In this paper, I will assess the role of education regarding the social and ethical aspects of information technology in the university curriculum. I will begin in section 1 by outlining a field of study which I call social and humanistic studies of computing (SHC) and contrast this with applied studies of societal aspects of computing (ASC). In section 2, I will argue for the importance of both SHC and ASC in university curricula and relate their roles to academic and professional functions of university education. In section 3, I will describe how courses in SHC and ASC may be taught in practice, illustrating this with a description of the minor ICT and Society which I have helped to develop at my university, and with a description of a course in Computers and Society. In section 4, I will assess the relation of computer ethics to SHC and ASC, and its role in the university curriculum. I will outline educational goals for computer ethics education and provide a brief description of a course in computer ethics that meets these goals. In the concluding section, finally, I will briefly consider how my remarks on social and ethical studies of computing would translate to a different area: that of secondary education.

1. Social and humanistic studies of computing

Computer ethics as a field of study is part of a wider field of study which may be called social and humanistic studies of computing (SHC). SHC are studies by scholars in the humanities and social sciences of computers and their roles in society. I define SHC as theoretical or nonapplied studies of the way in which various forms of information technology shape, and are themselves shaped by, aspects of their social context. By the social context of computer systems, I mean any aspect of individuals, collectives or social systems that constitutes part of the environment within which one or more computer systems are used. Hence, a study of the psychological effects of regular Internet use is a study in SHC. So is a study of the influence of computer networks on the structure of large organizations, a study of cultural practices of users of mobile computing devices, a study of cultural images of computers throughout history, or a study of the role of information technology in globalization. Studies in SHC hence consider any sort of way in which information and communication technologies (ICTs) relate to their larger context of use. Studies in SHC are theoretical, as opposed to applied. Their primary aim is not to change practices or develop policies. It is only to understand.
defined here, has increased dramatically. Still, SHC is not often seen as a coherent field of study. There has been some effort by social scientists, however, to turn social studies of computing into a field, for example by Rob Kling, editor of the journal *The Information Society*, who has been promoting the label 'social informatics' to designate social studies of computing. But on most counts, the coherence within the field of SHC is limited. Nevertheless, there are nowadays specialized journals that help give it coherence, such as *The Information Society, Computers and Society, New Media and Society, Information Technology & People and Information, Communication and Society*, as well as specialized societies and conference series.

Next to the emergence of SHC, there has been an emergence of various kinds of applied research on societal aspects of computing. Here, there is even less coherence between the various approaches that exist. Therefore, when I speak of applied studies of societal aspects of computing (ASC), I do not refer to a field but just an existing set of studies and approaches that are often unrelated to each other. Research in ASC has in common that it is not primarily concerned with a theoretical understanding of the social context of computer systems, although such theoretical knowledge usually plays a useful role in applied research. Instead, research in ASC is concerned with developing effective tools for professionals in various fields for coping with various societal aspects of computer systems. Such studies include applied studies on computer law, computer-assisted education, management and computing, and e-commerce, amongst others. SHC and ASC are hence complementary in the way they approach societal or nontechnical aspects of ICTs: the first is concerned with gaining at theoretical understanding, the second with developing practical know-how.

2. SHC and ASC in the university curriculum

Let me now turn to the question of the role that both SHC and ASC should have in the university curriculum. I take university education to have both an *academic* and a *professional* function. In some study programs, the academic function is emphasized. These are programs that lead to an academic degree. They are aimed at equipping students with theoretical knowledge within a field and with research skills for developing more theoretical knowledge in that field. Other university study programs lead to a professional degree. In such programs, the educational emphasis is on professional knowledge and skills, and the research skills that are taught relate to research aimed at developing applied forms of knowledge, or on applying knowledge in specific contexts.

Now, it is certainly not the case that the academic and professional functions of university education are mutually exclusive. Academic study programs always also have a professional role, in that they train students to become members of a certain profession. This is the profession of an academic scientist, equipped with research skills for furthering a specialized field. Conversely, professional degree programs at the university level tend to have an academic component, in that they emphasize academic, theoretical knowledge and skills. Theoretical knowledge acquired in a professional university program is considered important as a theoretical background for more applied tasks. For instance, a mechanical engineer should have a basic training in Newtonian mechanics because this theoretical knowledge is relevant to the applied knowledge and skills that are the primary focus of a mechanical engineering program.

Theoretical knowledge is not just important as a preliminary to mastering applied knowledge and skills, however. It is frequently also considered important for the more general academic outlook that is the landmark of university education. This general academic outlook is realized through courses in *general education*, some of which emphasize *cultural literacy*
and societal knowledge, others of which emphasize general cognitive and professional skills. Someone with a university degree, whether academic or professional, is not just expected to excel in his or her field, but also to adhere to certain minimum standards of cultural literacy, and to have good general cognitive skills. That is, he or she is supposed to have an above average understanding of society, culture and history, and to have above average cognitive skills in analysis and synthesis.

To summarize, some university programs focus on academic education, emphasizing theoretical knowledge and research skills, whereas others emphasize nonacademic professional knowledge and skills. Yet, every university program promotes a general academic outlook by offering courses in general education that are outside one's specialty. Given this characterization of university education, there are at least two reasons why it is advisable to make education in SHC and ASC a required part of today's university curriculum.

First of all, there are good reasons to suppose that the general education component in a university program should pay attention to issues in SHC. This is because, I claim, such a program would give a shallow and outdated picture of society if it left out an analysis of the great changes that information technology is effecting in virtually every sector of society. The economy, government, education, health care, religion, scientific research, the media, entertainment, the arts, organizations, the workplace, interpersonal relations, and many other core institutions of society are being transformed through information and communication technologies. If one were living at the time that the industrial revolution would take place, one would not want a general education program to focus on preindustrial society. Instead, one would want it to pay attention to industrialization processes and the changes these are affecting. Likewise, one would expect a contemporary general education program to pay attention to the current information revolution, including the roles and effects of information technologies.

Education in SHC may not just be desirable within an education program because it is an important part of a general education component. It may also provide part of the background or context within which a good professional is able to situate his or her work. This role of SHC education can perhaps be illustrated best by looking at computer science curricula. Computer science curricula focus on knowledge and skills by which computer professional may design, operate or manage certain types of technologically complex systems. Much of the knowledge this requires is technological: it pertains to the rules according which these systems operate. However, computer systems also have to make a good fit with their social context. Users have to be able to use them well, organizations have to benefit from them, and sometimes society as a whole is supposed to benefit as well. A good fit between a computer system and its social context is not the mere result of it executing certain input-output functions without error. The technology also has to work in harmony with its social context. Therefore, a broader understanding of how computer systems impact and fit in with various aspects of their social context is, if not necessary, then at least highly advisable if one is to be a good computer scientist. And this means that education in SHC is defensible as a required component in computer science curricula.

Second, within the professional component of a university program, there is a clear need for specialized courses dealing with the role of information technology within someone's specific profession. That is, there is a special need for courses in ASC. Nowadays, there are few professions left in which information technology does not play an important role. Obviously, nearly every professional will be using information technologies as an end-user. But this not the role of information technology in their profession I am referring to. It is not clear that special courses in ASC are required to be a better end-user of information technology. Instead, what are required are just courses that teach one how to use the
technology, and these are not courses in ASC because they do not normally focus on contextual aspects of information technology.

However, next to end-users, many professionals are also decision-makers regarding information technology. That is, in the course of their professional duties, they may be deciding that certain computer systems will be used, purchased or implemented, they may be deciding by whom they will be used and what they will be used for, and they may shape or influence various policies regarding the development, acquisition and use of information technologies. Because, increasingly, professionals have to make such IT-related choices, and because of the great impact such choices may have because of the revolutionary transformative power of information technology, it is increasingly important to include relevant education components on ASC in professional curricula. For example, in a policy program, it would nowadays be advisable to have a course on policy and information technology, because of the likelihood that professionals in this field will be making policy choices in which information technologies play key roles. Likewise, in an education studies program, it would be advisable to have education on computers in education, because of the profound impact that computers are having on education.

I conclude that because of the general education requirement in university curricula, and in some cases also because of the professional function of curricula (as in the case of computer science), education in SHC is highly advisable. Specifically, it would in my opinion be advisable to have a required course on "Computers and Society" across the university curriculum. Moreover, an equally good case can be made that professional programs should contain at least one relevant course in ASC. This course should focus on the role of information technology within that specific professional field and should convey professional knowledge and skills that enable intelligent professional choices regarding the role of information technology within that field.

For some programs, one course in SHC and one course in ASC may not be enough. It certainly would not be enough for programs that train one to be a computer professional. Specifically, I would propose that a computer science program would devote at least 10% of its professional component on SHC and ASC. This means that not more than 90% of the professional component should be devoted to the technical aspects of computer systems, and at least 10% should consider the fit between computer systems and their social context.

3. Teaching SHC and ASC

My university, the University of Twente, grants professional degrees in engineering and applied social science. There are five-year Master's programs in various engineering fields, such as electrical engineering, computer science, and design engineering, and four-year Master's programs in various applied social science fields, such as education, policy and business administration. Students follow a three-year bachelor program which includes a half-year minor program in a field different from their area of specialization, after which they follow a one-year or two-year master program. Students are free to choose a minor program to their liking and they also have some amount of choice regarding the master programs they may follow immediately after completing a specific bachelor program.

At my university, I have taken the initiative to start a new interdisciplinary minor program called ICT and Society. This minor is the equivalent of half-a-year of university education, or 820 hours, and is stretched over the course of an entire academic year. In the academic year in which they take the minor, students hence have 50% time to work on the minor and 50% time to take courses in their own field. The minor ICT and Society is not currently a required minor for any degree program at my university, but we hope and expect it
will be a recommended minor for several programs.

The aim of the minor ICT and Society is twofold. The primary aim is to acquaint students with basic issues in SHC. A secondary aim is to teach general professional skills for decision-making in relation to computer systems. This is a general ASC component of the major. Students have a degree of freedom to tailor the ASC component to their own professional area. In this way, the minor ICT and Society equips students with the basic understanding and skills to provide them with general education in this vital area and to deal with the social context of computing in their prospective careers.

To further these two aims, the ICT and Society minor is set up to have the following structure. In the first trimester of the academic year, students take three introductory courses. The first is a basic course on the technical aspects of computer systems. This course aims to familiarize students with basic properties of computer systems and the ways they are used in society. Computer science students participating in the minor do not have to take this course, and have the option of taking another course relevant to their professional interests, such as a course in computer law (which is not a required course in their own professional curriculum). The second course, taught by me, is a basic course on computers and society. It treats social aspects of computing as one would expect in a course dealing with basic SHC issues. The third course is a course on the role of computer systems in organizations (both governmental and commercial). This topic was considered by us to be an important SHC topic for the students at our university, because most will be assuming important roles in commercial or governmental organizations. This is why we decided to devote a special course to it.

In the second trimester, students take applied courses that can be characterized as courses in ASC. One course provides students with tools to do technology assessment of information technologies. This course aims to enable students to do general assessments of the societal or organizational impacts of new computer systems. A second course focuses on two specific topics: e-commerce and e-government. It studies models and theories within these two areas and teaches about applications and application methodologies in both areas. A third course focuses on virtual communities, and looks at methods for investigating such communities, as well as at assessing the conditions under which such communities function well. In the third trimester, finally, students take up a small research project within one or more of the aforementioned areas. They may do so individually or (preferably) in small groups in which people from different disciplines work together. For many students, however, a half-year program on ICT and Society may be too much of a good thing. I would not advise it to become a required minor for any program, with a possible exception of the computer science curriculum. In the previous section, though, I argued for a required course Computers and Society across the university curriculum. I will now consider what such a course may look like. The aim of a course in computers and society would be to acquaint students with basic issues in SHC, that is, it would teach about the role of information technology in various sectors of society and regarding various aspects their social context. A course on Computers and Society would leave students with a basic understanding of how ICT is transforming social institutions and practices. I now present a possible list of topics for a course in Computers and Society. Most courses would make a selection from this list:

1. **ICT in contemporary society.** A qualitative and quantitative assessment of the role of ICT in current society. A quick survey of the role of ICT and in various sectors of society (e.g., regarding work, the business world, medicine, education, government, the media, and everyday life), and related issues and problems. Key statistics on the users and uses of ICT.

2. **The Information Revolution and the Information Society.** A broad macro-perspective on the way in which ICT has changed the economy and social institutions in recent history. With a brief introduction to some theoretical perspectives, e.g., Beniger's theory of the Control
Revolution (Beniger, 1986) or Castells' trilogy on the information age (e.g., Castells, 2000).

3. **Social history of ICT and its role in society.** A historical survey of the birth and spread of the digital computer, and social and cultural changes resulting from it. Attention is paid to changing functions of the computer in the workplace, in the economy, and in organizations, to past social struggle, and to images of and discourses on ICT.

4. **ICT and the economy.** An assessment of the role of ICT in the economy and of the difference between Fordist and postfordist economies. A consideration of the role of producers and consumers in this process.

5. **ICT and politics.** An assessment of the way in which ICT is transforming politics, both regarding the relation of citizens to the state, the relation of corporations to the state and its citizens, and the hierarchical structure of organizations. A treatment of specific political issues like privacy, freedom, democracy, and social justice.

6. **ICT and law.** An assessment of the way in which ICT is transforming law. Problems and issues like informational freedom, privacy, and intellectual property.

7. **ICT and social structure.** An assessment of the way in which social structures, roles, relationships and behaviors are changing because of ICT. Topics may include the 'digital divide' between 'information-haves and have-nots,' changing roles of various social groups (e.g., women, the elderly), the changing structure of social relationships, and changes in communication.

8. **ICT and culture.** An assessment of the way in which cultural beliefs, practices and experiences are changing because of ICT. This may include an assessment of the changing role of media, of the changing role of communication and information, changes in lifestyles, and the emergence of new cultural forms.

9. **ICT and human psychology.** An assessment of psychological changes correlated with the use of ICT. Mental processing of information with new media; changes in personality and social psychology; changes in conceptions of reality, time and space.

10. **ICT and the future.** Current expectations and scenarios for future technologies and trends in the information society.

There are nowadays various good textbooks that could be used in such a course. A very good textbook is Richard S. Rosenberg, *The Social Impact of Computers*. Also excellent is *The Network Society*, written by my University of Twente colleague Jan van Dijk. Other books are the reader Computers in Society edite by Kathryn Schellenberg, Rob Kling's *Computerization and Controversy: Value Conflicts and Social Choices*, and Paul Winter's *Computers and Society*.

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@ @I currently teach two rather broad courses on computers and society. The course that I offer in the context of the minor ICT and Society is called *Humans and Information Technology*. It is not currently a required course for any degree program. The other course is called *The Information Society* and it is a required course for first-year computer science students. In both these courses I teach many of the topics that can be found in he above list. In this way, I hope to acquaint students with what I see as the main topics in Social and Humanistic studies of Computing.

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4. **Teaching Computer ethics**

For computer science students, or for other students specializing to become a computer professional of some sort (e.g., students specializing in library science or computer-assisted education) it would be highly advisable to have, in addition to a required Computers and Society course, a required course in computer ethics. To understand the role of computer ethics in the university curriculum, an understanding is needed of the kind of knowledge and
skills that are the hallmark of it. I will try to arrive at such an understanding by analyzing the goals of computer ethics education and its relation to the goals of education in SHC and ASC.

To start with the second issue, is computer ethics a form of social and humanistic studies of computing, aimed at a theoretical understanding of ethical aspects of computing, or is it rather a form of applied research on societal aspects of computing, aimed at developing practical professional tools? If one would take as one's point of departure Jim Moor's influential conception of computer ethics, one would have to conclude it is both. Moor claims: "On my view, computer ethics is the analysis of the nature and social impact of computer technology and the corresponding formulation and justification of policies for the ethical use of such technology." (266). Quite clearly, the analysis Moor refers to in the first part of his statement is a central concern of SHC, whereas the formulation and justification of policies referred to in the second part clearly belongs to ASC. Thus we have more fundamental studies in computer ethics, that belong to SHC and that are aimed at an understanding of ethical issues relating to computers and their uses, and we have more applied studies in computer ethics, that belong to ASC and that are aimed at arriving at specific policies.

In teaching a course in computer ethics, one may of course emphasize either the more fundamental or the more applied dimension of computer ethics. In a professional program for computer science students, one may want to opt for a course in computer ethics that is mostly applied, and that focuses on professional roles of computer scientists. In program in policy studies, or in law, or in science, technology and society, one would likely emphasize more fundamental issues in computer ethics. Normally, however, a course in computer ethics would integrate both dimensions. Regarding privacy, for example, it would both teach general moral theory on privacy, specific moral analyses of informational privacy, the various ways in which privacy considerations come up in contemporary computer systems and their uses, existing privacy law and policies, and professional responsibilities for protecting privacy.

An ideal course in computer ethics, then, should have both the goal of promoting an understanding of major ethical issues in computing, as well as of providing aspiring professionals with tools for giving content to their own professional responsibility in dealing with computer systems. In constructing such a course, one should begin with a selection of moral issues regarding computers that can be considered to be the most pressing in contemporary society. The will include many of well-known issues in the computer ethics literature. My own selection would certainly include issues of privacy, autonomy, justice (with special emphasis to the problem of the so-called 'digital divide'), democracy, (informational) freedom and quality of life. Second, one should opt for a 'rich' presentation of these issues, in which one treats both (i) their moral worth and significance; (ii) the way they come up in current computing controversies (include here a consideration of one or more exemplary cases); (iii) past policies and laws that have been devised to deal with them; (iv) professional responsibilities regarding the issue and ways in which professionals may deal with them.

The way in which the professional component of a computer ethics course is set up will depend strongly on the nature of the professional program within which the course is situated. Obviously, in a law program, a course in computer ethics would focus on ethical issues in computer law, and how to deal with them professionally. In a program in education studies, a course in computer ethics would focus on ethical issues in designing education programs involving computers an in using computers in the classroom. In a program in computer science, there should be special emphasis on ethical issues in the design of computer systems and software (cf. Friedman and Nissenbaum, 1997; Brey, 1998, 2000), as well as in their maintenance and their operation. In all cases, the emphasis should not just be on the ethical issues that come up in these professions, but also on the professional responsibility to deal with them, and the practical procedures one may follow in dealing with
5. Conclusion

I have argued in favor of a required course in university curricula on Computers and Society, that acquaints students with basic issues regarding the role of ICT in contemporary society, and a required course in ASC in professional programs, that focuses on the role of information technology within the relevant professional field and that conveys professional knowledge and skills that enable intelligent choices regarding the role of information technology within that field. I have also argued for computer ethics as a required course in professional programs that prepare students to become computer professionals. These courses should both acquaint students with major ethical issues in computing, and provide them with practical tools for giving content to their own professional responsibility in relation to computer systems.

Let me close by focusing on the role of education on social and ethical aspects of IT in education programs prior to university, specifically in secondary education. In secondary education, there is less of an expectation that students will have a serious decision-making responsibility regarding information technology in their future profession. Hence, education in and SHC and ASC at the secondary school level may not be justified by reference to the future profession of secondary education students. The argument for attention to SHC in general education, however, certainly applies to secondary education as well. Therefore, acquainting students with the role of ICT in society should be considered a legitimate and important topic in secondary education.

Next to this, I think there are also good reasons why an attention to ethical issues regarding ICT has a place in secondary education. Secondary education is the learning phase at which ethics can first be taught. Moral issues like abortion, the death penalty, and genetic engineering are great issues to explore in secondary school, not through an emphasis on moral theory, but through an emphasis on cases, and moral learning through a joint discussion of such cases. Their own morality in their everyday life should certainly also be a topic. In relation to this, it would be very useful to discuss with students the ethical issues that come up for users of information technology, for example in using the Internet, and to discuss also their own moral stance on these issues, as (potential) users of the technology.

Such a discussion is particularly important because information technology is not yet a technology that has reached "closure" (Pinch & Bijker, 1997). That is, the interpretations, rules, policies and patterns of behavior surrounding information technology are not yet as fixed as they are around many other technologies. The world of cyberspace is not yet an orderly society. It is still a bit the Wild West, and as this vast new space is being colonized, and made into an orderly society, everyone should be asking the question of what kind of society we want it to be. We as adults should not just ask this question to ourselves and to each other, but also to the new generation that will inhabit it.

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