

Today and Tomorrow – Can ICT Assist Learning and Living?

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Keywords: E-Learning, Blended Learning, CAS, MOOCs, Africa, Embedded Chips, Ageing Body Suits, Robotic Carers, Living Wills.

Abstract: The paper considers the current and future possible developments in education, health and living from the perspectives of students, the elderly, educational establishments, organisations and governments. Various legal and ethical issues are also considered.

The changes from 2014 to the English school curriculum relating to ICT, the introduction of Higher Apprenticeships and the need to address employers' requirements, together with the introduction of MOOCs, possibly affecting universities, are discussed. The combination of these could lead to new developments in e-learning, including in developing countries.

Some current and potential future medical developments, together with their ethical issues, are addressed, including the Internet of Things, embedded chips and robotics. The methods to change the views of those working directly and indirectly with the elderly are considered. These include the use of "ageing suits" to make those more aware of what it is like to be elderly. These are used by medical and care workers, and designers of clothes, goods, furniture and accommodation, suitable for the disabled and the elderly. The experiences involving these and other aging equipment at Southampton Solent University are discussed.

1 INTRODUCTION

In this fast changing world of IT, everyone is affected, from students to the ever increasing population of elderly people. There is a need for students to understand and address the needs of the elderly and disabled, ranging from issues of using technology to understanding how IT could address the needs of the elderly.

By increasing the understanding and knowledge of computer science by pupils from an early age, they can maximise the advantages of technology by understanding its potential. Changes in education could help in the near future in caring for the elderly.

In England from September 2014, the majority of schools introduced computer science for all pupils from the age of five to sixteen as a compulsory subject. Online resources and support are provided by CAS (ND) (Computing at School) which is part of the professional body, BCS, The Chartered Institute for IT (ND). In primary schools, the students use the Scratch language whereas in the secondary schools the pupils use either Python or Java. In some schools they have introduced, in addition to conventional equipment, technology such as 3D printers. At the age of 16, students are able to progress to A-levels or alternatives, or can undertake

an IT apprenticeship with companies where they would gain practical experience, receive training and also a salary. Choices are also offered at the age of approximately eighteen for students to progress to university degrees, some with a full year placement between the second and final year in industry and students often undertake projects that are industry based. Alternatively from the age of eighteen, students could undertake a form of higher apprenticeship where they gain practical experience, study subjects leading towards a degree of particular relevance to their employers, who will also provide a salary and pay for their tuition, usually at a relevant university.

Many courses now use a blended approach where the students work with Activity Based Learning and that they have material made available to them through a system such as Moodle. Many lectures are now being captured directly through systems such as Panopto, whereby the student can replay sections that they had problems understanding (Griffin and Ross, 2015). These recorded lectures are particularly useful for students whose first language is not English or those with particularly learning, hearing or sight disabilities. Hand-held devices or the student's own mobile-phones are also used by some lecturers to enable all

students to individually respond to multi-choice questions, allowing the lecturer to assess if it is necessary to further explain certain topics.

2 USING TECHNOLOGY TO RAISE AWARENESS OF THE PROBLEMS OF THE ELDERLY

To assist students to understand the problems of the elderly and disabled, some students at Southampton Solent University, are given practical experience of problems relating to sight, hearing and mobility. This involves the students experiencing these problems themselves, so the requirements of the elderly can be understood so more accurately capturing their requirements. The students put on "ageing suits" which restrict their movements, ranging from the ability to sit comfortably, rise from a chair, walk, reach high or low objects, to open containers and use a keyboard. By the students wearing special gloves attached to batteries, their hands develop a tremble, so the problems of writing, pouring or trying to drink liquid can be experienced. By blocking their hearing to different levels and the use of specialist glasses, other health problems can be experienced. These range from their sight being affected with diabetes to cataracts. The opportunities to experience these have been used by students on various courses, from computing, construction, interior and exterior design, including the design of packaging. These experiences have been arranged both within the courses and by meetings of the BCS (British Computer Society), which also enables these activities to be open to the general public.

An example of the use of these was linked to fashion and marketing students, when they experienced the problems which, in some cases were insurmountable, in dressing and undressing while wearing these ageing suits, also trying to put on make-up using the other additional devices. The aim was to encourage them to consider the physical requirements of the elderly and disabled in their future roles, especially as the worldwide increasing elderly population provides a market for elderly and disabled friendly articles. These in turn should increase the well-being, both physically and mentally of this ever-increasing sector of the world population. These ageing suits and other equipment are used at some hospitals including St Mary's Hospital on the Isle of Wight, in training courses for nurses, doctors, porters and clerical staff to understand the problems of the elderly. There is a

very high proportion of elderly living in the Isle of Wight and on the South Coast of England as this is viewed as a popular retirement area.

The opportunity to use technology directly, through body scanners and 3D printers, could provide in the future, clothes at low cost, personalised for the individual elderly or disabled person to fit their changing body shapes, whereas commercially marketed clothes are designed to expect the population to stand "up straight". By producing individually constructed clothes, this would allow the wearer both to look and feel smart and comfortable, and should encourage a more positive approach to ageing.

3 E-LEARNING AND HOW THIS COULD HELP THE AGEING POPULATION

With the increasing ageing population, there is a growth in various types of Universities of the Third Age. These often provide courses and one-off lectures, usually led by volunteers, at the cost for attendees of only the refreshments and the hire of the room. These provide both mental stimulation and social interaction. The former is provided are also by games, such as Scrabble, which can be played individually or through the Internet with players anywhere in the world, possibly having met through this medium.

Another means of encouraging mental agility is undertaking remote on-line study. By interviewing various retired people, many of whom have undertaken courses such as those run by the Open University in the UK, to obtain new skills and develop their hobbies in greater depth, and in some cases obtaining university degrees. Other elderly have chosen to follow MOOCs (Massive Open Online Courses) related to their interests (EC report, 2014). These MOOCs, often provided by universities in various parts of the world, are usually free but with mainly peer support and only limited tutor assistance. Interviews were undertaken by the author, with some of these elderly MOOC users. Some comments were:

It assumed too much pre-knowledge,

It over-simplified certain topics so I did not learn anything new,

It was easy to pass the self-assessment tests, by just checking back on the material,

I had technical problems with slow or missing Internet connections.

In most cases the elderly interviewees did not feel any

positive social interaction through these courses.

MOOCs do not normally have any accredited qualifications, although one university in Germany has created a direct link with a MOOC (EC report, 2014).

3.1 E-Learning and Third World Countries

MOOCs, by allowing self-study, can be used as part of preparations for a professional qualifications, such as those of the professional bodies such as the BCS. These qualifications can be taken at various global locations. Many of the Foundation qualifications are online multi-choice, internet based and are equivalent to the first or second year of a degree course, and range from Business Analysis to GreenIT. Various charities, such as MOOCs Africa and TULSA, have been established to assist learning for children and adults, especially women, in rural Africa. Local schools and colleges can use these MOOCs as part of their teaching, and, by following a selection of relevant MOOCs, learners can be prepared for these globally recognised professional examinations (Dewar et al, 2014)..

The tutors could provide extra material if required, and could run short one or two day sessions, utilising buildings on days when these are not in use (Uhomoihi and Ross, 2015). The increasing use of mobile phones in Africa provides an ideal base for using MOOCs. This provides a further opportunity for the elderly, with the relevant skills, to assist with MOOCs support to others, possibly in Africa, and also by doing so, promoting their own mental well-being. MOOCs are also being developed to increase be understanding of basic health care, prevention of disease including HIV, and issues such as pregnancy, particularly for women in Africa.

4 MEDICINE AND TECHNOLOGY

Technology is being used to scan patients, such as in Southampton hospitals, then using 3D printing to produce a model of the damaged body part, such as a hip joint or showing the position of a kidney stone. These have been used to explain to the patient, the nature of the problem and facilitate discussion of the various treatment options. It was reported that this was particularly useful with complex operations, allowing the surgeon to pre-plan the operation in greater depth, so reducing the time in one case from

ten to seven hours which then also reduced the cost of the operation and the risk to the patient.

Embedded chips in the body have been used for a number of years for humans as well as pets. In England, from April 2016, dogs are legally required to have an embedded ID chip.

Embedded chips can be implanted to monitor and administer medication such as with pregnant women and diabetics. It was reported that US Vice President Dick Cheney was not allowed by the US security services, to have a remote heart transplant monitoring system in case it was remotely hacked (Internet Murder, 2014).

With the increasing ageing population, patients with dementia could be identified if found with a "passive" embedded chip. In the future, with the increasing power and reduced size of batteries, an "active" embedded chip could identify quickly a missing sufferer of dementia. These are currently used to track pets, as the chip can be fixed to the pet's collar so the location, linked with GPS, is sent directly to the owner via an App on the owner's mobile phone. The concept of embedding such an "active" chip in the body raises considerable ethical issues, especially if the idea was extended to locate missing children. For adults, a "living will" would be needed in preparation for the possibility of becoming a sufferer of dementia. Risks of hacking, computer viruses, remote interference with the embedded chips, in addition to battery life, and the risks associated with confidentiality of the person's data, as in today's world data is more widely "joined-up", would be some of the issues to be balanced against the health and safety benefits of embedded chips (Ross, 2015).

5 ROBOTS AND THE AGED POPULATION

Robots are already available to assist mankind, from meeting and greeting at a hotel to carrying heavy bags for the humans. They can also help the disabled to walk and assist in many ways. Robots could become the pet that could be more widely used to provide "companionship" for the elderly and to those in hospital to replace or supplement the hospital's "visiting" dogs. These robotic pets could also supplement the highly trained "hearing" or "seeing" dogs, with the added advantage that if the owner apparently needed help, they could transmit full details of the problem, the exact location to under one metre and possibly a view of the problem. This could quickly result in summoning the appropriate

assistance. Again ethical issues are raised, about the privacy of the individual, so perhaps this would be a situation to be included in a "living will" agreeing to some elements of surveillance by their "pet".

Robots could play a further part in assisting the elderly and disabled to live independently, replacing in part, the visiting human carer, in their roles of distributing and ensuring medication is taken. This could be undertaken by a robot, reporting back to "control" if the robot does not "see" the medicine being swallowed. Again this might be viewed as an infringement of the person's privacy, despite being possibly essential for their health. The human carer usually would help their "patient" with washing, assisting them with dressing and undressing, as well as the very personal role of helping them in the toilet. Robots are capable of undertaking these roles, but would this be acceptable to the "patient". The carers in the UK, provided by the local authority, now have been asked, in many cases, to reduce their visits to fifteen minutes or thirty minutes per visit, whereas the robot would be available 24x7 for the patient. Elderly independent lives are often delivered cooked meals, often by volunteers, to their homes, but with very limited choice of timing or menu. Robots could provide freshly prepared meals on demand, and assist the "patient" to eat, and also recording any problem or abnormal eating behaviour. Again there are major benefits in addition to ethical dilemmas. The "patient" would probably like human visitors so by using these robots, the human visitor need not be a highly trained carer but could possibly be provided by links to local colleges or charities. Additional human social interaction could currently be provided through the Internet, with human friends who might be globally separated. The quality of this type of care could be seen to be by some as better than the human carer (Ross, 2015).

The acceptability, rather than the technical ability of such robot based caring, is a major consideration. The willingness to undertake such care, where provided at home, at a retirement establishment or at a hospital, needs to be addressed, not only by the person, again in a "living will", but also by the authorities. These must not be influenced only by the potential financial savings to the state. The use of robots as a nanny with the care of children is even more of an ethical dilemma, with legal implications for the parents and guardians.

6 CONCLUSIONS

Students of today need to understand both the

current and future applications of technology, but also the ethical decisions, which could be more difficult to solve than the technical problems.

With the increasing availability of e-learning, both for initial learning at colleges or as self-study, e-learning can now be used to "up skill" throughout to the whole career and during retirement. It can be accessed easily through mobile phones and other technology throughout the world, personalised for individuals, and at times that are convenient for the user. This compares to attending conventional courses, which might not be available locally or are too expensive. This can change the e-learning pattern lifelong, to provide a means to enhance the mental capacity of all, including the elderly.

This could also help to address the issues of dementia, providing an option to mentally stimulate the elderly, those with learning difficulty and also those separated from other regular human contact. These e-learning opportunities can now be provided in a form suitable for all, especially those with disabilities, including the blind and the deaf.

The current and future technology offers wonderful potential to assist all, regardless of age, ability and location, but, as with all good things, there is a possible "down side". In this case, rather than issues of cost, the ethical issues could be a need for consideration now and in the future.

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