invited, decide to come here. […] They are choosing their high school electives to be about STEM.

Allowing the students to focus on topics of interest is a way to ensure that the students stay interested and motivated in school. The students in the Talent Center reported that their program allowed them to focus on their interests. The students attributed this to the new subjects in class each day and their long-term projects. The students have a long-term project that they work on the entire school year. The students have complete freedom in choosing the project, as long as it is related to STEM. The teachers reported that the purpose of the projects is to fulfill the students' need to focus on topics that suit their interests. One student implies how the long-term project is based on her interests:

> Synnøve (TC): We got a generator for a bicycle and then we are going to make something that makes electricity while you are riding the bike, like a charger or something. […] And then we are going to have a research project about clean energy in [name of city] and figure out how to improve that. This is my outlet for the ideas that I had and the things that I wanted to do when I came here, which is fun.

The students in the Tech Program reported not having much freedom in focusing on their interests within the STEM subjects. Three out of five students were 9$^{th}$ graders, which might have influenced the findings, as the students cannot choose a pathway or classes according to their interests until 10$^{th}$ grade. However, one student and two teachers mentioned having open-ended assignments, where the students have freedom in selecting some components of the projects/assignments. This way the students were able to influence what they were working on and could adapt to their interests. The student focused on the benefits of the open-ended assignments:

Abigail (TP): Because when we write about something that we like, not just a book that we are given, and when we learn about stuff that we want to learn, we are more motivated and we are more excited to learn.

A central part of the Tech Program is a mandatory internship at a workplace the summer before senior year. The teachers focused on how the internships are a way for the students to focus on their special interests. One of the teachers pointed out the benefits:

Leslie (TP): They choose where they do their internship and sometimes if they are not sure at all we have them pick something, because they could either love it or eliminate it from their future options. More common I would say, students have one or maybe two goals in mind, and then this kind of solidifies it, they realize that they really like medical or they realize not so much, so I should go this direction.

The teacher points out how the process is overall beneficial, even if the students end up not enjoying the internships – they know that it is not the pathway for them. However, as three out of the five students were freshmen and did not really get to choose any electives this year, they felt limited in that freedom right now. The only senior in the sample reported her internship was a valuable experience for her as she found new interests and subsequently wishes that she chose a different pathway in the program. The same student expressed that her motivation for STEM had declined after participating in the program. The student realized that she did not enjoy STEM as much as before:

Cara (TP): And when I took it, I usually thought I was really good at math, and I really liked that stuff, but then after taking it, I was actually kind of difficult, and I like I think I got a C in both classes and I was just like, maybe this isn't for me.

The student's thoughts on how her interests in STEM declined are also reflected through one of the teacher's experiences. One teacher argued that some students experience loss in motivation once they begin the STEM focused program and attributes the decrease in motivation to some of the pathways' heavy focus on these subjects. Another teacher points to how some students apply for the program solely based on the program's reputation and the need for a "good education", rather than STEM being their true interest:

Albert (TP): If you do not live locally then you have to be involved in the STEM thing, even though science and math may not be their thing. So they have to kind of put up with it.

This can make the students that are participating in the program more vulnerable than they already are at loosing motivation. Several teachers mentioned the students' attitude of "doing the right thing" in the Tech Program. The teachers reported typical conversations they have had with their students where they cannot always pursue their interests. The students focus on a good education rather on their true interests.

### Future in STEM

Relating to motivation are the students' prospects for a future in STEM. Being interested in a future in STEM can be an indicator of how motivated the students are. All the students were determined to have a future in STEM, except one student in each program. Both teachers and students in both programs expressed the benefits and advantages the participation in the programs had for the students' future. The students' exposure to the subjects made them more equipped for conscious decisions later, in either continuing with STEM or pursuing other interests. The teachers in the Talent Center mentioned how working practically with STEM subjects made the students more able to make informed decisions on their further education and career. The teacher in the Tech Program followed the same argument:

> Albert (TP): From the combination of the internships and the classes they have been exposed to are things that will help them to either say: I'm going to keep going that path, or that is not for me. Because I know firsthand, and it's not based on what people tell me, I have tried that, and it's not my interests, I want to go there.

The student in the Tech Program who did not want to pursue a career in STEM, was determined that her experience in the program made her realize that she was not interested in the field. This falls in line with the teachers' views on the purpose of the internships. She did not mention any prior interest in STEM, and she also pointed out that her parents were the ones who wanted her to attend the program. The student at the Talent Center who was unsure about her future in STEM, was uncertain about her future career goals. She reflected that her exposure to the program made her feel that she could make a conscious decision about her future later.

A majority of the students in both programs had plans for a future in STEM. All the students mentioned wanting to go to college, which is not surprising considering their high learning potential. Additionally, some students in the Tech Program shared their vision of their future beyond school and higher education. While the students in both programs indicated motivation for a future in STEM, several of the students at the Talent Center were more hesitant about specific future plans than the students in the Tech Program. Typical responses included:

> Christian (TC): I think I want to get an engineering education or something.

> Markus (TC): I am considering studying physics.

Several American students knew exactly what they wanted to do in the future. At the age of 14 one student had a long-term plan for the future:

Daniel (TP): What I want to do is that I am going to finish with a good enough GPA to get into a good college and I will get a good job, and then when I am done with my student loans and all that, I am going to do stuff.

Even one of his peers who did not have a specific plan, were future-oriented in his response:

Alexander (TP): I mean knowing this now, being able to and learning the skills now, I have the options to do this and be ahead of what my competition will be, instead of starting in college.

### Motivating assignments and teaching methods

When the students and teachers were asked about experiences of motivational assignments and teaching methods, the responses were mainly focused on these three aspects: expanding knowledge/challenging assignments, practical approach and teachers. As the lines between assignment and teaching methods were not made explicit in the interviews, the findings from these questions are combined into one section.

There were several students in the Talent Center who reported increased motivation when difficult and challenging assignments were provided to them. One could assume that all the students would regard the high level as motivating, however one female student in each program reported feeling overwhelmed by the challenging classes and the high academic level. The student in the Talent Center reported:

Synnøve (TC): I am not on the highest level in this group and sometimes I struggle to keep up because it [the instruction] goes really fast, we do not get a lot of explanations, and that is the point and it has been a struggle for me.

All six students in the Talent Center reported feeling motivated by the practical approach of their assignments. One student compared the experience to his regular school:

Markus (TC): I do feel more motivated here than at school, because we work more practical here.

The teachers at the Talent Center noted that practical work in the STEM courses was a priority, which was reflected through the students' experiences. Practical work in their computer science classes was something that the students in in the Tech program also reported as motivating:

Alexander (TP): What I prefer is when he lectures for a couple of days and then he allows us to do as much as we can on our labs[4] during class

[4] Labs in this context means practical approach through assignments, which can include but is not limited to, working in an actual lab.

Additionally, students and teachers in the Tech Program also mentioned interactive assignments as a preferred method for the students to work. One of the teachers pointed out that when the students are working on assignments linked to their interests, they appeared to be more motivated. Another teacher in the Tech Program argued that the students are not given sufficient practical experience, only given a lot of theory in the subjects but not necessarily the practical skills. The teacher feared that the students' motivation could be harmed. A majority of the students in the Tech Program regarded their teachers as motivators. Several of the students in the Tech Program and one student at the Talent Center reported experiences with demotivating assignments in their program. While the students in California focused on mundane and repetitive assignments, the Norwegian student pointed out how a shallow introduction to a subject was demotivating and that he was more interested in getting into the fundamental issues of a topic. Additionally, one of the teachers at the Talent Center noted that his students wanted deeper theoretical knowledge.

There are several aspects of both programs that influence the students' motivation, similarly as some aspects of the programs made the students demotivated. However, the majority of the students are motivated to continue with STEM. In the following section the findings from the second category in the multifactor model are presented.

### 5.1.3 Creativity

Creativity is the second category in the multifactor model. Creativity is understood as the capacity to problem solve in an independent and productive way and is the opposite of reproduction (Mönks, 1992). In order to foster creative thinking, the students need to be stimulated in their creative abilities throughout school. In exploring how the programs foster creative thinking, the students and the teachers were asked questions regarding their perceptions of the programs' priority in developing creative skills. This question led to responses on how the students are able to work creatively and develop their creative skills in the programs. No specific definition of creativity was given to the respondents in the interviews.

A majority of the students in the Tech Program and all the students at the Talent Center reported that they were able to use their creative skills in the program. The students in the Tech Program focused on how they used their creativity in the tech classes through computer

programming, innovative thinking and ways to solve problems in the assignments. The students in the Talent Center focused on how they have to be creative in order to do practical work in the STEM subjects. The students pointed out that they were often given assignments where they had to solve issues using different formulas and methods, which gave several students a sense of freedom. One student at the Talent Center pointed out how they have to be creative as there are different ways to solve the assignments:

> Richard (TC): I feel that the assignment that we work on here is that there is not just one formula and then use it. It is more like, okay, here you have a couple of different formulas, give me five, six formulas, and then they give me an assignment and then I have to understand how I can connect it and understand more, and many assignments are very difficult where you have to find the creative solutions and that is really fun.

One of the teachers in the Tech Program describes the development of creativity in computer science through problem solving:

> Albert (TP): And it is not about push this button, push that button, uncheck that box. You know they have security challenges and they do not really know what the issues are, they have to find and fix it, so they have to be creative there. So I think, from a tech perspective, all of our pathways are kind of pushing them to do things that are a little bit different.

One teacher from each program had different perspectives on the programs' mandate in developing the students' creativity. While the teacher at the Talent Center reported that she wanted to take back creativity in the STEM subjects, the teacher in the Tech Program reported that it was not necessarily a priority, however in order to work in STEM you have to be creative. Although the responses were mainly positive towards the use of creativity, one teacher at the Talent Center pointed out some of the strict frameworks in STEM when asked about developing the students' creativity:

> Øyvind (TC): We have some gatherings where the assignments have very restricted frames, which are not open-ended; you have to do things in a certain order to get the correct answer.

One student and one teacher in the Tech Program reported limited use of creativity in the program:

> Jessica (TP): We just read chapters, we take notes, and take a test and then repeat, repeat, repeat...we have projects and stuff, but overall it kind of gets boring sometimes.

> John (TP): In this environment we have to set aside the creative outlets and aesthetic outlets and work really hard at these STEM things with an English and social science kicker.

All the students and teachers in the Talent Center reported use of their creativity, while the students and teachers in the Tech Program reported some use of creative skills and instances where they were not being creative. The following section will present findings from the third category in the multifactor model, high ability.

### 5.1.4 Summary of educational needs

All the students in the Tech Program and a majority of the students in the Talent Center reported academic challenges in their programs. There were differences between the two programs in whether they reported feeling special attending the program, where all the students in the Tech Program reported feeling special and a majority of the students in the Talent Center reported that they did not feel special. The majority of the students are motivated to continue with STEM. While the students in the Talent Center pointed out their prior motivation to STEM, the students in the Tech Program claimed that the program made them more motivated. The students attributed their motivation to several factors, including the programs' focus on STEM, the practical approach, challenging assignments and their teachers. All students but one wanted a career within the STEM field and the students showed a great deal of ambition for their futures. The programs allowed for the students to focus on their interest, however this was more evident in the Talent Center than in the Tech program. Additional differences between the programs can be found in the heavy focus on practical approaches in the Talent Center, and several students mentioned occasionally demotivating teachers and assignments in the Tech Program. The students and teachers in both programs reported use of creativity when solving problems and assignments. However, differences between the programs were evident through the informants in the Tech Program's report on limitations to the use of creativity in the program through mundane tasks and limited aesthetic creativity. One teacher in the Talent Center mentioned some limited use of creativity in certain STEM subjects. However, all the students and teachers in the Talent Center reported use of creative skills in the program.

## 5.2 Social needs

The multifactor models' three social categories family, peers and school, are the environmental surroundings of the student with high learning potential. Investigating how the informants experience these categories in relation to the students are valuable when looking at the students' social needs.

### 5.2.1 Family

The families' involvement in their children's education is important to look at as, families are at the core of children's environmental stimuli growing up and there are strong links to parent involvement and academic performance (B. Clark, 2013; Freeman, 2000). The students were asked questions concerning whether they felt that their parents supported them in reaching their academic potential, how interested their parents were in their education, and their perceived contact between their families and the school. The teachers were asked about the contact with the families and how they perceive the families' interest in the students' education. All students and teachers expressed a high level of parent involvement in their education, although the involvement varied from family to family. What characterized the informants' responses was parental support in reaching the children's potential and/or parental pressure on their children to perform academically.

#### Support

All students responded positively when asked about their family's support in reaching their academic potential, although there were different degrees of involvement. Several students mentioned how their parents are interested in their children doing their best academically, while other students reported their parents support and trust in their children's academics:

> Jessica (TP): So I feel like my parents, they really trust me in what I'm doing, they really do support me, they work really hard to make sure that me and my siblings get all the resources we can have, that they didn't have. They'll drive really long distances to take us places, and they like losing a whole bunch of sleep to take us where we want to go.

> Thea (TC): They are very supportive, they support me, and they never pressure me to do anything, they tell me it's ok if I do not get the best grades, which I think is good.

In addition, two students in the Talent Center reported explicitly that their families were supportive of them attending the program. Although all students reported supportive parents, one student in each program mentioned times where their families were having difficulties accepting their academic plans or need for extra challenges. A student in the Tech Program reported that his parents were not supportive of him applying to the program and his plans to go to the military for a free education. The parents of a student in the Talent Center did not want her to get extra challenges. The students mentioned the parents' wish for their children to be with their friends and how they would not if they got extra challenges or attended the

programs. The experience at the Talent Center was one student in the Talent Center's first experience with getting extra challenges for her abilities:

> Synnøve (TC): I just feel that I have not been challenged enough in school and I often got offered to do other things that could challenge me, but we have really said no to everything my parents and me. They wanted me to be a part of the normal. So it is really the first time that I have done anything out of the normal classroom. I mean, I did get some extra tasks and assignments and stuff in primary school, but this is the first time I am attending something as an addition to the regular classes I take.

Three students in the Tech Program had siblings attending the program or who had attended it previous years. Support from their siblings was important to these students:

> Abigail (TP): We mostly have the same classes and teachers too, so were always there to support each other. If she asks for homework help, I will help her, and if I ask for help she helps me, it is always helpful to have a sibling in the same grade as you because you can really ask for help and you know, they are really your outlet if you ever need anything you know.

All of the students reported that their families were supportive of them reaching their academic potential. However, the students have different experiences with how involved their families are. This will also be evident in the next section where teachers and students in the Tech Program mentioned academic pressure from the students' families.

### Pressure

In five of the interviews of students and teachers in the Tech Program, the informants talked about times where the students' families put pressure on their children. The pressure was mainly focused on getting into the program, pressure on performing academically and pressure of getting into college. This aspect of pressure was not found in the interviews at the Talent Center. The students and the teachers in the Tech Program talked about how the parents are putting pressure on their children to perform academically. The students talked about pressure on performing on a high level through constant talk about doing homework, and explaining below-par grades on the report card. One teacher elaborates:

> Albert (TP): One of the common situations here is that a B+ is considered an F in some families.

Several students talked about how their families were stressing them out about their academics in order to get into college. The parents of one student wanted him to take more advanced classes to prepare him for college:

> Daniel (TP): My parents want me to do like AP biology, get that out of the way. Do as many AP classes as I can, so I do not have to pay as much for college, which I understand because it is expensive, but it is also how like, it doesn't matter if I do AP biology if I get a C in it.

The teachers general impression on pressure from the families were linked to the students high abilities:

> Albert (TP): What I find, because of the higher level students that we have here we have a lot of parents that are pushing. Pushing their children to be successful, they are looking at what the grades are, not necessarily what the content is.

The students at the Tech program reported more pressure than the students at the Talent Center. The teachers reinforced this notion from their views on the students and their families.

### Teacher-parent interaction

A majority of all the students and the teachers reported limited contact between the programs' teachers, beyond the weekly or monthly information email. The students and teachers attributed the lack of interaction between the families and the teachers to the students' age and that they are expected to solve eventual issues by themselves. One student in the Tech Program mentioned that her parents always contacted the school when there were issues because she felt that the teachers took her parents more seriously. However, the students in general felt that there was no need to get the parents too involved. The teachers in the Tech Program mentioned that sometimes they have parents complaining about their children's grades without knowing the circumstances. One teacher talked about a conversation he had with one of his students:

> Albert (TP): I had a student last week that was like; "do you give extra credit?", "What is your grade in this class?", "92/93". "Well that's an A". "Well my mom says it has to be at least 95". "Your mom has no concept on the content or how I grade" and so that does not make a lot of sense to me. "And does your mom know that I don't give A pluses and A minuses? 89.9-100 you get the same letter grade", so there is nothing there to say that they did not perform well. That's the struggle that we have here.

This is in line with the parental pressure that some students experienced in performing well academically. However, this seemed to mostly occur for the students in the Tech Program, not in the Talent Center. The teachers at the Talent Center reported only positive feedback from the parents expressing gratitude and that their children are happy to participate at the Talent Center.

## 5.2.2 Peers

Peers are a valuable category to explore, as students are free in their choice of friends and can be a support through shared experiences and coping with problems (Mönks, 1992).

Investigating how the students and teachers experience the social environment in the programs is valuable when looking at the students' needs. The informants were asked about their perspectives on students' preferences concerning group work. Additionally, the students were asked whether the program has contributed to them making more friends and the teachers were asked how the programs contribute to improving the social environment. These questions served the purpose of investigating the social environment in the program through friendships among peers, perspectives on group work with peers and whether the students had any positive or negative experiences with the students not in the program.

### Positive social environment

The students and the teachers in both programs reported positive social environments. The students at the Talent Center praised the teachers' initiatives for social activities outside the program, while the students in the Tech Program celebrated the accepting and friendly environment. The students reported easiness of gaining new friendships and they attributed it to how the students relate to each other and willingness to help their peers gain new friendships. Both teachers and students pointed out the benefits of finding similar minded peers and how that is positive for the social environment:

> Abigail (TP): We all have a background of being in gifted programs and stuff, which I think helps us relate to each other more, because sometimes we are in hard classes and you are like, "hey, can you help me with this like project" or something. Like, you want to help each other out, and it is just awesome.

Other students pointed towards the acceptance of each others abilities and how this was a benefit of the similar minded student body:

> Alexander, (TP): I think [name of school] is just more supportive, in general, just the student class […]. Because I think at [name of school], the difference is that people do not shame you for being smarter, and that was kind of how it was at my middle school you know. It was cool to not be smart and not try at all.

The teachers at the Talent Center worked actively towards a positive social environment. Having a positive social environment where the students can interact and create networks with similar-minded peers was a priority, something that they got positive feedback on. While the students at the Tech Program specifically pointed out the social environment as friendly and supportive, the students at the Talent Center focused more on the social activities that they were doing. When asked about making new friends in the program, the students at the Talent Center were more hesitant in their reports. All the male students reported at least one new acquaintance, or that it was easy to make friends in the program. The female students

were more cautious in their descriptions, and decided to portray it as "knowing people better", not necessarily having new friends. The difference between the programs might be accounted for by the different relationships the students have with each other, as the two programs are different in time structure. The students at the Talent Center do not know each other as well as the students in the Tech Program because the students in the Talent Center meet each other twice a month, and the Tech students see each other every day. Additionally, the program was only halfway through its course, and only one student mentioned meeting peers from the program outside of the Talent Center. Another interesting finding when it came to similar-minded peers was that several students at the Talent Center preferred working in groups in the program while not preferring it in their regular school. One student reported this when asked about preferring working alone or in a group:

> Synnøve (TC): Here, in a group. Otherwise I like to work alone.

All the students at the Talent Center reported that they enjoyed both working alone and in groups, while there was an equal mix between preference for working alone, in groups and both at the Tech Program. Generally, students had positive experiences with group work in the programs and mentioned several benefits of working with other students. One of the students at the Talent Center had a typical response:

> Richard (TP): I really like working with one partner because then I can talk about the problems with someone.

What was interesting concerning the students that reported that they enjoyed group work was that the success of the experience depended on different factors. The students had remarks for conditions on how the group work could be a positive experience and equally comfortable or better than working alone. When these conditions were met, the students enjoyed doing group work. The comments centered on the assignments' level of difficulty and more often, the group members. Another student at the Tech Program mentioned that when you can work with a person of your choosing or with similar ability level, group work is better:

> Alexander (TP): If you are in a group and you have individuals with similar thought processes or even different ones, if everyone is working on it equally then that is more beneficial than if you are working on it on your own.

The program's difficult assignments made two of the students in the Talent Center prefer to work in groups when in the program. One student elaborates:

Synnøve (TC): There are a lot of things I am able to do by myself in school, which can make it distracting to work with others. But here, there are more people who do not understand what we are doing, and then we can talk about it together and figure it out. Someone knows a lot, while others do not know as much and then you can learn from each other. It is much better to work in groups here, because then we can complement each other's abilities.

The teachers in both programs mentioned that they often do group projects. While one teacher in the Tech program gives his students group work at least once a week, the teachers at the Talent Center have the students working in small groups, except in their long-term project. Working in small groups was also what the students preferred. At the Talent Center the teachers do not decide whom the students work with. Choosing who is going to work together was something that one teacher at the Tech Program also talked about:

Albert (TP): The first project we had, you pick whomever you want. And now the second, you pick anybody else you have not worked with before. In the end of the year you will have worked with everybody.

One student at the Talent Center reported how she wanted the teachers to control the groups sometimes, in order to work with more people in the group:

Synnøve (TC): Maybe they could have chosen the groups that work together, because it is very like; work with whoever. And that is a good thing if you have a friend, but if you are alone or want to mix it up, they could control a little bit more.

Related to the students' preference of working alone were the negative experiences of group work. These experiences were often related to other students not doing their part of the assignments and wasting their time:

Jessica (TP): Usually there are one or two people that just do not really work in a group, so you have to pick up their slack, and afterwards they start complaining, and it makes the whole team feel really bad and unmotivated.

Richard (TP): I like to work and not waste my time, because then I have to do it at home or some other time, and then I have to yell at the people in my group and no one likes that.

All students but one mentioned that besides group work they also enjoy working alone. The students mentioned the positive aspects of working alone as being in control of the assignment in terms of quality and time spent thinking about and doing the assignment. Additionally, one student reported the positive aspects on the self-esteem when completing an assignment by yourself. There were two students in the Tech program who reported that they always prefer working alone. This falls in line with the impressions of two teachers in the Tech Program who describes their students as hard workers that like to be in control of their work:

Leslie (TP): There is definitely an subset of students that work really hard and would rather do it themselves, and are willing to put in the effort.

Both programs reported positive social environments. The following section will look at the informants' perceptions of the programs' quality and the student-teacher relationship.

### 5.2.3 School/program

#### Quality of program

When asked whether the program was of high quality, all the informants affirmed this. They attributed the high quality mainly to the teachers, students and the content. Common responses included:

> Markus (TC): I think this is a pretty good program. It is a good way of learning STEM subjects.

> Jessica (TP): It just feels really, like in other schools it kind of tends to feel half planned, half baked, and the teachers kind of said we will see what goes along, we will just go with it, here it is really good structured, well planned out, I feel really taken care of here.

For many of the teachers in the Tech Program, they regarded their students as important contributors to the quality of the program. Through "high quality students", the programs got recognition and attracted other similar students. The teachers mentioned that through this process the teachers and the program coordinators always had to develop their program in order to meet the students' needs and stay attractive to potential students. Although the respondents viewed their program as high quality, through the content, students and teachers, some reported improvements they would like to see in the programs. In the Tech Program the teachers mentioned improvements in the distribution of the internships towards the students' interests, less homework for the students, and more staff working solely with the students in the program to cater to their needs. One student at the Talent Center wanted more math, while another wanted the classes to be better organized by the teachers.

#### Student-teacher relationship

Teacher support is important for students with high learning potential (Idsøe, 2014). Central to schools or programs' provision of educational challenges and support are the teachers. Exploring the students' and the teachers' impressions of their interaction are relevant when looking at how the students perceive teacher support. Both the students and the teachers in both programs reported good communication between them. When asked about their perceptions on whether they felt that their teachers supported them the students had different

perspectives, although most students mentioned how the teachers were supportive when it came to their academics:

Jessica (TP): They (the teachers) are really attentive to individual people. Like you can just come after school you can email them, they always - at the beginning of the school year they were all like, if you have any problems just talk with me and we can work it out.

Richard (TC): I do get more of the things I really have not learned anything about before (…) If I want challenges in my regular school I have to find it myself.

Thea (TC): They are very helpful and they think it is fun if we do something different and they are really good.

Several students at the Talent Center praised their teachers' knowledge and ability to help them:

Richard (TC): They are good at explaining things to us, they really know what they are talking about, and then you learn more and get more motivated, right.

Most of the students at the Tech program felt that the teachers enjoy teaching and that they were considerate of their students' strict and hectic academic time schedule:

Abigail (TC): I have teachers that has been like: "let me know if you have big exams that day, cause then I will switch and have it another day", and then we're like, "thank you!"

Several students at the Tech Program mentioned the easiness of contacting the teachers through their own chrome books, provided by the school. Most students reported that they had no problems asking their teachers for help with the academics, however none of them felt comfortable talking to their teachers about more sensitive topics. The students mentioned however, that the school has guidance counselors assigned to them for those issues. One student at the Tech program pointed out how the teachers are really interested in the school's social calendar, and were often participating in games and bets with the students on campus. One teacher explained that he would talk to his students about homecoming prom and how to ask someone to the dance. At the Talent Center the students mentioned how the teachers focused on the social aspect of the classes and initiating social activities for the students and teachers.

One could expect the relationship between the students and teachers to be different in the two programs as the students in the Tech program interact with their teachers every day, while the students at the Talent Center meet their teachers twice a month. However, one of the teachers at the Talent Center reported several experiences of students talking to him about their issues. He noted that many of the students were not comfortable talking about these things with their regular teachers, and how he supported them when talking about their issues.

While the informants mostly reported a positive relationship between the students and teachers, some students pointed out some challenging factors in their relationship with their teachers. Two students in the Talent Center reported that the teachers had too many students that needed guidance and that sometimes they were too busy to help them. One student attributed this to a gender divide, where the teachers were not as attentive to the girls as they were not as loud as the boys:

> Synnøve (TC): They [the boys] are in majority; they make more noise and fuzz and are on a higher level. I think many of them work on these subjects in their spare time, and they get more time with the teachers than we do sometimes. Even though we are the ones who need more guidance and help.

Not having enough teachers to support the students was also a concern to the teachers in the Tech Program. Two teachers mentioned how it is difficult to make sure that all their students get the specific support and follow-up they need as they have big classes with many students. The challenge of supporting all students in the large program, can also be reflected in one of the students in the Tech Program, and how he was unsure about the teachers' true interest in the students:

> Daniel (TP): Yea, they can help us when we need help, but I don't know if they really care about their students. Some teachers you can tell that, yea, they're devoted to their job and other teachers its like, yeah they're devoted to their job, but are they just doing that because its their job?

### 5.2.4 Summary of social needs

All the students reported involvement from their parents in their education, as a majority reported support from their parents, some students in the Tech Program reported pressure from their parents to perform academically, get into college or into the program. Parental pressure was not mentioned in the Talent Center. Both programs had positive social environments, where especially the Tech Program's students mentioned the easiness in gaining friendships and support through similar-minded peers. The students in the Talent Center praised their teachers' focus on improving the social environment in the program through doing activities on their spare time. However, fewer friendships were made in this program. The student teacher relationships were also mostly supportive in both programs. However, there were issues concerning teacher shortage to fully support the students. The teachers in the Tech Program had concerns about being a large program with many students and how it was impossible to provide sufficient support for all the students. In the Talent Center, one female student reported that the male students got more attention, which made the

lack of teacher support in classes divided by gender. This gender difference was not mentioned in the Tech Program.

# 6 MEETING STUDENT NEEDS IN SPECIAL PROGRAMS

One way of meeting students with high learning potential's educational and social needs is through specialized programs. Benefits of attending special programs are the access to more educational opportunities, less boredom and work with similar-minded peers. This study includes one full-time program and a pullout program. These specialized programs have the potential to meet the students' needs as many students with high learning potential have similar educational and social needs, however, is participation in a special program enough?

This chapter aims at investigating how the explorations of the categories could explain for how the students' educational and social needs are met, through answering the two research questions for this thesis; 1) How do the educational STEM programs work towards meeting the educational needs of the students with high learning potential?, 2) How do the educational STEM programs work towards meeting the social needs of the students with high learning potential? The chapter links the data material to the thesis' theoretical framework to present and conclude on the research questions and the overall research problem. The multifactor model's six categories were thoroughly explored and the informants' perceptions on how their needs are met in the two programs paints a mostly positive picture. Following up from the previous chapter, the two programs meet a majority of the students' needs when it comes to motivation, creativity and high ability (see Table 8.2, p. 113), and when it comes to teacher support, parental support and peers (see Table 8.3, p.114). The model can account for how the students' needs are met to some degree, however the model is limited in the specification of issues that emerge both within and beyond the categories. This means that the categories can account to some degree for why the students' needs are met and serves a purpose for a discussion on the elements within and beyond the model to how the students' educational and social needs are met in the programs.

## 6.1 How the programs meet the students' needs

When looking more closely at the programs' structure and how they work towards meeting the needs of their students', the results are promising. In the following section, a discussion of the elements that can argue for how the programs meet the students' needs is presented.

### 6.1.1 Pedagogical strategies

#### Enrichment and acceleration

To facilitate work on topics of interest and provide sufficient academic challenges is a central element in education provision for students with high learning potential (Rogers, 2007). Enrichment and acceleration are two methods to facilitate this, as an important element in both strategies is to provide challenges for the individual student at their level. Additionally, in enrichment, the students develop their knowledge within and based on the students' own interests. The findings indicate that the students in the Talent Center were provided with enrichment activities, and although the students in the Tech Program reported less influence, the program's structure allowed for focus on interests in the higher classes. Both programs provide subject-based acceleration for the students. The Talent Center provides this through the advanced and focused content on STEM, while the students in the Tech Program have subject-based acceleration through their Advanced Placement classes in STEM (Rogers, 2007). All the students in both programs felt challenged by the academic level of the programs. This argues for how the programs were able to challenge the students' at their individual level.

As an argument to how the programs meet the students' needs through acceleration and enrichment is through the students' motivation. Provided with challenging assignments in topic of interests, the students can become more/or stay motivated and interested in the specific subjects (Mönks, 1992; Skogen & Idsøe, 2011). The findings found no decrease in motivation, except one student in the Tech Program. The students in the Talent Center reported similar motivation and the students in the Tech Program reported more motivation after attending the program. The motivation was also evident as all students, except one student in each program, were determined to have a future in STEM. Enabling the students to focus on their interest in the STEM subjects and providing them with academic challenges can be one of the possible explanations for how the programs kept the students motivated or increased their motivation. If we assume that a majority of the students were somewhat interested in the STEM subjects, this practice led to positive outcomes for the students. The students' motivation indicates that the program managed to keep the students motivated.

When the students were asked about their influence in choosing topics to work on, the students at the Talent Center reported a high level of influence and the students in the Tech

Program reported a lower level of influence. The students at the Talent Center were able to influence topics in classes and their individual long-term projects. The lesser influence for the students in the Tech Program in choosing topics did not seem to have any impact on their general motivation towards STEM. Perhaps the challenging assignments and general focus on STEM compensated for the lack of freedom in choosing topics to work on.

### Practical approach

Another central aspect of enrichment is solving real-life problems (Rotigel & Fello, 2004). All of the students at the Talent Center mentioned the practical approach in their program as motivational and a few students in the Tech Program reported the same. This was one of the new themes that emerged from the data. The teachers in the Tech Program were not satisfied with the level of skill development in the program, which could harm their motivation. Teachers might perceive theory learning as the best way to stimulate the students, as this is perceived to be the only way to provide advanced content. Research has shown that a practical approach to STEM can yield several beneficial outcomes. Situating the issues in real-life contexts can increase the students' motivation, and can lead to more students being literate in STEM (Bell, 2016). With the use of too much theoretical understandings, the students might feel the subjects are boring and unpractical (Tseng, Chang, Lou, & Chen, 2013). Providing the students with a practical approach can meet their high ability needs and keep up the interests and motivation for STEM. The multifactor model does not specify practical approach in education provision for students with high learning potential, however in 'high ability' and 'motivation' categories, the central aspect is to provide the students with methods that meets their needs. The model does indirectly focus on methods to keep the students challenged and motivated, but does not explicitly point to a practical approach. This might be due to the emerging concept of practical approach, however a problem-based pedagogy has been popular for several years. Closely related to a practical approach are the problem-based strategies as they focus on using theoretical models to real world applications (Gallagher, 2000). Research has shown that this practice benefits students with high learning potential (Rogers, 2007). The Talent Center provides a practical approach, which can account for the motivation and positive attitude towards this way of working.

## Creativity

Creativity is also a central element in Renzulli's enrichment model, where enrichment activities develops the students' creative productivity by introducing the students to a range of topics, areas of interests and fields of study (Renzulli & Reis, 2000). The students and teachers in both programs reported how the STEM classes prompt use of creative skills, as they have to be innovative and creative in their problem solving and working on their assignments. All the students and teachers at the Talent Center reported use of creative skills in the program, while there were some informants that reported lack of using creative skills in the Tech Program.

The open nature of creativity can lead to different understandings of the concept, which was evident when it came to the information from the Tech Program reporting the lack of creativity in the program. The student in the Tech Program reported mundane assignments where she could not employ her creative skills, while the teacher reported lack of aesthetic outlets as limiting the students' ability to use their creative skills. The responses from the interviews suggested different understandings of the concept of creativity. Some might see creativity only in terms of the physical or aesthetic while it can in reality be employed in different types of subjects (Sternberg, 2005)**.** This falls in line with how people often have different concepts of what creativity is (B. Clark, 2013). As the teacher in the Tech Program understood creativity as an aesthetic outlet, this poses a limited view on how the students work creatively and employ their skills. Research has shown that creative training enhances creativity skills (Feldhusen & Clinkenbeard, 1986; Vaughn, Feldhusen, & Asher, 1991). This suggests the importance of teaching creativity in order to develop the students' creative thinking and doing. To foster creativity, the teacher has to allow the students greater choice in the selection of topics, welcome unorthodox views, and reward divergent thinking (Renzulli, 1992). This points out how important the teachers are in enabling creativity training. If the teacher is not aware of the range of ways to be creative, it can limit the creative experience for the students. The informants' differing views on creativity, can also explain why there was a mismatch between the students' and the teacher's opinion on using creativity in the Tech Program.

As the students are placed in special programs for students with high learning potential, the teachers have great opportunities to foster the students' creativity. Open-ended assignments can be beneficial for students with high learning potential (Rotigel & Fello, 2004), as the

stricter frames and less freedom the students have, the less creative they are (Young & Balli, 2014). Creativity is closely aligned to problem solving (Russo, 2004), which is one of the methods that the teachers can use to develop the students' creative skills. One of the teachers in the Talent Center reported that some assignments have strict frames and are not open-ended, however all the students in the Talent Center reported use of creative skills, which does indicate that being provided with some close-ended assignments does not harm the view on creativity in the program. Open-ended assignments were a preferred way to work for the several students in the Tech Program. If the teachers provide the students with open-ended and problem based assignments the students can develop their creative skills. The multifactor model regards creativity as a capacity to solve problems in an innovative way (Mönks, 1992), however it does not say how to train creativity. Again, the model does account for how the students experiences that the program meet the students' creative needs, it does however indicate that creativity is central when providing education to these students.

### 6.1.2 Social environment in the programs

#### Supportive environment: teachers and peers

The multifactor model describes the students' relationship with the school as a dependent factor, as the students have little influence on which school/program they attend. As the students have deliberately decided to participate in the programs, this is not the case for the informants in this study. Because of this, the model does not account for specialized programs. However, as the model focuses on the importance of peers in learning processes and support, an argument can be made for how the model supports a similar-ability grouping. Both programs have students with high learning potential, however it is only the Tech Program, which has had an admission process to guarantee that all the students are high performers. Although several of the students in the Talent Center were high performers as well, the admission process was not dependent on an achievement test or grades. In this case, the model supports the Tech Program grouping to a bigger degree than the Talent Center grouping.

All the students reported positive social environments in the programs, through supportive teachers and peers. All the students in both programs talked positively about their teachers and reported easy communication between students and teachers. Additionally, several

students in the Tech program regarded their teachers as motivators. Based on the students' responses, the teachers appeared to be supporting the students and their individual needs. In regarding the school as a dependent factor, the multifactor model does not highlight the teachers' role in supporting the students. However, as the teachers are the main contact with the program, the teachers can be regarded as a 'representatives' of the school, and are important for students with high learning potential. The teachers are central to facilitating for the students' learning, and thus, meeting their needs (Idsøe, 2014). In order for the students to be provided with education suited to their needs, they need to have teachers who are aware of their potential and provide support and encouragement for the students with high learning potential. As the students reported support from the teachers, it can account for the students' positive academic development in both programs, as this is central to all students including students with high learning potential (Idsøe, 2014).

When it comes to peers in the programs, the students in the Tech Program reported a supportive social milieu as the environment allowed for them to show their abilities. Being among similar-ability peers can reduce stigmatization and the feeling of differentness, through social support. The 'social handicap' of being labeled as a student with high learning potential (Cross et al., 1991), may thus be reduced in similar-ability groupings. Several students in the Tech Program mentioned easiness in creating friendships. Previous literature also points out the importance of similar-minded peers, as all people tend to choose friends based on similarities in interests and abilities (Porter, 2005). Compared to the Tech Program, the students in the Talent Center reported having fewer friends in the program. However, the students reported positive aspects of being among similar-minded peers. Students with high learning potential can have difficulties creating long lasting friendships when they are in mixed ability classrooms, as the selection of similar minded peers are limited (Porter, 2005). In both programs, all the students have high learning potential which makes the selection of potential friends bigger. As the students reported positive social environments and the students in the Tech Program reported easiness in creating friendships, the similar-minded peers aspect might have had a positive influence on the social environment in the programs. This indicates that the Tech Program may have met the students' peer needs slightly better than in the Talent Center. Although, the much lower frequency of meetings at the Talent Center probably explains why the students have not created as many friendships as in the Tech Program.

As previous research has suggested that students with high learning potential usually prefer working alone (C. Clark & Shore, 1998; French et al., 2011), and some students in this study also stated a preference to work alone it was interesting to see that several students in both programs preferred working in groups. However, the preference for group work was dependent on several factors, including being able to choose your group partners and the difficulty of the task. This also falls in line with previous research on students with high learning potential and different work methods (B. Clark, 2013; Diezmann & Watters, 2001). When it came to group work, several students in the Talent Center reported a preference for group work in the program compared to their preference for working alone in their regular school. The literature on gifted students and group work suggests that students with high learning potential prefer group work when they are not slowed down by their partners and receive sufficient challenges (Diezmann & Watters, 2001; French et al., 2011). Working with similar minded peers could create a more positive attitude towards group work; due to being places in groups where everyone does their fair share and the project has to meet a certain standard. The two programs are programs with students with high learning potential, which can explain for their mostly positive attitudes towards group work. One of the benefits of acceleration and ability grouping is the possibility for the students with high learning potential to meet similar minded peers. The programs have worked towards meeting the students' needs through creating positive social environments, enabling friendships and creating positive attitudes towards group work.

From the positive aspects of how the programs work towards meeting the students' needs, a natural continuation are the less positive experiences and perceptions that the informants reported in the interviews. The following section will include a discussion on the aspects of the programs that is not meeting the students' needs, and how this related to the multifactor model and additional literature.

## 6.2 How the programs do not meet the students' needs

Although the previous chapter and section presents a positive picture of the programs and how they work towards meeting the needs of the students, there were incidents where the programs did not meet the students' needs. The following section will present a discussion on the negative outcomes of the pedagogical practices in the programs, through loss in

motivation and academic self-concept, instances of demotivating teachers and signs of stress and perfectionism for a small number of students.

### 6.2.1 Negative outcomes of the pedagogical strategies

#### Decrease of motivation

Important factors for academic motivation for students with high learning potential are self-efficacy and academic self-perception (Dai et al., 1998). Although the majority of the students in both programs reported motivation in the STEM subjects, one student in the Tech Program reported a decrease in motivation towards STEM after participating in the program. After performing below her regular standards, her motivation towards the subjects decreased. A fair assumption is that her self-efficacy and academic self-concept declined with her grades, which might have led to the decreased motivation. The decreased motivation due to lower grades can be linked to extrinsic motivation. When the student did not master the STEM subjects like previously, there was a decrease in motivation, as the extrinsic factor of good grades did not motivate anymore. This can also be an argument for how the program did not meet her needs, as the level was too difficult. Another reason for the decreased motivation may be that a common misunderstanding is that students with high learning potential have high potential in all subjects (Jeltova & Grigorenko, 2005). If students apply for the program believing that they have high learning potential in all subjects and it turns out they have "domain specific giftedness", it could be the reason for why they do not perform as well as expected.

Another construct to take into consideration is the academic self-concept. Loss in motivation can be linked to decreased academic self-concept (Bong & Skaalvik, 2003; Skaalvik & Skaalvik, 2004). One female student in each program had difficulties with the high level of instruction and the perceived higher level of their classmates. Although the finding was small, only based on two students, it is important to highlight the reasons for why this happens. The student's lowered academic self-concept can occur as a result of the high ability grouping. The students indicated lower academic self-concept in the high ability programs compared to their mixed ability experience in the previous school or regular school. The Big-Fish-Little-Pond-Effect (BFLPE) (Marsh, 2009) can be one way of explaining the decrease in academic self-concept for the two female students. The student in the Tech Program lost confidence in

her abilities, as she was accustomed being a top performer in her previous school. The female student in the Talent Center reported how she compared herself to the others, and found herself at a lower level. Having to adjust to a more demanding curriculum and a more competitive climate can lead to uncertainty regarding their academic standings (Preckel, Götz, & Frenzel, 2010). The two female students experienced the level in each program as too difficult. Previous research shows that female students can be more vulnerable to the BFLPE, as girls have a sensitivity to external cues and they have a drop in self-esteem in their adolescent years (Catsambis et al., 2001). Academic self-perception is influenced by social comparison, which can argue for girls being more vulnerable in feeling the BFLPE. Both female students were used to being top performers and when placed in the high ability groups could have possibly changed their academic self-concept. However, the student in the Tech Program mentioned how she overcame her academic obstacles and started to believe in her abilities again. Research has suggested that the students with high learning potential can experience decrease in self-concept in the beginning of the ability grouping, but that their academic self-concept increases over time (Dai & Rinn, 2008; Moon et al., 1994). This finding of loss in academic motivation in the ability grouping indicates issues with the acceleration of the two students, where the students' needs were not met. Even though the students have high learning potential, it is important to remember that they are a homogenous group.

### Demotivating teachers and assignments

While the students overall were supported by their teachers, a few students in both programs reported occasions where the teachers were not supportive. While one student in the Tech Program reported monotonous teachers as demotivating, two students in the Talent Center and teachers in the Tech Program reported that the teachers often were not able to provide sufficient support, as there was not enough time or enough teachers. Another student in the Tech Program reported demotivating and mundane assignments that were based on repetition. One of the most reported attitudes towards the curriculum by students with high learning potential is boredom (Gallagher et al., 1997). STEM education has been heavily influenced by traditional theoretical learning approach, which emphasizes rote skills and memorization, which can lead to the students perceiving the subjects as mundane and repetitive (National Academy of Engineering and National Research Council, 2014). One way of providing the students with interesting assignments is through a more practical approach, which in

provision of enrichment activities is central (Rotigel & Fello, 2004). The potential outcome of loss in motivation and boredom is underachieving, which in worst-case scenario can lead school dropout. Although the students in the Tech Program are not underachievers, these students are also at risk of becoming demotivated and bored if not provided with work that motivates. The teachers reported that the Tech Program's internships were intended to fulfill the students' needs to work with topic of interests. Internships or other types of expertise can work supplementary to programs for students with high learning potential (Subotnik et al., 2016). The experience in an internship can enhance the students' creative and productive skills and well as providing them with real life work experience. However, as the internships were completed in the summer before senior year a majority of the students had not done their internships. If the students find interesting internships, it can possibly keep them motivated and provide them with new understanding of the work life and hopefully some of their interests.

One student in the Talent Center highlighted disproportionate teacher attention, based on gender. The student reported that the boys got more attention from the teachers as they were louder than the girls. These patterns are found in educational research on gender roles in the classroom. Boys tend to get more attention from the teachers than girls (Jones, Dindia, & Tye, 2006). An asymmetric power relation between the genders can lead to the teachers treating the girls and boys differently (Nielsen, 2000). Research has also shown that boys who are high achievers in school are the winners when it comes to the teachers' attention as they get more praise, more academic feedback and more advanced questions. Interestingly, the high achieving girls were the student group that received the least attention from the teacher (Good, Sikes, & Brophy, 1973). Thus, the teachers have to be aware of the gender differences in the classroom to provide sufficient and equal support of all their students.

### 6.2.2 Stress and perfectionism

The high academic level in special programs for students with high learning potential can lead to stress, high pressure and expectations. These elements were evident in the students in the Tech Program, where the students reported hectic and demanding school days, especially the two female students. Attending a special program can have a stressful effect on young people. The school experience can be another stressor for students enrolled in full-time advanced programs (McNamara, 2000). When the students are met with higher teacher and peer

performance standards, uncertainty in reaching academic goals, competition among the students and a strong fear of failure, the students can experience stress and performance anxiety (Zeidner & Schleyer, 1999). Additionally, girls often show higher emotionality scores than boys (Zeidner, 1998). This can account for why the girls reported feeling more stressed about the program than the boys did. However, girls more often than boys seek support in social relationships when dealing with academic stressors (Preuss & Dubow, 2004). It might be that the boys felt equally stressed, but chose not to talk about it to the researcher.

Several students and teachers in the Tech Program mentioned how the students have to find a "balance" in order to manage the work in the program. The students' aspire to excel academically, succeed in their band or sports team, and generally had high expectations for their work. Stress and anxiety linked to high expectations can be linked to perfectionism, which is a personal characteristic in many students with high learning potential (B. Clark, 2013). Some students in the Tech Program had high expectations of their work, and thus feelings of stress and anxiety, which can be explained by self-oriented perfectionism (Speirs Neumeister, 2007). In reducing the stress and perfectionism for the students, it is suggested that parents, teachers and counselors at the Tech Program can guide the students with planning for realistic goals, making reasonable commitments and accepting the consequences of their actions (B. Clark, 2013). The students at the Talent Center did not mention feeling stresses or having tendencies towards perfection. This can be explained by the fact that the two programs differ when it comes to structure, where the level of comprehensiveness is distinctively different. As the students in the Talent Center did not talk about their regular school experience, they might also feel stress in that environment. However, when it came to their experience in the Talent Center, they did not report any feelings of stress. Another factor that can account for the differences is the education system through college admission process and costs can make the American students more inclined to worry about their future, whereas the Norwegian students can afford to be more relaxed. It should come as no surprise that the students differ in this aspect.

## 6.3 Family – Support and pressure

When talking about how the family can affect their children's education, the influence is two-fold; through the parents' contact with the school and the home climate. The following section will include a discussion on how the families supported and pressured their children

with high learning potential through contact with the school, interests in their schooling and high expectations of their children.

### 6.3.1 Parent-school interaction

The students in both programs reported little contact between their families and the teachers. The teachers reported contact with the families through informational emails, on a weekly or monthly basis. Unless there were special circumstances, the contact between the parents and teachers was limited. The literature points to the importance of good communication between the school and the families for the students with high learning potential to benefit the most from their education (B. Clark, 2013; Idsøe, 2014). The fact that the informants did not experience much contact between the families and the teachers might be contrary to what is believed to be beneficial for the students' academic provision. However, it can also be an indicator that the families have little need to be in much contact with the school and teachers. Clark (2013) highlights how parent interaction with the school can occur more frequently when the parents experience lack of control and they experience not sufficient education for their children provided by the schools or programs. Neither the students nor the teachers mentioned much contact besides the informal email and did not report wanting more frequent contact. Possibly, the parents were provided with sufficient information and felt that their children are well taken care of in their academic and social development. It seems that the programs have met the students' needs through the contact with the parents and how the parents appear satisfied with the programs.

### 6.3.2 Family support

The families' role in their children's education is central when it comes to school performance and attitudes towards school, both in Norway and in the U.S. (Bakken, 2004; Freeman, 2000). As family support is not something that the directly contributes to meeting the students' needs in the program, it central to the students' social and academic development as a supportive family can promote healthy school attitudes and behavior. All the students and teachers reported a high level of parent involvement in the students' education. The students' families have likely contributed to the development of the students' potential and attendance in the programs. All the students, except one in the Tech Program, reported that their families were supportive of them reaching their academic potential. The literature on the importance of

families for students with high learning potential confirms this. Interested and invested families create a home environment where the children get to develop their potential (Clarke, 2013). Research on effective parenting of students with high learning potential, is having an 'academic home climate' (Campbell & Verna, 2007). There are various elements of an 'academic home climate', and what characterizes it is that it generates curiosity and encouragement in following the students' interests. This can also promote positive behaviors, attitudes, values and beliefs that lead to high achievement (Campbell & Verna, 2007). The students in the Talent Center reported how their parents tried to guide and help them with their homework and showed great interest in their work. Several students in the Tech Program mentioned how their parents enabled them to attend the program through encouragement, allowing them to focus on their schoolwork and driving long distances as many of the students lived hours away from the school. When the families support and motivate the children to perform well in school, it enriches the students and can create a positive home environment (Idsøe, 2014). When the 'academic home climates' match the students' school, the students have greater possibilities to prosper academically. The parents' support is also evident in the students' participation in the programs. For the students to attend a special program, the families must to some degree have special interests in their children's education. One can argue that it can be the students' motivation to participate in the program, however as all the children are minors they need parental consent in order to participate.

### 6.3.3 Non supportive actions by the families

#### Not supportive of acceleration

Although almost all students reported having supportive parents in general, some students reported episodes where their parents were not supportive. One student in the Talent Center talked about how her parents never allowed for extra challenges in school as they feared social separation from her peers. One student in the Tech Program reported a similar response from his parents when he applied to the Tech Program. This falls in line with previous literature on the topic. Some teachers, parents and students believe that acceleration leads to social and emotional harm to the students. This includes decline in academic self-concept, higher anxiety (Rogers, 2007) and social separation (Southern et al., 1989). Others argue that the harm is limited, as few students are completely separated from their peers (Southern & Jones, 2004). Although the student in the Tech Program was separated from his peers from his

previous school, he still chose to participate. When letting a student accelerate, it is important to consider the needs of the student, as there are many ways to accelerate. Some students have negative outcomes for certain types of acceleration, while positive experience with others (Rogers, 2007). The use of 'student portfolios' is useful in getting a comprehensive understanding of the student and their background in order to understand and meet the student's needs. This can be done when planning the educational provision for the student with high learning potential. The literature does however describe the positive effect of acceleration, and the consensus among researchers is that acceleration mostly benefits the students with high learning potential (B. Clark, 2013; Mayer, 2005; Southern et al., 1989). The long-term effects of acceleration are also positive as the students that have accelerated in their school career are twice as likely to be in a STEM career in their 20's and 30's (Lubinski & Benbow, 2006). This points to the positive aspects of acceleration. Parents are central to providing the students with opportunities at home and to having a positive interaction with the teachers in the schools or the programs. Thus, parental support is essential for the students' needs to be met (Idsøe, 2014).

### Parental pressure

In the Tech Program, three students and two teachers talked about pressure from parents, while none of the Norwegian students and teachers reported this. It can indicate cultural differences in approaches to parenting and how the educational systems in Norway and the US are very different when it comes to access and opportunities. The American parents might put greater pressure on their children as higher education is perceived as the best way to guarantee future success, such as higher earnings (National Center for Education Statistics, 2018). For students with high learning potential, parental pressure to perform academically can lead to several negative consequences. Parental pressure can lead to socially prescribed perfectionism, insecure parent-child interactions and unrealistic expectations for their children to achieve (Garn & Jolly, 2014; Mudrak, 2011). As the students mentioned pressure from their parents to get into the Tech Program, performing academically and getting into college and at the same time expressing the desire to be able to fulfill their parents' wishes, the students' run the risk of having socially prescribed perfectionism.

There might be several reasons for parental pressure when their children show signs of high learning potential. As previous research shows, parents can feel obligated to the society to

fully develop the potential of their children (Mudrak, 2011). They might be aware of the important contributions to innovation and development their children can be a part of (Garn et al., 2010). The parents who put pressure on their children most likely believe it will lead to better outcomes for their children. However, research shows a different picture. High levels of support and low levels of pressure are linked to high achievement (Campbell & Verna, 2007). Having an effective parenting strategy with low levels of pressure and an academic home climate is more beneficial for the students with high learning potential. As this aspect of parental behavior is influenced by cultural differences, it is suitable to follow up with the next section on differences between the programs that can be accounted for by cultural differences.

## 6.4 Cultural differences

When it comes to differences between the systems and cultures the two programs exist in, two noteworthy themes emerged from the interviews. Another interesting aspect of the differences in the systems is the share of top performers in each country. The themes that emerged from the interviews concerned the teachers in the Tech Program's reflection over the students' real interests in STEM and the students in both programs attitudes of attending the special programs. When looking at the shares of top performers in each country, it adds a valuable dimension into the differences between the countries.

### 6.4.1 Interest in STEM and motivation

The teachers in the Tech Program reported how several students apply and participate in the program, as they want to "do the right thing". Students who were not sincerely interested in STEM, still applied for the program as they hoped the academic path would provide benefits for them. Subsequently, the teachers reported that in their experience, many students lost motivation after starting the program. In this section, it is worth noting the issue concerning how teachers access information about their students' motivation. Teachers often confuse highly motivated students and students with high learning potential, when in fact a large number of these students might be unmotivated and in some cases underachieve (Gagné & St Père, 2001). It might be that the students were unmotivated for other reasons or were never interested in STEM; however, the teachers' perspective on their students is valuable in this context, as they have a more general image of their student body. The issue of true interests in STEM and subsequent motivation was not mentioned at the Talent Center. One possible

explanation is that the students in the Talent Center were intrinsically motivated in the STEM subjects. Learning new things for the pure pleasure of learning is something that characterizes many students with high learning potential (Clinkenbeard, 2012; Vallerand et al., 1994). The students in the Talent Center did not have any other outcomes of participating in the program than the experience itself, which can argue for why the students were most likely driven by intrinsic motivation. If some of the students in the Tech Program started the program for other outcomes than learning STEM out of interest, the students can have been extrinsically motivated, which can account for loss in motivation after participating in the program. This can also indicate that a part of the student body in the Tech Program is only high achieving students, and not students with high learning potential. This is because intrinsic motivation is a distinct characteristic of students with high learning potential. However, most people are driven by a mix of extrinsic and intrinsic motivation, and the type of motivation depends on the context (Clinkenbeard, 2012). However, it is interesting to review these constructs when discussing the students' motivation and thus the education program.

When looking at the differences in motivation and participation in the STEM programs, it is relevant to take the cultural context into consideration. In the U.S. the national push for STEM-related education might influence the students' choice of education path (Maltese & Tai, 2011). Another central element is the minimal governmental supervision and control of colleges and universities in the U.S. (Bok, 2013). As college fees are high and there is tight competition for scholarships, American students have to think about higher education early. Higher education is preferable for many students as statistics show that the wage gap between college graduates and students with high school diploma is 57% among young people in the U.S. (National Center for Education Statistics, 2018). "Doing the right thing" might provide the students with opportunities that can, in turn, yield benefits for the students' future. For Norwegian students, the education landscape is rather different. In Norway, higher education is state controlled and is free of charge for all students as it is perceived as a social good (Fägerlind & Strömqvist, 2004). There is however a national push for STEM in Norway as well, which is one of the reasons why the Talent Centers were opened (Norwegian Ministry of Education and Research, 2016a).

The orientation towards the future and ambition was also more apparent in the American students when talking about the future in STEM. As the majority of the students in both programs were motivated for a future in STEM, the American students were more future-

oriented than the Norwegian students. There is a possibility that the Norwegian students' easier access to higher education and possible more intrinsic motivation can account for the differences in the responses. The American students might need to be more focused on the future and consider the possible positive outcomes when it comes to their education, where as the Norwegian students participating in the program may be truly interested in STEM because of the lack of pressure. Additionally, perhaps the Talent Center is better at recruiting students with true interests in STEM. This can also account for why the students reported motivation to STEM prior to attending the program.

### 6.4.2 Attitudes of attending special programs

In response to attending a special program the students in the two programs had different responses. One possible explanation for the different responses can be cultural context and traditions in talent development. In Norway, the attitudes towards talent development are influenced by the egalitarian ideology of inclusion in schools and "janteloven". The egalitarian ideology of inclusion has led to an education system where the students are treated equal and provided with the same education. Many believe that providing the students with high learning potential with additional educational input is a threat to the egalitarian attitude in the school system (Skogen & Idsøe, 2011). A central element to "janteloven" is to not believe that you are better than anyone else, which is evident in the school system as everyone is supposed to get the same education. This can explain why the Norwegian students reported not feeling special attending the program. While in the U.S., the society is largely individualistic and most Americans share the belief in the concept of the American dream (Hochschild & Scovronick, 2003). The American dream is the idea that any person can work hard and subsequently fulfill their potential; any failure to do so is the fault of the individual. The American school system is largely performance based and students' work hard to attain their goals in order to achieve benefits in the future. These views can influence how the students talk about how attending the programs made them feel special. They worked hard to get in, and they are on their way to fulfilling their potential and reaching their dreams.

Most of the Norwegian students did not report feeling special, or did not want to say that they felt special. The Norwegian students largely live in a culture where talking about getting extra challenges in school is regarded as elitist (Skogen & Idsøe, 2011). This was evident in the female student at the Talent Center who was hesitant about getting special treatment as her

notion of education, was affected by the egalitarian notion that everyone should receive the same education. This can account for why the students did not say that they felt special attending, what is indeed, a 'special program'. Instead, several students reported feeling lucky being able to participate in the program. As there are few such educational options for these students in school, they might be aware of this and thus feel lucky about being able to participate. Another element of 'janteloven' is talking about you in a positive manner, which can lead to negative peer attention or perceptions. One student reported that he was worried that his friends would think he was bragging if he talked about his participation in the program, which made him not talk about it at all. When a central element of 'janteloven' is not to brag about yourself or your abilities, talking positively about yourself attending a 'Talent Center' is most likely something a Norwegian will not do. The students might feel special, however they might not want to express that feeling, as it does not follow the social norms in Norway. The differences in attitudes can be explained by different social norms and the culture of how to talk about yourself and your abilities.

### 6.4.3 Top performers in PISA

This study has revealed the effects of the programs and general initiatives for students with high learning potential. When looking at the student group in its micro system, it is also relevant putting it in a national or macro systemic context, such as the international assessment PISA. Although the numbers should be regarded with caution, it is nevertheless interesting when taking a closer look at the PISA numbers and how it relates to the U.S.'s and Norway's share of top performers. The rationale to increase the Norwegian students' general competencies in STEM and to get more students on a higher proficiency level, is grounded in the international assessment test PISA (Norwegian Ministry of Education and Research, 2016c, 2016b). The low share of top performers in the early years of the test created room for new initiatives for students with high learning potential. In PISA 2015, the Norwegian share of top performers were 10,8% in math and 7,3% in science, which for the first time puts this Norwegian students group slightly above OECD average in both subjects. One could assume that the U.S.'s focus on promoting talents would yield a high percentage of top performers in in international assessment contexts. As 5,9% of the students in math and 8,5% of the students in science were placed as top performers, situates them considerably lower than the OECD average in math (10,7%), but above the average in science (OECD average 7,1%) (OECD, 2016c). When we look closer at the numbers, there are several interesting things to notice.

There is an increase of Norwegian of top performers is in reading and math from 2003 to 2015 (for math, see Figure 8.1, p. 115) (Kjærnsli et al., 2004; OECD, 2007, 2010, 2014b, 2016c). Although the increase does not include science (see Figure 8.2, p.115), the development can indicate an effect of the efforts set forth by the Ministry of Education and Research since 2010. As the Norwegian research and literature on students' experiences in school paints a picture of a system that needs to further develop their efforts for the students with high learning potential, the future looks promising. What is interesting or rather a concern regarding the American numbers, are the considerable drop in share of top performers in math, from 10,8% in 2003 to 5,9% in 2015 (see Figure 8.1, p.115) (OECD, 2014a, 2016c). These numbers are interesting for several reasons. First, an indication that the efforts of improving the education for students with high learning potential in Norway has possibly yielded positive results, provides grounds for keep improving the educational provision for these students. Secondly, although the U.S. performs higher than the OECD average in science, it seems that the efforts and programs suited for these students are apparently not meeting the students' math needs, when placing it in an international comparative context. In addition, for a country that focus on talent promotion, the U.S.'s number does not come close to the economies that are on the top of the top performers list, such as Singapore with 24% top performers in science and 34,8% in math (OECD, 2016c, 2018). It can indicate that although there exists programs that serve the needs of the students with high learning potential, there are students who are not given the opportunity to fulfill their potential. Although there are several drawbacks to PISA, the comparative value of these tests should not be overlooked.

## 6.5 Summary

The previous section discussed how the programs worked towards meeting the students' needs. A majority of the students reported a continued motivation towards STEM. The focus on STEM and sufficiently challenging assignments through enrichment and acceleration can be the reason for this. Another motivating factor for the students at the Talent Center was the practical approach in their assignments, which was preferred, but less used in the Tech Program. The students in the Talent Center reported higher levels of freedom in choosing topics in both programs, however the overall focus on STEM in the Tech Program and sufficient challenges might compensate for the lack of freedom in choosing topics to work on.

The difference between intrinsic and extrinsic motivation could explain why one student in the Tech Program was demotivated after performing below her standards after participation in the program, while this can also be accounted for by domain-specific giftedness which was not in STEM. Loss in motivation should be taken seriously as this can lead to boredom, underachievement and dropping out of school. There were instances where the motivation was closely linked to the academic self-concept, as one female student in each program reported lowered academic self-concept after participating in the programs. The students' perceptions on the use of their creativity in the programs were mostly positive. The different perceptions on creativity might influence their responses, which can account for why the respondents replied how they did. The responses indicated that the creative needs were met for the students in the Talent Center, while less so in the Tech Program.

The students reported mostly positive interactions with teachers and supportive environments with similar-minded peers. The students in the Talent Center reported a preference for group work in the program compared to their regular school. Although the students reported mostly supportive teachers there were instances of monotonous teachers in the Tech Program and a gender divide when it came to the teachers attention in the Talent Center. Attending the special program created some stress and sign of perfectionism for the students in the Tech Program. Students and teachers in both programs reported minimal contact between the parents and teachers, which can be an indication to satisfied parents when it comes to the educational provision for their children. The parents were overall supportive, however one student in each program reported parents who were not supportive of acceleration and the students in the Tech program reported parental pressure to perform on a high academic level. Also, there were differences between the programs, which can be accounted for by cultural differences. This was the teacher perspective of the students' interests in STEM in the Tech program and how the competitive education climate in the U.S. makes the young students choose their educational pathway based on convenience and attractiveness to college, and not interests. The second cultural difference was how cultural aspects such as the American dream and 'janteloven' influenced the students' responses in feeling special attending a special program. Situating this in an international assessment context, it seems that the efforts set forth by the Norwegian government has improved the share of top performers in math in PISA 2015. The U.S. performs higher than the OECD average in science, although the focus on talent promotion has not yielded results that meet the level of the top performing countries. Although the previous section and chapter paints a mostly positive picture of both programs,

there is an indication that the Talent Center is better at meeting the students' educational needs. Both programs meet the students' social needs, through different strengths of the programs. Overall, the Talent Center managed to meet the students' needs when it came to creativity, while both programs challenged their students and kept them motivated for a future in STEM. Many of the findings did fit into the multifactor model, however additional literature was needed to go deeper and beyond the categories. Thus, the model was not completely sufficient in answering how the students' needs were met. Analytical generalizations can consequently be made to other situations, through the findings and how it relates to the multifactor model and other relevant literature in the field. As assumptions to how the students' needs were met in the programs it is fair to assume that in other similar situations the findings might be similar to what was found in this study. The main takeaway from this study is how some specific aspects of the programs should be set, while the need for fluidity and adapting to the individual students' personality and learning style is necessary to meet the students' needs.

# 7 CONCLUDING REMARKS AND FUTURE RESEARCH

The findings from this research on STEM programs for students with high learning potential in California and Norway have indicated that attending a special program can meet the students' needs. However, it is noticeable that the heterogeneity within the homogenous groups of students with high learning potential must also be accounted for in creating special programs. Thus, placing students with high learning potential in specialized programs is not always the only solution in educational provision for these students, as it does not meet all needs for all students. It is important to be cautious of the literature that solely highlights the positive aspects of attending special programs, as this is evidently not a guarantee to meet all the students' needs. However, the programs worked towards meeting the students' educational and social needs in such a way that a majority of the students' needs were met when looking through the lens of the multifactor model. As much literature focuses on how these students' needs are not met, it was refreshing to experience students with high learning potential that were mostly satisfied with their educational opportunities and social environments. The analysis of the teachers' and students' responses from both programs present quality programs that aim at providing the students with a good education that work towards meeting their needs and gives them an advantage for the future.

The findings revealed similarities and differences in the programs when in came to structure, gender and cultural differences. When it came to structure, both programs provided their students with acceleration and enrichment. The students reported how the programs mostly met their educational needs through motivation for STEM and challenging content that suited their high ability, although the Talent Center met their students' creative needs slightly better than the Tech Program. The high ability grouping and teacher support did mostly meet the students' social needs in the programs, and most students reported supportive families that might have contributed to the students' academic success and attendance in the programs. The students in the Tech Program reported better social atmosphere, through a solid focus on similar-minded peers, which made the process of gaining new friendship easy. When it came to gender, the research revealed one female student in each program who struggles with the high academic level and thus the loss in academic self-concept. This highlighted how this is not just an issue for students with high learning potential, it points to how there are gender

differences in education. The gender differences were also discovered when it came to teacher attention in the Talent Center and stress and anxiety for the female students in the Tech Program. The cultural differences were present when it came to the differences in motivational interests for STEM. The research indicated more extrinsically motivated students in the Tech Program, which can be due to the increased focus on STEM education and careers, high pressure for higher education and thus, higher earnings. As Norwegian students do not have this high pressure, the students at the Talent Center might attend, as they are intrinsically motivated for the subjects as there was no other outcome than the learning itself. The cultural differences were also present when the students talked about attending the programs, where a majority of the American students felt special attending the program, whereas the Norwegian students did not want to portray themselves as special, they described themselves as "lucky".

Nevertheless, there were many similarities between the programs in how they worked towards meeting the students' needs. Enrichment, acceleration and working with similar-minded peers were some of the aspects both programs provided for their students. This is interesting looking from a comparative perspective, where the elements of the educational system are intertwined with the overall cultural values. Which in this context, there were similarities and differences in the education systems and cultures. International research points to the need of finding cultural appropriate ways to meet the needs of the students, which this research indicated that the programs did. This study contributed with a cross-cultural study of a comparison that has not previously been conducted. As the comparison revealed support for existing research on this student group, it should be regarded as valuable to the field.

From the discussion and analysis above, we can see that the Talent Center appears to meet the students' educational needs slightly better than the Tech Program, when it comes to creativity although both programs mostly kept the students motivated and challenges. Both programs seem to meet the students' social needs through different strengths, such as easiness in gaining friendships in the Tech Program and the students' preference for group work in the Talent Center. Thus, the Talent Center seem to meet the students overall needs slightly better than the Tech Program. Having a special program can thus meet the students' needs if the practices include the elements that are necessary to so. To meet the individual students' needs, the teachers and educators have to be aware of the differences between the students. Interestingly, this is one of the purposes of education for students with high learning potential

as well the main purpose of 'individually adapted education' in Norway. Ability level, interests, learning style, gender sensitivity and pace are among the important elements to consider when providing adapted education for these students, whether it is in a special program or in a regular classroom. As the group of students is heterogeneous within the high ability group, there are efforts that might work for some students, but not for others. This is one of the important lessons taken from this research. Additionally, this research tells us that programs intended for these students should have some set standards for themes and social aspects, however it should be fluid in how it can adjust to the students' interests and personalities.

To situate the findings from this study in a larger context, the findings from this research can contribute to the process of improving the educational provision to students with high learning potential. As this research revealed overall satisfied students, it indicates that creating programs intended to provide proper education especially suited for students with high learning potential, are effective. Including the small, but rising percentage of Norwegian top performers in PISA should create food for thought for Norwegian educators, teachers and policy-makers who are skeptical of providing special education to students who need additional challenges the normal classroom cannot provide. In addition, increased focus on teacher competencies are important to be able to identify these students and provide adapted education suited for these students' needs.

Researching education provision for students with high learning potential and how this relates to their social needs is vital to understanding how to meet their needs. Future research would benefit from digging deeper into each category of the multifactor model in order to more thoroughly examine the needs of these students and how it can be met in an educational setting. Also, having a program provision framework for students with high learning potential would make an interesting approach to evaluating how the students' needs are met.

## 7.1 Limitations of the study

First of all, the scope of this research is broad, as it covers all the categories in the multifactor model. As the categories in the model are wide, studies within the scope of this thesis could have conducted the research only looking at one or few of the categories. However, the purpose of this research was to look at the interaction between the personal characteristics and

the social environment, which made looking at only one or a few categories inadequate for answering the research questions.

Overall, the students had some limited experience with both programs. Three out of the five Californian students were in 9th grade, which indicates that they had been participating in the program for three months. It was a similar situation for the students in Norway, as the fieldwork there was conducted in the same time frame and these students only meet twice a month. Additionally, in the interviews with the students certain questions opened for critique of the programs or the teachers. The students might not want to talk negatively about their programs or teachers, in which the students' perceptions on how their needs are met might be presented in a more positive matter than what is actually the case. However, the students were willing to open up about their experience with the program, which I believe was the most important aspect in conducting the research.

# Literature


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# 8 APPENDICES

## 8.1 Appendix 1: Interview Guides

### 8.1.1 Student Interview guide

1. **Do you feel (more) motivated to learn and participate in the STEM courses science, technology, engineering and math because of the TROY tech program? Why/why not?**
    - What part of the program makes you motivated?
    - What part of the program makes you not motivated?
    - Are there any classes you like more than others? Why do you like this class more than the others?
2. **Does the way of teaching and the assignments motivate you to learn? Can you explain why/why not?**
    - What kind of teaching methods/assignments motivates you? Why?
    - Are there specific methods/assignments you like more than others? Why is that?
    - Can you tell me about one time that the teaching method/assignments made you motivated?
    - Are there any teaching methods/assignments that make you unmotivated?
    - Can you tell me about one time where the teaching method made you unmotivated?
3. **Do you think you will choose a career in one of the STEM areas? Why/why not?**
    - What area do you think that would be? Or what kind of job would you like?
    - Do you think that the program has influenced your thoughts on this? If yes, in what ways?
4. **In your opinion, does this program prioritize developing creativity? In what ways does it/does it not?**
    - Could you tell me about a situation where you felt that you were using your creative skills?
    - Do you feel that you have learned to think more creatively by this program?

5. **Do you feel you get the knowledge/skills that you need through this program? Why/ why not?**
    - Do you feel that the program covers the needs you have?
    - Do you think that the program meet the needs you have at your level?
    - Would you like additional challenges?
6. **Does your teachers/program allow you to focus on a special area that you are especially interested in?**
    - If yes, in what ways does the school facilitate this for you? And what is the project?
    - If no, would you like the school to allow you to? What would you have done if they did?
7. **Do you feel this is a high quality program? Why/why not?**
    - Does it fit and adapt to you needs?
8. **Is there anything else you would like to add concerning your classes?**
9. **Do you feel more comfortable working alone or in a group? Why?**
    - What about working alone makes you more comfortable?
    - What about working in a group makes you more comfortable?
10. **Does this program contribute to you making more friends?**
    - If yes, in what ways?
    - If no, what is it that makes it difficult to get new friends?
11. **You are attending a special program. Does this make you special?**
12. **TP: Do you think that the other kids here not attending this program look at you differently? TC: Do you think the other kids in your regular school look at you differently?**
    - If yes, in what way?
    - Do you look at other students not attending this program differently?
13. **Do you feel that your teachers support you?**
    - In what ways?
    - If not, in what ways could it be better?
    - Do you feel that the teacher cares about you? In what ways does the teacher care/not care about you?
    - Do you feel that they help you when you need help?
    - Is the teacher available to you outside of the classroom?

14. **Are there other people in your school that offers support and care for you? Who?**
15. **Do you feel your family supports you in reaching your potential?**
    - In what ways do they support you/not support you?
16. **In what ways does your parents care about your education?**
    - Do you talk about school every day?
    - Are they interested in what you have learned/what is going on at school?
17. **Does your parents/guardian have any contact with your teachers in your school/program?**
    - If so, what do they talk about? What is the contact about?
    - Do they discuss what education is best for you?
18. **Is there anything else you would like to add concerning your family, peers and teachers?**

### 8.1.2 Teacher Interview Guide

1. **Do you feel that your students are (more) motivated to learn science, technology, engineering and math (STEM) because of this program? Why/why not?**
    - To your knowledge, what part of the program makes your students motivated?
    - Why do you think the students are motivated because of this?
    - Or, why do you think the students are not motivated for … in these classes?
2. **In your experience, what teaching methods/assignments makes the students most motivated? Can you explain why?**
    - What kind of teaching methods/assignments do you usually use? Why?
        - Are there specific methods you like more than others? Why is that?
        - Can you tell me about one time that the teaching method/assignment made the students motivated?
        - Are there any teaching methods/assignments that make your students unmotivated?
        - Can you tell me about one time where the teaching method/assignment made the students unmotivated?
3. **Do you think the program prepares the students for careers in one of the STEM areas? In what way?**
    - What about the program makes them interested in the careers?
4. **If you could chance something with the program to make the students more motivated, what would you do?**
5. **In your opinion, does this program prioritize developing creativity? In what ways does it/does it not?**
    - In what ways do you let the students work on their creative skills?
    - Could you tell me about a situation where you felt that the students were given the opportunity to use their creative skills?
6. **Do you feel that your students get the knowledge/skills they need through this program? In what ways yes and no?**
    - Do you feel that the program covers the needs the students have?
    - Do you think that the program meet the needs on all the students' different levels? In what way? Why/why not?
7. **Do you facilitate for the students to focus on a special area that they are especially interested in?**

- If yes, in what ways does the school facilitate this for the student?
- If no, would you like the school to allow you to? What would you have done if they did?

8. **Do you feel this is a high quality program? Why/why not?**
9. **Is there anything else you would like to add concerning the education you provide to the students?**
10. **Does your students feel more comfortable working alone or in groups? Why?**
11. **Does this program contribute to improving the social environment in the classes?**
    - Do you actively work towards making sure that all the students have friends?
    - Do you focus on the student's social life in the classroom?
12. **Do you feel that you provide your students with enough support and encouragement?**
    - If yes, in what ways?
    - If no, in what ways could it be better?
    - Are you available for your students outside of the classroom?
13. **Do you interact with the students' families? In what way?**
    - In what way does this program cooperate with the students' families?
    - Do you feel the cooperation could be improved?
14. **In your experience, are the students' families involved in the education of the students?**
    - How could the family's support influence the students?
    - Is it important for students to have a supportive family when it comes to their education?
15. **Is there anything else you would like to add concerning the student's social support?**

## 8.2 Appendix 2: NSD Approval

NSD

Liu Fengshu
Institutt for pedagogikk
Universitetet i Oslo
Postboks 1092 Blindern
0317 Oslo

Our date: 09.08.2017 Our ref: 55196 BGH/LR

### Affirmation

The Data Protection Official for Research at the Norwegian centre for research data (NSD) finds that the processing of personal data in relation to the project "Gifted students' educational experiences in school: are their needs met?" is in accordance with the Norwegian Personal Data Act, ref. our letter to Mathilde Lange dated 08.08.2017.

Sincerely,

Marianne Høgetveit Myhren
Head of Section

Belinda Gloppen Helle

Belinda Gloppen Helle

Adviser

Contact person:
Belinda Gloppen Helle

Copy:
Mathilde Lange, mathilde_flange@hotmail.com

NSD – Norsk senter for forskningsdata AS Harald Hårfagres gate 29 Tel: +47-55 58 21 17 nsd@nsd.no Org.nr. 985 321 884
NSD – Norwegian Centre for Research Data NO-5007 Bergen, NORWAY Faks: +47-55 58 96 50 www.nsd.no

## 8.3 Appendix 3: Table of Research Informants

| Students in California Tech Program (TP) | | |
|---|---|---|
| Pseudonym | Grade | Gender |
| Abigail | 9th grade | Girl |
| Alexander | 10th grade | Boy |
| Cara | 12th grade | Girl |
| Daniel | 9th grade | Boy |
| Jessica | 9th grade | Girl |

| Teachers in California Tech Program (TP) |
|---|
| Pseudonym |
| Albert |
| John |
| Leslie |

| Students in Norwegian Talent Center (TC) | | |
|---|---|---|
| Pseudonym | Grade | Gender |
| Adrian | 12th grade | Boy |
| Christian | 10th grade | Boy |
| Markus | 12th grade | Boy |
| Richard | 12th grade | Boy |
| Synnøve | 12th grade | Girl |
| Thea | 11th grade | Girl |

| Teachers in Norwegian Talent Center (TC) |
|---|
| Pseudonym |

| |
|---|
| Sanna |
| Øyvind |

**Table 8.1:** Table of Research Informants.

## 8.4 Appendix 4: Tables With an Overview of How the Programs Meet the Students' Needs

| ***How*** **the programs meet the students' educational needs:** | **Talent Center (TC):** | **Tech Program (TP):** |
|---|---|---|
| **1. Motivation** | | |
| Prior motivation for STEM | A majority | Teachers |
| STEM focus | - | A majority |
| Focus on topic of interests | All students | Few |
| Future in STEM | A majority | A majority |
| Motivating Assignments and Teaching methods | | |
| • Challenging assignments | A majority | All students |
| • Provision of practical approach | All students | A minority |
| • Teachers | Did not mention | A majority |
| **2. Creativity** | | |
| Use of creative skills | All students | A majority |
| **3. High Ability** | | |
| Perception of students abilities | | |
| • Perceived as special | A minority | A majority |
| • Not perceived as special | A majority | A minority |
| Academic challenges | A majority | All students |

**Table 8.2:** An overview over how the programs meet the students' educational needs based on the framework. Estimated on the basis of how many students that responded within each category: "all students", "a majority", "a minority", "none". Compiled by the author.

| How the programs meet the students' social needs: | Talent Center (TC) | Tech Program (TP) |
|---|---|---|
| **4. Family** | | |
| Support | All students | A majority |
| Pressure | - | A majority |
| Teacher-Parent Interaction | | |
| • Sufficient contact | All students | All students |
| **5. Peers** | | |
| Positive social environment | All students | All students |
| Similar-minded peers | A few | A majority |
| Positive to group work | A majority | A majority |
| **6. School** | | |
| Teacher support | A majority | A majority |

**Table 8.3:** An overview over how the programs meet the students' social needs based on the framework. Estimated on the basis of how many students that responded within each category: "all students", "a majority", "a minority", "none". Compiled by the author.

## 8.5 Appendix 5: Line graphs on the development of share of top performers in PISA

### 8.5.1 Top performers in math 2003-2015

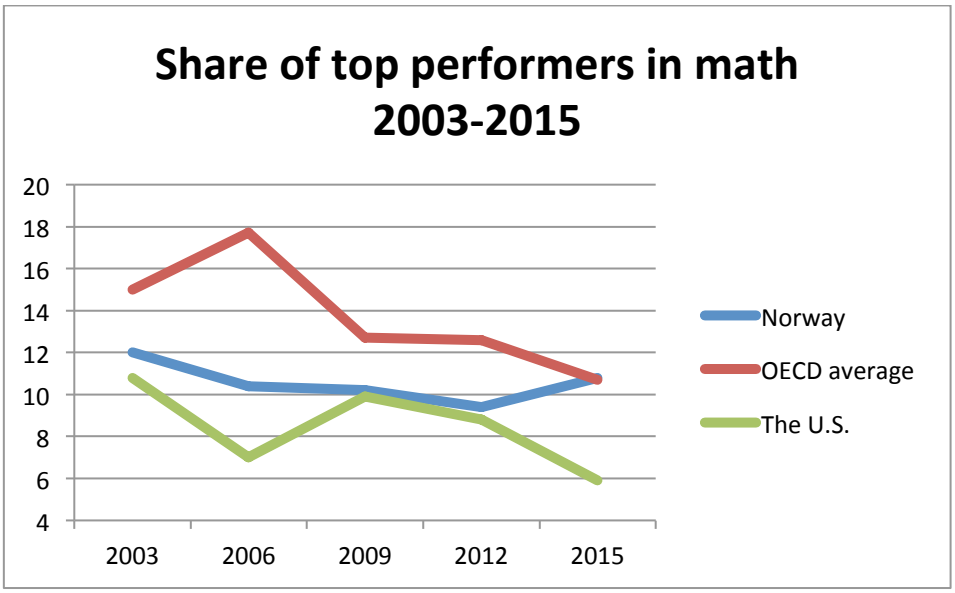


**Figure 8.1:** Share of top performers in math 2003-2015 (Kjærnsli et al., 2004; OECD, 2007, 2010, 2014b, 2016c).

### 8.5.2 Top performers in science 2006-2015

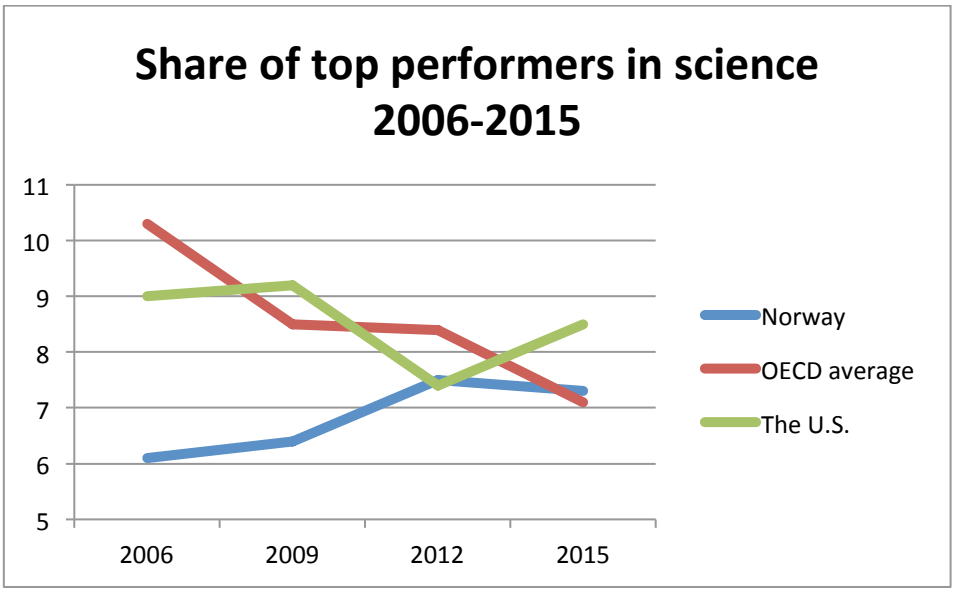


**Figure 8.2:** Share of top performers in science 2006-2015 (OECD, 2007, 2010, 2014b, 2016c)