Information Literacy in the Netherlands: Rise, Fall and Revival

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Abstract. This contribution describes and reflects on the development of Information Literacy in the Dutch curriculum for secondary education in the early 1980s, its place in the curriculum in the 1990s and its evaporation early 2000. After a decade without any attention for Information Literacy in the curriculum, the Royal Academy of Arts and Sciences called for a revival of Information Literacy early 2013. Based on lessons learned from the past, we will finish our contribution with some reflections on this initiative and describe emerging opportunities

Keywords: information literacy, The Netherlands, curriculum, computer science

1. Introduction

Developments in information technology at the end of the 1970s and the early 1980s lead to policy discussions and recommendations in North America and Western Europe about implications of these developments for the education sector. In the Netherlands this resulted in a number of advisory reports [1,2] with recommendations regarding the role of information technology in education.

Although the implications of developments in information technology for education are driven by many different rationales [3], in the early 1980s the social rationale was an important argument in the debate. The social rational focuses on the need to prepare young citizens for living in a society driven by information technology. In many countries, although not without debate, discussions between different stakeholders lead to the call for a new subject in the curriculum. The new subject, often referred to as computer literacy, aimed to develop basic knowledge and skills in computing. It is distinguished from specialized computer science courses offered in vocational education programs and in higher education. Lockheed, Hunter, Anderson, Beazly and Esty [4] defined computer literacy as everything a person needs to know and to do with computers in order to function competently in an information-based society. The curriculum discussion at national or state levels did not question so much the need for paying attention to computer literacy in the curriculum, but focused on the goals and content of the new subject and the location of the new subject in the curriculum [5].

From the start computer literacy did not only deal with being able to operate computers, but aimed for broad educational goals [6]. For instance programming was considered important because of the perceived link between programming skills and problem solving skills [7]. The potential of computers to store, retrieve and manipulate enormous amounts of data addressed the importance of dealing with concepts as 'information' and 'data'. In the Netherlands the call for computer literacy as a new subject in the curriculum resulted in a number of curriculum development activities in the 1980s resulting in a new compulsory subject for lower secondary education in the early 1990s.

2. Information Literacy for all: The Development of a New Subject

In 1982 the Minister of Education Culture and Sciences took the initiative to ask for advice on the place and content of new technologies in education. The Adviescommissie Onderwijs en Informatietechnologie [AOI] which was appointed published four advisory reports. Two of these reports dealt with the development and implementation of a new subject in lower secondary education [8,9].

In her first report the AOI advised to implement a new compulsory subject in lower secondary education called *burgerinformatica* ("Information technology for all"). The committee proposed four domains for the new subject: (1) experiencing computers (acquiring a functional understanding of computers); (2) computers, programming and data (acquiring an operational understanding of computers); (3) managing computer systems and (organizational, economical, societal, psychological) impact; and (4) applications of information technology [8]. Based on the comments the AOI received it was decided to add aspects of information literacy to the new subject. As a result the name for the new subject was changed into *informatiekunde* (information literacy) with the following domains: (1) information and data; (2) general applications of information systems; (3) applications of digital information systems ; (9) problem analysis & programming, and (5) design principles of hardware and software [9]. The committee advised to implement *informatiekunde* in lower secondary education as a compulsory subject taking two hours per week at the expense of mathematics and Dutch language.

In 1983 a pilot project (100-scholen project *burgerinformatica*) took off in secondary education. One hundred secondary schools were provided with eight computers (Philips 2000 and Aster CT-80) and software and curriculum materials developed by the National Institute for Curriculum Development in the Netherlands. To prepare teachers to teach *burgerinformatica* in-service education open for teachers of all subjects was provided by teacher education institutes. In the pilot project schools were asked to explore and experiment with the potential of information technology in education. A major concern at the start of *burgerinformatica* was its association with mathematics and science, and the possibility that the new subject was in the interest of boys, leaving out the girls. One reason for this concern was the emphasis on computer literacy in the initial plans of the AOI [8]. In addition in the participating schools mainly math teachers appeared to be the early adopters of the

new subject, because of their knowledge, experience and interest in information technology [10]. Voogt [11] showed that this concern was indeed valid. In a survey among students in the participating secondary schools it became clear that boys had more positive attitudes towards computers than girls. To deal with this concern it was decided to broaden the scope of the subject with aspects of information literacy, as became clear in the recommendation of the AOI in 1984 [9]. In addition SLO, the National Institute for Curriculum Development, focused on curriculum materials for *burgerinformatica* that covered a broad spectrum of information technology applications, which are not only interesting for boys, but also for girls.

The preparatory work of the AOI and the experiences in the pilot project resulted in 1988 in the formal installation of a curriculum development group by the Ministry of Education, Culture and Sciences that had to develop core objectives for the subject *informatiekunde* (information literacy) in lower secondary education. The curriculum development group used much of the preparatory work done by the AOI and launched an ambitious plan for the new subject which should take 80 hours of curriculum time. The new subject had four domains: (1) data, data processing and information; (2) information processing systems; (3) applications of information technology and (4) the impact of information technology on society. Concrete core objectives were formulated for each of these four domains.

At the time an educational reform of lower secondary education took place and all subjects of the lower secondary education curriculum were reconsidered and updated. The curriculum deliberations taking place during the reform resulted in the decision for a mixed approach in the delivery of *informatiekunde* in the curriculum. A small 20-hour course called *informatiekunde* was planned as a separate subject in the curriculum. This course had to deal with concepts related to information handling and basic skills in using general computer applications. In addition to the separate course the goals of *informatiekunde* had to be addressed via other subjects in the curriculum such as Dutch language, mathematics, science and social studies. Specific subject related core objectives for *informatiekunde* were formulated such as the use of word processing in Dutch language and the use of simulations and data logging in science. It was assumed that the 20-hour course for *informatiekunde* would have a launching effect and after a couple of years all objectives of *informatiekunde* would be fully integrated within other subjects [12].

The integration of information literacy in other subjects caused new challenges for the implementation since teachers were not well prepared for the uptake of information literacy in their curriculum. To investigate the potential of the integration of information technology in other subjects several studies were conducted, amongst them three studies were conducted focusing on the integration of information technology in Dutch language [13], the integration of information technology in science education [14] and the integration of information technology in social studies [15]. In these studies exemplary curriculum materials aiming to support teachers in the implementation of *informatiekunde* objectives in their curriculum were developed and evaluated. The exemplary curriculum materials respectively focused on the use of word processing to support written communication in the Dutch language curriculum, the use of probe software to support inquiry-based learning in science education and the application of hypertext in the social studies curriculum. The three studies showed two main problems: (1) teachers not only needed a lot of help to learn how to use the

technology, but also needed to change their pedagogical approach to teaching and learning in order to be able to implement the technology; and (2) the infrastructure in schools was not yet ready for the uptake of technology.

3. Implementation of Information Literacy in the Lower Secondary Education Curriculum

The new lower secondary education curriculum was implemented from 1993 onwards. i*nformatiekunde* had a modest by secure place in the new curriculum both as a separate subject and integrated in other subjects, and underpinned by attainment targets schools were expected to realize in their teaching. However, due to the advisory reports by the AOI and the pilot study (*100 scholen project burgerinformatica*) *informatiekunde* had in fact already taken off much earlier in most secondary schools. Many publishers had developed textbooks for the new curriculum using the exemplary curriculum materials of the National Institute for Curriculum Development and the objectives formulated by the AOI as a starting point.

The findings of the International Computers in Education Study, in which the Netherlands participated showed that in 1989 89% of secondary schools offered *informatiekunde* in at least one of the first three years of lower secondary education and 15% of the schools integrated the goals of *informatiekunde* in one or more other subjects [16]. However by comparing textbooks with the formal core objectives for *informatiekunde* a number of discrepancies were found [17]. In the textbooks ample attention was paid to basic computer concepts, accessory devices and software applications (word processing, databases, simulations, telecommunication and educational games). Although programming skills were not part of the goals of *informatiekunde*, about half of the textbooks paid attention to programming. The results from school practice showed that at the end of the 1980s schools in particular paid attention to basic computer concepts and word processing, implying that only a small part of the planned core objectives were realized [17].

The participation in CompEd resulted in the development of a national monitoring system to oversee the implementation of information technology in the curriculum. The results were very informative concerning the implementation of *informatiekunde* as a separate subject and the integration of *informatiekunde* in other subjects. The 1998/1999 monitor showed that only one third of the teachers in secondary education used information technology in their instructional practice but on an infrequent basis [18]. This had hardly changed since 1992. Moreover, in comparing scores of 5th (primary education) and 8th graders (lower secondary education) in 1992 and 1998 on an information literacy knowledge and skills test it could be shown that students in primary and secondary education knew more about information technology and had better skills in 1998 compared to 1992, but also that the difference between primary school students and lower secondary education students decreased significantly. In fact there was an 70% overlap between the two groups [19, 20]. This implied that already in primary education the majority of the students mastered many of the information literacy goals when they entered secondary education. The study also found that primary and secondary school students knew more about information

technology than their teachers think. Teachers tended to underestimate the knowledge and skills of their students [21]. In addition, based on an evaluation of the 1993 lower secondary education reform, it was concluded that the quality of lessons *informatiekunde* were poor and the students results insufficient [12].

Based on these findings it was decided to revise the lower secondary education. *Informatiekunde* as a separate subject was no longer compulsory. The 1998 core objectives targets were reformulated on a much more general level, implying that the specific core objectives which secured the integration of *informatiekunde* in other subjects had disappeared. By the year 2000 *informatiekunde* had a nearly invisible place in the curriculum. These developments lead to the evaporation of *informatiekunde* in the curriculum by early 2000.

4. Computer Science in Upper Secondary Education

Compared to the development of *informatiekunde*, the development of computer science for upper secondary education drew less political attention. Computer science was never considered a compulsory subject for the upper secondary science curriculum, but an optional course. The examination program for the optional computer science course was agreed upon in 1995. This course has four sub-domains: Computer science in perspective, basic concepts and skills, systems and the way they are structured and applications in conjunction. It was decided not to have a national examination for computer science at the end of secondary education, but a school-based exam instead. Through this decision the subject never is taken very serious by secondary schools. The course is offered by about 60% of the secondary schools. Computer science as a subject in upper secondary education always had its problems, which can be summarized as (1) too few students choose computer science; (2) too few qualified teachers; (3) too few means (hard- and software, including text books) to develop and teach the subject and (4) the maintenance of hard- and software is complex and expensive. An additional problem was that the subject attracted relatively few students, probably because the subject was perceived by students as too technical [22]. A recent review study of the text books for computer science in upper secondary education showed a poor quality of the curriculum materials with much attention on knowledge reproduction and hardly any practice in complex learning activities like programming. The study concluded that students in upper secondary education learn about programming without practice in programming [23].

5. A New Call for Digital Literacy in the Curriculum

At the end of the 1990s and the early 2000s the educational policy regarding the role of information technology in the curriculum had shifted. From a focus on the social rationale the policy had shifted to an emphasis on the pedagogical rationale [3]. From learning *about* information technology, as expressed in the *informatiekunde* curriculum the policy focused now on *using* information technology to learn [24,25]. For more than a decade the policy focused on the integration of information

technology as a tool for learning and the uptake of information technology by teachers and not on information literacy goals.

Thirty years after the early policies on information technology in education, with its focus on understanding information technology concepts, the impact of information technology on society, and basic knowledge and skills in information technology for coping with changes in society [26] the debate on the importance of information technology for society and the need to pay attention to it not only as a means for learning but also as a curriculum goal seems to revive. Kennisnet, the public educational organization which supports and inspires Dutch primary, secondary and vocational institutions in the effective use of Information and Communication Technology, commissioned a white paper about 21st century skills. In the white paper the importance of information technology as driving force for changes in society and its implications for education was analyzed and discussed [27]. A major issue in the white paper was the need to pay attention to digital literacy[1] (knowledge and skills), not only as a tool for learning but also as a goal in itself. In particular attention was paid to the need for students to better understand technological developments in order to be able to cope with changes in society. Voogt and Pareja Roblin [27] recommended a public debate about the need for and place of 21st century skills in the curriculum.

Early 2013 the Royal Netherlands Academy of Arts and Sciences [28] published a report in which they recommended to pay more attention to digital literacy in the secondary school curriculum. The report was highly influenced by an influential report of The Royal Society [29] in the United Kingdom. The Royal Society advocated for more attention to Computer Science in the primary and secondary school curriculum and emphasized the importance of computational thinking as an important ingredient of digital literacy. Computational Thinking was defined in their report as "the process of recognizing aspects of computation in the world that surrounds us, and applying tools and techniques from Computer Science to understand and reason about both natural and artificial systems and processes" (p. 29). According to Wing [30] computational thinking is a universally applicable attitude and skill set everyone, not just computer scientists, would be eager to learn and use" (p. 33).

The report of the Royal Netherlands Academy of Arts and Sciences questioned the lack of education in digital literacy in the lower secondary education curriculum and the outdated computer science curriculum in upper secondary education. The Royal Netherlands Academy of Arts and Sciences recommended to develop and implement a compulsory subject Information and Communication for the lower secondary school curriculum and a profound renewal of the optional computer science course in upper secondary education. In both courses computational thinking was mentioned as a core skill needed in the knowledge society. Both subjects should have clear links to each other and to other school subjects. To overcome the problem of under-qualified teachers it was also recommended to redesign the preparation programs for computer science teachers.

[1] The term digital literacy is used here, because it shows the development of the concept information literacy since the early 1980s.

By the end of 2013, as an answer to these developments, the National Institute for Curriculum Development was asked by the Ministry of Education, Culture and Sciences to define a conceptual framework for digital literacy in the primary and secondary school curriculum [31], which might be an indication of a revival of attention for information literacy and computer science in the primary and secondary school curriculum in The Netherlands. In addition the Dutch Government is preparing a policy document that will provide a vision on how to prepare students on the use of information technology. This policy framework will be published in 2014 and could be the formal revitalization of information literacy in Dutch education.

6. Discussion

This chapter described the rise, fall and revival of information literacy as a curriculum goal in the Dutch secondary school curriculum. Looking back at the history critical decisions were taken at specific points in time, that caused the lack of attention for digital literacy as a school subject in the current (2013) primary and secondary curriculum. Lessons learned from history may inform the current debate on the place of digital literacy in the curriculum, which we will discuss in this section.

6.1 The Gap between the Intentions and Practice

From an international perspective the debate in the late 1980s and early 1990s focused on two issues (1) a conceptual versus an instrumental approach to information technology as a school subject and (2) the place of the new subject in the curriculum [5]. In the instrumental approach computers were seen as increasingly important tool in society, and it was considered important to be able make use of them. For this reason the main focus was to become acquainted with major computer applications. A big threat to the instrumental approach is that rapid technological developments makes information literacy obsolete in a short time, as was already observed by Collis in 1988 [32]. In the conceptual approach the subject was based on a body of knowledge about information and information systems and accompanying skills. The main focus was on understanding information systems. The use of computer applications was only a minor part of the subject. In the Netherlands the latter approach was opted for, as becomes clear in the reports of the AOI. In both approaches the debate about the place of programming skills stayed unresolved, which also caused unclarity about the content of information technology. For instance, despite the fact that programming skills were not part of the core objectives of the subject, in the Netherlands many text books of the early days offered some kind of basic programming skills, leading to attention for programming skills in the curriculum in practice.

In addition to the discourse about the focus of information literacy, the place in the curriculum was also disputed. Collis [32], for instance, argued that computer literacy as a separate subject hampered the integration of information technology as a tool for learning in different subjects. She argued that teachers would not see the necessity to

use computers to enhance teaching and learning if information technology applications are also offered in a separate subject. England and Wales therefore completely integrated information literacy goals in their National Curriculum. It was this approach that The Royal Society [29] in their report of 2012 qualified as unsuccessful, because of its lack in meeting information literacy goals. In the Netherlands the place of the subject in the curriculum became obscured when the domain was split: A minor part of information literacy was offered as a separate subject, and the major part was integrated in existing courses. The separate course never got beyond the instrumental approach, leading to an evaporation of the subject by the early 2000. So although the conceptual approach was aimed for by the curriculum developers it was not realized, because of poor text books and under-qualified teachers. The integration in existing subjects on the other hand was also unsuccessful, because subject teachers were not prepared to teach with technology and because there was no assessment system in place, teachers simply did not teach the core objectives which were considered relevant for their subject. Although the availability of an information literacy curriculum is a requirement, it is insufficient to warrant implementation. The start of a new subject without qualified teachers, adequate teaching resources and clear assessment procedures are a necessary condition for a successful start. But also when the goals of information literacy are integrated in existing courses these conditions are a prerequisite.

6.2 Digital Literacy to Prevent Inequity

As a result of the mixed approach to *informatiekunde* in the curriculum and the weak implementation in educational practice, the position of *informatiekunde* at the end of the 1990s was very weak. However, the position of *informatiekunde* became even worse, when research had shown that primary school students were able to perform to a large extent as well as students in lower secondary education on a test measuring information technology knowledge and skills. Instead of blaming the quality of the implementation of information literacy in the curriculum such a finding might have given rise to the misunderstanding that students automatically acquire information literacy knowledge and skills, because of the overall presence of technology in society. However, research has shown that students differ in their information technology knowledge and skills and in their use of technology [33,34]. To prevent the creation of a new digital divide between those who are digital literate and those who are not attention for digital literacy in the curriculum is needed.

6.2 A Shared Vision on Curriculum in the Knowledge Society

The international SITES[2] study [35] showed a decrease in attention for lifelong learning skills (including Information technology skills) in a number of European countries (Denmark, Norway, Slovenia) between 1998 and 2006, while some Asian countries (Hong Kong, Japan, Taiwan, Thailand, Singapore) showed an increase for

[2] Second Information Technology in Education Study

lifelong learning competencies in the same period. A secondary analysis of the data [36] was able to show how educational policy impacted teaching and learning in schools. Findings from the recent PISA studies [37] initiated discussions about the quality of education in many countries, often resulting in calls for more attention to basic literacy and numeracy skills, stricter examination practices and schools being accountable for their results.. In the Netherlands the general educational policy became narrowly focused on basic literacy and numeracy skills as core subjects in the curriculum. This focus was accompanied by an increased emphasis on testing. This caused a decrease in attention for other subjects in the curriculum. Similar trends took place in other European countries, as became clear from the SITES data described above. For instance in Denmark an increased focus on curriculum-centred instruction, tests and individual student learning in the Danish educational policy decreased the attention on collaboration, independent learning and the use of technology in Danish schools [38], illustrating how educational policy impacts teaching and learning in schools.

Stakeholders of the education system (e.g. the corporate sector, (inter)national organizations, parents) try to influence educational policy. Some recent developments indicate that in several European countries the narrow emphasis on basic literacy and numeracy skills is changing again. In the United Kingdom The Royal Society [28] drew attention for the need of student awareness for computer science and computational thinking as a domain of study. One reason was the need for computer scientists in the workforce. Their report was highly influential as it resulted in a compulsory program of study on computing for the ages 5-14, starting in 2014. Also in the Netherlands the narrow focus on basic literacy and numeracy skills is disputed by influential bodies such as the Education Council of the Netherlands [39] which recently published a report where they questioned whether the curriculum prepares its students for the knowledge society. They advocate to put lifelong learning skills, including digital literacy, back on the education agenda. These developments show a pressing need for a shared vision on what should be learned in the knowledge society, including the place for digital literacy. Moreover it can be learned from the past that qualified teachers are a necessary condition for a successful revival of information literacy.

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