**DEGREE PROJECT IN TECHNOLOGY AND LEARNING PEDAGOGICAL EDUCATION PROGRAM**
Advanced level 15 hp

# Student's views and thoughts regarding learning the technology subject in primary schools in Sweden

## An examination regarding student views on learning technology

**FITWI RUSSOM ZERESLASSIE**

**KTH**
**SKOLAN FÖR INDUSTRIELL TEKNIK OCH MANAGEMENT**

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**FITWI RUSSOM ZERESLASSIE**

**DEGREE PROJECT IN TECHNOLOGY AND LEARNING BRIDGING TEACHER EDUCATION PROGRAMME**
**Titel in Swedish:** Elevernas syn och tankar gäller attityder i teknikämnet i Grundskolan i Sverige.
**Title in English:** Student view and thoughts regarding the technology subject in Primary School in Sweden.
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# Sammanfattning

Intresset för teknikämnet har ökat de senaste åren, särskilt i grundskolorna. I Sverige är teknik en del av läroplanen och anses vara ett viktigt ämne för att utrusta eleverna med problemlösnings, kreativitets, innovationsförmågor och kunskap. Min undersökning syftar till att undersöka elevers perspektiv och tankar om teknikämnet i grundskolan, med särskilt fokus på elever årkurs 9 som har avslutat sin grundskoleutbildning och ska börja på gymnasiet.
Dessutom, utforskar studien elevernas lärandepreferenser inom teknikämnet och söker insikt i deras attityder och tankar. Vidare syftar studien till att bidra till ökad positiv inställning till teknikämnet genom att belysa effektiviteten i undervisningen i förhållande till elevernas lärande. För att få empiriska data användes jag både kvalitativa och kvantitativa forskningsmetoder i form av två enkäter, en digital och en annan i pappersform. Forskningsfrågorna som undersöks är följande:
i. Hur föredrar eleverna att teknikämnet ska undervisas i grundskolan? ii. Vilken del av teknikarbetsområde väcker elevernas intresse för teknikämnet i grundskolan? iii. Vad påverkar students programval gällande programmet i gymnasieskolan?
Studiens resultat visar en betydande skillnad mellan elevernas förväntningar och deras faktiska upplevelse av att lära sig teknologi. Det är intressant att notera att eleverna föredrog att arbeta i grupp eller par. Dessutom fann de flesta eleverna programmering vara ett engagerande ämne, vilket indikerar deras stora intresse för det.
Studien visade att programmering var det område där eleverna ville förvärva mest kunskap. Resultaten av elevernas attityder och erfarenheter av teknikundervisning i grundskolan visade på en skillnad mellan deras förväntningar och faktiska erfarenheter. Trots detta hade eleverna i allmänhet en positiv inställning till teknikundervisningen. Praktiskt lärande och programmering var de mest underhållande aspekterna, och det är avgörande att involvera eleverna i beslutsfattande och erkänna deras preferenser för att öka deras intresse.

***Nyckelord**:* Teknisk utbildning, Teknikämne, elevsyn, grundskola, årskurs 9, gymnasiet.

## Abstract

The interest in technology subject has been growing in recent years, especially in primary schools. In Sweden, technology is part of the national curriculum and is considered a critical subject for equipping students with problem-solving, creativity, innovation skills, and knowledge. My research aims to investigate the perspectives and thoughts of Swedish primary school students on technology subject, with a specific focus on 9th-grade students who have completed their primary education and are about to enter secondary school.

The study seeks to explore students' learning preferences in the technology subject and gain insight into their attitudes and thoughts. Additionally, the study aims to contribute to increased positive attitudes towards the Technology subject by highlighting the effectiveness of teaching in relation to students' learning. To obtain empirical data, both qualitative and quantitative research methods were used in the form of two surveys method, one in digital and another in paper form.

The research questions investigated are as follows: i. How do students prefer the technology course to be taught in primary schools? ii. Which part of the technology syllabus offered evokes students' interest in the technology subject in primary school? iii. What influences their program choices regarding the program in secondary school?

The research question, survey results, and conclusions reveal a significant disparity between students' expectations and their actual experience of learning technology. The students expressed discontent with their learning, it is intriguing to note that they preferred working in groups or pairs. Moreover, most students found programming to be an engaging subject, indicating their keen interest in it. Pinpointing the specific programming activities that students enjoy would be beneficial in shedding light on the particular aspects of the technology curriculum that appeal to them.

Results regarding students' attitudes and experiences of technology education in primary school revealed a discrepancy between their expectations and actual experiences. However, students generally had a positive attitude toward technology education. Practical learning and programming were found to be the most enjoyable aspects, and involving students in decision-making and acknowledging their preferences is crucial for increasing their interest.



***Keywords**:* Technical Education, Technology subject, student view, primary school, $9^{th}$ grade, Secondary school

# Foreword

During my study thesis many people have been a big help. First off, I would like to thank my supervisor Helena Isaksson Persson who gave me tremendous much guidance during the writing of the thesis. Helena Isaksson Persson is involved in the process with including proposal of my thesis. She has been a big inspiration and a key person for me. She has always been there for me and made time to discuss my work during the whole period. I really appreciated her engagement in me and my thesis.

Stockholm, April 2023
Fitwi Russom Zereslassie

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# 1 Introduction

The prevalence of technological utilization has increased dramatically in recent years. However, the continued increase in technology use is linked to the evolution of daily life. It connects to tasks related to those of an engineer and a craftsperson, such as evaluating technical systems and didactic elements in elementary education (Carlborg et al., 2019). Technology education should focus on helping students gain technical knowledge and awareness so they can navigate and function in a world that is heavily reliant on technology. The school should operate in a way that prepares children for participation in society (Skolverket, 2019). As we live in a technologically advanced culture, technology is a subject that students need to be knowledgeable about (Skolinspektionen, 2014). Students contribute by showing an interest in understanding technology and the capacity to approach technological problems thoughtfully and creatively. The prerequisites for developing knowledge of technology in daily life and familiarity with the subject's unique forms of expression and concepts will be provided for students through obligatory the studying of technology subject in Swedish primary schools.

Gyberg and Hallström (2009) note that most young people do not see the superficial connections between society and technology and that young people's views of technology are more closely related to technology associated with the technology of a more modern kind, such as computers and mobile phones.

We live in a world and society that is constantly changing and where technology is playing a far bigger role. Students' perspectives on learning technology vary depending on the major role of technology (Gyberg & Hallström, 2009). With this in mind, I decided to research students' perspectives, with the goal of this study being to concentrate on students' perspectives on educational technology. Therefore, my research focuses on how ninth graders at a particular school perceive a learning process.

# 2 Study detail

## 2.1 Aims of the study

The purpose of the study was to investigate students' views on how they learn best when studying the technology subject and a special focus on 9$^{th}$-grade students who had completed their primary school, waiting to enroll in secondary school.

## 2.2 Research questions

The following research questions guided the study.

i. Students views how they prefer the technology course to be taught in primary schools?

ii. Which part of the technology syllabus offered evoke students' interest in the technology subject in primary school?
iii. What influences their program choices regarding the program in secondary school?

# 3 Background

The various perspectives on technology today are rooted in its history. Exploring the history of modern technology can provide valuable insights into how its form and purpose have evolved over time. In primary school, it is mandatory for students to study technology. In secondary school, choosing a technology program can help guide students towards selecting a specialization in fields such as database management, computer and communication, construction, CAD, data science, and design. Students should also comprehend what constitutes a technology subject and understand its various elements, such as technological advancement, programming, product development, the relationship between artifacts and systems, daily life, the ability to create and design technical structures, and the basics of technology (Carlborg et al., 2019). Of course, these elements can be interpreted in many ways. Learning about the unique and knowledge-building components of technology is a positive development. Although technology has undergone significant growth in higher education, and engineering programs have become increasingly specialized, Sweden's secondary schools still have a national technology program (Stigberg & Stigberg, 2020).

There is a widespread belief that technology plays a significant role in the development of society, with an emphasis on improving the quality of life for individuals and advancing society as a whole. For example, individuals who study technology are believed to develop strong analytical skills and the ability to make informed decisions (Stigberg & Stigberg, 2020). Ambitious initiatives are being launched to increase people's interest in science and technology, such as the collaboration between two prestigious institutions, the Kungliga Vetenskaps Akademien and Kungliga Ingenjörsvetenskaps Akademien (Carlborg et al., 2019).

The primary school curriculum aims to equip students with the necessary skills to address a variety of issues and meet their technological needs. Students should have to get the tools to develop their perspectives, theories, and solutions related to technology. In the classroom, students should learn about the significance of technical activities and the application of technical solutions to individuals, society, and the environment (Qaddumi et al., 2021). Furthermore, teaching should provide students with opportunities to gain confidence in their ability to evaluate technical solutions and connect them to ethical, gendered, economic, and sustainable development challenges (Dadakhon & Sabohat, 2022).

As per the Swedish technology syllabus (Skolverket, 2019), students should have the opportunity to compete and demonstrate their ability to create technological solutions to engineering and construction-related problems. During teaching, students can use various types of technology and learn about, and sometimes even create different technical solutions. Moreover, students have the flexibility to create technologies, with the boundaries being established by their knowledge and abilities (Skolverket, 2019).

According to the Swedish syllabus for the technology subject in primary schools (Skolverket, 2019), students are expected to develop their technical knowledge. The primary school curriculum, known as Lgr11 (Swedish primary school curriculum from 2011 that was revised 2019), aims to equip students with problem-solving skills and the ability to understand and use technical terms and concepts (Skolverket, 2019). Lgr11 is a national curriculum in Sweden that outlines the knowledge and skills that students are expected to acquire at each grade in primary school. It also sets forth the goals and objectives of the Swedish educational system.

The syllabus for technology subjects has several long-term objectives that are summarized as practicing and actively engaging in different learning activities. The knowledge requirements in the later sections of the syllabus are based on these competencies (Skolverket, 2019). Teaching the technology subject enables students to put into practice what they have learned and equips them with the necessary knowledge to facilitate their learning. The aim of the technology subject is to prepare students for the tasks and occupations of the 21st century (Dadakhon & Sabohat, 2022). The technology surrounding us needs to be visible and understandable so that we can grasp how it affects the individual, society, and the environment. Technology education should be considered as its goal to assist students in growing their technical knowledge and social understanding. The technology's approach is without bounds for them (Dadakhon & Sabohat, 2022). Understanding the technology view is essential for students who wants to be informed about the impact of technology on society, and for anyone who wants to be a responsible and informed citizen in an increasingly technological world.

# 4 Previous research

A significant portion of the high-demand jobs was created within the last decade (Dadakhon & Sabohat, 2022). The advancement in technology, digital transformations, and intense globalization calls for the need for teachers to help students acquire the requisite skills to succeed in the digital era. Using digital tools in classroom learning fosters student engagement and helps teachers improve their lesson plans to facilitate personalized learning (Dadakhon & Sabohat, 2022). It is worth noting that technologies are tools in education and learning, not an end. The educational technology's promise lies in what the instructors do with the innovations and how they use them to best support for the students to realize their learning needs. Learning institutions are increasingly investing in technologies. Parents, researchers, educators, and policymakers are exploring the most appropriate ways of integrating technology in classrooms to enhance instruction and learning (Qaddumi et al., 2021).

## 4.1 Didactics in the subject of technology.

Unlike other subjects, problems and design questions do not have a single correct answer, and the focus is on finding multiple solutions to the same problem. The use of collaborative work is emphasized during the various stages of technological development to provide students with opportunities to discuss and question different solutions and constructions, ultimately leading to the presentation of a final product (Bjurulf, 2015). By engaging in practical tasks that require teamwork, students are inspired and stimulated in their learning.

Teachers have a crucial responsibility to act as pedagogical leaders in the classroom, requiring them to acquire knowledge, skills, and values to impart onto their students (Berg, Sundh, &Wede, 2012, p.29). However, it is important to recognize that instruction occurs within a pre-determined environment and situation. While a teaching model may be effective for one teacher, it may not be as successful for another and can have varying effects on students within the same school. As such, instruction must be tailored to each individual student's needs, and the dissemination of knowledge by teachers may have different impacts on different students (Pennlert & Lindström, 2012). It is unrealistic to expect a perfect teacher, but a teacher who continually strengthens and develops their students' knowledge through their teaching is considered competent (Hattie, 2012).

Students should be able to apply the knowledge and skills outlined in the Swedish curriculum and subject plan for technology in real-world contexts, in order to develop a practical understanding of the subject (Sandström & Johansson, 2015).

Technology subject presents students with opportunities to identify and solve problems by seeking knowledge about them, making it a vital subject (Bjurulf, 2015). However, if students are not provided with opportunities to investigate and experience technology in everyday life, the subject may seem abstract. Studies have shown that incorporating practical teaching alongside theoretical teaching can enhance students' learning, as this variation in teaching methods helps them better understand the content of the lessons and approach complex problems (Marton & Carlgren, 2001, pp. 222-224). It is essential to view technology subject as a multimodallearning process that encompasses various perspectives and occurs over an extended period (Jones, Buttins, & de Vries, 2011).

## 4.2 Student interest in technology subject

Research about students' attitudes towards the technology subject in school found that their ability to understand and explain the subject is dependent on their interest and expectations (Svenningsson, 2018). Students' experiences outside of school also play a significant role in shaping their interest in technology, particularly if they have someone who can explain the career options within the field. Attitudes can be categorized as affective and cognitive, and they shape behaviour and motivation. It is challenging to accurately understand students' attitudes towards technology if they cannot describe the subject's contents. The curriculum goals and content may be overshadowed by teaching approaches that emphasize practical work and a broad perspective that includes societal influences (Mattsson, 2002 & Jidesjö, 2012). The quality review found that few instances of teaching effectively addressed students' experiences, expectations, and interests (Skolinspektionen, 2014).

Lindahl (2003) conducted a study on the interest of students in science and technology from grades 5 to 9. The results were presented by gender to highlight the differences between boys and girls, and they were compared based on their interest and perceived competency in the subject between grades 7 and 9. Students reported feeling more competent in 9th grade than in 7th grade, and Lindahl (2003) argued that feeling competent leads to feeling more knowledgeable and having an increased interest. The study showed that engaging in practical tasks can increase students' interest and curiosity in technology subjects (Lindahl, 2003).

Mattsson (2002) found that students associate technology with hands-on practical work, but struggle to understand its purpose and connections to society. Skolinspektionen (2014) also reported a decline in students' perception of the subject's importance as they progress to higher grades. Jidesjö (2012) argues that schools need to better capture students' inherent interest in technology.

Nordlöf's (2018) study shows that teachers' attitudes towards technology are influenced by their education level, school leadership, and subject planning. Teachers with technology education and access to continuing education have a more positive attitude. Schools that invest in technology and offer good subject planning also lead to more positive attitudes towards technology. However, technology subject continues to be marginalized compared to other subjects, and technology teachers lack support (Nordlöf, 2018).

Bjurulf's (2015) research indicates that older students associate technology with innovation and meeting human needs, while younger children view it as a tool for changing and improving things. Mattsson (2002) found that students generally associate technology with practical work, which they find enjoyable and engaging, but they struggle to understand the subject's purpose and its connections to society and technological advancement. Mattsson (2002) suggests that making technology education fun and engaging can help to spark student interest and connect to their digital learning. However, the literature suggests that schools have not been successful in capturing student attention, as the technology subject is not viewed as important or relevant to their lives. This indicates a gap between student interest and school curriculum (Mattsson, 2002).

Anderhag (2014) stated that having an interest in a subject is crucial for learning and engagement, but research has shown that students may find science and technology subjects less interesting than others. Lack of curiosity about what is taught in these subjects may be a factor. Skolinspektionen (2014) reported that students in technology subjects lacked stimulation and felt their interests were being ignored, and teachers play a critical role in engaging students' interests and defining educational objectives. Students' motivation and interest could increase with greater influence over their education. Obtaining a student perspective is important, and research has shown variations in students' interest in technology and science subjects both in and outside of school. Therefore, curricula, textbooks, and teaching methods should consider students' experiences and interests (Sjøberg & Schreiner, 2010).

Incorporating technology education into students' daily lives is essential, according to Ravnås' (2016) thesis, as well as previous studies. Bjurulf (2013) emphasizes that it is important to initiate technology subject from students' everyday lives to make it relevant to them, but also notes that focusing solely on specific technical artifacts can be problematic without understanding their integration into a holistic perspective. Peterson (2004) emphasizes the importance of assigning problem-solving tasks that are socially relevant and linked to life beyond school, as well as the significance and importance of the task for society. McCormick (2004) suggests that students find it easier to solve tasks related to their daily lives than abstract tasks.

The importance of linking technology education to students' daily lives and experiences is highlighted in various studies. Bjurulf (2013) and Peterson (2004) stressed the significance of initiating technology education from students' everyday lives to make it relevant to them. Björkholm (2014) and Lindh and Holgersson (2005) designed teaching strategies that provided opportunities for students to identify and solve technical issues in their daily lives, which helped students realize the importance of acquiring technological skills. Additionally, studies have shown that incorporating realistic tasks that relate to students' daily lives and experiences can help develop their problem-solving abilities (Lindh and Holgersson, 2005; Skolinspektionen, 2014).

According to Svenska Teknikdelegationen (2009), students did not see the connection between technology education in school and the technology they used in their daily lives. Lindahl (2003) also discovered that science and technology education did not reflect students' daily experiences. Andersson et al. (2008) found that students associated technology with modern and advanced technology rather than older forms. Jidesjö et al. (2009) noted that students were more interested in learning about computers, the internet, and modern artifacts than historical technology.

# 5 Theoretical framework

The study utilizes Vygotsky's sociocultural theory (1978) and Dewey's pragmatic theory (1916/1999) as the theoretical foundation for analyzing students' views and attitudes towards studentsin learning technology in primary schools. Vygotsky's theory (1978) emphasizes the importance of social interaction and cultural context in shaping learning and development, while Dewey's theory stresses the significance of learning through experience and reflection. My study examines three research questions utilizing the two theories.

Firstly, Vygotsky's theory (1978) suggests that cultural norms and values of students' communities and their social interactions with teachers and peers influence their preferences for how technology subjects should be taught. Secondly, Dewey's theory (1916/1999) suggests that practical, practical experiences allowing students to apply their learning in real-world situations may increase their engagement with technology (Säljö, 2015).

Vygotsky's theory of sociocultural learning emphasizes the importance of social interaction and cultural context in shaping cognitive development. According to Vygotsky, learning takes place through social interaction and communication, and children's cognitive development is influenced by the cultural and social context in which they grow up (Säljö, 2015). This theory can be relevant in researching students' views and attitudes towards learning technology in primary schools because it recognizes the importance of context and social interaction in learning, which is particularly relevant in the context of technology.

Vygotsky's Zone of Proximal Development (ZPD) is highly relevant in researching students' views and attitudes towards learning technology in primary schools because it highlights the importance of support and guidance in promoting learning. By understanding the ZPD, educators can identify where students are in their learning journey and provide appropriate support and guidance to help them achieve success. In the context of technology, students may have varying levels of experience and familiarity with different technologies (Säljö, 2015). Some students may be more confident and comfortable using technology, while others may struggle or feel intimidated by it. By understanding the ZPD, researchers can gain insights into the level of support and guidance that students need to learn effectively.

For example, if a student is struggling to use a particular piece of technology, a teacher or peer may be able to provide guidance and support that helps the student move into their ZPD and achieve success. Alternatively, if a student is already proficient in using a particular technology, they may benefit from more challenging tasks that push them beyond their current level of understanding.

Research that considers the ZPD can help educators to identify where students are in their learning journey and provide appropriate support and guidance. By recognizing the potential for growth and development, teachers can create a more positive learning environment that encourages experimentation and risk-taking with technology (Darling-Hammond, Hyler, & Gardner, 2017).

Vygotsky's theory of sociocultural learning emphasizes the importance of social interactions in shaping cognitive development. According to Vygotsky, learning takes place through social interaction and communication, and the cultural and social context plays a crucial role in cognitive development (Säljö, 2015). This theory is relevant in researching students' views and attitudes towards learning technology in primary schools because it recognizes the importance of social interactions in shaping students' beliefs and attitudes towards technology.

In primary schools, students' views and attitudes towards technology can be influenced by a range of social interactions, including interactions with peers, teachers, and family members. By understanding the role of social interactions in shaping students' views and attitudes, researchers can gain insights into how these attitudes are formed and how they can be changed. In addition, the social interactions that students have with their peers and teachers can also influence their attitudes towards technology (Säljö, 2015). For example, if a student is part of a peer group that values technology use, they may be more likely to develop positive attitudes towards technology. Similarly, if a teacher is enthusiastic about using technology in the classroom and provides effective support and guidance, students may become more engaged with technology and develop more positive attitudes towards it.

Research that considers the role of cognitive development can help educators to identify where students are in their learning journey and provide appropriate support and guidance to help them develop more positive attitudes towards technology. By recognizing the importance of cognitive development, educators can create a more positive learning environment that encourages experimentation and risk-taking with technology, ultimately leading to more effective learning outcomes. Vygotsky's theory of cognitive development emphasizes the role of social interactions and cultural context in shaping cognitive development. According to Vygotsky, learning is a social process that occurs through interaction with others, and cognitive development is closely linked to cultural and social factors (Vygotsky, 1978).

For example, students who have more advanced cognitive development may be better able to understand the benefits of technology and be more willing to experiment with new technology. On the other hand, students with less advanced cognitive development may struggle to use technology or may be more resistant to new technology due to a lack of understanding.

In addition, Vygotsky's theory of cognitive development also emphasizes the importance of scaffolding, which refers to the process of providing support and guidance to help learners move from their current level of understanding to a more advanced level (Säljö, 2015). In the context of technology use in primary schools, teachers can provide scaffolding to students by breaking down complex tasks into smaller, manageable steps, and providing guidance and support as needed.

**Key concepts in Dewey's pragmatic theory (1916/1999):**

According to Dewey, learning is most effective when it is connected to real-life experiences and when learners are actively engaged in the learning process (Dewey, 1938). This theory is relevant in researching students' views and attitudes towards learning technology in primary schools because it recognizes the importance of hands-on, experiential learning in shaping students' beliefs and attitudes towards technology. Dewey's theory of experience also emphasizes the importance of active experimentation and learning by doing. In the context of technology use in primary schools, this means providing opportunities for students to experiment with technology and learn through trial and error. By engaging in active experimentation, students can develop a deeper understanding of technology and develop more positive attitudes towards it.

Research that considers the role of experience in shaping students' attitudes towards technology can help educators to create more effective learning environments that promote hands-on, experiential learning. By providing opportunities for students to experiment with technology and learn through real-world experiences, educators can help students to develop a deeper understanding of technology and develop more positive attitudes towards it (Kolb, 1984).

Dewey believed that learning is most effective when it involves an active process of integrating knowledge and skills through hands-on, experiential learning (Dewey, 1938). This theory is relevant in researching students' views and attitudes towards learning technology in primary schools because it acknowledges the significance of active learning and the integration of technology skills in real-world contexts.

Dewey's theory of activity highlights the essential role of integrating knowledge and skills. In the case of technology use in primary schools, this implies creating opportunities for students to merge technology skills with other subject areas, like utilizing technology to conduct research and produce projects in science or social studies.

According to Dewey (1916/1999), education should be a process of identifying and solving real-world problems, rather than simply memorizing information. This theory is relevant in researching students' views and attitudes towards learning technology in primary schools because it recognizes the importance of problem-solving and critical thinking skills in the effective use of technology.

In primary schools, students are often introduced to new technologies without an explicit understanding of how they can be used to solve real-world problems. By incorporating problem-solving and critical thinking skills into technology education, students can develop a more comprehensive understanding of how technology can be used to solve real-world problems, rather than simply using technology as a tool for entertainment or communication. Furthermore, Dewey's theory of problem-solving also highlights the significance of collaboration and teamwork in problem-solving (Dewey, 1938). In the context of technology use in primary schools, this implies creating opportunities for students to collaborate and work as a team to solve problems using technology. By encouraging collaboration and teamwork, students can not only enhance their technology skills but also improve their interpersonal and communication skills.

Lastly, both theories can be used to explore the role of social and cultural factors in students' program choices.

# 6 Methodology

This section outlines the research methodology employed in the study. The chapter commences by describing the research strategy utilized and outlining the study's design. Then I provide an overview of the selection of participants, the procedures used, and how the data was collected, processed, and analyzed. The section ends with a discussion on the quality criteria of the study and methodological criticisms that may arise.

## 6.1 Data collection method

The study aimed to investigate the perceptions and attitudes of ninth-grade primary school students towards learning technology. Therefore, the chosen method of data collection, a quantitative method in the form of a survey, was appropriate for the study as it allowed for the collection of information regarding the participants' perspective.
There are several factors that can influence the choice of data collection method. I choose to use only closed-ended surveys for I had many participants and limited resources, as closed-ended surveys can be relatively easy to administer and process. Closed-ended surveys also provide the opportunity to collect data that is easy to compare and analyze. It can also be a suitable choice if the researcher wants to collect specific data in a standardized way, so that all participants answer the same questions and with the same response options. This can be particularly useful in studies where the researcher wants to measure exact levels of participants' attitudes, perceptions, or behaviors (Maxwell, 2013).
According to Maxwell (2013), the choice of data collection method depends on the research question, the purpose of the study, and the type of information that needs to be collected. Closed-ended surveys can be a suitable choice if the researcher wants to collect standardized quantitative data from a large population, while group interviews and open-ended surveys can provide more qualitative and flexible data. Thus, the choice of data collection method was appropriate for this study since it enabled the researcher to collect information about respondents' views.

Since the respondents are in the ninth grade, have completed primary school, and are awaiting the commencement of secondary school, surveys allow for the rapid collection of data. The data collection was carried out through a closed-ended survey that was distributed to students. The purpose of the closed-ended questions, which were constructed as statements that students had to respond to with options that were either agreement or disagreement, or hilarious or boring, was to ascertain the students' attitudes (Trost & Hultker, 2007). To create an effective questionnaire, it is crucial to design it in a clear and straightforward manner, with simple and easy-to-understand instructions and questions. It is also essential to ensure that the questions are relevant to the target audience and cover the relevant topics (Trost & Hultker, 2007)

The survey consisted of statements and questions, consisting of yes or no, agree or disagree, boring or funny questions, statements based on a Likert scale, and a multiple-choice question with fill-in boxes where the respondent could leave more than one answer. To maximize the validity of the study, I was meticulous in ensuring that the items to be addressed by the respondents pertained to the subject matter for which I sought answers (Djurfeldt, Larsson & Stjärnhagen, 2003).

By systematically categorizing all items under headings related to my research questions, I could evaluate the validity of the questionnaire in a clear and organized manner. When designing the questionnaire, I was also careful to ensure high reliability. Reliability refers to how our measurement instruments are designed to obtain reliable responses (Djurfeldt et al., 2003). The statements were adapted to ensure reliability, for example, by adding the response option "do not know" to statements that respondent potentially had no experience with. This way, I did not force respondents to take a position on an unknown statement, which would have decreased reliability.

### 6.1.1 Form and design of survey

The survey was designed in two parts, both parts focusing to answer the thoughts and opinions of students regarding the technology subject.

1. The first part, which was filled out on paper, consisted of 16 questions about the classroom environment. The questions were formulated as statements where the respondents could indicate whether they agree or disagree, find it funny or boring, and whether they were satisfied or unsatisfied. Some statements also had additional options for the respondents to choose from. The students were given a survey in which they were asked to respond to several statements about the technology subject (Appendices 1).
2. The second part of the survey was available on digital form and were published on the school’s learning platform (Appendix 2). Like the first part, this section also consisted of 16 questions formulated as statements. The respondents could indicate their agreement or disagreement, funny or boring, and answer yes or no and option statements.

To prevent respondent fatigue and guarantee that students have enough energy to answer all the questions, a limited number of questions were selected, taking care to choose questions that were appropriate for the respondents (Trost & Hultker, 2007). To avoid demotivating respondents, the focus was on reducing the questionnaire to the minimum number of questions and creating an attractive layout according to recommendations (Bryman, 2011).

To address my research questions, surveys were utilized as the data collection method to collect information. The questions and statements were kept brief to avoid misinterpretations. The survey was created to investigate students' perceptions of the technology subject and their interests, as it has been observed that technology education often does not originate from students' interests and daily life (Skolinspektionen, 2014). Moreover, each answer option in the survey consisted of only one question, preventing respondents from being unsure about which question to answer (Bryman, 2011).The questions that assessed the extent of the respondents' experience with the statement utilized a five-point Likert scale with choices ranging from "amusing" to "dull," from "strongly disagree" to "completely agree," from "content" to "discontent," and from "yes or no" to "option question." The response options were consistently displayed in a manner that enabled respondents to rank them from being well-versed in the statement to not being knowledgeable, to generate a favorable survey experience (Wenemark, 2017).

## 6.2 Selection of pupils

In the survey 109 pupils were participating who attended the same school. Fifty-one students participated in the study's questionnaires (paper sharing) at school, and 58 students were sharing in digital form. To ensure that participation was ethically justifiable, it was important that the voluntary nature of participation was clear. As the questionnaire was distributed simultaneously to a convened group, it can be called a group survey, although the answers are individual and without cooperation between respondents (Ejlertsson, 2014).

## 6.3 Data Collection implementation with pupils

I completed my teacher training (VFU) at a school where I had the opportunity to distribute survey questionnaires and interact with both teachers and students. To help with data collection, I received assistance from three technology teachers who were easily accessible during and after my internship. I explained to them how I planned to conduct the data collection and they were happy to assist. I informed them that I intended to distribute paper surveys in the classroom and share a digital survey through Google Classroom.

A total of five classes participated in the survey questionnaires; two classes completed the paper surveys in the classroom while the remaining three filled out the digital survey via the school's learning platform on Google Classroom. The two teachers who assisted by distributing the paper survey in their respective classrooms and also shared the digital survey with their students.

During a technology lesson, I observed one of the teachers informing the students that it would take approximately 10 minutes to complete the Google Form surveys. The other two teachers communicated with their students through Google classroom, letting them know that they had 24 hours to complete the survey. I provided all necessary information on how to fill out both the paper and digital surveys to ensure clarity and consistency in the data collected.

Additionally, I informed them about how the data would be handled, that the respondents would be anonymous in the report, and that participation was voluntary in accordance with the Swedish Research Council (Vetenskapsrådet, 2017). During the survey participation, a friendly conversation was sought, and I appreciated their willingness to share their opinions and perceptions. I thanked both the teacher and students for taking the time to participate in the survey.

## 6.4 Design of questionnaire

The surveys consisted of closed-ended questions, which means that respondents were presented with several answer options to choose from. The closed-ended questions in the survey that were measured with a Likert scale led to a reduction in variation, which enables easier processing and coding of data (Blair et al. 2014). Bryman and Bell (2017) argue that respondents get a clearer picture of the survey question when answer options are presented, which makes it easier for respondents to answer (Bryman & Bell, 2017).

According to Strunk and Mwavita (2022), the Likert scale creates ordinal variables, which means that the ranked response options do not have the same distance from each other (Strunk & Mwavita, 2022). However, Bryman and Cramer (2011) explain that it is accepted to interpret the Likert scale as interval data, although there are differences of opinion among researchers, which means that the distance between the ranked response options has equal distance from each other. Boone & Boone (2012) also write that it is possible to interpret data from the Likert scale as interval data when the purpose is to combine responses from several survey questions to obtain a combined score, which is consistent with the study's approach to measuring attitudes and thoughts.

## 6.5 Data processing

To respond to the questions posed, I must process, organize, and compress the information gathered during a survey. Data can be processed using statistics, which can also be used to organize, describe, and analyze data. Statistics can be descriptive, which means that they can be used to describe the data that have been collected and throw light on the study issue (Patel & Davidsson, 2011).
For data processing, Microsoft Excel 2021 was used during data processing. The data was collected using paper surveys and digital survey. The responses from each survey were entered into an Excel sheet, where yes and no questions were treated as 1 and 2, respectively. For questions with multiple options, each option was assigned a number, with the first option designated as 1 and 2 for the next option, and so on. For questions with a Likert scale, each mark was assigned a number from 1-5 (from left to right). Missing values were recorded as 0. Questions with a 5-point Likert scale were interpreted as follows: if the respondent had provided the first options (<3), the respondent considered themselves to have not satisfied, agree or funny of what the question dealt with. The value (=3) or is neutral and Values for the last three options (>3) were interpreted as the respondent not considering themselves to have satisfied, agree or funny.

As I mentioned above, both the survey was structured closed question. Answers to the questionnaires have been compiled in an Excel diagram to give an idea of student's views and thoughts regarding learning technology subject.

To tally the number of respondents, I utilized formulas in the Microsoft Excel application to process the survey data that was obtained. The calculations involved addition, division, and percent, which allowed for a tally of how many respondents answered for all scales. This information was automatically registered in Excel. Additionally, tables and graphs were created from the processed data.
The surveys were compiled manually, with each answer to a statement being counted separately and then compiled into a diagram. The diagrams were created to provide an overview of the total results for all participants. Additionally, the results were compiled by grade level in order to identify any possible differences between these groups. The diagrams offer an overview of the frequency distribution of the answers (Larsen, 2009). Most questions in the survey offered five response options. When response options are closely related in meaning, they can be combined to provide a more comprehensive view of the results (Larsen, 2009).

### 6.5.1 Likert scale

The use of Likert scales is a prevalent method of measuring attitudes and thoughts, which is why it was engaged in this study (Boone & Boone, 2012). Additionally, Likert scales are the most used tool for both generating quantitative and qualitative data in small-scale social research (Denscombe, 2018). Furthermore, Denscombe (2018) explains that Likert scales can use different numerical scales as their measurement units. The survey questions in this study were based on previous research in related subjects (Bjurulf, 2015, Mattsson, 2002), where the five-point Likert scale was used, as is the case in this study (Denscombe, 2014). The survey in this study was structured by presenting several statements that respondents either agree or disagree, funny or boring with, by selecting one of the five response options.

## 6.6 Analysis method

The analysis methods I selected were both quantitative using Likert scales and qualitative using deductive thematic analysis. In chapter 5, I mentioned that the study was guided by two theoretical framework key concepts from Dewey's pragmatic theory (1916/1999) and Vygotsky's sociocultural theory (1978). According to Bryman and Bell (2017), research methodology involves collecting relevant data through either quantitative or qualitative research. Therefore, in this study, both research methodologies were utilized to analyze specific aspects of student attitudes and thoughts towards learning technology in primary school. The research strategy involved conducting a survey to collect a large volume of data for drawing general conclusions relating to my research questions in this study.

To guide the study methodology, both Dewey's (1916/1999) and Vygotsky's (1978) theories were used to analyze the research question. The study utilized Likert scale survey questions designed to explore the connection and continuity of technology subject in primary schools and how they relate to students' interests based on key concepts from Dewey's theory (1916/1999). Additionally, Vygotsky's theory (1978) was used to design collaborative activities that promote learning and to explore the role of cultural tools in mediating students' understanding of the technology subject.

Analyzing the Likert scale survey using key concepts from Dewey's pragmatic theory (1916/1999) and Vygotsky's sociocultural theory (1978) involves examining the responses to each statement and determining if they align with the theories.

Both learning theories were also used to guide the deductive thematic analysis of the answers that was collected from the questionnaires, with Dewey's theory providing a framework for understanding the connections between students' experiences and interests, and Vygotsky's theory providing a framework for understanding the social and cultural contexts in which learning occurs. Looking for patterns in the responses to the survey can reveal whether they align with the key concepts in the two theories. Braun and Clarke (2006) description of how to perform a deductive thematic analysis was the main inspiration of the analysis of this study. Thematic analysis, also described by Widerberg (2002), enables internal or external comparison of school, and questionnaire responses are suitable for this type of analysis.

## 6.7 Principles of research ethics

Ethics was considered in this study because each participant was aware of their right to choose whether or not to engage in the questionnaires. When conducting a survey, it's critical that the participants are aware of the type of phenomenon with which they will be tasked (Larsen, 2009). Students in the ninth grade must be able to read and understand the existing text to participate in the survey. Before the study began, an official request was also addressed to the relevant technology teachers. Only the appropriate individuals had access to the student data obtained, and it was used solely to address the research objectives posed by this study.

Study participants should be protected from harm or violation to the greatest extent possible in connection with their participation in research, in accordance with the Vetenskapsrådet (2017) guidelines for good research ethics. I followed ethical guidelines for research based on the four basic requirements from the Swedish Research Council (Vetenskapsrådet), the consent requirement, the confidentiality requirement, and the use requirement. Initially, I briefly verbally clarified the purpose of the study to the respondents and that participation in this study is voluntary and each participant has full right to end the survey answer at any time. I obtained consent from all respondents before the respondent began, then the respondents answered the questions and shared their opinions and experiences. Respondents were also informed that the data from the study would only be saved. Participants were also informed to ensure confidentiality not to reveal their names, schools they work at, or any information that reveals their identity. I was also careful not to reveal any sensitive information about the respondents. I used the respondents' attitudes, opinions, and experiences only for the specific purpose of this study and not for other purposes.

## 6.8 Method discussion regarding datacollection

Various factors can influence the result that I got. For example, the methods I used, how the results were analyzed, or how I conducted the survey. When it comes to the questionnaires, even though the students showed great interest and motivation, I may give the survey a lower gradation depending on how the students feel when they answer the survey.

I distributed the survey through both student school account and paper distribution during school lessons. The surveys consisted solely of closed-ended questions in both digital and paper format which could have had a negative impact on the quality of the data that was to be analyzed.

Using both digital surveys and paper surveys can have several benefits. Digital surveys can be more convenient for respondents, as they can be accessed and completed from anywhere, at any time. They are also time-efficient, as respondents can take their time to answer the questions at their own pace. Moreover, digital surveys can be more efficient in terms of data collection and analysis, as the results can be automatically compiled and analyzed using software (Yan, Newman & Huang, 2013).

According to Patell and Tebelius (1987), there is a tendency to avoid conclusions and endpoints and instead gravitate towards the central tendency. This can result in many markings on the middle option. To increase reliability, students were given ample time to answer the survey via a Google form. The paper-based surveys were completed in the classroom after the lesson, which may have been influenced by factors such as how the students felt, their comments, and the availability of time during the instructions. It is possible that I may have missed conversations and comments from students during the lesson without realizing it. However, I provided a well-structured guide on how to answer the survey, and I am confident that the results are reliable. Unfortunately, I collected data from one school, and only 109 students participated in the survey. Initially, I had hoped to gather data from multiple schools, but I was unable to do so due to constraints in both time and resources.

Additionally, ordinal scales are commonly used in surveys like mine, where respondents answer (1) not at all agree, (2) somewhat agree, (3) neutral (4) mostly agree, or (4) completely agree. This type of scale is both equidistant and both, meaning that it is not possible to compare the distances between positions on the scale. The values can be ranked, and mode can be calculated, but otherwise, the scale has no mathematical meaning (Djurfeldt et al., 2003). Based on the ordinal

scale, I could compare different participants' answers to each other and see if the measurement values differed, but because it is not possible to measure the distance between the measurement values, I could not make any further comparisons (Ejlertsson, 2014). An example from my study is the statement "I have gained a lot of knowledge in technology subject." If students A answers, "strongly agree" and participant B answers "strongly disagree," I can only make conclusions about each participant's perceived level of knowledge in comparison to each other. I cannot measure or make statements about who has more knowledge, only form an opinion about how each participant individually perceives their knowledge. It is possible that participant B has more knowledge than participant A despite their answer to the statement.
The nominal scale was used in the study for questions where the respondent indicated their answered YES or NO to a statement. The scale values can be expressed in any order with the same meaning in the response, for example, yes or no answer: (1) Yes, (2) No. Mathematical calculations cannot be performed based on the nominal scale other than obtaining the mode.

In my study, as I am clarifying under section 6.1, I used two ways of distributing the surveys during data collection, giving out the paper survey during class and distributing the digital survey digitally. There are some differences in the survey questions and question scope between the two surveys. These differences can have implications for the analysis of survey results (Babbie, 2016). The survey questions are almost the same, but the question scope is different. The idea is to change some questions so that students can understand them easily.

The analysis of two surveys focusing on two main points:
1) The difference between survey questions and
2) The purpose of changing some of the survey questions.

To start with, I utilized two distinct sets of survey questions that are nearly identical except for their scope of research inquiry. This implies that both question sets assess the same variables, but with varying degrees of detail or different approaches. It is crucial to consider the differences between the two sets of survey questions when deciding which one is more suitable for a specific purpose or objective.

In addition, I modified some of the questions to enhance their comprehensibility for students. This indicates that the survey is directed towards a particular student audience, and it is crucial to formulate the questions in a clear and understandable manner. By identifying which questions require modification to increase the survey's understandability for students, it is possible to enhance response rates and improve the quality of the data obtained (Babbie, 2016).

Changing the question scope can be an effective method for helping students better understand survey questions. By simplifying the language and formulating the questions in a way that is easier to understand, students can better relate to the questions and answer more accurately (Babbie, 2016).

Bryman and Belle (2017) discuss pros and cons of open vs closed questions in surveys. This study used closed questions to aid processing, clarify meanings and reduce variation. But closed questions can limit answers and induce bias. Blair et al. (2014) suggests using Likert scale to avoid yes/no choices. Closed questions may also lead to different interpretations by respondents. Authors aimed to avoid bias by providing clear and concise survey.

## 6.9 Method discussion regarding analysis methods

In this study, students were asked to share their experiences and perceptions of a specific aspect of technology education, which provided greater freedom in their responses and resulted in a large amount of unique data.
The study did not make use of interviews, open survey or other information directly linked to the individual student, such as grades or the student's attitude towards technology education. Additionally, the study did not include questions about the student's teacher or class. The data collection was conducted only in one school. Therefore, the study does not provide a basis for making analysis at the teacher level.

It is always good to reflect on the choice of analysis method and consider if there are other methods that could be suitable for answering your research questions. There are many different analysis methods to choose from, and it is important to select a method that is appropriate for the specific research question and data collected.
I have only one way used a survey to collect data, there may be other methods, such as interviews or focus groups, that could provide a more in-depth understanding of the topic. When it comes to analysis methods, it can be valuable to consider different statistical tools depending on the type of data collected.

## 6.10 Reliability and validity

I have explained some aspects of reliability and validity under method discussion, but in this section, I will explained some points. See sections 6.1-6.5 for the chosen method.

The validity of the study was based on choosing an appropriate methods to answer the research question.

Bryman (2011) explains two aspects of reliability - internal and external. External reliability is whether the study can be replicated. That is, if someone follows the same data collection method, there should be enough information in the study. Validity in a study is about whether the investigation has measured what has been assumed to measure. It is also the validity that answers whether the study's results are related to the investigation or not (Körner & Wahlgren, 2015, p.15). There are different types of validity, in quantitative studies, concept validity, internal and external validity are most relevant in this study. The questions in the survey were formed based on previous research on consumer attitudes (Duffett, 2015; Duffett, 2017), which increases the relevance and probability that the right questions have been asked.

The result of each measurement is consistent. By using both digital and paper surveys, there may be a risk that participants respond differently to the questions depending on which type of survey they use. This can affect the reliability of the results because it can be difficult to determine which type of survey provides the most reliable results (Babbie, 2016). To minimize these risks, it is important to carefully plan the survey study and ensure that both digital and paper surveys are used consistently. It is also important to choose an appropriate target population and to use surveys designed in a way that minimizes bias and sources of error (Babbie, 2016). Finally, it is important to analyse the results carefully and be aware of any limitations in the study when interpreting the results.

# 7 Results

This chapter presents the results after analysis of the data collected by distributing two different surveys to 109 pupils in one primary school in Sweden. The analysis result is below presented in a structure that is based on each of the study's research questions. Responses that were unclear or had no answer were excluded, resulting in a smaller number of responses for some claims.

The qualitative and quantitative data obtained from the data analysis and results analysis are presented in chapter 7.1-7.3, which is divided into sub chapters based on the three research questions. Chapter 7.1 provides answers to research question 1: Students' views on how they prefer the technology course to be taught in primary schools. Chapter 7.2 provides answers to research question 2: Which part of the technology syllabus offered evokes students' interest in the technology subject in primary school. Chapter 7.3 addresses the research question, "What influences their program choices regarding the program in secondary school?"

The analysis of survey results can provide valuable insights into students' views and thoughts on technology subjects in primary schools.

The survey analysis in question is based on the digital and paper survey, which is a comprehensive questionnaire designed to gather information from primary school students about their attitudes towards technology. The survey covers a wide range of topics, including students' experiences with technology, their level of interest in technology subjects, and their perceptions of technology subject.

## 7.1 Students' views on how they prefer the technology course to be taught in primary schools.

In order to be able to understand and find answers to the study's first research question, three different survey questions and their respective answers were analyzed. These survey questions have been designed to gather information from students about their preferred modes of learning and the types of technology-based activities in teaching that they find most engaging and enjoyable.

The research question regarding students' views and thoughts in primary schools were analyzed based on both Vygotsky's sociocultural theory (1978) and Dewey's pragmatic theory (1916/1999), as both theories highlight the significance of social interaction and context in shaping individual learning and development.

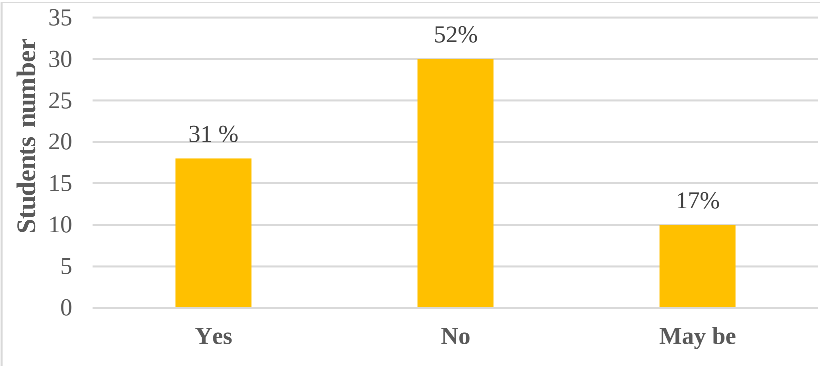


**Figure 1.** My expectation in learning technology was fulfilled (Appendix 1, question 2).

The answer to the above survey question (Figure 1) indicates a significant difference between students' expectations and their actual experience of learning technology in the classroom. Only 31% of students felt that their expectations were met, meaning that the majority of students were not satisfied with their learning. 52% of students did not feel that their expectations were met, indicating that this is a significant issue that needs to be further explored.

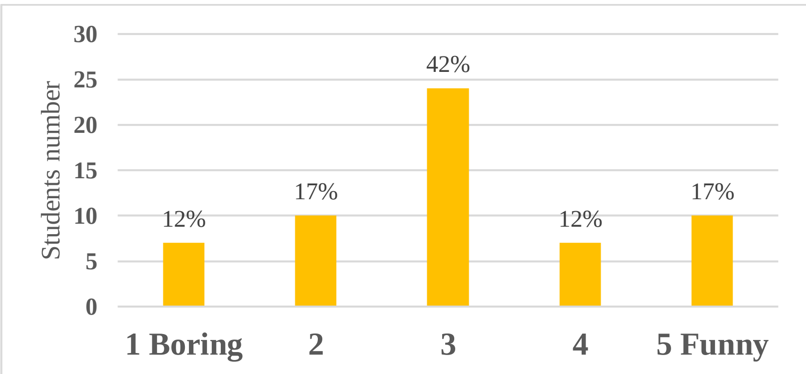


**Figure 2**. Technology is. (Appendix 1, question 3)

The above survey question (Figure2) targeted students' interest in technology in primary school (7-9th grade). Most students thought that technology may be fun or not; the result was neutral 42 % technology interest in primary school. Neutral (bar 3) represents the students were not sure if they felt that subject technology is funny or boring.

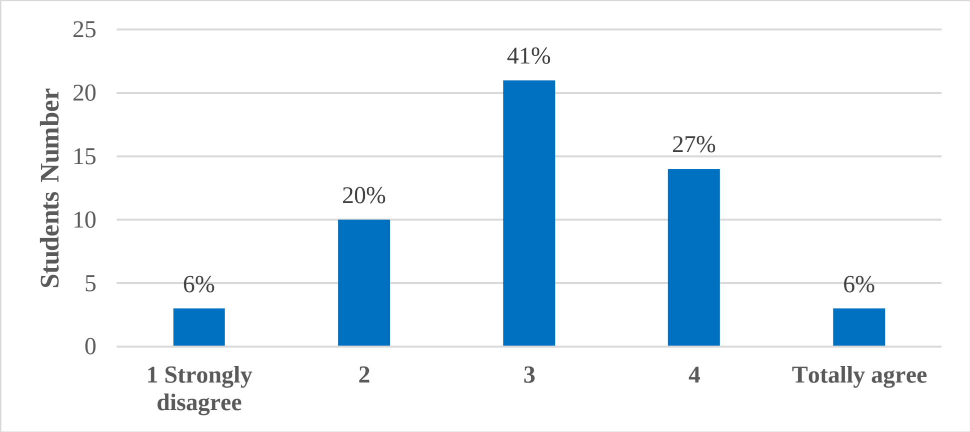


**Figure 10.** I have learned a lot about the technological subject. (Appendix 2, question 3).

Based on the survey question (Figure 10), it is evident that a considerable percentage of learners (41%) responded neutrally when asked whether they feel that they have learned a lot in the technological subject.

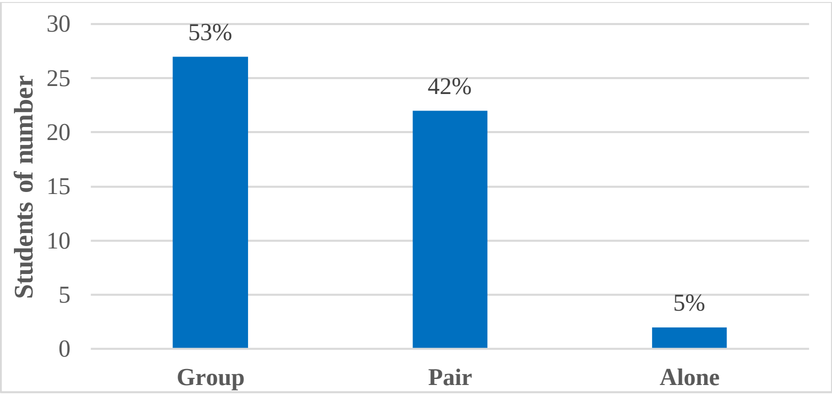

**Figure 11.** Technology is easy to work in. (Appendix 2, question 4).

Answering the question of how they believe it is easier to learn about technology (Figure 11), surveyed pupils have almost identical views on learning in a group or in pairs. 53% of them responded that they prefer learning in a group, 42% believe it is easier to learn in pairs, while only 5% believe it is easiest to learn alone.

## 7.2 Technology syllabus offered evokes students' interest.

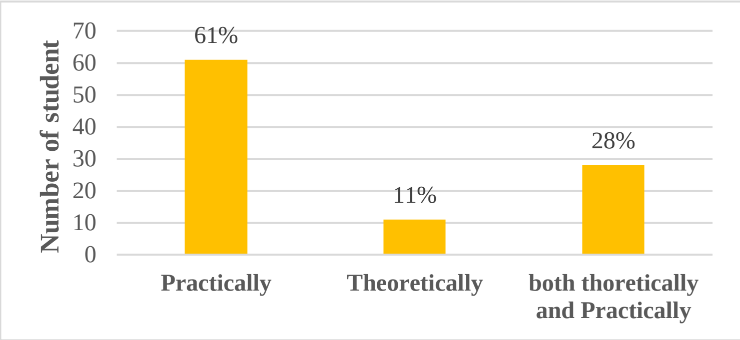


**Figure 3.** What do you want to work under the technology lesson? (Appendix 1, question 4)

The majority of students would like more practical classes, as many as 61 percent of them, and only 11 percent would like to have only the theoretical part of classes (Figure 3).

**Students' thoughts on the different topics of technology**

The digital and the paper survey (Figure 7-9 or questions 10-13) states students' thoughts and views on the different technology work areas. Programming, technical solution, innovation, and product development are some of the work areas in technology subject (Skolverket, 2022).

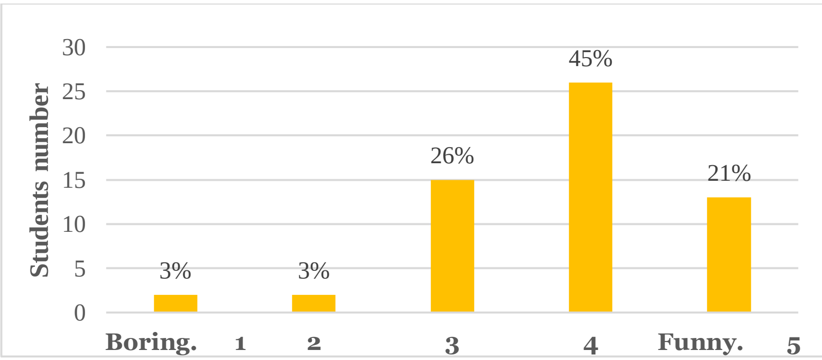


**Figure 4**. My opinion on a technical solution. (Appendix 1, question 5)

In the above (Figure 4), 66% of the learners agreed that the technical ability of the technical solution is relatively funny, with only 6 % thoughts that it is not fun.

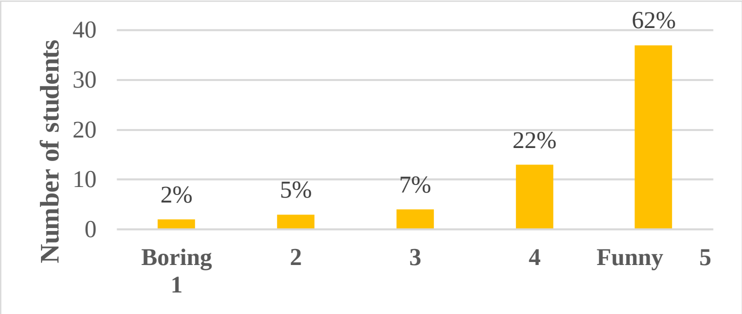


**Figure 5.** My opinion in programming. (Appendix 1, question 6)

The vast majority consider programming to be a fun part of technology. The Figure 5 above reported that it was established that 86% of the students perceive technology programming as funny, with 7% considering it a boring task.

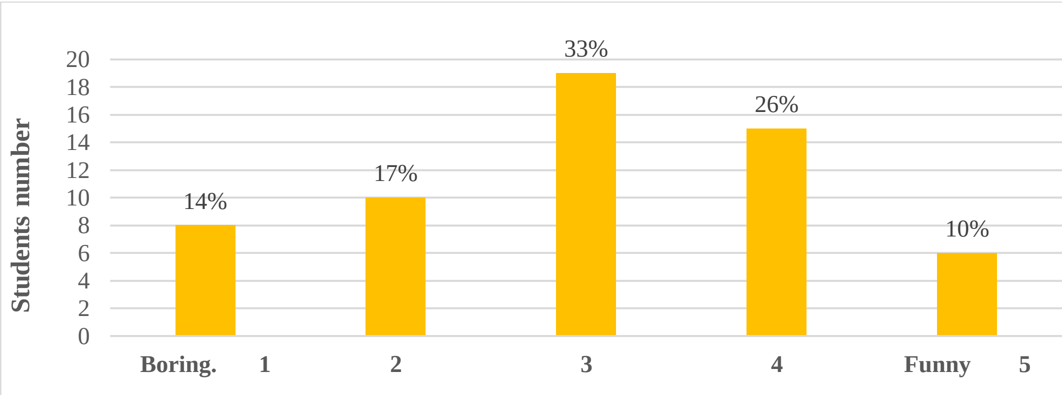


**Figure 6.** My opinion on Innovation. (Appendix 1, question 7)

According to Figure 6, which gathered the opinions of students on technology, the majority of learners, 21 out of 58 (36%), found innovation technology to be interesting to learn. Conversely, 19 out of 58 students (33%) and 18 out of 58 (31%) found it to be boring. Therefore, the findings suggest that students have a neutral stance towards learning innovation technology for promoting innovation.

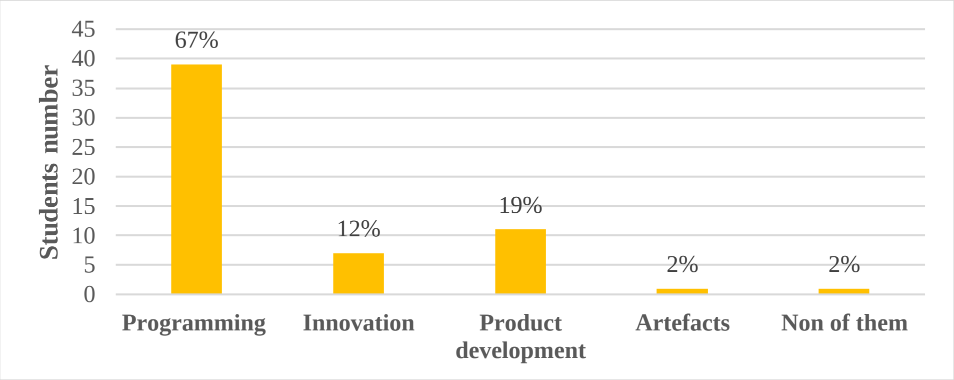


**Figure 7**. I have gained enough knowledge and am satisfied that student remember from primary school. (Appendix 1, question 8)

The above survey question aimed at (Figure 7) how much knowledge is gained in primary school technology work areas. Results showed that in 39 of 58 (67%) of the learners reported that in the area of programming have gained enough knowledge, respectively product development (19%), and Innovation (12%).

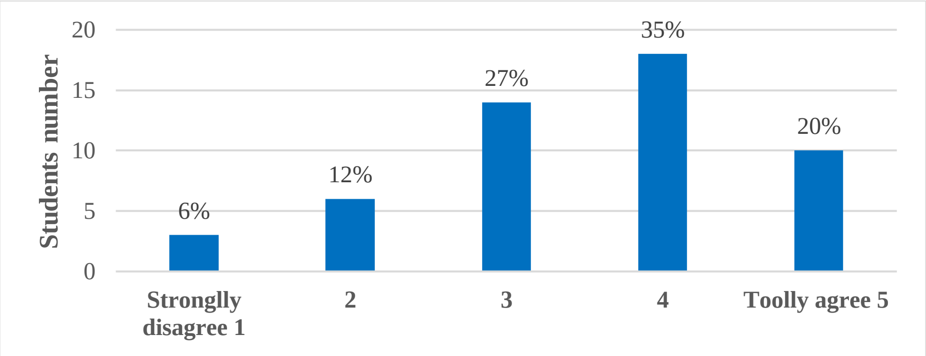


**Figure 9.** I understand why I study technology subject. (Appendix 2, question 2).

The answers received to the question whether students understand why they are learning about technology (Figure 9), at least 55%of students agreed that they understand why they study technology subject in school, while 32% disagree; on the other hand, 27 % were neutral about why they study technology.

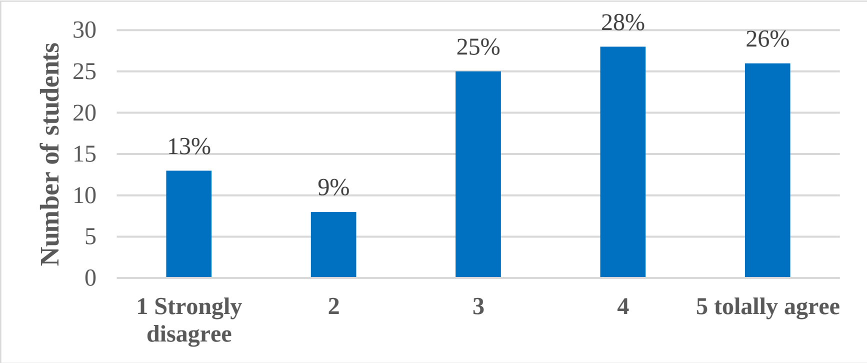


**Figure 14.** I have benefited from the feedback I have received through the daily report. (Appendix 2, question 7).

Figure 14 displays the findings of a survey question that inquired about students' opinions regarding receiving feedback from their teacher through a daily report book, as well as their views on writing a report during every technology lesson. The survey indicated that 54% of the participants believed that receiving feedback through a daily report book was highly beneficial.

## 7.3 Influences of their program choices in secondary school

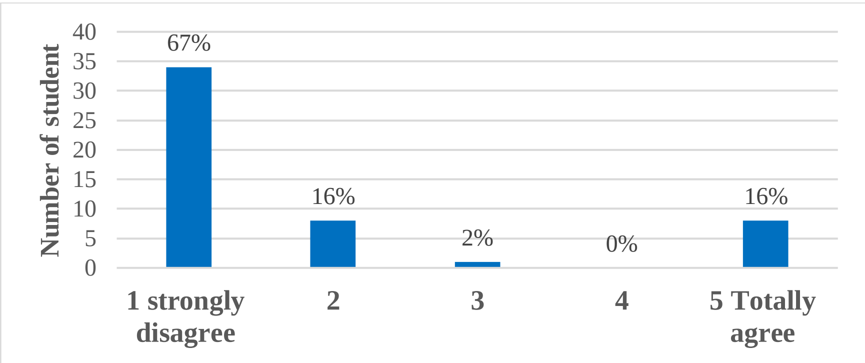


**Figure 12**. I intend to study technology program in high school. (Appendix 2, question 5)

The answers to this survey question, shown in Figure 12 show that at least 82% of the learners reported that they strongly disagree that they have chosen a technology program to study in secondary school. And 32% reported that students have already chosen a technology program as their first or second choice.

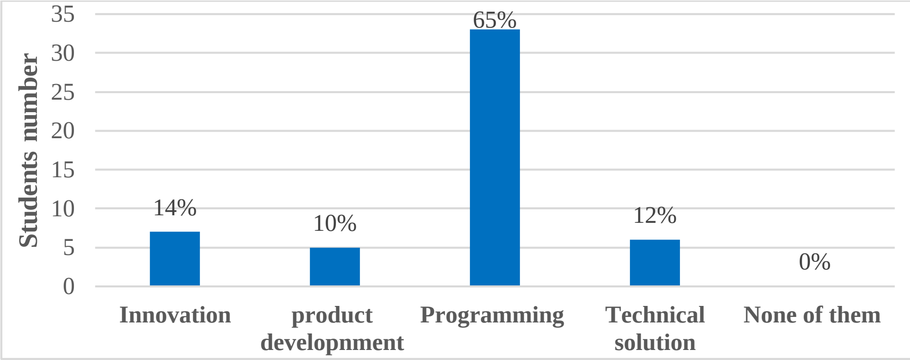


**Figure 13.** If the student could choose to study the technology program in secondary school, the field of work would positively affect student choice (Appendix 2, question 6).

Most of the students (65%) reported that they would use choice programming if they studied technology program in secondary school. Innovation (14 %), Technical solution) (12%) and product development (10%), respectively, would positively influence to choose of technology program (Figure 13).

# 8 Discussion

The purpose of the study has been to understand ninth graders' views and thoughts on technology in their everyday lives, in school, and the future concerning education and their career choices at secondary school. The compiled survey answers were analysed and gave a good picture of how everyone is involved in the subject of technology.

**Connection to my research questions**

i. Students views how they prefer the technology course to be taught in primary schools?
ii. Which part of the technology syllabus offered evoke students' interest in the technology subject in primary school?
iii. What influences their program choices regarding the program in secondary school?

## 8.1 Research question: Students views how they prefer the technology course to be taught in primary schools?

Based on the first theme of research question one, the study investigated students' views on learning technology in primary school. This section will discuss the study's results with the research and theory presented in the background.

According to the findings from Figure 2, a significant gap exists between students' expectations and their actual experience of learning technology in the classroom. A majority of students (69%) expressed dissatisfaction with their learning, which could potentially lead to a declining interest in technology if not addressed (Lindahl, 2003). Skolverket's investigation (2014) shows that involving students in deciding the lesson content could increase their interest in technology. However, the current study found that all surveyed students felt they were not involved in deciding the lesson content. Nonetheless, as Lindahl (2003) suggests, students do provide suggestions on topics they would enjoy learning, indicating the importance of understanding what students deem meaningful to learn. Interest in learning increases when students understand the significance of knowledge (Sjøberg& Schreiner, 2005; McCormick, 2004; Jidesjö et al., 2009).

Dewey's (1916/1999) research aptly notes that when students are interested, their motivation to learn increases. In the current study, 30 of 58 students reported that learning technology was not as they expected (Figure 1). If the lessons are not equivalent to the students' expectations, there is a risk that they will lose interest in technology (Lindahl, 2003). According to the Swedish Schools Inspectorate (Skolinspektionen, 2014), students' interest in technology would increase if they influenced the content of teaching. From a pragmatic perspective, lessons should be planned based on the students' experience and curiosity to build based on knowledge (Säljö, 2015). Vygotsky's theory specifically highlights the role of interactions with more knowledgeable individuals and the cultural context in shaping cognitive development, making it particularly useful for understanding how students' views and thoughts are influenced by their interactions with teachers and peers within the school environment. In contrast, Dewey's pragmatic theory (1916/1999) highlights the significance of practical experience and problem-solving in the learning process. Dewey asserts that learning should be rooted in real-life experiences and focused on addressing practical problems. This theory provides valuable insights into how students' views and thoughts are influenced by their participation in classroom activities and engagement with hands-on tasks and projects.

The findings of the current study support previous research conducted by Mattson (2005), which suggests that motivation plays a crucial role in all forms of learning. Positive feedback from teachers to students results in significantly better learning outcomes than negative feedback. Van Aalderen-Smeets et al. (2011) also emphasize the importance of investigating students' attitudes to comprehend how teaching affects their interest in a subject.

The results of the survey indicated that students were interested in the subject of technology and strongly preferred practical work. More than half of the students reported that having more practical lesson in technology lessons would be more fun. According to the survey, students wished for lessons to be as practical as possible, and they wanted to work with their hands and perform tasks (refer to Figure 2 & Figure 10). These findings align with Mattson's (2005) study. However, 15 out of 58 students did not find technology learning enjoyable. Out of these 58 students, 27 responded that technology was fun (refer to Figure 2), which may be due to differences in how technology is perceived as a general concept and how it is experienced in learning (Jidesjö, 2012). In his study, Jidesjö (2012) found that students' interest in technology may differ from the technology they encounter in school, which may also apply to this study. The article discusses various studies on teaching technology, highlighting how curriculum goals and content can be overshadowed by practical work. Mattsson (2002) argues that teaching often emphasizes investigative and hands-on activities, while Jidesjö (2012) suggests that teachers adopt a broad perspective when selecting teaching sources. Bjurulf's study indicates that teachers with different backgrounds approach teaching technology differently, and smaller class sizes allow for more practical work. However, theoretical tasks are still necessary for achieving high grades. Tosun's (2000) studies reveal that teachers' attitudes towards natural science can influence their teaching ability and students' attitudes towards the subject.

The article also presents a survey of younger students' attitudes towards technology teaching and learning. The results show that students have a positive attitude towards technology teaching and learning, with a preference for more practical work. Students also want to work in groups to utilize each other's resources and help each other, which promotes collaboration and interaction within the group (refer to Figure 11). This finding is consistent with the idea that knowledge is developed and mastered through the interaction of people who try to coordinate their perspectives and jointly deal with situations (Säljö, 2015).

Several studies have highlighted the importance of understanding what is interesting and important for students to learn, as well as the results that interest increases if students see the relevance of knowledge (McCormick, 2004; Jidesjö et al., 2009; Dewey, 1916/1999).

## 8.2 Research question: Which part of the technology syllabus offered evoke students' interest in the technology subject in primary school?

The second part of my research focused on the technology lessons that would generate students' interest in primary school. The aim was to understand what aspects of learning technology would excite students in primary school, particularly their views on teaching methods. In the current era, digitalization is prevalent, and most students associate it with computers and programming (Stigberg & Stigberg, 2020). Consequently, the study found that programming was the most enjoyable lesson for primary school students (Figure 5). In grade 9, students typically associate the term technology or technology subject with programming.
Apart from teaching approaches, the research sought to establish students' perspectives on the technology subject. The survey had 51 responses, with 55% indicating that they understand why they study technology in school (Figure 9). The students found practical learning more engaging than theoretical learning, with group discussions being more effective than lectures (Figures 3 & 7). According to studies, combining practical teaching with theoretical teaching can improve students' learning. This variation in teaching methods helps students grasp the lesson content

and tackle complicated problems more effectively (Marton & Carlgren, 2001, pp. 222-224).

Surprisingly, at least 82% of the pupils reported that they strongly disagreed with choosing a technology program to study in secondary school, but 32% had already chosen technology as their first or second choice (Figure 4). According to Svenningsson (2018), how interesting students will find technology has a lot to do with what they learn in extracurricular activities, as well as the way the teacher presents the material. Säljö (2015) suggests that although most students are interested in programming, very few have a genuine interest in how computers work or communicate with them. Nevertheless, programming questions must be part of today's general knowledge to prepare students to be responsible, active, and aware citizens in the digital world.
The increasing digitalization of society has made programming a common part of teaching worldwide. In Europe, 16 different countries have introduced programming into their curriculum (Balanskat & Engelhardt, 2015), and Sweden has implemented programming in primary schools as part of a digitalization reform (Skolverket, 2018). Even with the opportunity they have, but also the interest, many do not decide to further develop their programming knowledge as they could do in their further education.

Vygotsky's sociocultural theory (1978) emphasizes the importance of social interaction and cultural context in the development of cognitive processes. According to this theory, learning takes place through collaboration and social interaction with others, and cultural tools and artifacts play a critical role in shaping our thinking and understanding of the world. In this sense, a technology syllabus that emphasizes collaborative learning and the use of cultural tools and artifacts, such as digital media and interactive software, is likely to be more effective in evoking students' interest and promoting their learning (Säljö, 2015).
On the other hand, Dewey's pragmatic theory (1916/1999) highlights the importance of practical learning experiences and problem-solving in education. According to this theory, learning should be grounded in real-life situations and connected to students' interests and experiences. Therefore, a technology syllabus that emphasizes practical learning and the use of technology to solve real-world problems is likely to be more engaging and relevant to students.

A technology syllabus that incorporates both the principles of Vygotsky's sociocultural theory (1978) and Dewey's pragmatic theory (1916/1999) is likely to be most effective in evoking students' interest and promoting their learning. This would involve using technology to facilitate collaborative learning and problem-solving, while also connecting learning to real-life situations and students' interests and experiences.

The survey also revealed that students commonly used computers, mobile phones, and tablets in their daily lives (Figure 4 & 6). They found technical solutions relatively enjoyable, which supports pragmatism's idea of linking everyday life to school teaching (Sundgren, 2011).

As noted in the previous section, most students express a strong interest in practical, hands-on learning in the classroom. They find it challenging to write reports and keep a daily logbook, which suggests that they prefer to work with tangible objects and use technology to create physical things. This is particularly true when it comes to programming, which many students connect with electronics and other practical applications (as shown in Figure 5).

These findings are consistent with the work of Säljö (2015), who argued that computers are central to modern teaching, providing a means of searching for information, formulating ideas, and solving problems. Vygotsky (1994) similarly emphasized the importance of artifacts in teaching, noting that they help students to develop new concepts, habits, and ways of working. In light of these insights, it is important for teachers to create lessons that are grounded in students' experiences and interests, using technology and other tools to help them explore and learn. Research has shown that incorporating modern technology into teaching can be particularly effective in engaging students and making the material more relevant and accessible. Andersson, Svensson, and Zetterqvist (2008) and Jidesjö et al. (2009) found that students are especially drawn to computer programming, seeing it as a modern, cutting-edge technology. The result from my study reinforces these findings, with a majority of students expressing an interest in programming and finding it enjoyable.

To capitalize on this interest, I believe that it is important for teachers to design programming activities that are both fun and practical, helping students to see how programming can be used to solve real-world problems. By doing so, they can keep students engaged and motivated, and foster a deeper understanding of how technology works and how it can be applied in their daily lives. Teachers should also be mindful of the technologies that students are most interested in, such as mobile phones and tablets, and find ways to incorporate these devices into the curriculum. Failure to do so can lead to a decline in students' interest in the subject and a loss of opportunities to engage with technology in meaningful ways.

The second question focused on technology lessons that could spark students' interest in primary school. During the survey, students were asked about their opinions on various teaching moments, and it was discovered that the most positively received statements were related to activities that allowed them to engage in things like inventing, disassembling objects to understand how they work, programming, and witnessing real-world applications. Teachers should consider their students' interests when planning and designing lessons for learning, which is in line with recommendations from Anderhag (2014, p. 86) and Sjøberg (2005, p. 357). The Skolverket (2011b, pp. 270-271) also recommends that students be provided with and be given the opportunity to practice and develop knowledge within diverse methods for technological problem-solving, including opportunities to create their own practical constructions, take objects apart to comprehend their construction, and collaborate in groups and pairs.

The survey revealed that a significant majority (86%) of students expressed a keen interest in learning programming, which may influence their decision to choose a technology program in high school (Figure 6). However, it is essential to note that the analysis was based on a relatively small dataset and may not represent all students' opinions.

Björkholm (2014) investigated effective ways of teaching technology in lower grades of schools, and teachers collaboratively designed teaching strategies that allowed students to identify and solve technical issues in their daily lives. This approach helped students realize the importance of acquiring technological skills (Björkholm, 2014, p.18). Similarly, Lindh and Holgersson (2005, p.1109) emphasized the significance of realistic tasks for students to apply knowledge outside of school. In their study, the students programmed Lego robots to solve various tasks, and the perceived realism of the tasks played a crucial role in developing their problem-solving abilities. Skolinspektionen (2014, p.17) also stressed the importance of teaching that connects with students' everyday experiences. This once again shows that it is possible for students to develop greater interest, but also understanding with practical action, which, among other things, also proved to be the preferred way of learning. In addition, students' everyday experiences would likely make them relate to the subject they are studying on a new level.

Moreover, a study conducted by Andersson, Svensson, and Zetterqvist (2008 p.174) on students in grades 7-9 agreed that students associated technology with modern and advanced technology rather than older forms, such as a stone axe. They also viewed technology as something new rather than something that has existed for a long time. Jidesjö et al. (2009 p.225) noted that students were more interested in learning about computers, the internet, and modern artifacts than historical technology. They preferred to learn about future technology rather than the history of technology (Jidesjö et al. 2009 p.226) agreed with my research.

## 8.3 Research question: What influences their program choices regarding the program in secondary school?

The influence of technology subjects in primary schools on students' choices of programs in secondary schools is the focus of the third theme of this research. To comprehend and address the initial research question number three, the study analyzed two survey questions along with their corresponding answers. These survey questions were specifically created to elicit information from students regarding their influences of technology subject their program choices in secondary school.

Vygotsky's sociocultural theory (1978) and Dewey's pragmatic theory (1916/1999) both have implications for program choices in secondary school. According to Vygotsky's sociocultural theory (1978), learning takes place through social interaction and cultural tools. Therefore, a secondary school program that emphasizes collaboration and the use of technology and other cultural tools is likely to be more effective in promoting students' learning. For example, a program that incorporates group projects, interactive software, and online forums for discussion and collaboration would be in line with this theory.

Dewey's pragmatic theory (1916/1999) emphasizes the importance of practical learning experiences and connecting learning to real-life situations. Therefore, a secondary school program that includes opportunities for students to apply their learning to real-world problems and projects is likely to be more engaging and relevant to students. For example, a program that includes internships, service learning, or community-based projects would be in line with this theory. In addition, both theories suggest that students should be actively involved in their own learning and that teachers should act as facilitators rather than just lecturers (Säljö, 2015). According to Dewey's theory, therefore, a program that includes opportunities for student-led learning, such as student projects or peer teaching, would also be in line with these theories.

Overall, a secondary school program that incorporates the principles of both Vygotsky's sociocultural theory and Dewey's pragmatic theory is likely to be most effective in promoting students' learning and engagement. Such a program would emphasize collaboration, hands-on learning experiences, real-world problem-solving, and student-led learning, while also incorporating cultural tools and technology to facilitate learning (Säljö, 2015).

Programming has been found to influence the choices of students who want to study technology programs in secondary school (Figure13), which is in line with Säljö's (2015) observation that students' daily lives are increasingly dependent on computers for learning and problem-solving. The study aimed to assess the willingness of learners to pursue technological courses at the secondary level after covering the foundation and fundamental aspects of primary school. Surprisingly, 42 students (83%) reported being unwilling to study secondary school technology programs (Figure12), which suggests that the challenges experienced by students at the primary education level need to be addressed to develop their interest in studying the program at the secondary school level.

The study also aimed to establish the connection of technology with other subjects taught in school and to determine the students' willingness to pursue technical courses in secondary school. Bjurulf's (2013) study highlighted that technology subjects are not given the same level of importance as other subjects in school, with teachers preferring to teach science subjects. I believe that this underscores the importance of teachers' education and professional development, as teachers with a background in mathematics and science may feel constrained when teaching technology due to their lack of comprehensive knowledge required for effective teaching.

Anderhag (2014, p.81) emphasized the significance of students' interest in a subject for both their desire and ability to learn and engage with it. However, Jidesjö et al. (2009, p.217) found that although students recognize the importance of science and technology subjects, they may find them less interesting than other subjects. The lack of curiosity about what they learn in science and technology classes may explain this (Jidesjö et al. 2009, p.224), suggesting that the content of teaching plays a significant role in shaping students' interest. The data shown by this research, such as the fact that slightly less than half of the pupils do not understand why they study technology or that they find the teaching boring, as well as that learning about technology did not meet their expectations, could be just some of the reasons why students do not want to further develop their knowledge at least in this subject.

The Skolinspektionen (2014, p.18, 20) reported that students in technology subjects lacked stimulation and felt that their interests were being ignored. Thus, teachers have a critical role to play in engaging students' interests and defining the objectives of their education (Anderhag 2014, p.86). Obtaining a student perspective on subjects is crucial (Sjøberg 2005, p.357). Jidesjö (2012, p.87) demonstrated that there are variations in students' interest in technology, which may not align with the technology emphasized in education. Lindahl's (2003, p.234) research discovered differences in students' interest in technology and science subjects in and outside of school, indicating that it is important to consider students' experiences and interests when designing curricula, textbooks, and teaching methods (Sjøberg& Schreiner 2010). In this research, it is perhaps a bit worrying that to some basic questions like whether the teaching meets the students' expectations or whether they find it fun or boring, most of them answered that they don't know. The very indecision of the students on this issue shows their indolence in showing interest with their answers or comments so that the quality of teaching could be improved. This is especially interesting considering that so many students have the desire and love to learn programming. The imbalance between what they learn and what they want to learn seems to be the biggest obstacle.

# 9 Conclusion

In this study, primary school students' attitudes towards technology and their classroom experiences were investigated. The results indicated a significant disparity between the students' expectations and their actual experiences, with 69% expressing dissatisfaction. The study revealed that involving students in decision-making regarding lesson content and recognizing their preferences for meaningful learning experiences are crucial for increasing their interest in technology. Students preferred hands-on practical work, and group collaboration was highly valued. Discovering what students consider meaningful to learn is crucial, as interest in technology increases when students see the relevance of knowledge.

The research focused also on part of the technology syllabus that evoked most of the student’s interest in the technology subject in primary school. The study found that programming was the most enjoyable lesson for primary school students, and practical learning was more engaging than theoretical learning. Although most students were interested in programming, few showed a genuine interest in understanding how computers work or communicate with them. My study also revealed that integrating modern technology into teaching can be highly effective in engaging students and making the material more relevant and accessible. To capitalize on this interest, teachers should design programming activities that are both fun and practical, incorporate mobile phones and tablets into the curriculum, and provide students with diverse methods for technological problem-solving.

This study examined what influences students program choices regarding the program in secondary school. The study found that students who want to study technology courses in secondary school are influenced interest in programming mainly arising from extracurricular activities.

However, despite importance for students to be given the chance to compete and showcase their skills in developing technological solutions for engineering and construction-related issues, a majority of the students reported being unwilling to study technology courses in secondary school. The study also found that teachers play a crucial role in how technology is taught in school and that their education and professional development impact students' interest in the subject.

# 10 Recommendation

In the empirical part of my study, I have used surveys as a way of collecting data as well as thematic analysis of answers to questions to illustrate students' visions and barriers to learning technology. What made me interested during the work was finding out what it currently looks like for students regarding technology learning in primary school. I have only done one survey in one municipality and school. I can imagine that the results would have been different if I had done several surveys in several municipalities and schools. Conforming to this, the study would have different results over time. Furthermore, it would be interesting to study students' views on technology.

Regarding recommendations for further study, the interested researchers should conduct a study to:

i. Establish the causes of the unwillingness of primary students to pursue technology courses in high school.
ii. What are the influences that students have in studying technology in relation to their interests in technology?
iii. The best motivator to allow primary students to pursue a technical course in high school.

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## Appendix 1
**(Digital survey)**

1. Jag går i årskurs ______
2. Mina förväntningar i teknikämnet uppfyllda
   Ja, Nej, Kanske
3. Teknikämnet är
   Tråkigt 1 2 3 4 5 Roligt
4. Vad vill du jobba med på tekniklektionerna?
   - Arbeta praktiskt med tillverkning
   - Arbeta teoretiskt för att få förståelse i ämnet
   - Både praktiskt och teoretiskt

**Elevernas tankar kring om olika arbetsområde teknikämnen (7–9)**

Skala fråga 7–9
Tråkigt 1 2 3 4 5 Roligt

5. Tekniska lösning
6. Programmering
7. Innovation
8. Jag har fått tillräckligt med kunskap och tillfredsställt att eleverna minns från grundskolan i.
   - Programmering,
   - Innovation,
   - Produktutveckling
   - Tekniska lösning,
   - Inga av dem
9. Teknikämne är jämföra med andra skolämnen.
   Svårt 1 2 3 4 5 Lätt
10. Jag är nöjd med teknikundervisning?
   Icke nöjd 1 2 3 4 5 mycket nöjd

Tråkigt 1 2 3 4 5 Roligt

11. Produktutveckling
12. Undervisningsmetod i teknikämne under grundskolan
   Icke nöjd 1 2 3 4 5 nöjd
13. Lärare ger det möjligheten att arbeta i grupp
   Aldrig Ibland Ofta Alltid Vet e
14. Jag fick tillräcklighet tid att arbeta med projekt
   Håller inte alls med 1 2 3 4 5 Håller helt med
15. Fick du tillräcklig kunskap om teknikmaterial och dess olika kunskaper
   Aldrig Ibland Ofta Alltid Vet ej

16. Andra kommentarer om Teknikämnet

- ________________
- _______________
- ________________

## *Appendix 2*

**(Paper sharing survey)**

1. Jag är (kryssa)
    - Flicka
    - Pojke
    - annat
2. Jag förstår varför jag läser teknikämnet i skolan.

Håller inte alls med 1 2 3 4 5 Håller helt med

3. Jag har lärt mig mycket om teknikämnet.

Håller inte alls med 1 2 3 4 5 Håller helt med

4. Jag tycker att det är lätt att jobba.
    - I grupp
    - I Par
    - Enskilt
    - Annat
    - Övrigt
5. Jag tänker läsa teknisk linje på gymnasiet.

Håller inte alls med 1 2 3 4 5 Håller helt med

6. Om du skulle läsa teknikprogrammet på gymnasiets, vilka arbetas område skulle det påverka positivt att läsa?
    - Innovation
    - Produktutveckling
    - Programmering
    - Tekniska lösning
7. Jag har haft nytta av den återkoppling jag fått genom loggboken.

Håller inte alls med 1 2 3 4 5 Håller helt med

8. Jag kan se kopplingen mellan teknikämnet och andra skolämnen.

Håller inte alls med 1 2 3 4 5 Håller helt med

9. Vad uppfattar du som svårt för dig i teknikämnet? (fler kryss)
    - Att skriva loggbok
    - Att skriva rapport
    - Att skissa förslaget
    - Att jobba i grupp
    - Att redovisa
    - Att välja rätt material

10. Jag har kunnat påverka genomförandet av mitt projekt.

Håller inte alls med 1 2 3 4 5 Håller helt med

11. Jag har lärt mig om olika materials egenskaper i teknikämne.

Håller inte alls med 1 2 3 4 5 Håller helt med

12. Jag tycker det är tillräckligt med tid för att genomföra konstruktionsarbete.

Håller inte alls med 1 2 3 4 5 Håller helt med

13. Jag tycker hållbar utveckling inom teknisk ämnet är viktigt.

Håller inte alls med 1 2 3 4 5 Håller helt med

14. Jag brukar använda digitala verktyg för att lära mig teknikämnet.

Håller inte alls med 1 2 3 4 5 Håller helt med

15. Jag tycker kamratbedömning hjälper mig mycket för att utveckla min förståelse för teknik

Håller inte alls med 1 2 3 4 5 Håller helt med

16. Jag kan använda mig utanför skolan av det jag lärt mig inom teknikämnet.

Håller inte alls med 1 2 3 4 5 Håller helt med

*Appendix 3*

**(bar chart)**

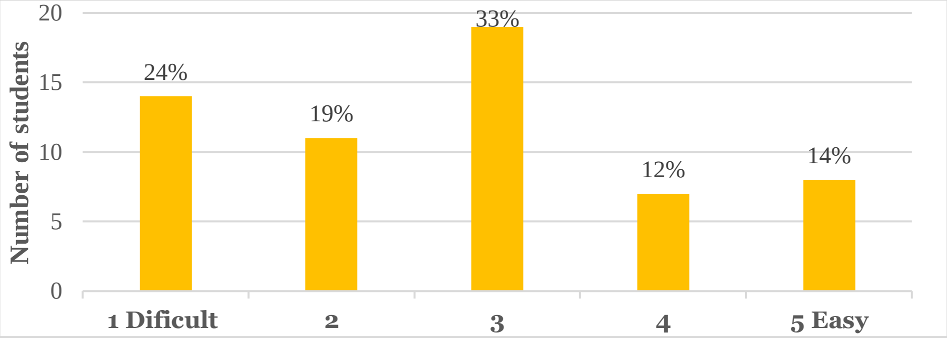


**Figure-1.** Technology compared with the other school subject (Appendix 1, question 2).

The other aspect that the study aimed to establish is how technology is difficult to learn compared to other subjects. (Figure-1) The respondents reported that almost 43% and 33% reported that technology is difficult and neutral compared with the other subject.

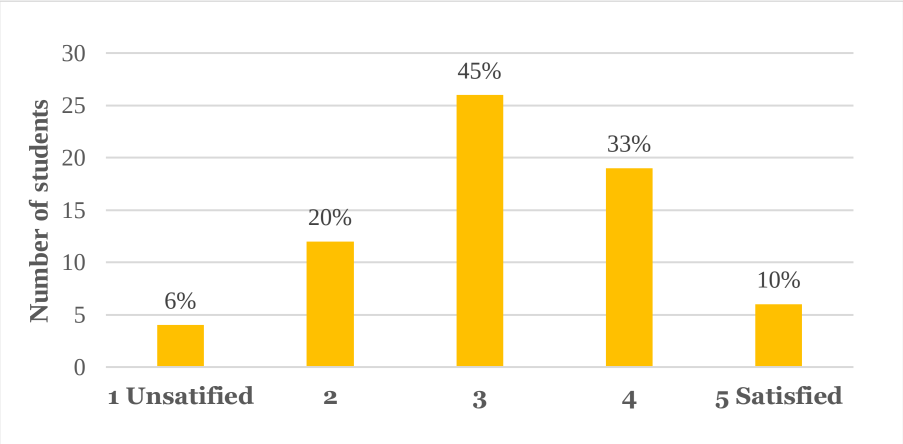


**Figure-2.** I am satisfied with technology teaching (appendix 1, question 3).

From the results above (figure 2), 45 % of the 58 students reported neutral satisfaction with teaching technology from 7-9 grade. And 43% are satisfied with technology teaching methods in primary school. Bar 3 represents neutral, which means somehow satisfied and unsatisfied.

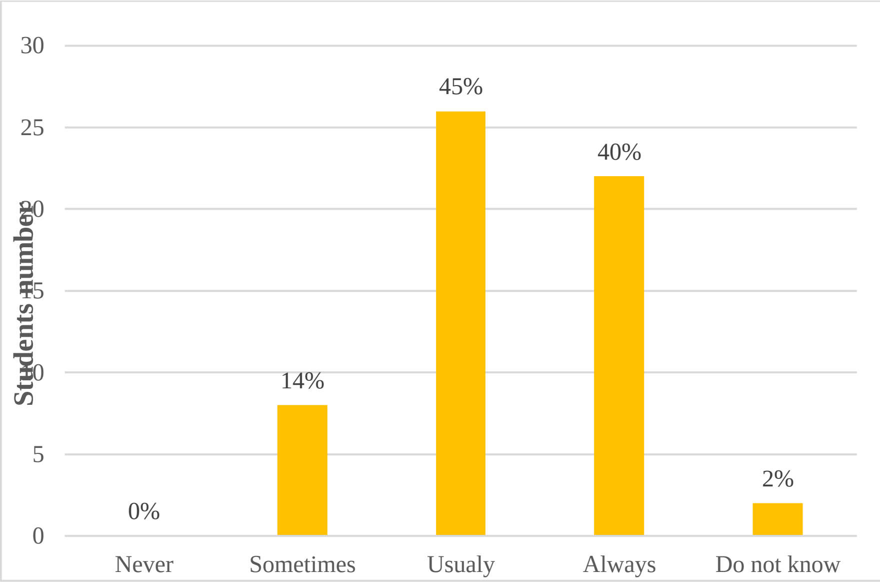


**Figure-17. The teacher allowing working in group. (Appendix 1, question 14)**

The survey in (figure 4) aimed to establish whether the teachers allow the learners to work in groups, especially for complex tasks requiring the students to exchange ideas and manage skills. At least 45% and 40% of the 58 students (Figure-4) reported they usually and always work in groups, respectively.

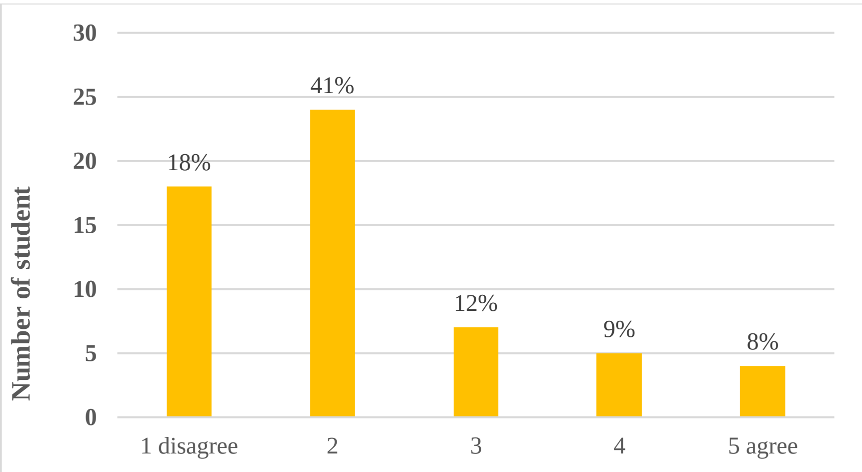


**Figure-18. I have sufficient time to work on the projects. (Appendix 1, question 15).**

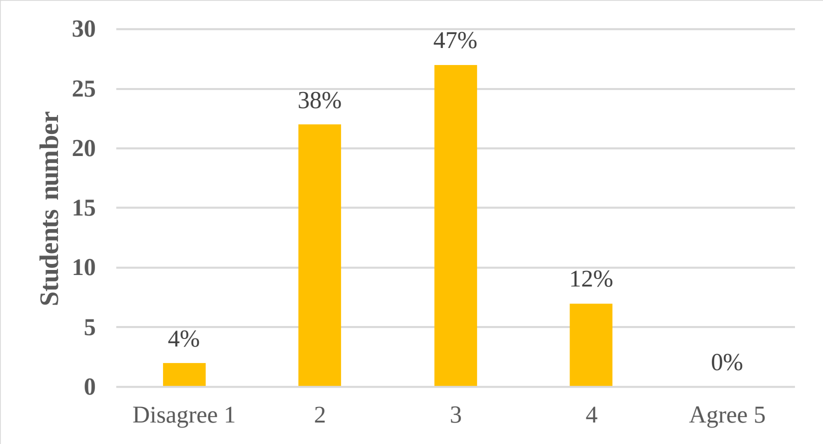


**Figure-19. I have Gained sufficient knowledge about technology material and its various knowledge. (Appendix 1, question 16).**

In the above (figure 6) states that the grade 9 students reported almost 3/4 (72%) of 58 students have lack of time to study and understand technology. According the above (Figure-6) Students have reported they have neutral (47%) consciousness in using of material and gained knowledge in technology. Neutral represents that the student were not sure if they gained knowledge and the material purpose. Nearly 42 % and 6% have reported that the that they haven't gained knowledge and gained knowledge in technology respectively.

The above (Figure 12) targeted that students' thoughts on product development. The result findings that a significant portion of the students 34 of 58 (59%) agreed that the product development was funny. 15 of 58 (26%) and 9 of 58 (16%) students respectively reported that product development was boring.

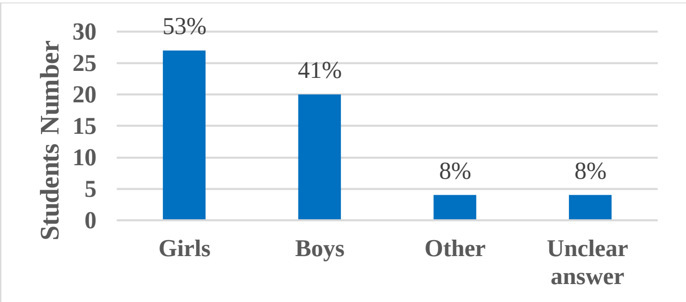


**Figure-8**. Participant gender (Appendix 2, question 1)

A total of 51 students have responded (Figure-8), of them 27, 20, and 4, girls' boys, and others, respectively. 4 students have responded clearly, so it's not part of my investigation.

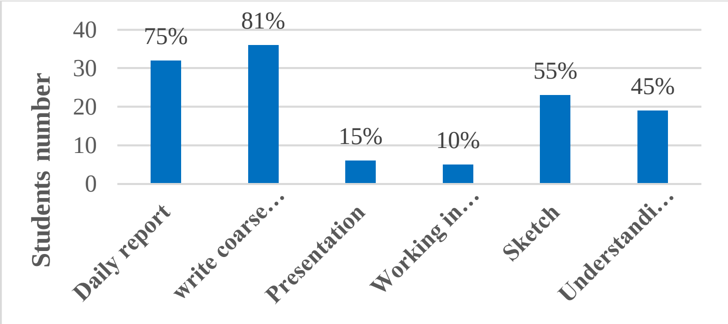


**Figure-21. What do you perceive difficult for you in technology. (Appendix 2, question 9)**

The survey in number 4 was choosing multiple options (Figure-16). The survey aimed to investigate which technology activities difficult to learn. The result re orted that writing coarse report, daily report and sketching the project (80%, 75% and 55%) respectively was difficult to learn technology. While Presentation and working in group was easy to learn technology.

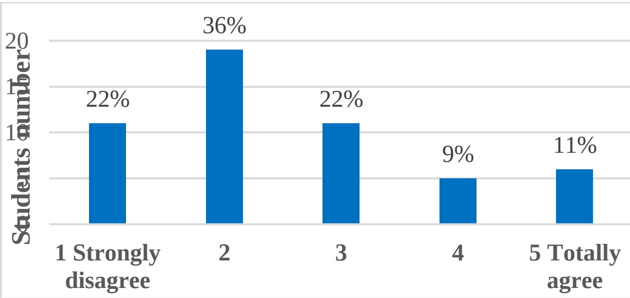


**Figure-22. I think I have had enough time to carry out technology lesson. (Appendix 2, question 10)**

From the above (Figure-23) have reported that more than half percent (58%) have hade lack of time for learning technology.

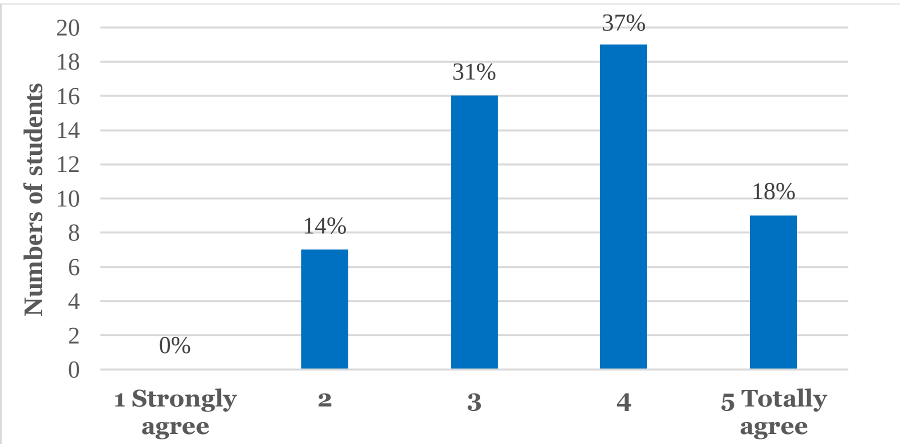

**Figure-23. I usually use digital tools to learn technological subject. (Appendix 2, question 11)**

From the above Figure-24, showed that more than halve (55%) respond digital tools are goo to use when you learn technology.

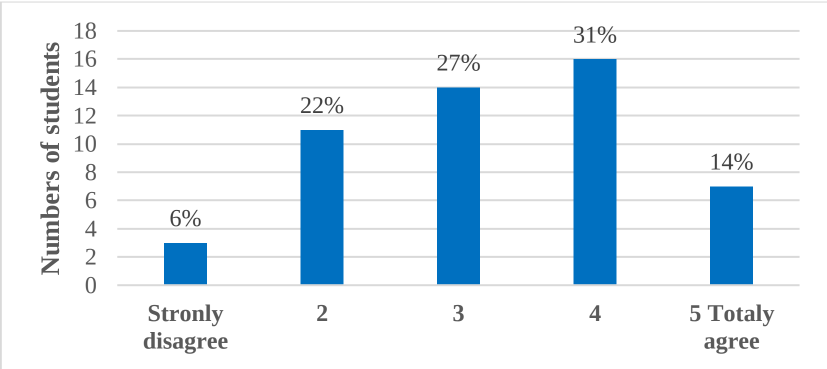


**Figure-24. I think peer assessment helps me a lot to develop my understanding of technology. (Appendix 2, question 12)**

Figure-24 reported that 45 % strongly agreed to learn technology through peer assessment and discussion while 27 % answered neutral

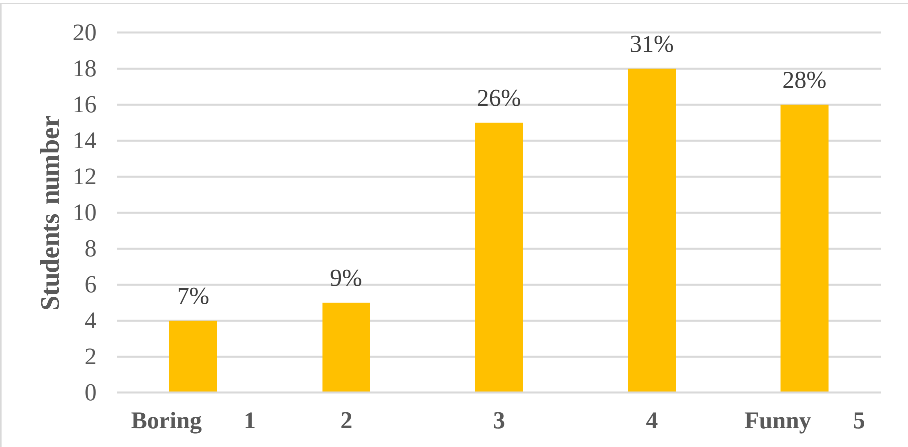


**Figure-20. My thoughts on product development (Appendix 1, question 17).**

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