Social, Ethical and Cognitive Issues of Informatics and ICT

Working Group 3.1

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Abstract The group members, drawn from countries with very different educational systems, were all concerned with teaching informatics courses, developing information/computer science curricula or promoting the integration of ICT in schools and higher education. Concern that pupils leave education with a limited understanding of basic concepts of informatics/ICT led to the identification of key actions to resolve this problem. Exploration of social and ethical issues associated with ICT development brought a plea for fresh and exciting curriculum content. After addressing the difficult area of the relationship between informatics and other subjects the group proposed the creation of new, ICT-rich, learning environments.

1. INTRODUCTION

During the course of their deliberations the group addressed a great number of topics and issues related to social, ethical and cognitive issues in informatics/ICT. All members were concerned that, although the impact of informatics/ICT is so profound and so pervasive in society, many young people – and indeed a large percentage of their teachers – have only a superficial understanding of both the basic concepts of informatics/ICT and of the social and ethical issues involved in this rapidly developing area. At all times their discussions attempted to identify reasons for what they regarded as a regrettable situation and suggest possible remedial action.

2. CONCEPTS OF INFORMATICS

The group unanimously supported the assertion that too many pupils currently leave the education process with an imperfect understanding of the basic concepts of informatics/ICT – concepts which fall into four principal categories: computer architecture and operation, changes in informatics/ICT and in society, developing informatics/ICT skills, and information handling concepts.

Most of their informatics/ICT experiences in school or college are concerned with 'doing' – usually what they have been told to do – rather than thoughtfully or critically selecting informatics/ICT resources and deploying them for purposeful activity. Normally their task has not been fully explained to them and they frequently do not appreciate or understand why informatics and ICT is being chosen over other options. Thus much of their educational experience of informatics/ICT is concerned with brief encounters with, or excursions into, different software applications – often only one application rather than the judicious use of a number of complementary applications – with little consideration of how the software operations are performed or indeed why they are necessary and no appreciation of the specific advantages which accrue from their selection and use.

Equally, many teachers, particularly those who have had little or no education in informatics or computer science, lack understanding of these basic informatics/ICT concepts. Many teachers who use informatics/ICT in their classrooms are self-taught or have attended short in-service courses and then refined the ideas, concepts and skills which these courses have covered so that they can make use of the new technology resources which are available in their schools. Even teachers who have been able to get some training find they are unable to bring informatics/ICT into their teaching and learning as effectively as they would wish as hardware and software supplied is inappropriate and they are not afforded time to reflect on the training and develop their new found skills. In the past, though less so now, training has been technical in orientation and has ignored pedagogic applications.

In addition the group were concerned that too often teachers turn to the informatics/ICT expert in school to solve all of their problems and make unrealistic demands on the time/resources of these individuals.

The group were clearly of the opinion that pupils and teachers need to be introduced to a set of basic concepts of informatics in a structured way and that they should fully understand these concepts so that they can make the best and most effective application of the technology which is and will increasingly be in their classrooms. Teachers already in post need to be offered appropriate training which should include consideration of how best

to establish these concepts with pupils in different classroom contexts. They will also need time to consider these concepts and create classroom opportunities for coverage in their curriculum.

Student teachers in teacher education institutions need to be introduced to the concepts. These should permeate the teacher education experience and the students should be led and supported by teacher trainers who model good practice. The training programme should offer opportunities to introduce informatics/ICT into their classroom experience and students should be assessed in their mastery and understanding of informatics/ICT concepts.

Pupils in school should be involved in a curriculum which is rich in appropriate informatics/ICT experiences. The group appreciated that there is tremendous diversity in the opportunities which are currently offered to students, in the demands of the tasks they should complete and in the standards they are expected to achieve. This diversity was clearly demonstrated at WCCE 2001. Additionally there is much debate as to whether or not pupils should be examined in and gain accreditation for their mastery of informatics/ICT concepts and abilities. The group consider that pupils who are grounded in informatics/ICT concepts will be better able to make judicious selection of informatics/ICT tools for particular tasks and will also be better equipped to transfer skills from one application, or one generation of application, to another.

The group realises that pupils acquire and understand the aforementioned basic concepts at widely different ages and stages. There should not only be an attempt to map concepts to ages and stages which would give form to their curricular introduction and development but there would be considerable educational benefits if these concepts were visited and progressively refined through the delivery of a spiral curriculum model. In considering the mapping and delivery of these basic concepts in curricular programmes it is important to remember that new developments add to or introduce new concepts and this should be built into the planning.

3. SOCIAL AND ETHICAL ISSUES

Many aspects of informatics/ICT have ethical implications and all of them generate social implications. A great number of these aspects and applications have already exercised a profound impact on society. Teachers must become conversant with the field of social and ethical issues that result from the use and development of new technologies and should be able to guide their pupils/students to appreciate and understand them.

The group discussion on social and ethical issues was triggered by a comment on plagiarism. This sparked wide ranging discussion over a host of

topics which were seen not only as presenting problems which had to be urgently addressed, but also opening up new challenges and possibilities for education to respond to and exploit. The topics included copyright; the changing forms, flows and patterns of communication; pornography; racism and discrimination; the need to respect cultural differences and linguistic diversity; the globalisation of legal systems; security and privacy.

The group appreciated that social and ethical issues are often dealt with last in any courses/curricula in schools and that the topics that are addressed – which really could be made relevant and fascinating to pupils – are all too often presented in a sterile and uninteresting way. These are topics and issues that it is very important to explore and discuss with pupils as they will increasingly impact on their day-to-day life. We must try to ensure coverage within the curriculum, ensure they are addressed in an interesting and motivating way and that pupils are encouraged to reflect quite deeply on these topics and issues and on their implications for our global society.

Different group members offered fresh ways in which topics and issues might be explored – issues of copyright might be considered through reference to music-CD and DVD piracy (even piracy of pupil compositions) – sexuality through an examination of chatroom behaviour and discussion of Web content and access compared to paper content and access – security issues through on-line shopping and a review of the strengths and weaknesses of financial organisations' protocols – discrimination through evaluation of relevant Web-content and examination of authorship.

An important conclusion which emerged was the need to involve and motivate pupils to examine ICT sources, particularly those on the Web, very carefully and critically – to try to establish the veracity of content and to develop skills which will help identify discriminatory, biased or propaganda material.

As the flow and volume of data/information which is accessible through the spread of ICT increases, teachers should help pupils to become more critical of the materials they are exposed to. Alongside the development of critical thinking skills many of the group members saw opportunities for promoting values education and moral education through the use of ICT.

Another interesting area that might be developed is the exploration of games/simulation software which illustrates how past civilisations were organised and operated or which presents and invites consideration of different ethical perspectives. Pupils might valuably engage in constructing scenarios and other games/simulations that could explain or illustrate their interpretation of social and ethical issues.

The group appreciate that responding effectively to the many socio-ethical problems and issues posed by ICT will be difficult but it is a challenge educators must address.

Many aspects of informatics hold ethical implications and all hold social implications. Many applications have already exercised an extremely profound impact on society. Teachers must be conversant with the field of social and ethical issues which result from the use and development of new technologies and should be able to guide their pupils to appreciate them.

4. RELATIONSHIPS BETWEEN INFORMATICS AND OTHER SUBJECTS

The world of our pupils is increasingly dominated by an ever more sophisticated technology. It is the pervasiveness of this technology that makes it essential that an integrated view of ICT is presented to every pupil.

This highlights a major problem in many schools in most countries at present. The group was unaware of any comprehensive course on informatics which is offered to all pupils. They quoted examples where courses tend to be delivered to the older students (often the able student who may also be studying mathematics or science subjects) usually after they have had many experiences with computers/software across the curriculum.

In secondary schools it is common that teachers of subjects other than computer science only superficially address and establish basic concepts of informatics/ICT. Rather they encourage pupils to see computers and the new media resources they can be interfaced to as 'black boxes' which should be intelligent enough to meet all of their demands and solve all of their problems. They want to use the technology to illustrate concepts in subjects ranging from geography to art and music or to find, manipulate and present subject-oriented information. However, many subject teachers tend to make limited use of ICT in their teaching and learning – all too often because they have few models of good practice to build on and have had too little time to consider how they might deploy ICT in their classrooms – always supposing they have access to resources and a supportive school administration which promotes use.

It is time for teachers of many subjects to see the informatics teacher, not simply as a hardware provider and technical trouble-shooter but as a colleague who can make a valuable input to the skills and concepts which children should experience across the curriculum. The group did not see the responsibility for creating curricular resources to help establish basic concepts or developing opportunities for discussion and evaluation of issues resting solely with teachers of informatics/computer science. This is a whole school problem. Curriculum change and resource development must be discussed at relevant times by various members of staff. All staff should be involved and school management should coordinate the experiences

throughout the curriculum to ensure coverage is interesting, stimulating and provocative to enthuse pupils.

All subject teachers should regularly appraise their curriculum to reflect the impact ICT has on their teaching and learning.

The group noted that there are a number of problems associated with different cultures which have not yet been fully considered in schools and proposed that interdisciplinary projects could promote co-operation and collaboration. Collaborative development focused on language could stimulate writing, thinking and promote evaluation of information sources. If such collaboration will be extended to involve pupils of different nationalities it would force pupils to consider different cultures and different linguistic features.

5. A NEW LEARNING ENVIRONMENT – NEW TEACHER EDUCATION

It is vitally important, but has so far proved to be extremely difficult, to create an ICT-rich environment in schools and persuade all teachers to integrate ICT into their teaching and learning. It has also been difficult to persuade teachers of many subjects to build on informatics concepts established by their colleagues.

Various conference presenters at WCCE 2001 spoke most forcefully on this subject – one contributor outlining five criteria which must be satisfied before successful advancement of pupil knowledge can be realised. Presenters and the SECIII group raised the importance of defining what an appropriate learning environment comprises. It is clear that we do not, as yet, have a clear vision of this environment. We have yet to determine its technological demands or provisions. We simply know it will be more ICT-rich than we have today and trust it will be more educationally stimulating and effective.

Certainly the curriculum which is studied, the delivery effected by the teachers and the interaction between the teachers and the pupils will be different. To date the changes have been mainly to the hardware and infrastructure with less impact on curriculum transformation and alternative teacher delivery.

It has also been difficult to persuade teachers of many subjects to build on the informatics/ICT concepts established by their colleagues. The group are convinced that in-school relationships need to be improved and that senior management must become more involved in managing and engineering staff interaction to ensure that all pupils have equitable access to

opportunities where they can acquire and reflect on the basic concepts and the examples or issues which are focused on.

The group appreciate that different countries have adopted different policies, plans and strategies concerned with the integration of Informatics concepts and ICT integration in the curriculum – most expensive – most unsuccessful. Indeed, within many countries a number of responses and emphases exist. The group suggests that, while a convergence of thinking on basic concepts and on ICT integration into the curriculum is welcome, any policy formulation and determination of a national framework should respect and support cultural and linguistic diversity.

Perhaps most hope for success in this field rests with the new generations of teachers who will have had a lifetime of experience of ICT. They will be conversant and comfortable with the technology and will feel free to address the issues associated with the technology's introduction.

6. CONCLUSION

The SECIII group* found the professional group task they were set at WCCE 2001 extremely challenging but most absorbing. The diverse nature of the backgrounds of the group members ensured a wide cross-section of topics and issues were explored. The group thought it important that they formulated a number of responses and recommendations to address these issues and there was great unanimity in determining these. They were particularly concerned that a major problem exists and that educators need to try to resolve it as soon as possible.

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