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Teachers Translating and Circumventing the Computer in Lower and Upper Secondary Swedish Schools in the 1970s and 1980s

Abstract: Computers made their appearance in some Swedish schools in the late 1970s when teachers and administrators, interested in the possibilities these machines represented for education, brought the first devices, and used them in the classroom. More systematically and at the initiative of the State, national projects and initiatives brought computers to a larger number of schools. However, it was not until the 1990s that computers had a more obvious place in the classroom. The computerization of the classroom depended on a large extent on teachers who acted as both catalysts and detractors of the process. With the help of Bruno Latour's model of translation, I argue that teachers as a group did not react homogeneously but showed a variety of attitudes and positioning according to their experiences and place within the educational system and the political structure, which had tangible consequences for the development of the process of computerization of schools.

Keywords: computers in education; teachers; Sweden

“Joyful and hopeful I went to my meeting with ‘the computer’. My experience with computers was reading about them in books. I had never even touched one. But I really longed to do so”.¹ During spring 1988, Solveig Eriksson, a secondary school teacher from Huddinge reported her delight at her first opportunity to work with computers and to include them in her teaching. After a crash course with the technician who delivered the Macintosh SE to her school, she was able to get started and keep learning, with the aid of the user's manual. By then, plenty

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1 Solveig Eriksson, “Datorn på mellanstadiet,” *Datorn i utbildningen* 1 (1989): 54.

had happened at a national and regional level regarding pilot projects and national initiatives. However, computers were still far from ubiquitous in Swedish schools, and while teachers showed a varied range of attitudes towards computers, from enthusiasm to scepticism, most were certain that computers were on their way into classrooms.

In the early 1970s, few people had had any contact with computers, mostly researchers and workers in some industries, but by the early 1980s, many felt that computers were going to transform society. A researcher on employment questions claimed, in 1981, that “[computer technology] will affect us in all of our roles, as consumers, as producers and as workers [...] during our free time, at home, [...] [and] it will change our way to think and create new meanings”.² The main difference between computer technology and other technological changes that had affected Swedish industry was that this had the potential to transform all sectors of the economy, including the service sector. A healthy way to deal with the risks of computerization was, in his view, to steer computer development through state policy which included educational measures.³ Thus, in the early 1970s, most of the population, not least teachers, had never touched a computer; by the 1980s, it seemed clear that schools needed to train computer users and teach pupils how to live in a computerized society.

Teachers had a key role in discussions about and the implementation of computer technology in schools. Although use of computers in schools was very limited during the 1970s, interested teachers started conducting trials in their schools using their scarce resources. Others found ways to circumvent or postpone use of computers in their teaching, even when they were urged to incorporate them. The general process of introduction of computers into schools depended largely on the actions (or lack of action) of teachers, and their interactions with other actors and the computer devices themselves.

In this chapter, I explore the role of teachers in the introduction of computers into classrooms in Swedish lower secondary and upper secondary schools in the early stages. The period covered in this study is from ca. 1970 to the end of the 1980s, the years in which the first pilot projects and state-sponsored initiatives were developed and implemented. I am interested in capturing the actions of the first proponents of computer education, the first demands teachers faced and their responses. To this end, I will outline school projects and local trials as well as governmental initiatives and pilot programmes for the integration of com-

2 Nils Unga, “Tar datorn bort jobben?” in *Tar datorn bort jobben?*, ed. Lasse Svanberg (Östervåla: Forskningsrådsnämnden and Styrelse för teknisk Utveckling, 1981), 4.

3 Unga, “Tar datorn bort,” 13.

puters into the classroom, exploring the role of teachers and the intended aims under discussion regarding the use of computers.

The sources used in this study include the following: official reports on computer education initiatives; evaluations and reports emanating from or ordered by government agencies; official memos; archival material from some of the initiatives; material from teachers' journals and newspaper articles; and literature on the introduction of computers into lower secondary and upper secondary education, providing a historical and an educational perspective.

While there was a variety of actors involved in this process, such as politicians, the business sector, school managers and pupils themselves, I have chosen to focus on the views and actions of teachers as they constituted the group on which implementation of computer education was expected to rely. This chapter is inspired by sociologist Bruno Latour's model of translation,⁴ which sees actors not as groups who either exert, follow, or resist power, but as people who may act in different ways in a particular situation, depending on the context and their relationship with other actors and objects. Teachers, in this line of reasoning, could react in different ways to the use of computers in schools: they could resist, modify, deflect, or appropriate the process. This view also allows teachers to be visible as the heterogeneous group that I claim they were, and observe the variety of practices they engaged in.

Computers in Education in the Public Debate

Public debate on the effects of new technologies on democratic society was sparked by early adoption of computerized systems by the Swedish state. In 1955, the government decided to rationalize state administration with the use of new technologies,⁵ leading to the computerization of population statistics in the 1960s. This gave rise to a general debate on questions of integrity.⁶ Many believed that computers would impoverish work tasks and become government tools to control the population. Critics of the use of computer technology by central government to gather information demanded strict and clear legislation to avoid abuse

4 Bruno Latour, "The powers of association," in *Power, Action and Belief: a new Sociology of Knowledge?*, ed. John Law (London and Boston: Routledge & Kegan Paul, 1986), 266–269.

5 Magnus Johansson, "Smart, Fast and Beautiful. On Rhetoric of Technology and Computing Discourse in Sweden 1955–1995" (PhD diss., Linköping University, 1997), 31.

6 Sten Henriksson, "When Computers Became of Interest in Politics," in *History of Nordic Computing*, ed. Janis Bubenko, John Impagliazzo, and Arne Sølvber (New York: Springer, 2005), 418.

of power and integrity violation.⁷ However, the education of citizens was also brought up as a solution.

During the 1960s and 1970s, the state promoted ICT development through the support of industry and education.⁸ The Swedish government saw computer instruction as a necessity in order to cope with the effects of new technologies in the labour market, which was then embodied in a variety of initiatives and measures proposed in education in the coming years.

Critics argued that despite the dangers of computer technology, Swedish industry needed it in order to avoid being outcompeted by other countries. Hence, simply disregarding the need to learn about computers was not an option.⁹ Education could help citizens make the right demands in relation to technology, and therefore, the role of schools was vital.¹⁰ In this case, the argument centred on learning about computers in school and the importance of information.

Another angle in the debate was the role of computers in the teaching of different subjects. A positive argument was that these devices could take over the more concrete and boring parts of teaching from teachers and free them up for the important ones: placing the subject in context, making generalizations, and drawing conclusions.¹¹ However, on the question of transforming education with computers, distrust was patent. A liberal member of the Swedish parliament wrote in 1975 that the experiences of places like the United States, where computers had been introduced in some schools, showed that computer technology could be of benefit for vulnerable communities and low achievers, as well as the most privileged and high achievers, but it was not clear whether it would benefit all pupils and be worth the high level of investment required. By accentuating differences in achievement, the strategy could go against the highly democratic principles on which Swedish schooling was based.¹² Moreover, teachers were worried about a loss of autonomy in the classroom. The idea of using computers in teaching often brought about the fear of being replaced.

7 See analysis of the integrity debate in the 1970s in Åsa Söderlind, "Personlig integritet som informationspolitik" (PhD diss., Borås College and Gothenburg University, 2009), 158–212.

8 Lars Ilshammar, "Offentlighetens nya rum: teknik och politik i Sverige 1969–1999" (PhD Diss., Örebro University, 2002), 70–71.

9 Jacob Palme, "Before the Internet: Early Experiences of Computer Mediated Communication," in *History of Nordic Computing 3*, ed. John Impagliazzo, Per Lundin, and Benkt Wangler (Berlin/Heidelberg: Springer, 2011), 271–272.

10 Jacob Palme, "Datorer i dagens och morgondagens samhälle," *Nämnamnaren*, Special issue on Computers 1 (1976): 1–5.

11 Börje Langefors, ed., *Datorn och du* (Uppsala: Scientia Brombergs, 1979), 96.

12 Kerstin Anér, *Datamakt* (Stockholm: Gummesson, 1975), 60–65.

However, the idea that came to form the basis of the state strategy to introduce computers into schools in Sweden was that all citizens needed to become familiar with computer technology as a prerequisite for democracy and working life.

First Investigations and School Trials

The earliest investigations of the use of computer technology in Swedish education took place in the 1960s. A Swedish delegation, the CAI group (*Computer Assisted Instruction*) travelled to the United States to study, first-hand, projects such as the Plato system at the University of Illinois. The group released a report in 1966, in which it proposed initiatives to adapt CAI for Swedish schools. The report stated that the implementation of CAI could lead to higher quality and lower costs in education through, for instance, the substitution of teachers.¹³ This report formed the basis of a governmental proposal suggesting use of radio, television, and CAI as possible measures to deal with the lack of trained teachers that schools were then experiencing.¹⁴

The idea of rationalizing schools came from the central government and could be regarded both as part of the development taking place in industry and administration and as a response to the scarcity of trained teachers. In his book *Rationalise School! (Rationalisera skolan!)*, Commissioner of the *National Board of Education (NBE) (Skolöverstyrelsen)* Mats Hultin argued that the problems brought about by growth of the school system could be solved using computers and television in school administration and teaching.¹⁵ Hence, one of the first arguments on the use of computers in schools was related to changing pedagogical practices and rationalizing education. There are no signs of this approach having been backed up by teachers or schools, and, as I will show later, the first formal state projects did not follow this line.

Before the 1980s, computer instruction was limited to upper secondary schools. Few schools had access to equipment then, and in some cases, schools with connections to local industry relied on these to access computers. For example, an upper secondary school in Västerås, which had ties with the electrical en-

¹³ *Government proposition regarding measures within the area of adult education 1967/85*, 47, 54. <https://data.riksdagen.se/dokument/ES3085>.

¹⁴ *Proposition 1967/85*, 9, 36, 47.

¹⁵ Lennart Sturesson, *TV som undervisningsteknologi – Exemplet Linköpings tekniska högskola* (Malmö: Stiftelsen Etermedierna i Sverige, 2005), 58.

gineering company ASEA, was the first in the country to set up a computer laboratory to support its teaching.¹⁶

At this point, computer instruction was primarily technical, dealing with questions of programming and the functioning of computers. Systematic training in computing had not yet been established, and very few teachers were qualified to teach it. Some schools started trials, responding to the interest of teachers or school managers, using their own resources.¹⁷

In a school in Karlshamn, mathematics teacher Kenneth Borg, who had taken an evening course in the early 1970s, drove the initiative to firstly hire and then buy a minicomputer financed by the municipality. He, and other subject teachers, visited *Sunnerboskolan* to learn from this school's experiences and afterwards organized training for 10 teachers in BASIC programming.¹⁸ Some schools offered training for their staff, including social science teachers, with the help of training consultants. These consultants faced different attitudes from the participants. One of them noted that teachers would normally start the course expressing that computers did not concern them. But after his introductory lecture, *The computer and the people*, he recalled attendees would become enthusiastic and accept that computers were relevant for them, not only as teachers but also as citizens.¹⁹ Teachers also shared knowledge in forums like the meetings held by mathematics and natural sciences teacher associations, where modules on programming were organized.²⁰

At this point in time, it was mathematics and natural science teachers who had the monopoly on computer instruction and shared their experiences among them. At these courses and conferences, technical knowledge as well as views on what computers meant for education were disseminated among teaching colleagues by the few initiated ones, albeit on a small scale.

In the 1970s, the question of computers in schools was also discussed in forums that involved a broader group of teachers. At the *Education Days* event, organized by the *Swedish Confederation of Professional Employees* (TCO), the question of tech-

16 "Dator i undervisningen vid Västeråsgymnasium," *Dagens Nyheter*, January 21, 1970, 16.

17 Lennart Rolandsson, "Teacher Pioneers in the Introduction of Computing Technology in the Swedish Upper Secondary School," in *History of Nordic Computing 3*, ed. John Impagliazzo, Per Lundin, and Benkt Wangler (Berlin/Heidelberg: Springer, 2011), 162.

18 Kenneth Borg, "Några terminer med en minidator," *Nämnamnaren*, Special issue on Computers 1 (1976): 122–124.

19 Lennart Eliasson, "Kullor, masar och datorer. Hur det gick!," *Nämnamnaren*, Special issue on Computers 1 (1976): 48–49.

20 Harry Lindholm, *Föreningarna för Matematisk-naturvetenskaplig undervisning: Fortbildning och skolpolitik 1933–1971* (Uppsala: Förening för svensk undervisningshistoria, 1991), 182–183.

nical tools in schools dominated the programme. Several speakers at this event stressed that technological tools would not replace teachers. A social democrat minister proposed research investment to prepare people for the drastic changes to come. Politicians and TCO representatives agreed that research in humanities and social sciences should be promoted to catch up with technical development.²¹

The message from the upper echelons of educational politics seemed unified on the need for investment in computer technology for schools. However, in a teaching magazine, one concerned teacher advised against seeing investment in educational technology as more profitable than investment in human resources. He stated that school should not be a super technological intelligence industry; rather, human aspects needed to take primacy.²²

In the 1960s and 1970s, there was a clear divide between enthusiastic teachers who sought training on their own, pushed for equipment purchases and implemented computing courses in their schools, and sceptics who warned about the risks of introducing computers into schools without the necessary knowledge; the latter being the majority and the former subsequently becoming active participants in the design and implementation of state initiatives.

Translating Practical Knowledge into Pilot Projects and First Government-Funded Initiatives

Some schools have become iconic in the history of computer education in Sweden due to their early attempts to offer computer instruction, such as upper secondary schools *Sunnerboskolan* in the municipality of Ljungby, and *Berzeliuskolan*, located in Linköping. Rolf Nilsson and Bo Loftrup worked in the former as mathematics and technology teachers. Both had studied engineering and mathematics at university, and Nilsson had also worked in industry and used computers there. Lars-Eric Björk, another *Sunnerboskolan* teacher, had a background in social sciences and was interested in the consequences of computerization for social development.²³

21 “Tekniska hjälpmedel ersätter inte lärare,” *Lärartidning/Svensk Skoltidning* 46 (1970): 24–25; “Forskning måste också handla om människor,” *Lärartidning/Svensk Skoltidning* 46 (1970): 24–26.

22 Stefan Svedberg, “Skolan får inte bli en superteknologisk intelligensindustri,” *Lärartidningen/Skoltidning* 44 (1973): 24–25.

23 Bo Loftrup and Rolf Nilsson, “Intervju 104. Från matematikmaskin till IT,” interview by Martin Emanuel, July 18, 2008, transcript, 17, <https://www.tekniskamusee.cdn.triggerfish.cloud/uploads/2017/08/104-rolf-nilsson-och-bo-loftrup.pdf>.

They all proposed computing teaching in their school and, with the aid of the school budget, grants from the NBE and donations, obtained some equipment.

Berzeliusskolan started to offer computer instruction from the late 1960s, pushed by the head of the school, Peter Fagerström. Some of the school staff had connections with industries such as DataSaab.²⁴ Saab's management in Linköping promoted computer education early on in schools. According to the vice-CEO of Saab-Univac, society needed to take responsibility for educating pupils in computing as this would be the basis of future development. He also recognized the work of industry and computing associations in Sweden to put a greater focus on computer education in schools.²⁵

When in 1971 the *Ministry of Education* assigned the NBE the task of surveying the possibilities for using computers in schools, the first national project took place.²⁶ This project was not centrally run but was located in Linköping, where expertise in this matter already existed.

In 1973, the project *Computers in the School Municipality* (DISK) (*Datorn i Skolkommunen*) began in Linköping, led by Peter Fagerström. Its aim was to investigate the possibilities for computerizing school administration and teaching.²⁷ The DISK report served as a basis for the NBE's strategy, which was to implement computing in different subjects, as quickly as possible, at the same time as experimental work would help establish best practices.²⁸ Lars-Eric Björk, Bo Loftrup and Rolf Nilsson collaborated on the DISK report, thanks to the contacts that the former had with the NBE, particularly through the teacher training activities in which he had been involved. The DISK report stated that computing should not be taught as a subject on its own. Rather, computers should be used to enhance and facilitate learning in other subjects. Natural sciences and mathematics were subjects in which use of computers could be successfully adapted and could even transform teaching and learning.²⁹ These subjects were those in which they all had first-hand experience.

24 Lennart Rolandsson, "Changing Computer Programming Education. The Dinosaur that Survived in School," (Licentiate thesis, KTH Stockholm, 2012), 32.

25 "Datorer är ett krav för Saabs produkter," *Svenska Dagbladet*, September 24, 1979.

26 Anita Kollerbauer, "Intervju 133. Från matematikmaskin till IT," interview by Martin Emanuel, September 17, 2008, transcript, 8, <https://www.tekniskamusee.cdn.triggerfish.cloud/uploads/2017/08/133-anita-kollerbauer-2.pdf>.

27 Martin Emanuel, "Datorn i skolan: Skolöverstyrelsens och andra aktörers insatser; 1970 and 80-tal: Transcript of a witness seminar," Stockholm, October 30, 2008, 8, <http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-10287>.

28 Rolandsson, "Teacher Pioneers," 163.

29 Rolandsson, "Changing Computing," 31; Lennart Rolandsson and Inga-Britta Skogh, "Programming in School: Look Back to Move Forward," *ACM Transactions on Computing Education* 14, 2 (2014): 12, <https://doi.org/10.1145/2602487>.

The conference *Computers as a Tool in Education* took place in 1973 aimed at creating a forum to promote contact between pedagogues and technology professionals, and to spread activities and experience in this area. The Minister of Education, Ingvar Carlsson, presented the government approach: the aim of bringing computers into education was not to use them as tools to transmit knowledge, but to bring pupils closer to new technologies and help them lose their fear of them. Anita Kollerbaur, representing the national initiatives, assured teachers that the Swedish strategy was about using computers as a complement to their work and not to serve as a substitute.³⁰ Professor Donald Blitzer, from the University of Illinois, talked about the PLATO system at the conference. Although his contribution was received with great interest, a researcher from the Karolinska Institute argued that such a system might not immediately be accepted in Sweden because there was a plentiful supply of teachers.³¹ Teachers also participated in this conference, such as Rolf Nilsson, who presented practical examples of the use of calculators in mathematics teaching. While this event functioned as a stage for initiated teachers to promote their practices and form contacts with like-minded colleagues and professionals, it also addressed the fears and anxieties of the hesitant ones.

In 1972, as a result of the task assigned to the NBE to survey the introduction of computers into schools, an internal investigation was launched, followed by the pilot project *Computers in Schools* (DIS) (*Datorn i skolan*), which operated from 1973 to 1980. According to Anita Kollerbaur, the work of Lars-Erik Björk at *Sunnerboskolan* influenced the work of DIS.³² Several subgroups were created within DIS. One of these investigated how computers could be used in subjects such as mathematics, physics, and economics, as well as in construction and electrical technologies. The group leaders were the teachers who had been active in their schools in places like Ljungby and Gothenburg.³³ Another group was established in 1975 to examine equipment-related questions and formulate specifications for equipment purchases for schools. In 1974, the informatics teachers subgroup was created to outline modules for a computing subject (*datalära*) in the 8th and 9th grades in lower secondary schools and the informatics subject in upper secondary schools (*datakunskap*) for both mathematics and social sciences. Lars Bolander, a former lower secondary, upper secondary, and higher education teacher, who had started

30 Bo Estmer, "Utbildningsministern: Datatekniken bör läras ut i skolan," *Dagens Nyheter*, October 3, 1973.

31 Rolf Bergin, "Datorundervisning mot total kontroll?," *Svenska Dagbladet*, November 14, 1973.

32 Anita Kollerbaur, "IT for learning: A need for a New Approach?," in *History of Nordic Computing*, ed. Janis Bubenko, John Impagliazzo, and Arne Sølvber (New York: Springer, 2005), 225.

33 *Datorn i Skolan: SÖ:s handlingsprogram och slutrapport*, SÖ-projekt 628 (Stockholm: Skolöverstyrelsen, 1980), 23–24.

working with computers in education since 1968, was involved in outlining these courses.³⁴ The working group proposed a syllabus in 1975 which included basic knowledge of how computers work, the basics of information processing, the uses of computers in society, and the ability of individuals and institutions to influence development of a computerized society.³⁵

In the first stages of the DIS project, the course content was not clearly detailed because the idea was that teachers participating in the pilot projects would contribute to defining the contents. A mathematics teacher, for instance, promoted among his colleagues the inclusion of programming in the mathematics curriculum. He argued that teaching programming as a tool to solve problems could help develop a healthy attitude towards computers.³⁶ Computer science professor Börje Langefors added that basic programming could be simple to learn through dialogue-oriented systems, which would find a natural place in mathematics courses in the modern school.³⁷ But although some teachers were convinced that programming was necessary, variations in the content of teaching occurred, reflecting schools' situations and needs.

The DIS project's final report was adopted as the first action plan of the NBE in the area of computers in schools. The action plan formulated a threefold target for computer education in lower secondary schools: computer education should "give pupils knowledge so that they want to, dare to, and are able to take a position regarding computers and the use of computers in society".³⁸ The final report also mentioned that access to computer equipment was not a requirement in lower secondary schools. In order to support municipalities and schools in purchasing computer equipment, the DIS group suggested centrally formulated specifications, recommendations, and state grants.³⁹

The DIS group recommended continuous renewal of computer use according to changes in the use of computers in society and school. To support this aim, the action plan proposed the following: teacher training; changes in teacher education; access in upper secondary schools to computer equipment and software

34 Emanuel, "Datorn i skolan," 11.

35 Anita Kollerbauer, "Datorn i skolan – DIS projektet," *Nämnnaren*, Special issue on Computers 1 (1976): 19–20.

36 Håkan Söderström, "Dumma data! ... eller Hur människan åter kan bli herre över maskinen," *Nämnnaren*, Special issue on Computers 1 (1976): 8–9.

37 Börje Langefors, "Datorer och skolan," *Nämnnaren*, Special issue on Computers 1 (1976): 15.

38 *Datorn i skolan: SÖ:s handlingsprogram*, 2.

39 *Datorn i skolan: SÖ:s handlingsprogram*, 6.

through state grants; special resources for schools to help them organize their activities; and continuation of the work on creating course syllabuses and material.⁴⁰

Although DIS concluded that the computing subject should include only basic notions of programming and the functioning of computers and emphasize the effects of computerization in society and work, there was an ongoing debate on the importance of programming, steered by mathematics and natural science teachers, which was often mirrored in the teaching that took place in many schools and in broader teacher training.

Early Teacher Training

During the school year 1975/76, the contents of the computing courses for lower and upper secondary schools were the same. The DIS group organized teacher training for both levels starting in the summer of 1975. Publishers of teaching materials created resources, some of which were used and evaluated during the project.⁴¹

Teacher training in computing was scarce at this time, and to tackle this problem, Lars-Erik Björk recommended that readers of the mathematics teaching journal *Nämnanen* exhaustively read the journal's articles on computing and start working on a computer with an initiated guide.⁴² In addition to the NBE's summer courses, adult education and higher education institutions offered teacher training in computing.

Bengt Nilsson, who was in the Gothenburg County teacher training department in the mid-1970s, remembers that several teachers, especially those of natural sciences, were very interested in computers. For his training, Nilsson borrowed minicomputers from companies to demonstrate simple programming and invited dedicated guests and researchers as speakers to talk about the importance and future of computers. According to Nilsson, after the introductory courses, teachers expressed the desire to gain even more programming knowledge. Natural science and physics teachers showed such a high interest in programming that it almost became the main goal of the computing lessons. These teachers complained

⁴⁰ *Datorn i skolan: SÖ:s handlingsprogram*, III–IV.

⁴¹ Kollerbauer, "Datorn i skolan," 21–22.

⁴² Allan Henriksson, "Några frågor om datorer och fortbildning," *Nämnanen*, Special issue on Computers 1 (1976): 38–39.

about modules that dealt with the social aspects of the computer society and wanted this knowledge to be directed towards social science teachers instead.⁴³

The DIS report recommended that training be arranged in such a way that the teachers concerned would be able to influence the form and implementation of courses and take a leave of absence to attend training.⁴⁴ However, in practice, teachers had restricted influence on their training. In 1982, the demand was greater than the offer. In the Stockholm region alone, 965 teachers were on a waiting list for spring courses; there were only funds available for 20 to 30 teachers. A training consultant noted that technology was developing extremely rapidly, and the teacher training they were about to carry out already required an update.⁴⁵

In a teachers' union magazine article, Anita Kollerbaur (who was involved in development of the DIS summer courses and led training for lower secondary teachers at Stockholm university) addressed the concerns of many teachers she had met and stated that no programming knowledge was necessary to teach computing. Computing in lower secondary education, she affirmed, was mainly about the use of computers in society.⁴⁶ The scope of DIS remained limited throughout the duration of the project, reaching merely 450 teachers and 8000 pupils.⁴⁷

Feedback on training showed that mathematics and natural science teachers often acted as translators of computer knowledge, and transmitted the experience they had acquired through formal training and through their own practice. They had been involved with computers previously in their own schools and in their work outside schools, and they were considered by educational authorities and teaching colleagues as specialists in translating computer technology into classroom practice.

43 Bengt Nilsson, "Intervju 135. Från matematikmaskin till IT," interview by Martin Emanuel, December 5, 2008, transcript, 9, <https://www.tekniskamusee.cdn.triggerfish.cloud/uploads/2017/08/135-bengt-nilsson.pdf>.

44 *Datorn i skolan: SÖ:s handlingsprogram*, 5.

45 Anita Rooth, "På väg in i dataåldern? Skolfolk och dataexperter diskuterar datorns roll i skolan," *Lärartidningen/Svensk Skoltidning* 11 (1982): 2–4.

46 Anita Rooth, "Hur många fick en dator av tomten i julas?," *Lärartidningen/Svensk Skoltidning* 3 (1983): 17–18.

47 *Digitaliseringen i skolan – dess påverkan på kvalitet, likvärdighet och resultat i utbildningen*, Parliament report (Stockholm: Riksdagstryckeriet, 2016), 2015/16: RFR18, 67.

PRINCESS and PRODIS Focus on Pedagogy and Computer Equipment

The PRINCESS (*Project for Research on Interactive Computer-Based Education Systems*) (1973–1983) and PRODIS (*Software and Computer Equipment for Computers in Schools*) (1979–1981) initiatives were carried out in parallel with the DIS project. PRINCESS was a research and development project on use of computers as teaching aids in education, based at the *Department of Automatic Data Processing (ADP)* at Stockholm University.⁴⁸ The aim of the PRINCESS project was to improve education using computer aids, developed in an interdisciplinary fashion, involving pedagogues in system development.⁴⁹

Bengt Nilsson, who was partly responsible for the administration of teacher training in computing, recalls that his attitude and that of other mathematics teachers towards PRINCESS was critical because they considered its objectives to be too ambitious for the times. Mathematics teachers wanted to learn and teach basic programming, while the research project was using more advanced methods to integrate computers in schools. The lack of acceptance might, at least partly, have been a matter of gender, considering that a predominantly male teaching staff would be receiving input from a female research director. Nilsson affirmed: “She [Kollerbauer] was a woman and quite combative. This [meant] that she [encountered] antagonists in the natural sciences ranks, those who wanted to bring out these more math-oriented elements [in computing teaching]”.⁵⁰ While it is not possible with the sources available to analyse the effects of gender structures in the teaching body, teacher training, and the development of computing as a subject in schools, there appears to have been a masculine culture which would be worth investigating further.

The PRINCESS group concluded that computers could improve learning by allowing students to gain knowledge from performing meaningful activities in a way that satisfied their individual needs. Moreover, the project’s final report stressed the role of the user in hard- and software development. These results convinced the NBE to fund courseware development, and the Board for Technical Development (STU) to initiate a procurement project to build a school computer.⁵¹

48 Kollerbauer, “IT for learning,” 224; Martin Emanuel, “Folkbildning kring datorn 1978–85, Transcript of a witness seminar,” Stockholm, October 9, 2008, 22, <http://kth.diva-portal.org/smash/reCORD.jsf?pid=diva2%3A214187&dswid=8485>.

49 Kollerbauer, “IT for learning,” 225.

50 Nilsson, interview, 14.

51 Kollerbauer, “IT for learning,” 233–234.

The PRODIS group was formed by members of the DIS subgroup on computer equipment questions, some of whom also held (between 1975 and 1985) teacher training courses every summer. Part of the work of PRODIS was to find and create software that could be useful for different subjects. Teachers were encouraged to send their self-made programs to the PRODIS group for distribution, but nobody did. Instead, the PRODIS members created software and published a booklet⁵² with lists of programs for different subjects.⁵³

Except for PRINCESS, most pilot projects and national initiatives were primarily led and supported by teachers who had had early experience of computers in schools. They translated schools' needs and helped set the NBE's agenda. They were able to merge the government guidelines that stressed computer literacy for pupils with their interests in programming and use of computers, to transform teaching in certain subjects through their practical work in teacher training, creation of teaching materials and their work outlining specifications for hardware and software purchases. However, throughout the course of these projects, the participation of teachers was limited. Many felt excluded or apathetic regarding the use of computers in their teaching practice. Two important changes came about in the 1980s that broadened the scope of teacher participation: the curriculum reform for lower secondary schools and, to a larger extent, the three-year campaigns that funded the purchase of computer equipment on a broader scale.

Computing in Lower Secondary and Upper Secondary Schools

The curriculum reform for compulsory education (Lgr80) introduced computing as a central module in mathematics and as a topic in social sciences in the senior years of compulsory education, from 1982 onwards. This module consisted of basic programming and computer technology knowledge.⁵⁴ The idea was for all pupils to have an opportunity to become familiarized with the workings of computers.⁵⁵

52 Rolf Nilsson, ed., *Programvara i datalära* (Stockholm: LiberLäromedel/Utbildningsförl., 1980).

53 Emanuel, "Datorn i skolan," 30–31.

54 Ulla Riis, *IT i skolan mellan vision och praktik – En forskningsöversikt* (Stockholm: Skolverket, 2000).

55 Jörgen Nissen and Ulla Riis, *Datalära på grundskolans högstadium: en ögonblicksbild från tre kommuner och sex skolor vintern 1984/85*. Report Ds C 1985:15 (Stockholm: Liber/Almänna förlag, 1985).

However, this change did not lead to immediate and pervasive computing teaching practice in all Swedish schools, which can be explained partly by the process of decentralization of Swedish schools, which started in the 1970s.⁵⁶ Nevertheless, the reform laid the basis for subsequent initiatives and programmes to expand and implement computer education.

Teachers' engagement in computer instruction was considered crucial at the upper levels. The NBE's general director, Birgitta Ulvhammar, argued that teachers should be a bridge between the suspicious and ignorant older generation and the new computer-savvy generation.⁵⁷ However, computers were a source of anxiety for many. Computers changed established teaching situations and challenged the status of teachers as pupils in many schools knew more about the workings of computers than their teachers.⁵⁸

Municipalities had different strategies and levels of prioritization. While some municipalities aimed to offer computer instruction from the lower levels of mandatory education, others focused on higher level programming, and others were interested in stressing democratic values in their teaching. Teacher training strategies also varied, from sending teachers on advanced courses at the university to touring computer-equipped buses.⁵⁹ Despite the reform, however, scepticism was still latent, and most schools lacked equipment, which made the endeavour impracticable.

An orientation towards computing as well as programming had been offered in upper secondary education since the 1960s. However, to give computer instruction more time and depth in all tracks, upper secondary schools received a state grant for the purchase of computer equipment in 1981.⁶⁰ In 1983, the NBE developed a syllabus for computer science within the natural sciences programme, in the computing track. The curriculum was highly detailed, in order to give teachers clear guidelines to plan their teaching. It also led to an urgent need for training for

56 Carl-Henrik Adolfsson and Daniel Alvunger, "Power dynamics and policy actions in the changing landscape of local school governance," *Nordic Journal of Studies in Educational Policy* 6/2 (2020).

57 "Nya lär oplanen ger möjlighet för en skola som vill lyckas," *Lärartidning/Svensk Skoltidning* 11 (1980): 38.

58 Gunilla Jedeskog, "Lärare och IT," *Human IT Tidskrift för studier ur ett humanvetenskapligt perspektiv* 4 (1998): 5.

59 Anita Rooth, "Här har lärarna datautbildningen in på knuten," *Lärartidningen/Svensk Skoltidning* 29 (1985): 31; Anita Rooth, "Gymnasieelever gör program åt barnen på lågstadiet," *Lärartidningen/Svensk Skoltidning* 8 (1985): 20–21; Anita Rooth, "Datorn i Skolan- Temanummer om datorer, lärare och elever," *Nämnanaren* 4 (1982–1983): 66.

60 Regeringens skrivelse Skr. 1984/85:218, *Med redovisning av vissa planerade åtgärder för att effektivisera statens insatser inom informationsteknologiområdet*, 30.

mathematics teachers.⁶¹ Upper secondary schools and municipalities tried a variety of training strategies, although many required more advanced training in information processing, programming techniques, numerical methods, and systemization⁶² which was offered at universities and colleges. Social science teachers were generally less involved, even though some schools stressed questions of integrity and the social effects of computerization.⁶³

Teachers' Unions

In 1983, the *Swedish Teachers Association* (SL) decided to monitor the development of computer technology in education. While it recognized that the question of computers in schools had been the responsibility of a few enthusiasts, with the new curriculum change and the computerization of society, it was necessary for them to act centrally and involve a larger number of teachers.

The SL was concerned with the development of teaching forms that promoted pupil involvement in computer learning, increased gender equality in technical subjects, and help for pupils with learning difficulties.⁶⁴

In the early 1980s, a third of schools (primary, upper secondary, and municipal adult education) were not providing computer instruction. By the summer of 1983 there were 3000 computer workstations in primary schools and 5000 in upper secondary schools. On average, there were five workstations per primary school and 20 per upper secondary school, among the schools that offered computer instruction.⁶⁵

Against the backdrop of this situation, the SL presented its computer policy programme in 1984. The SL demanded that computers be used only when better pedagogical results could be ensured; that all teachers and school administrators were offered training; and that computer equipment be made available in all schools.⁶⁶ Inclusion of all teachers in computer education turned out to be unfea-

⁶¹ Rolandsson, "Teacher Pioneers," 164.

⁶² Bertil Lind, "Datateknik – variant på N-linjen," *Nämnamnaren* 2 (81–82): 57–58.

⁶³ "Vi vill krossa myten att det är svårt att hantera en dator," *Lärartidningen/Svensk Skoltidning*, 3 (1983): 34–38.

⁶⁴ Lars Emanuelsson, "SL: Datafrågor ger förbundet ett nytt bevakningsområde," *Lärartidningen/Svensk Skoltidning* 3 (1983): 24; Hans Hamber, "SÖ: – År 2000 finns säkert en dator i varje klassrum," *Lärartidningen/Svensk Skoltidning* 3 (1983): 26.

⁶⁵ SOU 1985:50, Datadelegationen, *Bred datautbildning*, 36.

⁶⁶ Anita Rooth, "Nu presenterar SL ett datapolitiskt program för skolområdet," *Lärartidningen/Svensk Skoltidning* 8 (1984): 10–13.

sible due to a lack of material resources (equipment, teaching materials, and teacher training funds) and the disinterest of many teachers.

A couple of years after the introduction of the computing subject in lower and upper secondary schools, teachers were concerned about the development. Up until then, the role of mathematics and natural science teachers had been dominant, even though the syllabus included the social consequences of computerization and awareness of the uses, risks, and benefits of computers in society. As an attempt to broaden teacher participation and increase schools' access to equipment, stimulus grants were distributed with the three-year campaigns of the 1980s.

Access to Computers – The Three-year Campaigns

In 1984, the second action plan for computers in school, *Education Facing the Computer Society*,⁶⁷ was released. This plan acknowledged the need for computer equipment and established a goal of 80 hours of computer instruction during the three years of lower secondary education.⁶⁸ In order to achieve this, the *Three-Year Campaign in Computing (Treårssatsningen på datalära)* (1984–1987) was launched. This campaign provided lower secondary schools with a stimulus grant of 20 million kronor per year to equip one computer room with eight computers in a local network.⁶⁹ Schools were required to present a teaching plan; to have at least one staff member trained in automatic data processing; to purchase NBE-approved equipment; and the municipality should contribute the same amount.⁷⁰ One year after the start, participating schools still had a long way to go in terms of achieving the set goals. The schools that were farthest ahead had one or two interested teachers (usually from the natural sciences) who had driven the development. In most cases, computing instruction was limited, and teachers were dissatisfied with the possibilities for undergoing training and the equipment available.⁷¹ Computer instruction and use of computers in schools were very far from meeting the expectations of policymakers.

67 *Utbildningen inför datasamhället: utgångspunkter och inriktning* (Stockholm: Skolöverstyrelsen, 1984).

68 Anders Söderlund, "Det långa mötet IT och skolan: om spridning och anammande av IT i den svenska skolan" (PhD Diss., Umeå University, 2000), 76.

69 Ulla Riis, "Skolans datorisering under 1980- och 90-talen," in *IT i skolan mellan vision och praktik*, ed. Ulla Riis (Stockholm: Skolverket, 2000), 10–11.

70 Nissen and Riis, *Datalära*.

71 Nissen and Riis, *Datalära*.

In 1985, in parallel with the *Three-Year Campaign in Computing*, two groups were established within the *Ministry of Education*: the *Informatics Education Group* (DUG) (*Datautbildningsgruppen*) and the *Educational Software Group* (DPG) (*Dataprogramgruppen*). The DUG was in charge of developing an action plan for the future of computer education at all levels, which was completed in 1986.⁷² The DUG's report proposed to revise the content of the computing subject, with the aim of deepening pupils' knowledge gained in lower secondary school and assessing the appropriate soft- and hardware needs to meet their curriculum ambitions.⁷³ While this group was part of a higher level political structure, there were also members who had closer contact with schools, such as Lars Bolander.⁷⁴ Bolander argued, in retrospect, that the ambition of the government to bring computers to schools was limited by the available funds, the state of software at that moment and the lack of interest of most teachers.⁷⁵ The report that resulted from this group's work was the basis of subsequent measures and programmes, such as the *Computer as a Pedagogical Tool* project (DOS).

The DPG, active from 1985 to 1988, was led by a director of the *Ministry of Education*; former teachers Lars Bolander and Göran Nydahl were also members of the group. The aim of the DPG was to establish criteria for appropriate educational software and to create software suited to different subjects in lower secondary and upper secondary education. This group was relocated in 1988 to the NBE to work within the framework of the DOS project.⁷⁶

The Swedish parliament established another three-year campaign, called the *Computer as a Pedagogical Tool – The Computer and the School* (DOS) (*Datorn som pedagogiskt hjälpmedel- Datorn och skolan*) in the period 1988–1991. This initiative, led by former teacher Leif Davidsson, included curricular development, educational software production, and evaluation of computer hard- and software.⁷⁷ The project aimed to promote use of computers as pedagogical aids in vocational tracks for occupations in which computers were present, as aids for pupils with a disability or learning difficulty and to facilitate individual learning.⁷⁸ This project

72 Ds U 1986:10, Datautbildningsgruppen, *Handlingsprogram för datautbildning i skola, vuxenutbildning och lärarutbildning*.

73 Rolandsson and Skogh, *Programmning*, 17.

74 Emanuel, "Datorn i Skolan," 11.

75 Emanuel, "Folkbildning," 22.

76 Söderlund, "Det långa mötet," 82–83.

77 Leif Davisson, *Verksamhetsplan för projektet Datorn och Skolan- DOS-projektet*, 75–88:210 P. 1989–03–22. Skolöverstyrelsen V-avd/ KOMVUX och GRUNUVUX Datorn och skolan/DOS-verksamheten F2: 1. National Archives of Sweden.

78 Ulla Riis, *Skolan och datorn: satsningen Datorn som pedagogiskt hjälpmedel 1988–1991* (Linköping: Linköping University, 1991), 10–11.

was once again of a pilot character and did not encompass all Swedish schools. Schools of all levels could apply for funds, which were distributed to a total of 160 local projects. In practice, language teachers were the most frequent users and they simply applied commercial word processing programs. Little was accomplished regarding software for other school subjects, and when such software was created, it could seldom be diffused beyond its local creator.⁷⁹

Some of the work on software development took place locally. The NBE's DPG gave the *Centre for Computer Pedagogy* in Gävle (GDPC), led by mathematics and physics teacher Örjan Broman, the task of developing pedagogical software according to the NBE's specifications. The DOS project ended rather abruptly when the NBE was replaced by the *Swedish National Agency for Education (Skolverket)* in 1991.

The DOS project was an attempt to broaden computer use to a wider variety of subjects and to engage a larger number of teachers and schools. The interest in software development responded to the need for more user-friendly programs, as many teachers had requested, but also to the further development of computer technology at the time. Unlike earlier projects in which programming knowledge was, in practice, a required skill for teachers, the DOS project focused more on the pedagogical needs of teachers and schools. While, according to school leaders, more teachers were interested in the projects, there were still many who were against the use of computers, arguing that pupils' social competencies could be at risk. At this time, many teachers who had fulfilled the role of computer expert and a driving force of school computerization were no longer active, and many had left for the IT industry.⁸⁰ However, in those schools who participated in the campaign, there were one or two enthusiastic teachers who led local projects. In most schools, the projects did not lead to the instituting of comprehensive and steady computer use, mainly because the great majority of teachers did not participate in such projects, even in schools where trials took place.

Concluding Discussion

In this chapter, I have presented a historical overview of the introduction of computers into lower secondary and upper secondary schools in Sweden. The projects discussed here were all trials focused on discovering and determining good practice.

⁷⁹ Riis, *IT I skolan*.

⁸⁰ Riis, *Skolan och datorn*, 57–58.

Although state initiatives and plans mandated computer education in Swedish schools (and budgets and personnel were allocated to support this aim), the role of teachers as agents of change was crucial. But teachers also acted as opponents, hindering the diffusion of computer use in schools.

With the help of Bruno Latour's model of translation, I have sought to uncover the framework around the introduction of computers in the classroom within which teachers have been a central actor. I have shown how the first attempts to use computers in education were initiated by teachers who brought computer devices to their workspaces and promoted teaching practices among their colleagues. The interest of these pioneering teachers matched centrally formulated political decisions. These teachers then became translators, their teacher peers and the educational authorities, when they were finally actively included in national projects.

I have shown the connections between so-called teacher enthusiasts and the authorities. Some names persisted as notable actors throughout the very early trials up to the 1980s campaigns, even though the aims and perspectives of computer education changed throughout the period.

But there is another side to the story often left untold. While sceptical teachers are often excluded from the narrative of computerization of Swedish schools, their views also help to explain the timing and development of the phenomenon. On the one hand, lack of action from their side prevented curriculum changes from being effectively implemented. On the other hand, critical stances gave rise to the engagement of, for example, teachers' unions and teacher training providers. Thus, when teachers encountered a computer (with guidelines on hand for teaching about computers, or the possibility of training in this area), their decisions and actions formed the path for what would become the Swedish experience of early computer education in Swedish schools.

Plenty changed in the 1990s, after the first pilot projects outlined here. One major change was the engagement of a significantly larger number of teachers in the endeavour. How and why this happened and which networks then became crucial are worthy questions for future research. I have, however, sought to provide a basis for understanding future developments in education in a country that, by the 1990s, was at the forefront of computer use.

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