ICT and inclusion

Teachers' perceptions on the use of information and communication technology for students with special educational needs in general educational settings

Helena Josjö

Abstrakt

Informations- och kommunikationsteknik (IKT) är ett aktuellt ämne i skolor världen över och denna studie kan vara av intresse för lärare, specialpedagoger, skolledare och lärarutbildare. Syftet med föreliggande studie var att beskriva och analysera lärares erfarenheter och uppfattningar av användningen av IKT för elever i behov av särskilt stöd som går i vanliga klasser, och att finna sambandet mellan IKT och inkludering. Vidare identifierades omständigheter och strategier för att göra arbetet med IKT mer inkluderande. En enkätstudie genomfördes med 92 lärare och kvalitativa intervjuer gjordes med fyra lärare i tre olika kommuner i norra Sverige. Resultatet indikerade att IKT användes för elever i behov av särskilt stöd i alla åldersgrupper, vanligast användes datorn för skrivande och ordbehandling. IKT skulle kunna användas för att kompensera för olikheter och bidra till inkludering för elever i behov av särskilt stöd, men då behöver undervisningen anpassas med tanke på elevers behov samt att tekniken bör integreras med pedagogiken. Uppfattningarna om vad inkludering innebär varierar och inkludering ses huvudsakligen som kunskapsmässig, vilket kan leda till både social och fysisk exkludering. Undervisningen i vanliga klassrum anpassades inte alltid för alla elevers behov och IKT verktyg användes ofta av elever i exkluderande miljöer. För att göra IKT användningen mer inkluderande behöver kunskap till lärare, utrustning och tid. Implikationer för praktiken är att lärare behöver mer utbildning i att använda IKT för elever i behov av särskilt stöd och att specialpedagogen bör ses som en handledare för lärarna. Förslag till fortsatt forskning skulle kunna vara fler liknande studier eller studier om möjligheterna med en-till-en för elever i behov av särskilt stöd.

Nyckelord: specialpedagogik, elever i behov av särskilt stöd, IKT, inkludering, vanliga klasser

Abstract

Information and communication technology (ICT) is a current issue in schools around the world and this study may be of interest to teachers, special education teachers, school leaders and teacher educators. The aim of this study was to describe and analyze teachers' experiences of and perceptions on information and communication technology (ICT) use for students with special educational needs (SEN) in general educational settings and to find the relationship between ICT and inclusion. In addition to that, conditions and strategies in order to make ICT use more inclusive were identified. A questionnaire survey was carried out with 92 responding teachers and qualitative interviews were made with four teachers. The results indicated that ICT was used for SEN students in all age groups, most commonly the computer was used for writing and word processing. ICT could be used as a way to bridge the gap to inclusion and compensate for differences and contribute to inclusion of students with special needs but in order to do that teaching should be adapted to students' needs and pedagogy ought to be integrated with technology. Though, the perceptions of what inclusion is differs and inclusion is mainly seen as didactic, which can lead to social and physical exclusion. Teaching in mainstream classrooms was not always adapted to all students' needs and assistive technology was often used by students in exclusive settings. In order to make the use of ICT more inclusive, teachers need knowledge, equipment and time. Implications for teachers and teacher educators are that teachers should become more educated about ICT for SEN and that special education teachers should be seen as supervisors for teachers. Suggestions for further research could be more similar studies or studies about the possibilities with one-to-one for students with special educational needs.

Key words: special needs education, students with special educational needs, ICT, inclusion, general educational settings

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1 Introduction

To organize a school that can accommodate all children is a challenge for all schools today. The inclusion movement became internationally recognized in 1994 with the Salamanca Statement (UNESCO, 1994), which was adopted by 89 countries worldwide and state that inclusive education requires that schools accommodate all children. The fundamental principle of the inclusive school is that all children should learn together, where possible, and that ordinary schools must recognize and respond to the diverse needs of their students, while also having a continuum of support and services to match these needs. Sweden preceded Salamanca with the curriculum of 1980 and the slogan "A school for all". Inclusion has been on school agenda for the last three decades in Sweden, and continues to do so in national curriculum, where Swedish School Law (SFS 2010:800) states that special education should be given to students within their classes.

National curriculum promotes inclusion, however, under special circumstances special education can be given individually or in separate groups. Despite the wave of inclusion that has swept over the world, Swedish law still allows students to be removed from their original classroom settings and there seem to be a tendency towards increased exclusion of students in Swedish schools (Brodin 2010; Giota & Emanuelsson 2011; Haug 1998; Westling-Allodi 2005).

Information- and communication technology, ICT, in its various forms, are said to bridge the gap and allow inclusion for students with special educational needs (Brodin, 2010; Gillette, 2006; Skoldatateket, 2012; SPSM, 2011). Development in the area of information- and communication technology is fast and new technological devices and programs are introduced every day. Schools make big investments in modern information and communication technology. ICT could allow students with special educational needs to be included in classrooms with their classmates, and assistive technology might help students to a greater extent reach the goals of their education (Brodin, 2010; Gillette, 2006). Several studies point to that ICT could help students with special educational needs, especially students with reading- and/or writing disabilities through word processors, word prediction programs, spell and grammar checks, voice recognition, text-to-speech programs, planning and organizing tools etc (Anderson, Anderson & Cherup, 2009; Maor, Curie & Drewry, 2011; Peterson-Karlan, 2011). ICT seems to have advantages for students with special educational needs and assistive technology devices might be used by students within their classes and in that way can promote inclusion.

In Sweden, "Skoldatatek" were introduced in the beginning of 2000. The intention was to inspire school staff to use ICT with students with special educational needs in order for students with neuropsychiatric disorders and reading- and writing disabilities to access computer technology as help in their school work and as a contribution to inclusion in the classrooms. Today there are 200 "Skoldatatek" in Sweden (Skoldatateket, 2012).

Articles in teacher's magazines tell about the vast ICT investments that are made on computers for all students are made in numerous Swedish cities. During the last three or four years the development has increased significantly. Still, research has yet to assure the benefits with these investments. Expectations on these investments are that the schools will be digitalized at the same pace as the rest of society. With better access to ICT, teachers are expected to increase their knowledge as they become more familiar with new technology (Brozin Bohman, 2012; Lindström, 2012).

The use of ICT for students with special educational needs is interesting from a special educational perspective since a goal for the special education teacher is to identify, analyze and participate in prevention and in efforts to eliminate barriers and difficulties in different learning environments (SFS 2007:638). The role of the special education teacher the area of ICT for students with special educational needs varies. However, in order to complete the goal from the degree objectives above, it is of interest to look into teachers' perceptions on ICT for students with special educational needs and the issue of inclusion in order to support the teachers who meet and work with the students in school on a daily basis. This fast changing world, with new curriculums and rapidly growing ICT market, places heavy responsibility on the teachers' shoulders. Adapting teaching for all students is a complex task, and teaching students who use assistive technology make new demands on teachers. An inclusive school requires teachers not only to follow the curriculum and modify teaching to meet the needs of all students, but also to be up to date with new technology and integrate technology with content and pedagogy.

There is a wide range of research on the area of ICT for students with special educational needs in general educational settings is extensive, especially with focus on ICT for students with reading or writing disabilities. However, when it comes to teachers' perceptions on working with SEN students in general educational settings that use ICT only a few articles could be found, and no Swedish doctors' theses or scientific papers that fully matched the area were found. This, together with the increasing investments that are being made on new technology in Swedish schools, calls for research in the area.

1.2 Aim

The aim of this study is to describe and analyze teachers' experiences of and perceptions on how ICT is used for students with special educational needs in relation to the issue of inclusion and to make a comparison of teachers in different grades. The research questions are:

- What are the different perceptions that teachers have of ICT use for students with special educational needs?
- What are teachers perceptions of the relationship between ICT use and inclusion of students with special educational needs?
- What kinds of conditions and strategies can be identified in order to make the use of ICT more inclusive for students with special educational needs?

1.3 Background

1.3.1 Definitions
Definitions will be given for terms related to ICT for students with special educational needs that are used throughout the essay.

Information and communication technology (ICT)
ICT is an abbreviation for information- and communication technology. ICT is an extended form of IT and it came into use in recognition of the growing significance of communications technology (Miles, 2001).

Assistive technology (AT)
Any equipment that is used to improve functional capabilities of individuals with disabilities is considered assistive technology (AT) according to the American IDEA (2004). Assistive technology services and devices allow access to the general education curriculum (Dyal, Carpenter & Wright, 2009). The focus of this study will be on assistive technology used by SEN students in general educational settings. Examples of assistive technology are computers, iPads, smart phones etc. equipped with text-to-speech programs, spelling programs for dyslexics, different kinds of word processors, talking keyboards, pedagogic applications, e-books, daisy books etc. (Engberg, 2011).

Assistive technology device (ATD)
The term assistive technology device (ATD) means any item piece of equipment of product system, whether acquired commercially, off the shelf, modified or customized that is used to increase, maintain or improve functional capabilities of individuals with disabilities (Dyal et al., 2009; IDEA, 2004). In Sweden assistive technology devices used to be referred to as compensatory tools used for compensating individuals for their lack of abilities. According to SPSM (2012) the term alternative tools are used today in order to emphasize the school's responsibility to organize a learning environment for all students.

Students with special educational needs (SEN)
The term students with special educational needs (SEN) is internationally recognized but the definition varies from country to country (European Agency, 2010). However, according to the British Education Act (1996), the term refers to children that have learning difficulties that makes learning more difficult for them than the majority of children the same age and children that have disabilities that prevent them from learning or accessing education. These children are entitled to special educational provision.

In Sweden the term "students in needs of special support" is used, which emphasizes that the difficulties are not related to the individual but occurs in the meeting between the individual and the surroundings (Skolverket, 2012a).

There is no exact definition of the phrase "need of special support". A student can be in need of special support for many different reasons. Many students come across difficulties some time during their school years and can be in need of special support for a shorter period of time. Other students can be in need of special support during all their school years due to illness, social condition, disability or that they have learning difficulties for other reasons.

However, students are usually defined as being in need of special support when they do not reach the goals of education or have other difficulties in their school situation (a.a.).

Inclusion

A lexical definition for the term inclusion is "the act or practice of including students with disabilities in regular school classes" (Merriam-Webster, 2012). The term inclusion has been given a prominent place when speaking about special needs education. Traditionally the term integration was used earlier which refers to children being abnormal and should be fitted into set structures. Inclusion emphasizes that education should be based on students' differences (Carlsson & Nilholm, 2004). According to the Salamanca Statement (UNESCO, 1994), inclusion is about providing education for all children, young people and adults within the regular education system. An international definition of inclusion according to UNESCO (2005) is:

> Inclusion is seen as a process of addressing and responding to the diversity of needs of all learners through increasing participation in learning, cultures and communities, and reducing exclusion within and from education. It involves changes and modifications in content, approaches, structures and strategies, with a common vision which covers all children of the appropriate age range and a conviction that it is the responsibility of the regular system to educate all children.
> UNESCO (2005), p. 13

1.3.2 National policy documents on ICT, SEN-students and inclusion

This section outlines the framework of ICT, students with special educational needs and the issue of inclusion set by Swedish national curriculum (Skolverket, 2011a; Skolverket, 2011b) and Swedish school law (SFS 2010:800).

Information and communication technology (ICT)

New technology makes new demands on people's knowledge and ways of working. The school is responsible for ensuring that each pupil can use modern technology as a tool in the search for knowledge, communication, creativity and learning according to the national curriculum (Skolverket, 2011a; Skolverket 2011b). Students should, without cost, have access to books and other tools for learning for a modern education (SFS 2010:800).

Students with special educational needs (SEN-students)

Schools have a special responsibility for students who, for different reasons, have difficulties with reaching the goals of their education. Teaching should be adapted to each pupil's circumstances and needs. Account should be taken of the varying circumstances and needs of pupils (Skolverket, 2011a; Skolverket, 2011b). If a student is in need of special support, he or she shall be given such support (SFS 2010:800). All teachers should stimulate, supervise and provide special support for students in need of it (Skolverket, 2011a; Skolverket, 2011b).

Inclusion

Schools should strive to be a social vibrant community, school staff should help develop students' sense of togetherness and teaching should be based on a democratic approach (Skolverket, 2011a; Skolverket, 2011b). Everyone has the right to equal access to education

and the right to education of an equal quality according to Swedish school law. Special education should be given to students within their classes (SFS 2010:800).

1.4 Previous Research

In this section research in different areas of ICT use in schools for SEN students and inclusion will be presented. Firstly, research about the use of ICT in school will be presented and after that ICT for SEN students in relation to inclusion. Finally research about making ICT use more inclusive will be presented.

1.4.1 The search for previous research

The search for previous research has followed the guidelines of Patel & Davidson (2011). The first step of the search was to scan the area of ICT for SEN students in order to see what can be of interest and what to focus on. Literature that does and does not have to do with the area of interest was read, and throughout the process central concepts emerged which eventually resulted in key words. A number of key words were generated in three key areas; ICT, students with special educational needs and inclusion. The key words were thereafter entered in different combinations in the EBSCO database which finally resulted in a selection of contemporary articles about ICT and inclusion and special educational needs published between 2005 and 2012.

Key words: ICT, IT, assistive technology, AT, ATD, technology, SEN, special needs, special education, inclusion and inclusion in general educational settings.

At first, articles that could be of interest were gathered and read. Articles of interest lead to reading more articles from the same authors. Articles containing facts of interest in the background lead to the search for the primary source of that information. The search resulted in various articles on ICT for students with special educational needs, and in order to narrow it down, mainly articles about students in general educational settings were used.

Doctor's theses from Swedish universities were searched for at avhandlingar.se and skolporten.se. No theses were found that matched all three key areas; ICT, SEN and inclusion. However, regarding SEN and inclusion a number of theses were found.

1.4.2 The use of ICT

This part includes research found concerning the use of ICT for students with special educational needs. Firstly research about benefits and effectiveness will be presented, then the perceived importance of adapting the assistive technology to the students' individual needs and teachers' knowledge of how to use ICT for SEN students. Finally there will be research on the various uses of ICT in school.

ICT for students with special educational needs

ICT could be beneficial for students with special educational needs, especially students with reading- and/or writing disabilities through assistive technology such as word processors, word prediction programs, spell and grammar checks, voice recognition, text-to-speech programs, planning and organizing tools etc (Maor, Currie & Drewry, 2011; Peterson-Karlan, 2011; Williams, Jamali & Nicholas, 2006).

In a British literature review by Williams et al. (2006) information on the perceived benefits of ICT in SEN was gathered from literature, government reports and academic journals in the fields of education, information science and social science. The study support that dyslexics are the group with special educational needs who potentially could obtain many benefits from ICT through reading and writing computer programs. However, by assisting access to learning, ICT can also bring benefits to students with emotional and behavioral difficulties (a.a.).

Evidence based research supports the effectiveness of ICT for students' writing. In an American review over 80 studies Peterson-Karlan (2011) accounts for whether ICT as a tool for writing has any scientifically documented effects for students with learning difficulties. The study point to that research supports that word processing programs have good effects for students' writing production and that use of spell checkers together with text-to-speech programs increases accuracy when writing. Furthermore the results indicate that programs for word prediction, speech-to-text, voice recognition and grammar checkers have effects on students' writing, though there is not enough research in the area to confirm these results. Effects of assistive technology for planning and organizing cannot be confirmed by the research studied.

Adapting technology for each student
ICT could be an effective tool for students with special educational needs, but it is important to discern students' individual needs and adapt technology for each student according to a research review over the effectiveness of ICT for students with special educational needs have been made by Australian researchers Maor et al. (2011). Scientific studies from the last six years about assistive technology for reading, writing, spelling and speech have been selected and analyzed. Most of the studies were from the US, but studies from Scandinavia, UK and Israel were also included. No general conclusions could be drawn about which program is the most effective because too many different programs were included in the review. The majority of the results show that the students writing, reading or spelling improve by using assistive technology. Though, there were exceptions, where ICT had no effect or students' results even deteriorated when using ICT. A conclusion the researchers draw is that students have individual differences and the assistive technology devices need to be adapted to each student's individual needs. The needs of the student and the student's family should not be neglected, and the family should be consulted before assistive technology is introduced. Complicated design, unexpected cost and lack of technical support can lead to IT abandonment (a.a.).

Successful computer integration in education may require an individual plan for each student that focuses on the student's need and if the computer should be used as an educational tool, an alternative tool for learning and/or a compensatory tool (ATD) in order for students to be included in education and to ensure that the students' digital skills are fully utilized (Lidström, Granlund & Hemmingsson, 2012). An American case study by Gillette (2006) emphasizes the need for an individual plan for SEN students who use ICT in school work. Gillette describes grade 7 student with learning difficulties and the team work between student, school and home that eventually generates an individual reading and writing assistive technology plan.

What assistive technology and how it is to be used is to be assessed from the student's needs, ability and requests and this method demands expertise in the area of assistive technology. Team work between student, parents and school personnel can result in positive effects of ICT use for students. There is a risk of IT abandonment if parents do not know how to use it (Gillette 2006).

Teachers' knowledge of ICT for SEN students

Teachers should be familiar with how to use ICT for students with special educational needs according to an American review of research about technical support in the classroom for students with mild disabilities (Anderson, Anderson & Cherup, 2009). Studies included in the review focus on special education technology for reading and written language, such as text-to-speech synthesis, word processor, word prediction and spelling and grammar checkers and their impact on inclusive classrooms. Students with mild disabilities may be found in every classroom and therefore every teacher should be aware that the integration of technology for these students can facilitate their learning.

Various uses of ICT in school

Lidström et al. (2012) compare the ICT use between students with physical disabilities with students who do not in a Swedish study. A conclusion that can be drawn is that students with physical disabilities have restricted participation compared to students from the general population in activities where the computer is used as an educational tool. The study is part of a larger project that aims at researching ICT use and participation in computer based activities in and outside school. A questionnaire about computers as assistive technology devices has been made with students 10-18 years old with and without physical disabilities.

Lidström et al. (2012) divides students' use of information and communication technology (ICT) as an educational tool, an alternative tool for learning and a compensatory tool, i.e. as a computer-based assistive technology device (ATD), see figure 1. The computer is used as an educational tool i.e. by looking for information on the internet, making presentations and word processing. As an educational tool the computer is also used as an alternative tool for learning, with online textbooks, programs that practice certain skills etc. The use as an educational tool dominates the use of computers for students without disabilities. For students with special educational needs the computer is also used as an educational tool, yet, the computer is also used as a compensatory tool to help the students compensate for abilities they lack. The computer-based ATD could provide students with special educational needs opportunities to participate independently in the same educational activities as their peers by compensating for activity limitations and promote the use as an educational tool and/or an alternative tool for learning (a.a.).
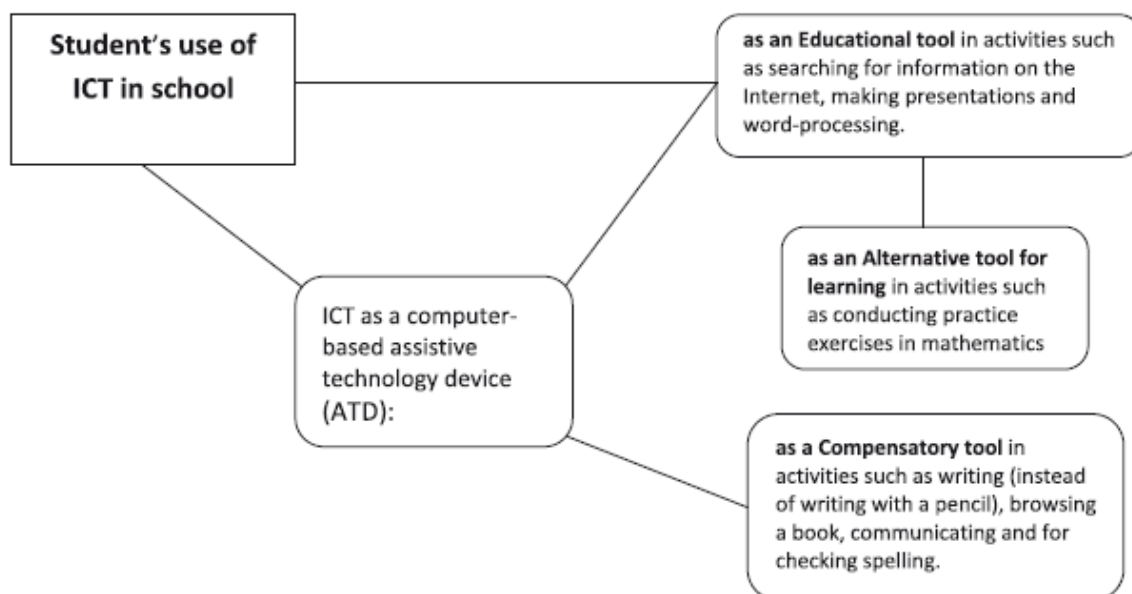
FIGURE 1.1 Various uses of ICT in school (Lidström et al., p 22).

1.4.3 ICT and inclusion

In this section, research about ICT in relation to the issue of inclusion will be presented, namely adapted teaching, segregated solutions and possibilities with ICT for inclusion.

Adapting teaching

Adapting teaching for SEN-students in general educational settings are considered important and necessary, but in practice few adaptations are made. A Turkish study about inclusion of SEN-students in general education classes by Kargin, Güldenogly & Sahin (2010) indicates that the success of inclusion mostly depends on the teacher's ability to adapt teaching to the students' needs. Opinions of 126 general educational teachers have been surveyed through a data collection tool that aims to determine teachers' opinions with regard to the adaptations that need to be made for inclusion. Teachers consider adaptations necessary for students with special educational needs, but the results indicate that teachers consider physical adaptations in the classrooms, like seating arrangement and noise level, more important than educational adaptations. As an attempt to explain this fact, the writers suggest that physical adaptations are the easiest to observe and implement and that teachers have limited knowledge with regard to the instructional adaptations that need to be provided to the students with special needs in inclusive settings. Teaching SEN-students requires using different strategies rather than traditional teaching methods, but in practice most teachers make few adaptations (a.a.).

Students with disabilities are educated alongside their peers and therefore mainstream schools are required to adapt to accommodate a diverse group of students with a variety of needs. Teachers need to become aware of the e-learning environments and their potentials for accommodating SEN-students in inclusive classrooms according to a study by Starcic (2010). Educational technology has an important role in facilitating digital literacy of students and teachers. Starcic has followed the implementation of a digital learning environment for students with special educational needs in Slovenian schools through a case study of student

teachers' experiences of implementing educational technology in inclusive classroom and special needs education. Implications of the study are that improved access to computers and the Internet in the context of school work can enhance digital literacy and e-participation of students with special educational needs and that ICT assisted learning environments could enhance student centered teaching and individualization with tools for learning.

It is important for all teachers to have knowledge of how to use ICT for students with special educational needs since students that benefit from ICT exist in practically every class according to Anderson et al. (2009). The special education teacher is used as a consultant and this role demands knowledge of ICT for students with special educational needs (Brodin & Lindstrand, 2003). Brodin & Lindstrand (2003) has evaluated a government investment on educating special education teachers in ICT. The study has been carried with a questionnaire and interviews with special education teachers and school leaders. The focus of the study is special education teachers' thoughts and knowledge of ICT for students with disabilities and in need of special support. The results show that the role of the special education teacher demands both supervision and consulting and knowledge of the ICT area, and the majority of the special education teachers perceived that they didn't have enough knowledge of ICT in order to supervise and consult within the area. SEN teachers had a difficult time with developing new ways of working and new strategies in the area of ICT and didn't feel confident about technology either. The authors conclude that technology gets more focus than pedagogy and for students with special educational needs this can become a problem since they often need both technology and adapted teaching to make it in school.

Separation and segregation of students
ICT could contribute to inclusion, yet, it is common for students to be separated from classroom teaching to use their compensatory tools. Results from a doctor's thesis about individual education plans (Isaksson, 2009) point to that the most common special support measure in Swedish schools is special training individually or in small groups outside the ordinary classroom. This work was mainly executed by special education teachers, but can also be done by teachers or parents instructed by special education teachers. The students' experience from being excluded from their classes was that although such support offered a peaceful and quiet learning environment, it also gave rise to feelings of non-participation in relation to their classmates and them being portrayed as deviant. Furthermore, there seemed to be a lack of coordination between the special support measures and the regular teaching. Pedagogical levels that are inadequate and ill-adjusted to students' needs were also problematic aspects according to Isaksson (2009).

There seem to be development towards increasing segregation of students in need of special education support rather than of inclusive education within the mainstream education system, according to a Swedish study about how head teachers handle special education issues (Giota & Emanuelsson, 2011). To teach certain students outside the regular class seems rather commonly to be accepted and is also legitimized when it concerns students with various school-related difficulties. The results from a questionnaire survey with head teachers showed that streaming or organizational differentiation is common in all schools, but more frequent in

grade 7-9 schools where this way of working is common in half of the schools than in grade 1-3 schools, where this is practiced in a third of the schools.

Possibilities with ICT for inclusion

The computer could be a versatile tool in school but is often used as a typewriter and all possibilities are not fully utilized, according to parents to students with physical disabilities in a Swedish study (Brodin, 2010). The aim of the study was to see whether ICT is used to support inclusion and equal rights for students with physical disabilities and the result indicates that the need of both technical and social support is immense for ICT to bridge inclusion of all students. The method of the study was a parental questionnaire and the results show that parents are disappointed at the lack of programs and teachers' lack of knowledge. According to parents in the study, teachers do not have enough time to update their ICT competence and they call for improvement considering access in school environment.

ICT might facilitate access to learning which increases motivation, fosters self-competition and confidence, and improves self-esteem (Williams et al., 2006). The computer could make a more traditional learning activity fun, although the writers argue that success with ICT lies in the context of its use rather than the software itself.

1.4.4 Increased inclusion with ICT

In this chapter, research about conditions on how teaching with ICT can be more inclusive will be referred to, namely the need for both technical and social support and one-to-one initiatives.

Need for technical and social support

There is a need for technical as well as social support for teachers who teach SEN students that use ICT in school. Teachers should be familiar with how to use ICT for students with special educational needs (Anderson et al., 2009). Using different teaching strategies than the traditional ones in order to adapt teaching for SEN-students in general educational settings is seen as important (Kargin et al., 2010). According to parents in Brodin's (2010) study, ICT was used only to a limited extent and they complained about teacher's lack of knowledge about ICT. Teachers need to be updated on new technology in order to use it in a creative way and in-service training of teachers is needed (a.a.).

One-to-one initiatives

Investments on one-to-one computing are becoming more common across the world according to Penuel (2006). A goal with one-to-one initiatives is to improve access to technology for all students, and that includes providing laptop computers loaded with contemporary productivity software, enabling Internet access through schools' wireless networks and using laptops to complete school work. Penuel has synthesized 30 different articles analyzing implementation and effects of one-to-one initiatives from a range of countries. The goals of one-to-one initiatives often are to improve academic achievement, reduce the digital divide and to transform teaching and make instruction more student-centered. The reviewed research point to that compared to 1-2 or 1-4 classrooms, students in 1-1 classrooms use computers more across the curriculum, use computers at home for academic purposes and use the computers for writing tasks. Teachers' instruction also

differed. Coordinating instruction with laptops when not all students have computers was seen a challenge for teachers which often lead to including two sets of instruction, one instruction for students with computers and one for students without (a.a).

Penuel also concluded that it appeared to be important for teachers to be able to count on the reliability of the Internet network and the computers. Teachers did not want to plan instruction for computer based activities when the computers or network failed. Another significant factor for successful ICT use was the teachers' attitudes towards technology. Teachers who viewed technology as a tool with a wide variety of potential applications were more likely to use laptops with their students, whereas teachers who were concerned that students would use laptops for unauthorized purposes were less likely to use laptops with students in class. Professional development support and technical support were critical for one-to-one initiatives, and other teachers seemed to be particularly important in helping teachers learn how to integrate technology into the classroom.

1.4.5 Summary of previous research

ICT can be beneficial for students with special educational needs, especially students with reading and writing disabilities (Maor et al., 2011; Peterson-Karlan, 2011; Williams et al., 2006). Research support that ICT is effective for students' writing (Peterson-Karlan, 2011) but there can also be benefits for students with emotional and behavioral difficulties (Williams et al., 2006) as well as for students with physical disabilities (Brodin, 2010; Lidström et al., 2012). ICT could facilitate access to learning (Williams et al., 2006) and digital literacy (Starcic, 2010). ICT needs to be adapted to students' individual needs in order to be effective (Gillette, 2006; Lidström et al., 2012; Maor et al., 2011). All teachers should be familiar with using ICT for SEN students because students who benefit from ICT can be found in every classroom (Anderson et al., 2009; Kargin et al. 2010; Starcic, 2010). All possibilities of ICT are not utilized in schools and there is a need of both technical and social support for ICT to bridge inclusion for SEN students (Brodin, 2010). Implementing ICT in everyday teaching is difficult (Brodin, 2010) and there is a need for both teachers and special education teachers to have knowledge of the area of ICT (Brodin & Lindstrand, 2003). Teachers consider adapting teaching for SEN-students in general educational settings important and necessary, but in reality few adaptations are made (Kargin et al., 2009). Even though ICT can contribute to inclusion, many students are excluded physically from their classes for special education provision (Giota & Emanuelsson, 2011; Isaksson, 2009). One to one initiatives are becoming more common across the world and aim at providing access to technology for all students (Peunel, 2006).

1.5 Theoretical Framework

In this section different aspects of inclusion will be presented as a theoretical framework for analyzing the results. Inclusion can be seen from many perspectives. Haug (1998) does not use the term inclusion but speak in terms of inclusive and segregated integration. Vislie (2003) deals with the shift in terminology from integration to inclusion where inclusion and exclusion are seen as connected processes. Asp-Onsjö (2006) has identified three different aspects of inclusion, physical, social and didactic inclusion.

1.5.1 Haug's segregated integration and inclusive integration

Haug (1998) divides the term integration into inclusive integration and segregated integration. Segregating integration is when the school closest to the student's home is perceived to be the natural place for most children. Individual children need other arrangements, and have access to other alternatives for organization of teaching as well as content. The alternatives when it comes to organization vary. The students with special educational needs can be taught in the classroom together with his or her class, or outside the classroom individually or in small groups or somewhere in between. The central point is to find the optimal environment for each individual student. This involves having to consult experts whose diagnoses of the students' needs decide what organization is the best for each student. The main issue is a wish for maximal subject-oriented learning and performance. School is primarily a place to learn. Interpretation of the term in need of special support is individual oriented, difficulties are identified as individual. The challenge is to give individual compensatory treatment so that the student can adapt to school and society. If the child is taken out from school or class the goal is often that the student should go back there and function at the same level as the other students. There is an apparent difference between teaching and special education provision and this view lays the foundation for professionalization of the area of special education. When it comes to defining social justice there is a close connection between segregating integration and the compensatory perspective.

Inclusive integration is about all children having access to individually adapted teaching in the ordinary class in their home school. There has been a continuous work to replace the traditional and segregating view on special education. All students have an equal right to participation according to collective democratic values. Everyone participates in the society on equal conditions independent of individual needs, interests and performance.

This lays a positive foundation for these children to be able to function in the regular society as adults. Social training is of great importance as well as developing solidarity. Individual differences between children are accepted and part of everyday life at school. These students are to be handled with individual adaptation of teaching for all children in the same school and the same classroom. Within that frame, the students should receive the education that enables them to develop as far as possible without being stigmatized or outcast. All students are considered as equal in school and school is equal to all students. This dissolves the difference between special education provision and regular teaching. Basically all teachers should have sufficient knowledge in order to teach all children. Teachers should have general or universal competence. Special needs are to be understood as a social construction. The idea is that the need of segregating special needs provision has been formed by the fact that schools are not made for all students. Not all students are assumed to succeed in school. Some are even expected not to make it. The challenge is to build up a school that includes all children and can educate all children. When it comes to the definitions of social justice there is a close connection between inclusive integration and the perspective of participation (a.a.).

1.5.2 The shift from integration to inclusion

Vislie (2003) addresses the new terminology that came into use after the Salamanca Statement (UNESCO, 1994) where the shift from integration to inclusion also proposed a new educational policy agenda. Compared to integration, inclusion is said to have a broader vision because it covers more issues. Inclusion was introduced as a more accurate way of describing the quality of the integrated provision. Inclusion is about how mainstream schools should cater for all their pupils and for inclusive schools for all.

Inclusion is a process by which a school attempts to see all pupils as individuals. Inclusion regards inclusion and exclusion as connected processes; schools developing more inclusive practices may need to consider both. Inclusion emphasizes the reconstructing of curricular provision in order to reach out to all pupils as individuals. Inclusion emphasizes overall school effectiveness. Inclusion is of relevance to all phases and types of schools, possibly including special schools, since within any educational provision teachers face groups of students with diverse needs and are required to respond to this diversity (Vislie, 2003)

1.5.3 Asp-Onsjö's three aspects of inclusion

Asp-Onsjö (2006) has conducted a study about the documentation for students who are considered to be in need of special support, the so-called individual education plans. The doctor's thesis consists of questionnaires and case studies. Inclusion is depicted from the meeting between the individual and the surroundings. Asp-Onsjö has identified three different aspects of inclusion; physical, social and didactic inclusion, in order to highlight the phenomenon from different angles. Physical inclusion is about to what extent the student spends time in the same room as his or her class. Social inclusion considers to what extent the student participates in a social context together with class mates and teachers. Didactic inclusion regards to what extent the didactic conditions are adapted to develop the student's learning. Though, these three aspects cannot be seen as entirely separated from one another.

It is possible, according to Asp-Onsjö, to be included physically but not didactically, and that means that the student spends his or her time in the classroom with classmates and has functioning relationships with other students and teachers. However, the student does not have access to personnel that can contribute to development in terms of knowledge at the required level and not to adequate material. The student is part of the class but risks not to develop in terms of knowledge.

Teachers are up against contradictory demands, i.e that the student should belong to his or her regular class at all times and in the same time they are considered to be in need of special education. It is not always possible to fully meet the terms of these two demands.

Asp-Onsjö suggests that inclusion shall be looked upon as a continuing process that affects the social context where the student is included. Inclusion shouldn't mainly be seen from a physical perspective. The student needs to be allowed to be in a social context with school staff and other students. The material needs to be adapted after his or her needs. But in many cases, students are just sitting in the classroom without moving forward knowledge wise. The ambition to include is at risk to become economic savings instead.

2 Method and material

In this chapter the methodological framework, phenomenography, will be described as well as the research approach. Later on methods used in the study will be presented. Finally the validity and the reliability will be accounted for as well as ethics in research.

2.1 Methodological Framework

Since the study considers teachers' perceptions of a phenomenon, phenomenography has inspired the analyses of questionnaires and interviews. Phenomenography is the empirical study of different ways in which aspects of the world are experienced and involves mapping the relations between persons and aspects of their world. The aim of phenomenography is description, analysis and understanding of experiences and knowledge that is generated from the description of conceptions of the world around us (Marton, 1981). Focus is on the apprehended, experienced and conceptualized. The aim is finding and systemizing forms of thought.

Phenomenography is a method for qualitative analysis that relates to how people percept a certain situation, and the perceived content is central (Kroksmark, 2007). Phenomenographic research focus on the relation between subjects and an aspect of the world and in this study focus will be on the relation between teachers and ICT use for and inclusion of students with special educational needs. Within phenomenography attention is given to the very commonness of the perspective, and Marton (1981) suggest the researcher to ask questions about what different conceptions people have and how common they are and describes conceptions and categories:

> Conceptions and ways of understanding are not seen as individual qualities. Conceptions of reality are considered rather as categories of description to be used in facilitating the grasp of concrete cases of human functioning. Since the same categories of description appear in different situations, the set of categories is thus stable and generalizable between the situations even if individuals move from one category to another on different occasions. (Marton, 1981, p. 177)

2.2 Research approach

The aim of this study was to describe teachers' perceptions of ICT for students with special educational needs and the relationship between the use of ICT and inclusion. In this study a combination of a questionnaire survey and interviews have been used. The aim of the questionnaire survey was get at broad material on teachers' perceptions on the use of ICT for students with special educational needs. Results from questionnaires can provide generalizable results and be used to see patterns amongst large populations. The questionnaire has been used for questions about teachers' perception of how ICT is used for students with special educational needs and to some extent the relationship between ICT and inclusion (Ejlertsson, 2005; Hartman, 1998; Holme & Solvang, 1991; Johansson & Svedner, 1996; Kvale & Brinkmann, 2009; Patel & Davidson, 2011; Trost, 2001). Interviews have been made in order to gain a deeper understanding of teachers' perceptions about inclusion and teaching students with special educational needs.

Traditionally two different methodological approaches are used, quantitative and qualitative Both of them aim at creating a better understanding of the society we live in and how people and groups act and are affected by one another (Holme & Solvang, 1991).

Quantitative and qualitative methods are often used combined (Johansson & Svedner, 1996; Trost, 2001) and this combination can, according to Holme & Solvang (1991), strengthen the analysis of the results and give a more nuanced and complete view of the problem area. However, Backman (2008) points out the difference in formulating hypotheses between the two methods, traditionally the quantitative method is deductive and hypotheses are created and tested in a study while qualitative methods are inductive and the result of the study generates hypotheses. Kvale & Brinkmann (2009) emphasize that both methods can be used successfully as long as it is a planned practice of two different methods, letting each method separately illustrate the problem.

The concept of qualitative and quantitative methods is discussed by Åsberg (2000) who concludes that a method cannot be seen as quantitative or qualitative. However, the attributes of the phenomenon after can be either words (qualitative) or numbers (quantitative), and both numbers and words are needed if we are to understand the world. The data from research methods reflects, represents or illustrates qualitative or quantitative characteristics of a phenomenon, see figure 2.1.
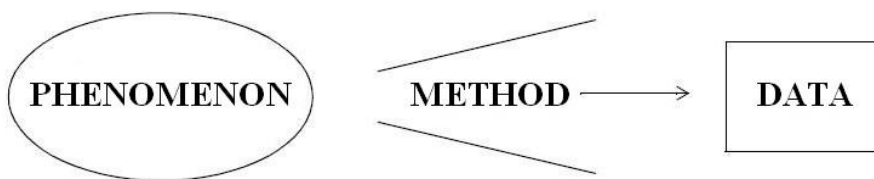
FIGURE 2.1 Data is established through different methods that mirrors characteristics of the phenomenon (Åsberg, 2001, p. 274. Text in figure translated by Josjö, 2012).

Questionnaires and interviews are similar in the way that they are both techniques for gathering information through questions according to Patel & Davidson (2011). Holme och Solvang (1997) assert that there is no absolute difference between qualitative and quantitative methods. Instead they point out that combining quantitative and qualitative elements in one study can benefit the results since the two methods share a common purpose; to give a better understanding of the world we live in and how institutions, groups and individuals act and affect each other.

2.3 Questionnaires

Quantity has to do with amount and how many there are of something, and the questionnaire with its ability to reach many respondents is considered to be quantitative. The questionnaire often has standardized questions with predetermined answers about how often, how many, how common. Questionnaires are characterized by a distance between researcher and object. The results can provide generalizable results and be used to see patterns amongst large populations (Ejlertsson, 2005; Hartman, 1998; Holme & Solvang, 1991; Johansson & Svedner, 1996; Kvale & Brinkmann, 2009; Patel & Davidson, 2011; Trost, 2001). An

advantage with the questionnaire is that it can reach a large number of respondents, but a limitation is that many questions are complicated to ask, i.e. questions about the respondent's attitudes and how they act in different situations are difficult to grasp through questions with predetermined answers (Hartman, 1998; Patel & Davidson, 2011).

The questionnaire was chosen for its benefits with reaching a large number of respondents and it suits the aim of the study, to describe and analyze teachers' experiences of and perceptions on how ICT is used for students with special educational needs in relation to the issue of inclusion. Considering the phenomenographic approach, Kroksmark (2007) states that within phenomenography alternatives to answers should not be given and respondents are to define aspects of the questions by themselves. Therefore a questionnaire with only open-ended questions would have been suitable. However, when it comes to response rates, Ejlertsson (2005) points out that few respondents take the time to answer open ended questions which lead to the decision of constructing a questionnaire with predetermined answers anyway in order to get as many respondents as possible. Open-ended questions were added after each question to allow participants to comment on their answers. Nevertheless, the phenomenographic approach has inspired the presentation of the results, where the answers have been divided into different categories after the teachers' different perceptions instead of presenting the results traditionally with frequency tables and diagrams.

2.3.1 Target of Investigation

Grade K-12 teachers were targeted for the questionnaire. The sample consisted of approximately 190 respondents from schools in three different cities. In order to choose a representative sample of the population for my survey controlled random collections have been conducted according to Hartman (1998). Teachers' e-mail addresses at eleven different schools were accessed through contacts or through the schools' websites. The goal was to get teachers evenly divided across the different grades. The sample consisted of male and female teachers aged 24-65 from both public and independent schools in three neighboring cities in northern Sweden.

Responses and non-responses

The questionnaire was distributed to approximately 190 teachers and a total number of 96 respondents answered the questionnaire which means that the response rate equals 51 per cent. Three of the respondents were not teachers so they were removed from the results. The response rate was lower for teachers teaching the youngest children and increased in higher grades.

2.3.2 Material

The questionnaire (see Appendix A) was designed with an on-line program. It was highly standardized and structured (Hartman, 1998). When constructing the questions for the questionnaire, simplicity in language, unambiguous questions, one question at a time were strived for while leading questions, questions about sensitive matters and negations were avoided as recommended by Ejlertsson (2005), Patel and Davidson (2011) and Trost (2001). The questionnaire contained no open-ended questions, only questions with predetermined

answers. Open-ended questions were included after each question to allow participants the opportunity to add comments regarding their answers.

The questions were designed on basis of the first two research questions about different perceptions teachers have of ICT use for students with special educational needs and the relationship between ICT use and inclusion. Previous research and theoretical framework presented in the background of this study were also inspirational for the questions in the questionnaire. The questionnaire consisted of ten questions where the first four considered the respondent's sex, age, what grades they teach and what their subject of teaching is. Then there were questions considering the use of ICT, like whether the teachers teach students with special educational needs that use ICT in school, what ATD:s that are used and for what different activities. Considering inclusion the teachers were asked where and how often the ATD:s are used and how the teachers percept ICT use affects students socially. Finally the teachers are asked about the classroom situation and whether they perceive their teaching to be adapted for SEN students who use ATD:s.

In the end of the questionnaire the teachers were asked to submit their phone number if they agreed to being interviewed.

2.3.3 Procedure

E-mails were sent to respondents where the addresses were entered in the "blank" field, which allowed all respondents to be anonymous. The e-mails contained a brief description of the study and questionnaire and a link to the on-line questionnaire (see Appendix B). The responses were saved automatically by the program used. The respondents had three weeks to answer the questionnaires.

The questionnaire survey includes both external and internal non-responses. External non-responses refer to respondents that for some reason did not have the opportunity to participate or who for various reasons did not want to participate in the study. Internal responses on the other hand refer to non-responses on individual questions of the questionnaire. The internal non-responses will be reported adjacent to the presentation of the result of the actual question as recommended by Ejlertsson (2005).

The external response rate for this questionnaire survey was approximately 51 per cent. Low response rates can generally be expected from e-questionnaires (Näsström, 2011). In order to increase the response rate the questionnaire was made in a respondent-friendly matter where no open-ended questions were included so it was easy for the respondents to quickly fill in their answers. According to Trost (2001), the response rates for questionnaires can be expected to be 50-75 per cent. An analysis of non responses can be made through comparing the material of the study with the population, and if there is a big difference between the sample and the population, carefulness should be obtained when drawing conclusions from the results (Trost, 2001). The bigger the non response rate is the bigger risk for making wrong assumptions about the target population (Ejlertsson, 2005). In order to see if the sample consists of misallocation or lies close to the population the sample has been compared to the population. The table below (figure 2.2) shows that the population and the sample are quite similar considering gender and age which indicates that the sample is close to the population

as a whole. The sample of the study consists of slightly more women and the teachers of the sample are a little younger than the teacher population of Sweden.
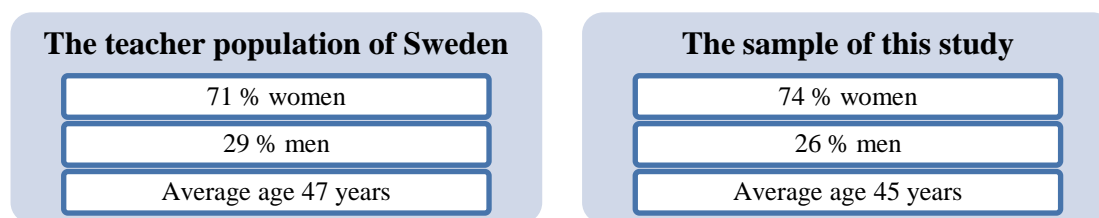
The teacher population of Sweden
71 % women
29 % men
Average age 47 years

The sample of this study
74 % women
26 % men
Average age 45 years

FIGURE 2.2 A comparison between the teacher population of Sweden and the sample of the study considering gender and age.

2.3.4 Analysis of questionnaire

Analysis and presentation of data

Data from the results were automatically generated through the web based program that was used for the questionnaire. The web based program used for the questionnaire provided frequency tables for each question which gave a quick overview of the results. The questionnaires should be categorized after the aim of the study (Johansson & Svedner, 1996) which was to describe and analyze teachers' experiences of and perceptions on how ICT is used for students with special educational needs in relation to inclusion. The raw data was copied into a calculation program where the answers were coded with numbers as suggested in Trost (2001) and Ejlertsson (2005).

The initial part of the questionnaire considering facts about the respondents have been summed up and presented in a frequency table. After that, there were questions considering ICT for students with special educational needs, ICT use in school and inclusion of students with special educational needs that use ICT. When analyzing the data of these questions, the respondents' different ways of perceiving different aspects of the world have been discerned, inspired by phenomenography (Marton, 1981). For example if the teacher answered that he or she has experience of students with special educational needs in every class that use ICT, the conclusion that they perceive it to be common with SEN students that use ICT has been drawn. The answers have been compiled into different categories of teachers' perceptions. Within phenomenography focus is also given to the commonness of different perspectives according to Marton, and that has been applied on the categorized perceptions in the results of this study.

Open ended questions have a weakness according to Ejlertsson (2005) and that is that only a few respondents actually answer them. In this study, only 11 teachers used the open ended fields, and the answers from the open-ended questions have been used to provide additional information (Ejlertsson, 2005).

Data has also been analyzed in a separate section of the result through the theoretical framework about inclusion presented in the background.

2.4 Qualitative interviews

An interview is considered to be a qualitative method and it is characterized by a lesser amount of formalization than the questionnaire. Its primary purpose is to understand. A qualitative interview can lead to a deeper understanding of the problem. Qualitative interviews give information about attitudes, views, approach and experiences. Interviews are characterized by trying to understand the world the interviewee lives in, how they see themselves and their relationship to the environment (Backman, 1998; Kvale & Brinkmann, 2009; Patel & Davidson, 2011).

Interviews are used for gathering more in-depth insights on participants' attitudes, thoughts and actions. The qualitative interview is used when trying to understand the respondents' reality as they perceive it. It is about everyday experiences, how people interpret and understand their surroundings (Kvale & Brinkmann 2009; Stukat, 2005). According to Patel and Davidson (2011) interviews are suitable when the aim of the study is to find out about people's actions, attitudes and experiences. Since the aim of this study was to describe and analyze teachers' perceptions the qualitative interview was found suitable.

2.4.1 Target of Investigation

A total number of nine teachers submitted their phone numbers in the questionnaire which indicated that they agreed to being interviewed. Out of these four teachers were chosen for interviews. The aim was to interview teachers representing all grades (K-12) and out of the nine possible respondents four teachers were chosen, teaching different age groups. When contacting the selected teachers, two teachers could not participate which lead to choosing two other teachers for the interview, and this time a convenience sample was made. The interviewees consisted of two female and two male teachers aged 34-52 years old from four different schools in two different cities representing both public and independent schools.

2.4.2 Material

The interview guide contained ten questions (Appendix C). Previous research and theory presented in the background section inspired the interview questions but the results from the questionnaire also motivated questions in different areas. The aim of the interview was to gain a deeper understanding regarding teachers' perceptions of different aspects of inclusion in connection to SEN-students and ICT.

The questions in the interview guide were constructed after guidelines in Kvale & Brinkmann (2009), and based on the research questions of this study (see figure 2.3).
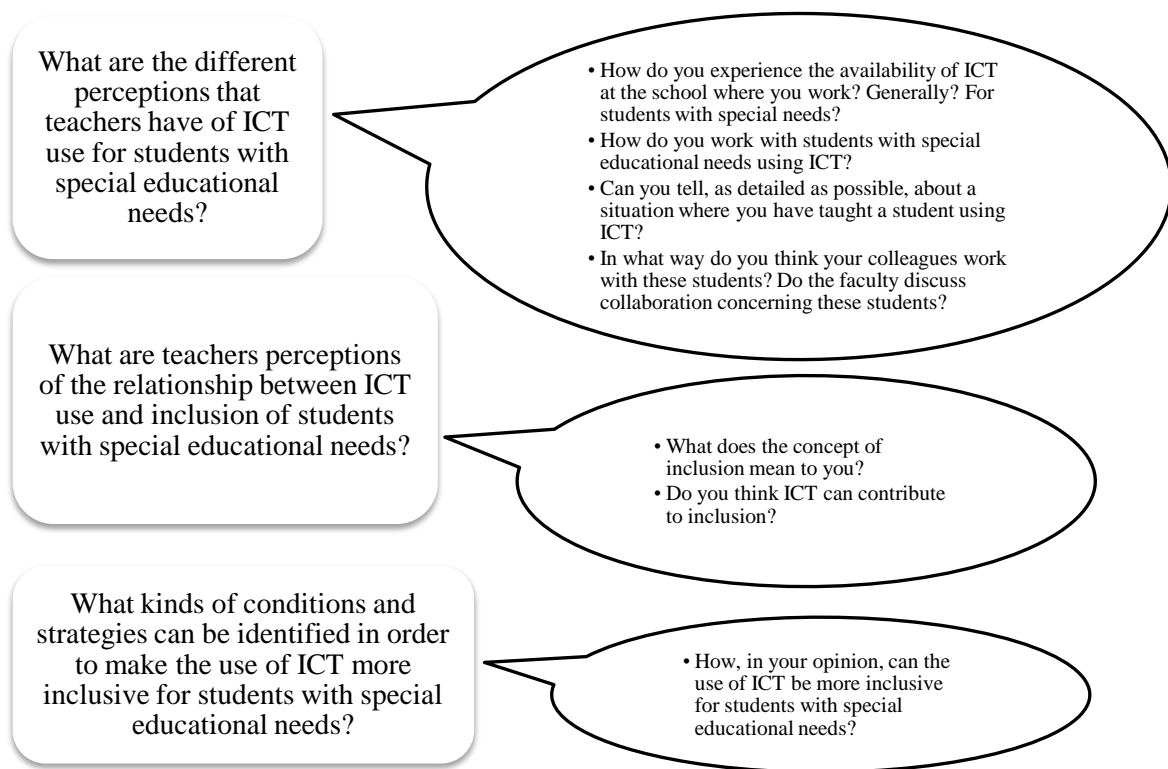
What are the different perceptions that teachers have of ICT use for students with special educational needs?

- How do you experience the availability of ICT at the school where you work? Generally? For students with special needs?
- How do you work with students with special educational needs using ICT?
- Can you tell, as detailed as possible, about a situation where you have taught a student using ICT?
- In what way do you think your colleagues work with these students? Do the faculty discuss collaboration concerning these students?

What are teachers perceptions of the relationship between ICT use and inclusion of students with special educational needs?

- What does the concept of inclusion mean to you?
- Do you think ICT can contribute to inclusion?

What kinds of conditions and strategies can be identified in order to make the use of ICT more inclusive for students with special educational needs?

- How, in your opinion, can the use of ICT be more inclusive for students with special educational needs?

FIGURE 2.3 The research questions and the connection to the questions in the interview guide.

2.4.3 Procedure

First of all, a pilot interview was made with a special needs teacher. After that, the interview guide was altered. Then the actual respondents were contacted through telephone numbers issued in the questionnaires. The interviewee must feel confident to talk freely (Kvale & Brinkmann, 2009) and therefore the interviews were carried out in the respondents' schools. The interviews were between 37 and 59 minutes long and they were all recorded as recommended by Kroksmark (2007). An important aspect of the phenomenographic interview is the use of empathy to further engage with subjects' life-worlds (Kroksmark, 2007). Open questions were used together with summaries and emphatic answers (Hägg-Kuoppa, 1997) in order for the interviewees to provide as much information as possible. As suggested by Kvale & Brinkmann (2009), follow-up questions, specifying questions, probing questions and silence were used in order to understand from the subjects' point of view and to uncover the meaning of their experiences.

Conceptions are closely related to the direct experience and to identify and categorize the conceptions is the aim of the interview. The interviewees should define aspects of the content in question single-handedly and should not be given alternatives to answers (Kroksmark, 2007). During the interviews in this study the respondents were to define aspects of the questions by themselves in order to identify their underlying conceptions.

2.4.4 Analysis of interviews

When processing the results of the interviews, the phenomenographical approach has been used. The main purpose of phenomenography is to find out how people percept different aspects of their life world (Dimenäs, 2007) and in this study the different perceptions teachers have on ICT and inclusion of students with special educational needs have been identified. People's experiences are the foundation for the conceptions they have, and if their conceptions are true or false is not of interest (Uljens, 1989).

The interviews were firstly transcribed and later categorized after the interviewees' different conceptions. The conceptions are the overall and primary criteria for categorizing according to phenomenography. In order to discover conceptions and categorize the results the interviews were read several times, as stated in Kroksmark (2007). The categories of description are to be formed directly from the transcribed text and the researcher has the right to interpret, discover and name the content of the categories (a.a). After categorizing, meaning condensation was used to abridge the meanings expressed by the interviewees into briefer statements (Kvale & Brinkmann, 2009).

When presenting the results the aim is a well balanced mix between quotes and commenting text (Johansson & Svedner, 2011). Thence, the results have been analyzed through the theoretical framework about inclusion presented in the background.

2.5 Ethics in research

The rules of research ethics by Vetenskapsrådet (2002) contains four principles intended to provide standards for the relationship between researcher and participant to promote a good balance between the research requirement and protection of the integrity of the individual. Research should be conducted in such a way that the integrity of the research object is maintained. Ethical issues such as informed consent, confidentiality and consequences for the interviewee should be taken into account with any qualitative interview according to Kvale and Brinkmann (2009). Research subjects should be informed about the purpose of the investigation and the main features of the design.

The first principle (Vetenskapsrådet, 2002) is about informing the participants about the study, its purpose and that participation is voluntarily. In this study, this principle has been met by the missive letter (Appendix A) where the aim of the study, is revealed. It also states that participation is voluntarily and that the informants at any time can terminate the survey.

The second principle, the consent principle, refers to that a participant in a study has the right to decide over his or her participation (Vetenskapsrådet, 2002). When using a web questionnaire, respondents consent by answering. During the interviews made, the interviewees were informed once again of the aim of the study and also that they were free to terminate their involvement at any time.

The participants in a study should be given confidentiality which is the third principle (Vetenskapsrådet, 2002), which is expressed in the questionnaire. Individuals are not to be identified by other people than the researcher. In the study conducted no personal information

has been used. The e-mail with the link to the questionnaire has been sent to blankly so none of the respondents can see who the e-mail has been sent to. It was not even possible to identify non-respondents in order to remind them since the e-mail addresses used were not marked in any way. At the last question of the questionnaire the respondents have given out their names and phone numbers. These personal data has been handled with the utmost care and has been separated from the questionnaires when processing them. During the transcriptions of the interviews no names have been used, instead they have been called Interview 1, 2 etc. In order to safeguard the identities of the participants of the interviews, little information about the respondents' backgrounds have been provided when presenting the results of the study. The names of the respondents of the interviews used in the presentation of the results have been made up.

The last requirement is about how the results of the study will be used. In this context, the collected information is to be used only for the purpose stated and not in any other context (Vetenskapsrådet, 2002). The results of the questionnaire survey and the interviews will not be used for any other purpose than this study.

2.6 Reliability and validity

Reliability considers if the situation has been the same for all respondents and if the questions have been perceived in the same way by everybody. High reliability would in this case mean that another study would give the same results (Trost, 2001; Ejlertsson, 2005). Considering the questionnaire survey, the respondents all got exactly the same instructions through e-mail. However, it is impossible to guarantee that the questions have been perceived in the same way by everybody. When it comes to the interviews, the questions have been perceived differently by the respondents, but then an advantage with interviews is that it is possible to directly ask question to unravel the different conceptions people have.

Kvale and Brinkmann (2009) point out that the issue of reliability often is treated in relation to the question whether a result can be reproduced in another time by other researchers, i.e if the respondents would have given different answers to different interviewers or if the interviewer has asked leading questions that unintentionally have affected the results. In the case of the study, personal or professional relationships existed between researcher and respondent in some cases which could have effect on the results of the interviews. The risk with having a connection with the respondent is that some results can be overlooked while others can be emphasized which can be detrimental to the impartiality (Kvale & Brinkmann, 2009). During the interviews, a professional role has been maintained focusing on the area of the study. When transcribing the interviews the reliability could have been higher if another person had transcribed since there in some cases is a matter of interpretation of what has been said (a.a.). But the text has been transcribed word by word and afterwards listened to in order to adjust any errors.

Validity is about measuring what is intended to be measured (Kvale & Brinkmann, 2009; Trost, 2001). Ejlertsson (2005) suggests validating the questions in relation to the aim of the study by conducting a pilot study. In order to prevent misconceptions two different pilot studies have been made before finally distributing the questionnaire. The first pilot

questionnaire was sent to a control group where the target was to see if the respondents interpret the questions as intended or if they add another meaning to them. After revising the questionnaire another pilot was made with participants who could have been included in the sample of the survey. The questionnaire has been altered into its final form according to the response from the participants in the second pilot study to support the validity of its questions.

According to Kvale and Brinkmann (2009), the validity should be checked continuously during the whole process of an interview study. The results should constantly be controlled, questioned and theoretically interpreted by the researcher. Validity does not only refer to the final product but to the way planning, interviewing, transcription, analysis and reporting has been conducted. In this study, the questions in the interview guide have been controlled by conducting a pilot interview. During the interviews, the questioning of the interviewees has been thorough order to clarify, control and validate the information given. When transcribing, attempts to preserve the style of the language have been made. The analysis of the results has been conducted in order to do justice to the respondents' actual perceptions.

3 Result and analysis

In this section the results of the questionnaires and the interviews will be presented in themes of the use of ICT, ICT and inclusion as well as increased inclusion with ICT. Lastly the results will be analyzed through the theoretical framework about inclusion.

3.1 Questionnaires

3.1.1 Respondents

93 teachers answered the questionnaire, 69 women and 24 men, which results in approximately 74 per cent women and 26 per cent men. The responding teachers' age vary from 24 to 65 and the median age is 44 years and the average age is 45 years. The respondents teach students from 6 to 19 years of age.

3.1.2 The use of ICT

The first question on ICT use considered whether the responding teachers currently teach students with special needs that use ICT in school. According to the teachers' perceptions, three different categories have been identified on this question. The majority of the respondents perceive it to be common or fairly common with students with special educational needs that use ICT in school. 11 teachers have never taught SEN students that use ICT in school. 88 teachers responded to this question which means there were five internal non-responses.
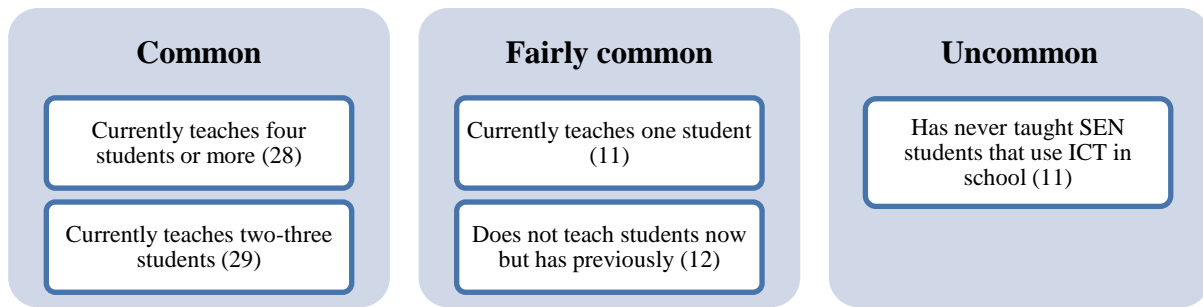
Common	Fairly common	Uncommon
Currently teaches four students or more (28)	Currently teaches one student (11)	Has never taught SEN students that use ICT in school (11)
Currently teaches two-three students (29)	Does not teach students now but has previously (12)	

FIGURE 3.1 Teachers' perceptions on the commonness of students with special needs that use ICT in school. The number of respondents is within brackets.

The next question considered whether the respondents' students with special educational needs use ICT in school for twelve suggested activities. The teachers could answer yes, no or I do not know on these questions and the identified categories are teachers who have knowledge and teachers who do not have knowledge of the suggested activities (figure 3.2).

Have knowledge of suggested activities	Does not have knowledge of the suggested activities
ICT is used	
ICT is not used	

FIGURE 3.2 Teachers' knowledge of the suggested ICT activities in the questionnaires.

Many respondents, namely 20, did not have knowledge of many of the suggested activities. Among the teachers who replied "I do not know" on the most, teachers for the youngest and teachers for the oldest students were overrepresented.

When it comes to the different areas of ICT use, the categories ICT as an educational tool, as an alternative tool for learning and as a compensatory tool have been identified (figure 3.3). A total number of 80 teachers responded to this question which means that there was one internal non-response to this question.
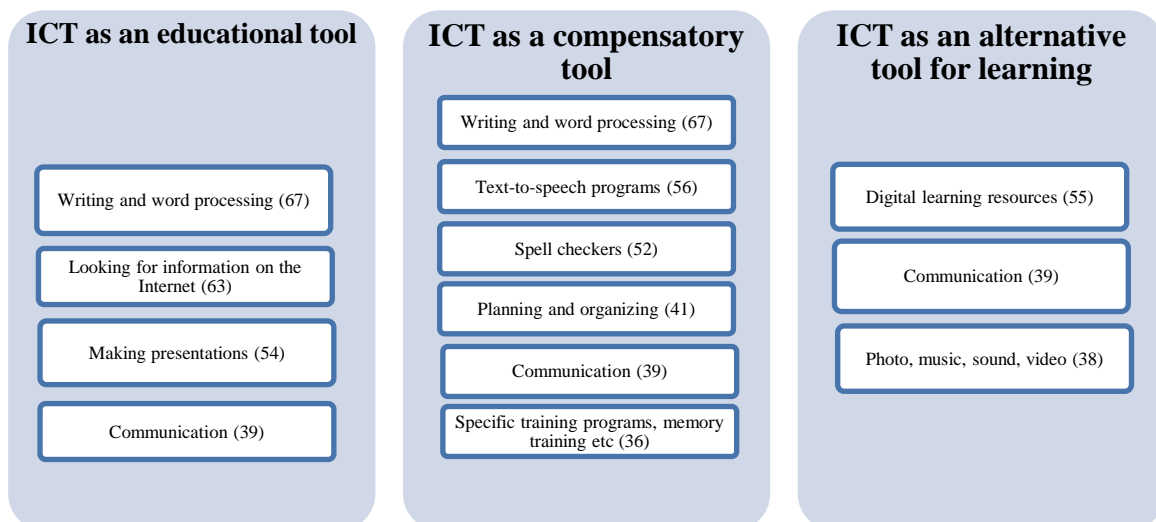
ICT as an educational tool	ICT as a compensatory tool	ICT as an alternative tool for learning
	Writing and word processing (67)	
	Text-to-speech programs (56)	
Writing and word processing (67)	Spell checkers (52)	Digital learning resources (55)
Looking for information on the Internet (63)	Planning and organizing (41)	Communication (39)
Making presentations (54)	Communication (39)	Photo, music, sound, video (38)
Communication (39)	Specific training programs, memory training etc (36)	

As seen in the figure above, a few subcategories appear in more than one category. That is because i.e. writing and word processing can be used both as an educational tool and as a compensatory tool, and communication can be used in all three categories.

3.1.2 ICT and inclusion

When it comes to ICT and inclusion, the teachers were asked about their perceptions on whether teaching is adapted for students that use ICT in school, to what extent the students use their ATD:s in and outside the classroom, whether ICT can contribute to students participation in regular teaching and finally what effect ICT can have on the students social inclusion.

On the question whether teaching is adapted for students with special needs that use ICT in school, three categories have been identified, where teachers perceive teaching to be adapted, not to be adapted and are uncertain (figure 3.5). 26 teachers perceive it to be adapted, 45 teachers perceive it to be adapted to some extent and according to three teachers teaching is not adapted at all. Seven teachers are uncertain.

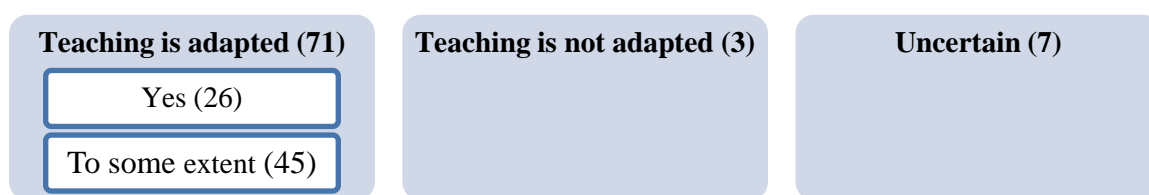| Teaching is adapted (71)	Teaching is not adapted (3)	Uncertain (7)
Yes (26)		
To some extent (45)		

FIGURE 3.5 Adaptation of teaching for students with special educational needs that use ICT in school. The number of respondents can be seen within brackets.

In an open-ended field of the questionnaire, a female grade 7-9 teacher states that is difficult to plan lessons for ICT use when all students do not have computers. Another respondent, a male 10-12 teacher, expresses his dissatisfaction on how badly technologically prepared teachers are for giving the students adequate material for their ATD:s. He also wishes for better technological equipment.

Concerning the classroom situation for students with special educational needs that use ICT, the teachers were asked how often the students used their ATD:s in and outside the classroom. Two different categories have been identified, students' use of their ATD:s in the classroom and outside the classroom (figure 3.4). In the classroom, 66 teachers perceive the ATD:s to often be used by their students. The perception that special needs teachers help students with their ATD:s in class at least once a week is apparent to 24 teachers. 42 teachers perceive the students to at least once a week use their ATD:s outside the classroom.
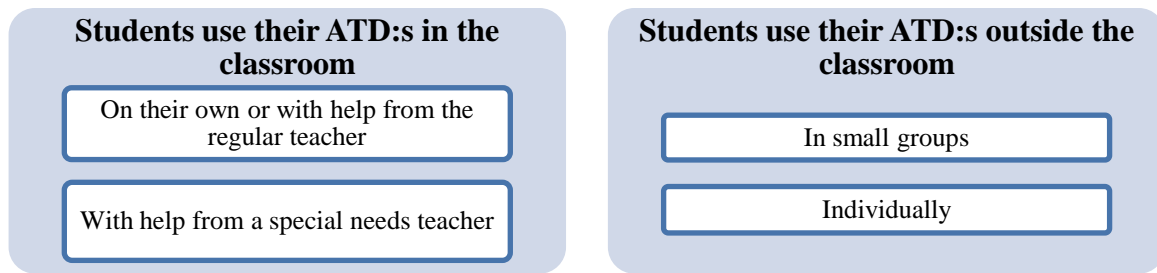
Students use their ATD:s in the classroom	Students use their ATD:s outside the classroom
On their own or with help from the regular teacher	In small groups
With help from a special needs teacher	Individually

FIGURE 3.4 Students use of ATD:s in and outside the classroom.

In an open-ended field, a female grade 7-9 teacher expressed that students that have computers in school should get regular support and supervision individually or in small groups on how to use the device at least once a week by a professional.

On the question whether the teachers perceived ICT to contribute to students' participation in regular teaching, three categories were identified, that is teachers who perceived ICT contributes to participation, teachers who did not and lastly teachers who were uncertain (figure 3.6).
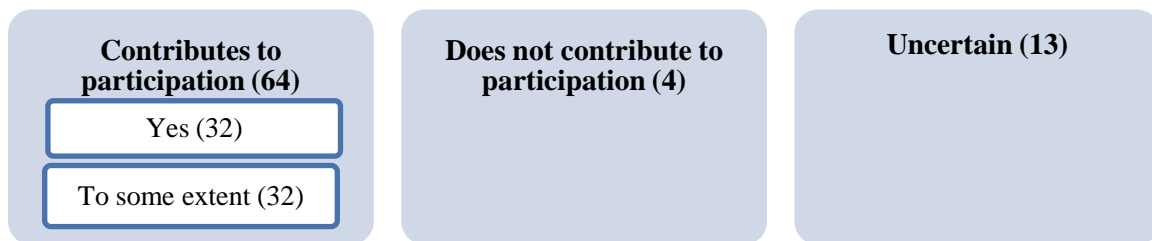
Contributes to participation (64)	Does not contribute to participation (4)	Uncertain (13)
Yes (32)		
To some extent (32)		

FIGURE 3.6 Teachers' perceptions on whether ICT contributes to students' participation in regular teaching.

In an open comment field of the questionnaire, a female grade 4-6 teacher expresses that ICT is very useful for students who need assistive technology devices. ICT can give students opportunity to reach the goals in the curriculum at the same terms as their classmates. Through ICT students become more independent in their school work and ICT can provide the students with a positive feeling that increase their motivation to school work.

The respondents were asked if they perceive the ATD:s affect the social inclusion in class. Three categories could be identified (figure 3.7), those who perceived ICT to affect students' social inclusion, those who did not and those who were uncertain.
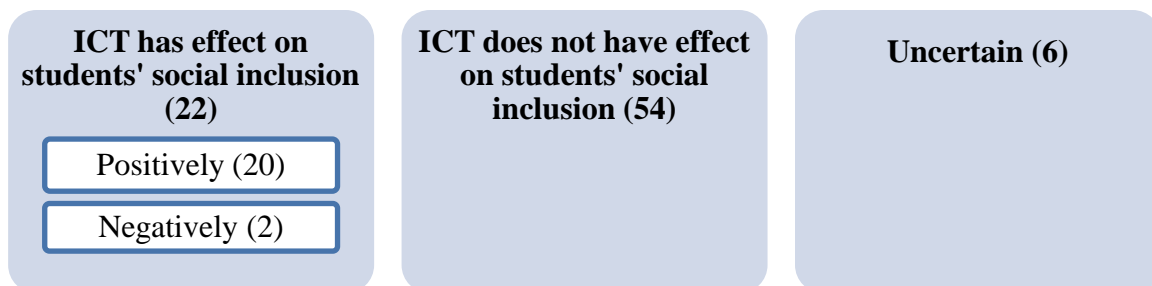
ICT has effect on students' social inclusion (22)	ICT does not have effect on students' social inclusion (54)	Uncertain (6)
Positively (20)		
Negatively (2)		

FIGURE 3.7 Teachers' perceptions on the effect of ICT on students' social inclusion. Number of respondents can be seen within brackets.

3.2 Interviews

3.2.1 The respondents
The respondents come from four different schools.

- Anna, a female grade F-6 teacher, age 52. Currently teaches 5th and 6th graders Swedish and English.
- Lars, a male grade 4-9 teacher, age 34. Teaches Swedish, English and social studies to students in grade 5 and grade 8.
- Maria, a female grade 10-12 teacher of psychology and religion, age 37.
- Erik, a male vocational teacher, age 40. Teaches grade 11 and 12.

3.2.2 The use of ICT
All of the interviewed teachers named the computer as the ATD used by their students. When it comes to the different perceptions of ICT availability two categories could be identified, access for all students and access for students with special educational needs (figure 3.8).
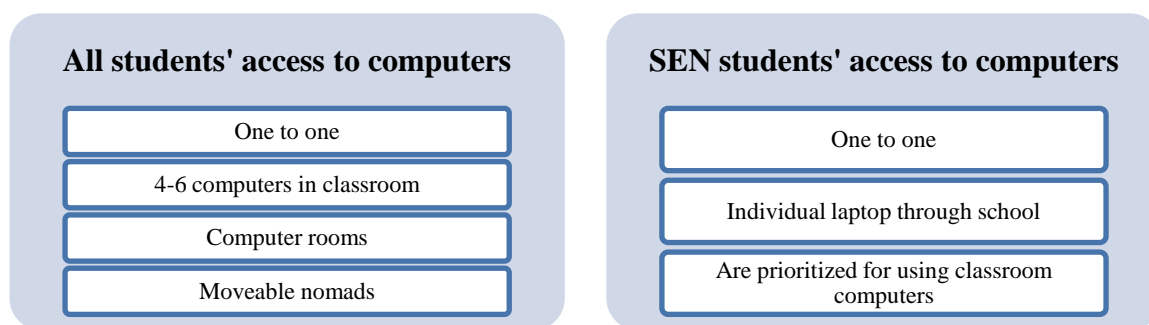
All students' access to computers	SEN students' access to computers
One to one	One to one
4-6 computers in classroom	Individual laptop through school
Computer rooms	Are prioritized for using classroom computers
Moveable nomads	

FIGURE 3.8 Teachers' perceptions on students' access to computers.

For one of the teachers, Erik who teaches grade 11-12, all students have access to computers at all times through a moveable nomad in the classroom. "We have computers for all students in the classroom." For Lars and Anna, the teachers from grade 4-6, the students with special educational needs always have access to computers. For the rest of the students the access varies. For Maria who teaches grade 10-12 it is different depending on what class she teaches where all students in grade 10 have their own computers but in grade 11 and 12 only students with special educational needs have computers. She perceives the access to computers in school to be tolerable but in order for all students to have computers they are to be booked and transported to classrooms which means both planning ahead and extra work for the teacher.

The interviewed teachers' perceptions of ICT use for students with special educational needs have been divided into two categories, the first where the computer is part of everyday education and the second where the computer is used for specific activities (figure 3.9).

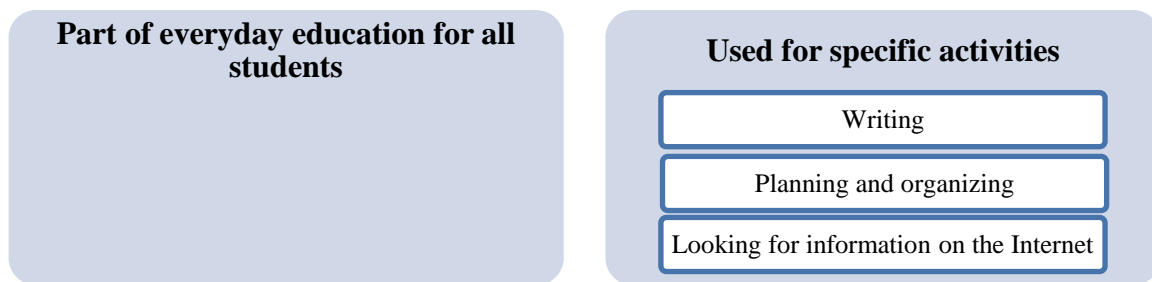| Part of everyday education for all students	Used for specific activities
	Writing
	Planning and organizing
	Looking for information on the Internet

FIGURE 3.9 Teachers' perceptions on ICT use for students with special educational needs.

Out of four interviewed teachers, one teacher uses ICT as a part of everyday education. It is Erik, the male vocational teacher. His perceptions of ICT are that it is a big part of everyday life as the students start working as car mechanics and therefore ICT is introduced to all students in school. Using the computer is so common, so he doesn't think even reflect on that students can be in need of special support.

The three other teachers' perceptions are that ICT is mostly used for students' writing but also to some extent for planning and organizing as well as looking for information. Computers are used when the students are writing for the most part.

3.2.3 ICT and inclusion

The teachers were asked to describe what inclusion means to them, and from their answers, the categories inclusion in terms of knowledge, social inclusion and physical inclusion have been identified (figure 3.11).

Inclusion in terms of knowledge	Social inclusion	Physical inclusion
Everybody should be given the opportunity to perform the same tasks	Not feeling left out or different	Being taught in the same room
Adapted teaching	Not feeling excluded, bullied or subject to comments	Included in class as much as possible

FIGURE 3.11 Teachers' perceptions on inclusion of students with special educational needs that use ICT in school.

Erik, Lars and Anna perceive inclusion first of all to be about including the students in terms of knowledge. Erik thinks inclusion is about everybody should know what to do and that teaching is based on their individual level. According to him, the teacher makes the biggest difference in including the students but ICT could function as an "extra teacher" if appropriate programs were available.

Lars perceives inclusion to be about all students joining the group and participating in class regardless of their difficulties. "Inclusion is about all students being taught in the same room, doing the same job, performing the same tasks." It is also about students not feeling left out or different from everybody else. The teacher has an important role in preventing those feelings. It takes place in the personal meeting, Lars argues, "it's about getting to know my students

and know what they can do and to put them in different situations without it becoming awkward or difficult for them."

Anna thinks students with special needs should be included as much as possible in mainstream education. Teaching needs to be adapted to students' needs to ensure participation on the same terms as everybody else.

Maria's perception of inclusion is that students first of all need to be included socially. She thinks everybody should be included socially and not be bullied, excluded or subject to comments. "That is why it is a good thing for all students to have computers, then students won't feel left out."

Differences concerning the acceptance of the environment could be identified, for one teacher it was important that the students were not perceived as different or abnormal while for other teachers there was a greater emphasis on the importance of acceptance in the environment.

When it comes to adapting teaching for SEN students that use computers in school's individual needs, the categories of perceptions are that teaching is adapted and that teaching not is adapted in the classroom.
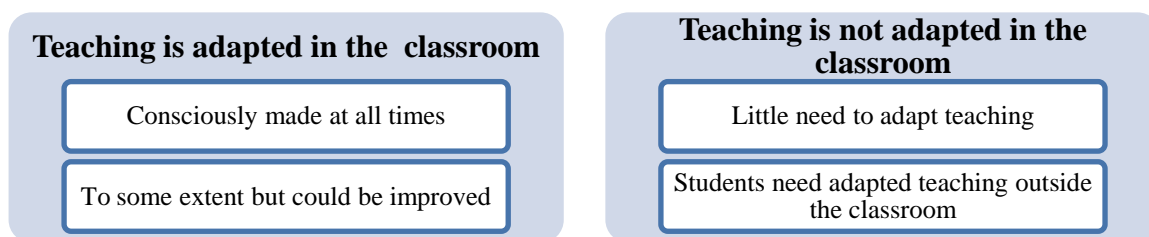
Teaching is adapted in the classroom

Consciously made at all times

To some extent but could be improved

Teaching is not adapted in the classroom

Little need to adapt teaching

Students need adapted teaching outside the classroom

FIGURE 3.10 Teachers' perceptions on adapted teaching in the classroom.

Erik, the vocational teacher, believes that in vocational education they are used to having students with special educational needs. "I don't experience the big problems you can hear that teachers in theoretical subjects have." Lars on the other hand perceives that there are probably possibilities to adapt teaching that he's uninformed of, and would like the special education teacher to give support, advice and recommendations. "It is difficult for the teacher to work both with the entire class of 20 and to be good at adapting teaching for a few students with different needs. You become too lonely and left out."

Maria thinks that her students have small problems compared to other students and that she doesn't do anything special to adapt teaching for these students. "The students work with different word processing programs and spelling programs. I'm no expert. It's the special education teacher." Anna perceives students to learn better if she can find the time to sit with them individually or if they can work with a special education teacher. Sometimes helping students too much in class can expose them to comments from the others, she says. "If I stand next to a person and helps the person for a longer period of time there's a risk for them to become subject to comments or something." She tells about two occasions where she successfully could help students individually. She perceives students to be afraid of being different or pointed out, for example by getting too much teacher attention. If she helps

students a little too long they can say they don't need help anymore even though she believes they do. Anna also says that it is important for the students with special needs to be encouraged to show their strengths.

The teachers' perceptions on separating students with special educational needs that use computers from their classmates resulted in three categories, namely no segregated solutions, segregated solutions in a tolerating environment and segregation the best solution (figure 3.12).
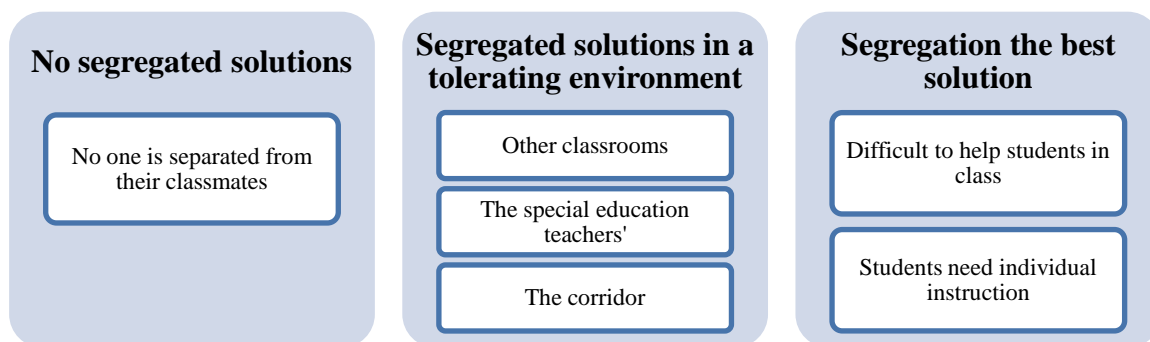
No segregated solutions

No one is separated from their classmates

Segregated solutions in a tolerating environment

Other classrooms

The special education teachers'

The corridor

Segregation the best solution

Difficult to help students in class

Students need individual instruction

FIGURE 3.12 Teachers' perceptions on separating students with special educational needs that use ICT from their classmates.

Erik says that the physical place is of no importance since the part of the school building where his students are is divided into different rooms and areas for different types work. No one is separated from their group for other reasons than that they work with different tasks in different areas of the premises.

Anna perceives the environment of her school to be accepting and allows students to in different areas of the school. Apart from the original classroom, it is common for students to work outside in the corridor, in another classroom or somewhere else. At some times students are seeing the special education teacher for different things, but it is no big deal when students leave their classes since their classmates might as well be spread out across school. Her school also has an accepting and permitting atmosphere, "it's a pretty important part of this school that students are not differentiated" she said. Sometimes students choose to go to the special education teacher to work in order to get some peace and quiet.

Lars' perception of excluding students physically is that students are not excluded from their classrooms, but sometimes a few students get special needs provision in a small room next to the main classroom. They work with another teacher in order to improve their weaknesses so that they ultimately can reach the goals for the national tests. This work is done as the class is practicing reading quietly and since the special needs provision requires talking it is conducted in a separate room. Taking students out from their classroom is always conducted in a discreet way and the atmosphere in the rest of the class is perceived as tolerating.

Maria's perception is that some students can best be helped through individual instructions. Sometimes it depends on that they are afraid to show their weaknesses in front of their classmates, other times it is just because they need the extra help and attention. "A couple of my students get help from the special needs teacher with organizing their school work". Maria

thinks it is good that some students get help with their problems. However, later she reconsiders, "I have never thought about it before, but maybe it is not so much fun for them to leave their classmates if it happens too often."

When it comes to the respondents' perception on whether ICT can contribute to inclusion, two categories have been identified.
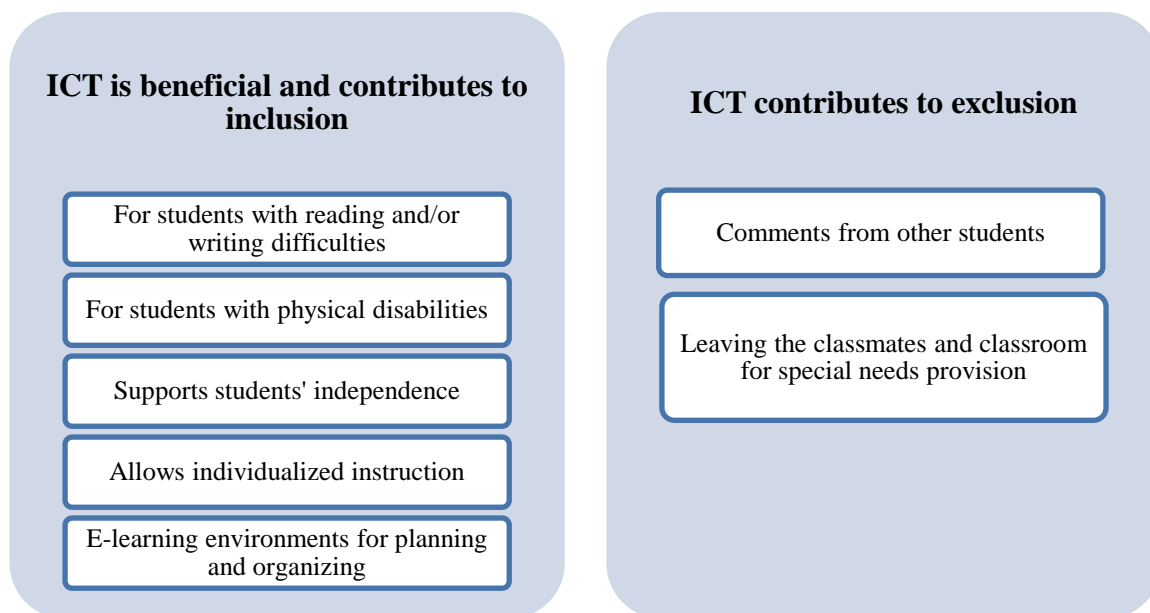

FIGURE 3.13 Teachers' perceptions on ICT in relation to inclusion.

ICT can be beneficial and contributes to inclusion according to the interviewed teachers in this study. All teachers have students with reading and/or writing difficulties that benefit from using computers. Anna thinks the students' difficulties would be much more evident if they did not have their aids. Lars has a student who is visually impaired who has a computer with a camera connected to it. The student controls the camera and can watch the images that appear on his computer screen. Student independence can be promoted through ICT for students with reading and writing difficulties as well as for students with physical disabilities and if Erik's students had access to web based repair manuals for all types of cars they could also become more independent. The web based material include step by step instruction with pictures and can be listened to through the computer's text-to-speech synthesis and could facilitate students' independence which is an important part of the future job as a car mechanic. Adequate e-learning resources could contribute to individualized instruction and e-learning environments could be beneficial for students' planning and organizing of their work according to teachers' perceptions in this study.

3.2.4 Increased inclusion with ICT
Teachers were asked if they could think of anything that could make teaching for students with special educational needs that use ICT in school more inclusive. On this question, the teachers' perceptions have been divided into two categories, measures for teachers and measures for students (figure 3.14).
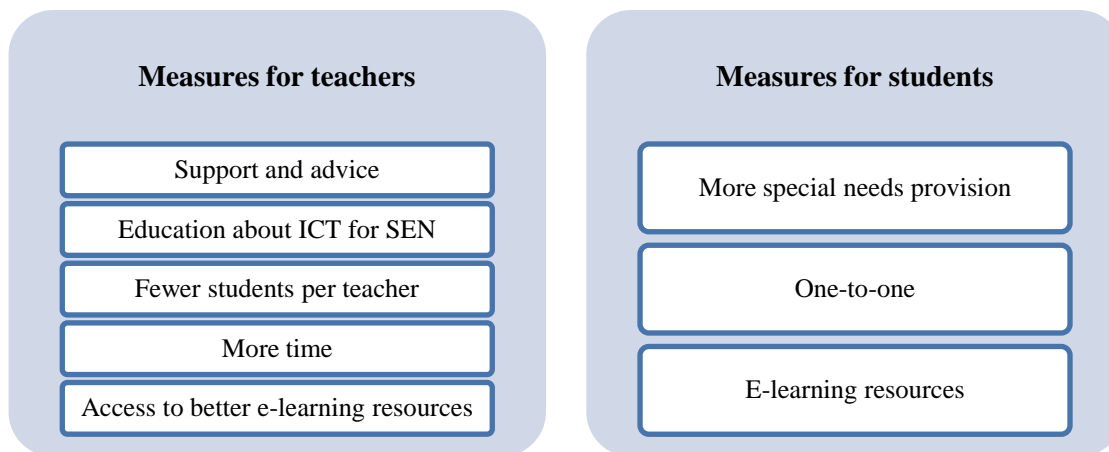
Measures for teachers

- Support and advice
- Education about ICT for SEN
- Fewer students per teacher
- More time
- Access to better e-learning resources

Measures for students

- More special needs provision
- One-to-one
- E-learning resources

FIGURE 3.14 Teachers' perceptions on how to make education for students with special educational needs that use ICT in school more inclusive.

On the question whether teaching students with special educational needs that use ICT in school can be made more inclusive, Maria feels that her students already are very included. She cannot come up with anything that would make the situation more inclusive for the SEN students. "Maybe if there were more computers, then there would be more computers for the rest of the students" she finally adds.

Erik believes that school could be made more inclusive if the proper digital e-learning resources were available and if all teachers adapted teaching to the students needs.

Anna thinks that it is important that the school can identify the students' difficulties as early as possible in order to provide the right support from the start. She also believes that the personal resource is number one, it is the most important factor. Therefore fewer students per teacher or more personal support for students would be desirable. The lack of time is the worst thing and that there are so many students in each class, there are up to 32 students in the classes Anna teaches. In order for school to become more inclusive she suggests that the number of tasks that are imposed on teachers should be reduced in order to get more time in the classroom with the students. "We have so many things to do so that we do not have the time to care about our students" she says.

In order for school to become more inclusive for SEN students that use ICT in school she thinks it is a good idea for all students to have computers, because then no one would feel different because he or she is the only one who has a computer.

Lars also believes that it is important for the teachers to be familiar with the different programs the students use. "The problem is that the computer is installed with a lot of programs and stuff but the teachers never get any education in how to use them" he says. There might not even be anyone at school that fully knows how to handle these programs, he continues. Other than that he requests more help from the special education teacher when it comes to adapting teaching for his students with special educational needs. Access to better e-learning resources would also be a way to make education more inclusive for students with special educational needs that use computers in school.

3.4 Theoretical framework analysis

The results of this study point to that the prevalent conception among teachers is segregated inclusion and the compensatory perspective as defined by Haug (1990). Students with special educational needs go to regular classes but they are often taught outside the classroom separated from their classmates. Nevertheless, the interviews revealed features from Haug's inclusive integration, where the grade 11-12 vocational teacher who adapts teaching to include all students and the 6th grade teacher Maria's school where there seem to be a wide acceptance of differences in the school environment.

For one third of the teachers in this study, teaching is adapted to students' needs, which can be seen as a confirmation on that there has been a shift from integration to inclusion and the emphasis on reconstruction of curricular provision and adapted teaching (Vislie, 2003), at least for some teachers. Still many teachers adapt teaching only to some extent and a few do not adapt teaching at all.

When it comes to inclusion, teachers seem to emphasize inclusion in terms of knowledge which is equivalent to Asp-Onsjö's (2006) didactic inclusion and Haug's segregated integration where the main issue is a wish for maximal subject-oriented learning and performance and where school primarily is a place to learn. Inclusion is mainly seen as students keeping up with the curricular goals that are to be learned. Social inclusion is seen as important when it comes to students not being bullied or subject to comments. Excluding students from their classrooms and classmates is perceived to be beneficial to students' learning and is not considered to contribute to social exclusion.

4 Discussion

In this section the method and the results from the questionnaire survey and the interviews will be discussed. The results will be analyzed and discussed in relation to previous research and theories provided in the background. Finally there will be a summary and conclusion of the main findings followed by suggestions for further research.

4.1 Method discussion

Although the phenomenography is an approach for qualitative methods, it was used on a quantitative method in this study. Pros and cons were weighed against each other, and the questionnaire was chosen for its ability to reach many respondents provide a result of many teachers' perceptions. In order to make the results of the questionnaire better suited for phenomenography, only open-ended questions could have been used. However, according to Ejlertsson (2005), open-ended questions are only answered by a small number of respondents which can affect the results. Therefore, the questionnaire only contained questions with predetermined answers. Nevertheless, the respondents had the opportunity to add comments through optional open-ended fields after each question. The danger with questions with fixed alternatives is that it is difficult to foresee all possible alternatives of answers to a question. However, two pilot studies have been conducted before the real questionnaire was distributed which should ensure the validity of the questionnaire.

There was a great number of non-responses to the questionnaire survey. The result may have been different if more teachers would have answered. It is impossible to say who did not answer, but the comparison with the gender and age of the entire teacher population of Sweden showed great similarity which indicates that no specific age group or gender did not answer.

The result could have shown a greater variety of perceptions if more respondents had been interviewed. However, there was a great diversity between the interviewed teachers' answers where practically no teachers had the exact same view of anything. The conducted interviews gave many different standpoints which enriched the study.

4.2 Result discussion

4.2.1 The use of ICT
The computer is by far the most common assistive technology device used by students with special educational needs, according to teachers in this study. The computers are used for different activities but both research and the result of this study point to the effectiveness of ICT use for students with reading and writing difficulties and dyslexics. Research also indicates that students should have individual plans where the ATD:s are adapted to each student's individual needs (Gillette, 2006; Lidström et al., 2012; Maor et al., 2011) and in interviews teachers mentioned the individual education plans that students with special needs often have. Though, it is not clear to what extent the ATD:s are adapted to students' needs through the individual education plans.

Teachers should have knowledge of ICT for students with special educational needs (Anderson et al., 2009) but according to the results questionnaire many of the teachers participating did not have knowledge of many of the suggested activities in the questionnaire. One possible reason can be that different age groups use ICT for different activities, and teachers for older children may not be aware of activities used for younger children and vice versa. It can also be an indication of that the teachers actually do not have knowledge of different areas of ICT usage.

When it comes to different ways of ICT use, ICT is perceived to be used both as an educational tool, as a compensatory tool and as an alternative tool for learning (Lidström et al., 2012). Both research and the results of the this study point to that ATD:s could provide students with special needs opportunities to participate independently in the same educational activities as their peers by compensating for activity limitations (a.a.). However, it is apparent that teachers do not always know how to help their students with their ATD:s which leads to the conclusion that students are left to on their own work with their tools and support is not always at hand.

4.2.2 ICT and inclusion
To make the most of ICT use for SEN students several studies point to the importance of both teachers' knowledge of ICT and that teaching is adapted to and integrated with the assistive technology used (Anderson et al., 2009; Brodin & Lindstrand, 2003; Kargin et al., 2010). Results from this study indicate that teachers do not have enough knowledge of ICT for SEN.

They do not have knowledge of all possibilities with ICT and possible explanations could be lack of interest, lack of time, lack of support and lack of access to technology. Teachers may also think that ICT for SEN is the special education teachers' job. Some teachers want to work more with ICT, but then there is lack of proper e-learning resources. A request for supervision and help has also been expressed.

The teachers in this study perceive that they make adaptations in their teaching for students with special educational needs that use ICT in school, but according to Kargin et al. (2010) adapting teaching is considered important by teachers but in reality most teachers make few adaptations. So, the results of this study point to that adaptations are made, but it is not clear to what extent and if the adaptations made actually are adequate for the students. As pointed out by Kargin et al. (2010), some adaptations are easily made by teachers but insufficient for the students. Based on the results of this study, it can be assumed that students are sitting in their classrooms with their ATD:s without receiving adapted teaching based on their needs.

Results from the questionnaire indicate that students often are placed outside the classroom to work with ICT which confirms results from earlier research (Giota & Emanuelsson, 2011; Isaksson, 2009). Removing children from their classmates is viewed as beneficial for the student's results by teachers in this study, and one teacher said students sometimes choose to go outside the classroom in order to study in a calm and peaceful environment. However, some of the teachers perceive it to be important with a tolerating environment that allows differences and nobody is supposed to feel stigmatized by going away from the classroom for special needs provision. Yet, the question is whether students who are excluded would not rather receive the teaching they are entitled to together with their classmates. Moreover, if students need to go outside the classroom in order to get a calm and peaceful environment, maybe it is time to look over the classroom environment.

Curricular recommendations say that streaming or organizational differentiation is to be avoided but, at the same time, it is not totally forbidden in the Swedish education system (Skolverket, 2011a; Skolverket 2011b). But the fact that just over 50 per cent of the teachers answering the questionnaire said that SEN students frequently use their AT:s outside the classroom is discomforting. ICT could bridge the gap to inclusion for students with special educational needs (Brodin, 2010) but results from this study clearly contradict that. At least if inclusion is referred to as being taught in the same room as the rest of the class. An explanation for this result can be that inclusion is seen mainly in terms of knowledge by the teachers in this study. In an attempt to include in terms of knowledge students are excluded physically. Including students in terms of knowledge is seen as superior to both social and physical inclusion.

Emphasis could be placed on the role of the special education teacher as a supervisor or consultant for teachers when it comes to adapting teaching for students with special educational needs. The fact that not all teachers are able to keep up with new technology and knowhow to work the ATD:s students use calls for professionals. The special education teacher is used as the expert for students with special educational needs when it comes to ICT use, and this view leads to excluding students in order to get help. On the other hand, seeing

the special education teacher as a supervisor for teachers will allow students to stay in their classes and not miss out on social and physical inclusion instead of leaving the classroom and classmates in order to hopefully understand better. The special education teacher could assist teachers with adapting material and teaching for SEN students within general educational settings, instead of sitting one on one with individual students. This would also help teachers develop their teaching and would also realize the special education teacher's task of eliminating barriers and difficulties in different learning environments (SFS 2007:638). However, results from Brodin and Lindstrand (2003) indicate that not all special education teachers are comfortable with the role of an ICT expert and that SEN teachers need to be educated in using ICT. Penuel (2006) identified other teachers as particularly important in helping teachers learn how to integrate technology in the classroom and therefore it could also be beneficial if teachers were given the time and opportunity to learn from each other when it comes to ICT for SEN.

When it comes to ICT in relation to the issue of inclusion, ICT is perceived to be a positive factor when it comes to both participation in regular teaching and social inclusion according to the results of this study. ICT could facilitate access to learning which might increase motivation and improve confidence and self-esteem according to Williams et al. (2006) but the results of this study cannot confirm this finding. However, results from this study indicate that ICT could contribute to inclusion of students with reading and/or writing disabilities and students with physical disabilities which confirms previous research (Lidström et al., 2012; Maor et al., 2011; Peterson-Karlan, 2011; Williams et al., 2006). ICT could support student independence, allow individualized instruction and e-learning environments could be useful for planning and organizing which all could be beneficial for inclusion of students according to this study. Results from this study also point to that ICT also contributes to exclusion of students. Teachers mentioned students being subject to comments or bullying and a few teachers think ICT affects students' social status negatively, but no previous research confirms this result. All in all, teachers seem to find ICT useful for students with special educational needs and…

4.2.3 Increased inclusion with ICT
The teachers in this study perceive there to be many factors that could make the use of ICT for students with special educational needs more inclusive. First of all, knowledge about technology, students' needs and how to best help students is expressed. This result is also supported by research where many studies point out the importance of teachers' knowledge (Anderson et al., 2009; Brodin & Lindstrand, 2003; Kargin et al., 2010). It seems like teachers try to adapt teaching and try to include students with special needs that use ICT, but they do not always have the knowledge to do it.

According to research, one-to-one initiatives could be part of the solution for including SEN students that use ICT, and this is also confirmed by this study. Teachers need to become aware of the e-learning environments and their potentials for accommodating SEN-students in inclusive classrooms (Starcic, 2010). ICT assisted learning environments could enhance student centered teaching and individualization with tools for learning (Peunel, 2006; Starcic, 2010). Both the students' use of ICT and teaching instructions should be adapted to students'

individual needs (Gillette, 2006; Lidström et al., 2012; Maor et al., 2011), which according to results of this study is not continuously put into practice. Inclusion of SEN students that use ICT could be facilitated by one to one initiatives also by allowing teachers to focus on one set of teaching instructions for all students (Penuel, 2006). The teachers in this study perceive that they would use the computers more and do different types of assignments with their students if all students had computers. Instruction tends to focus on the majority of the class and not a few individuals when there is only one or a few students in each class that has a computer. Teachers in this study also perceive one-to-one to be beneficial for students with special educational needs that use computers in school. It is perceived as difficult to adapt teaching when not all students have computers and students are less likely to be pointed out or bullied for being the only one with a computer. The question is whether one-to-one actually is a solution for students with special educational needs, or if their special needs will be overlooked when they are not the only ones sitting there with computers. When it comes to adapted teaching, one-to-one seems necessary in order for teachers to really integrate technology into their teaching. Still, it remains to be seen if one-to-one allows teaching to be adapted to both computing and students' special needs.

Penuel (2006) found that other teachers seemed to be particularly important in helping teachers learn how to integrate technology in the classroom. The results of this study did not indicate that teachers help other teachers and a wish for help from colleagues has not been expressed either. Thus, help from special education teachers, both for supervision of teachers and with special needs provision for students is requested.

Except for investments on digital resources, support and advice for teachers is requested in attempting to make teaching with ICT more inclusive. Teachers need knowledge of how teaching is to be carried out and adapted. According to the results of this study, the teacher still is the most important resource for the students, and this cannot be overlooked. No matter how much money is spent on computers, people will still be needed. Teachers cannot be replaced with digital technology, although ICT to some extent can compensate students for individual difficulties. Teachers need adequate education in how digital technology can be used in the best way for their students and how teaching can be adapted. In addition to that, time is needed as well as access to expertise. Mainstream pedagogy and special education can walk hand in hand in an inclusive school for all children, but more resources are needed and fewer student per teacher. The one teacher who includes all students and adapts teaching to all students' individual needs in this study is the grade 11-12 vocational teacher. He teaches 6-8 students and besides that he sometimes gets help from another teacher. The possibility to succeed with adapting teaching to all students needs at all times as the only teacher in a class with 20 or 30 students is small if not non-existent.

Lastly, a question that has arisen throughout the process of this study is whether we have too much faith in technology? Huge investments are being made on digital technology. Is modern technology supposed to bridge the gap to staff cutbacks?

4.3 Summary and conclusion

The results of this study have implications on the work of both teachers and special needs teachers in school. National curriculum still aim for inclusion and the special education teacher should work for inclusion of students in their regular classes. When doing this, taking students out from their classroom setting should be avoided in order to promote social and physical inclusion. Classroom teaching needs to be adapted to students' needs to allow didactic inclusion. A dilemma is that special education teachers are seen as experts on using assistive technology with students which leads to excluding students from their regular classes. Instead special education teachers should focus on investigating the student's individual needs and the consultant role as supervising the teachers in how teaching could be adapted in a successful way for the student in class. Teachers are to be assisted with how to adapt teaching for SEN students that use ICT in the classroom to utilize all benefits with ICT, so that ICT can become the bridge to inclusion of all students anticipated by Brodin (2010).

Only educating special education teachers in ICT for SEN is not enough, and will accentuate the SEN teacher's role as giving individual special support. Instead it is important for all teachers to focus on ICT in teaching while it is the SEN teacher's role to identify the needs of the students and the help teachers adapt teaching for student's individual needs. Regular teacher education should educate teachers on not only how to use ICT for all students but also how to use ICT for SEN students. In conclusion, ICT could have many benefits for students with special needs but ICT cannot replace the teacher.

4.4 Further research

More research is needed in the area of ICT for students with special educational needs. The focus of further research could be on students' perceptions of ICT as a tool for inclusion. It would also be of interest to observe teachers in order to see how lessons are executed for students with special needs that use ICT in school. Another suggestion is to make a similar study in an environment where all students have computers in order to see if one-to-one could promote inclusion of students with special educational needs.

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Enkät till lärare om IKT-användning för elever i behov av särskilt stöd

Jag heter Helena Josjö och jag genomför en vetenskaplig studie om hur IKT (informations- och kommunikationsteknik) används i skolan för elever i behov av särskilt stöd. Enkätsvaren kommer att användas i en D-uppsats i specialpedagogik på Specialpedagogprogrammet, Umeå Universitet. Detta frågeformulär är riktat till lärare och skickas till ca 200 utvalda lärare i två olika kommuner. Du som lärare har viktiga erfarenheter som kan bidra till att öka förståelse för området. Deltagande i enkätundersökningen är helt frivilligt och Du kan när som helst avsluta, men jag hoppas att Du vill hjälpa mig och bidra till att öka kunskaperna om IKT-användningen för elever i behov av särskilt stöd. Ditt svar kommer att behandlas konfidentiellt. Svaren kommer att databehandlas utan identitetsuppgifter och kommer således inte att kunna kopplas till Dig som person. Om Du har frågor om enkätundersökningen eller studien, kontakta mig på helena.josjo@yahoo.se eller 070-2124231. Tack på förhand för Din medverkan!

Luleå den 15 oktober 2012
Helena Josjö
Specialpedagogprogrammet
Umeå Universitet

---

*Obligatorisk

Din bakgrund

1. Kön *
- ○ Kvinna
- ○ Man

2. Födelseår * [   ]

3. Med vilken/vilka årskurser arbetar du? * Markera de alternativ som överensstämmer med din nuvarande undervisningssituation. Flera alternativ kan anges.
- ☐ Förskoleklass
- ☐ Årskurs 1-3
- ☐ Årskurs 4-6
- ☐ Årskurs 7-9
- ☐ Gymnasiet
- ☐ Övrigt: [   ]

4. Om du arbetar som ämneslärare, vilka är dina ämnesområden? Flera alternativ kan anges.
- ☐ Språk
- ☐ Matematik
- ☐ Samhällsvetenskapliga ämnen
- ☐ Naturvetenskapliga ämnen

- ☐ Idrott
- ☐ Praktiska/Estetiska ämnen
- ☐ Yrkesämnen
- ☐ Övrigt: [   ]

Elever i behov av särskilt stöd som använder IKT-verktyg i skolarbetet

5. Finns det elever i behov av särskilt stöd som använder IKT-verktyg i skolarbetet i de klasser/grupper du undervisar i? * Med elever i behov av särskilt stöd menas elever som riskerar att inte nå de lägsta kunskapskraven eller uppvisar andra svårigheter i sin studiesituation (t.ex genom en funktionsnedsättning). IKT-verktyg innebär t.ex en bärbar dator, läsplatta eller ett annat tekniskt hjälpmedel.

- ○ Ja, en elev
- ○ Ja, två-tre elever
- ○ Ja, fyra elever eller fler
- ○ Nej, inte nu, men har tidigare haft
- ○ Nej, jag har aldrig undervisat elever i behov av stöd som använder IKT-verktyg i skolarbetet. (Om du angett detta

svarsalternativ kan du gå vidare till fråga 11)
- ○ Övrigt: [   ]

6. Vilka IKT-verktyg (informations- och kommunikationsverktyg) används av eleverna som du undervisar? Flera alternativ kan anges
- ☐ Dator
- ☐ Läsplatta/iPad
- ☐ Mobiltelefon/smartphone
- ☐ Övrigt: [   ]

7. Vilka IKT-verktygen (datorer, läsplattor, mobiltelefoner) används i skolarbetet av elever i behov av särskilt stöd?

	Används	Används inte	Vet ej
Skrivhjälpmedel, ordbehandling, t.ex Word	○	○	○
Talsyntes som hjälper till att få text uppläst	○	○	○
Daisyspelare som spelar upp tal- och ljudböcker i daisyformat	○	○	○
Planering och organisation av skolarbetet	○	○	○
Rättstavningsprogram, t.ex Stava Rex, Spell Right	○	○	○
Kommunikation	○	○	○
Fota av tavlan eller dokument	○	○	○

	Används	Används inte	Vet ej
Digitala/interaktiva läromedel	○	○	○
Särskild färdighetsträning, t.ex minnesträning, lexia	○	○	○
Arbeta med bilder, musik, ljud, video	○	○	○
Göra redovisningar, presentationer	○	○	○
Leta information på internet	○	○	○

Kommentar [ ]

8. Var och när använder eleverna sina IKT-verktyg? Ange det alternativ som stämmer bäst överens med din uppfattning.

	Dagligen	En eller ett par gånger i veckan	Mer sällan än en gång i veckan	Aldrig	Vet ej
På egen hand i klassen	○	○	○	○	○
I klassen med hjälp av speciallärare eller specialpedagog	○	○	○	○	○
Enskilt eller i en liten grupp	○	○	○	○	○

Kommentar [ ]

9. Hur upplever du att IKT-verktyget (t.ex den bärbara datorn) påverkar elevers:

	positivt	varken positivt eller negativt	negativt	vet ej
Sociala status i klassen	○	○	○	○
Inkludering i kompisgemenskapen	○	○	○	○

Kommentar [ ]

10. Hur ser klassrumsundervisningen ut för de elever som använder IKT-verktyg (t.ex bärbar dator)? Ange de alternativ som stämmer bäst överens med din uppfattning.

	Instämmer	Instämmer delvis	Vet ej, obestämd	Instämmer inte
Undervisningsmaterial anpassas efter elevernas förutsättningar	○	○	○	○
IKT-verktyget bidrar till elevens deltagande i den ordinarie undervisningen	○	○	○	○

Kommentar [ ]

11. Övriga kommentarer

Tack för att du medverkade! Jag är intresserad av att fördjupa min kunskap inom detta område genom intervjuer. Om du är intresserad av att ställa upp på intervju, var vänlig och ange ditt förnamn och telefonnummer nedan. Dessa uppgifter kommer att behandlas konfidentiellt.

Skicka

Hej!

Du är en av ca 200 lärare i två olika kommuner som har blivit utvald att svara på en enkät om IKT och elever i behov av särskilt stöd. Enkäten ligger till grund för en D-uppsats i specialpedagogik vid Umeå Universitet.

Du som lärare har viktiga erfarenheter som kan bidra till att öka förståelse för området. Deltagande i enkätundersökningen är helt frivilligt och Du kan när som helst avsluta, men jag hoppas att Du vill hjälpa mig och bidra till att öka kunskaperna om IKT-användningen för elever i behov av särskilt stöd.

Länk   till   enkäten:
https://docs.google.com/spreadsheet/viewform?pli=1&formkey=dG40SDVNUGFQcGdVVHhma2t5RnBieXc6 MQ#gid=0

Tack på förhand för Din medverkan!

Luleå den 15 oktober 2012

Med vänlig hälsning,

Helena Josjö

PS! Om du inte arbetar som lärare ber jag Dig ignorera detta mail.

Intervjuguide

- Kan du berätta om din yrkesbakgrund?
- Kan du berätta om din nuvarande undervisningssituation?
- Berätta om din erfarenhet av elever i behov av särskilt stöd som använder IKT-verktyg?
- Hur är tillgången på IKT-verktyg på skolan där du arbetar? Generellt? För elever i behov av särskilt stöd?
- Hur arbetar du med elever i behov av särskilt stöd som använder IKT-verktyg?
- Kan du berätta så detaljerat som möjligt om en situation där du undervisat en elev använt IKT-verktyg.
- Hur tror du att dina kollegor arbetar med dessa elever? Diskuterar lärarlaget samarbete gällande dessa?
- Vad innebär begreppet inkludering för dig?
- Kan IKT bidra till inkludering?
- Hur upplever du att undervisningen av elever i behov av särskilt stöd som använder IKT-verktyg kan göras mer inkluderande? (Strategier, tankar, idéer synpunkter på relationen mellan användning av IKT i undervisningen och inkludering).