

# Technology and its Impact on Nursing Education

Sue Turale

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*Corresponding author: S. Turale*  
*E-mail: sturale@yamaguchi-u.ac.jp*

*Sue Turale DEd MN RN RPN*  
*FRCNA FACMHN*  
*Faculty of Health Sciences,*  
*Yamaguchi University*  
*1-1-1 Minami-Kogushi, Ube,*  
*Yamaguchi 755-8505 JAPAN*

## ABSTRACT

The overwhelming hallmark of the 21<sup>st</sup> century has been change, affecting all levels of societies and cultures. Globally there are fundamental shifts in science and technological advancements, including medical interventions and genetic knowledge; significant downturns in the economic wellbeing of many; catastrophic natural and man-made disasters; and significant concern about the environmental health of the Earth. We have increasing shortages of health professionals, and rising aged populations in many countries. Healthcare and nursing education have been affected by such changes within larger global and national social, economic, political, cultural, and environmental spheres.

Nursing educators have to prepare clinicians to promote health and improve wellbeing, but the foundations of nursing education need to be redesigned in many countries as technology, science, and the demands of the public for effective and responsive health care, become more complex. In some countries and regions nursing curricula are outdated, not preparing nurses for further practice. Technology has many benefits, but there are huge gaps in technology accessibility and training in nurse education and health settings, and challenges regarding the nature, cost, and high turnover of technology used in teaching-learning spheres. Other challenges include understandings about how technology impacts on the wellbeing of patients, clinicians, learners, and educators. This paper explores some of these challenges, including ethical concerns that may arise when the humanness of caring and education is lessened through technology.

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## **Introduction**

The hallmark so far of the 21<sup>st</sup> century has been rapid change affecting all levels of societies and cultures. Globally, there are fundamental shifts in science and technological advancements, including medical interventions, and genetic and genomic knowledge and application; significant downturns in the economic wellbeing of many; catastrophic natural and man-made disasters, especially in the Asia-Pacific region; and significant and sustained concern about the environmental health of the Earth. We are witnessing increasing shortages of health professionals globally, declining birth rates, and rising aged populations in many countries. These shifts all effect human health and healthcare education. The futuristic predictions of science and technology by science fiction writers in the last century, that once seemed so weird or unbelievable, have come true in our new millennium. If we want to be serious about understanding technology and its relationship to human health and its impact on education, it is critical to look at the bigger picture. Technological innovation and enhanced globalization are closely interlinked, and nursing education has to respond in a measured and carefully executed way if it is to be relevant.

## **The technological challenges for nursing education**

At no time in the history of nursing has technology had such profound effects on our lives, on practice, education, management, and research. In nursing education there seems to be some trends arising. In some countries we are emphasizing more outcome-based learning than process learning, for example through competency approaches; evidence-based strategies in learning-teaching; giving students more experiences in their learning than older forms of didactic instruction; and including advanced learning technologies in many programs. In all these trends is one great challenge: how we marry the art and science of caring together with the increasing technology at our disposal, so that caring remains focused on humans. Technology previously

has been known as the application of scientific knowledge for practical purposes<sup>1</sup>, but today is often used to describe computers and the like. Educational technology is the use of advanced forms of technology to facilitate the teaching and learning experience and for the past decade this has included using web-based learning in both live classes and classes uploaded to the internet for later access by learners. It also includes electronic resources, such as e-books, a variety of internet-hosted tools, computer access and broadband internet services within class and IT rooms, video cameras, smart-boards, whiteboard access, video-conferencing, cameras, pod-casting, and so on. Technology also includes the technologies in clinical practice.

As educators we have a double-edged role: to import and use appropriate technologies in education and to prepare nurses to use technology in practice. Despite the changes taking place around us, nursing remains intrinsic to health of peoples everywhere. We still have to concentrate on our social mandate to promote health and improve peoples' wellbeing for when it comes to human care what nurses do is extraordinary and highly complex. Today we need nurses who are highly educated, who are nurturers of the human spirit, and of cultures and societies, who are political and environmental activists, who are educated in both the scientific and technical aspects of care, and who provide holistic caring. The work of nurse educators is highly complex, a delicate balance between developing, and sharing knowledge, and engendering a quest for knowledge and skills in others.

## **Role makers, not role models**

In this century we need to produce and be role makers, not just role models. The future roles of nurses have not been determined, but we cannot afford to keep sustaining the current ways of doing things, especially when it comes to the importation and use of technologies in our practices. Readers will know the difference between training and education; for with training, after practice, the technical aspects of care become easy and fairly routine. But it is the

well-educated nurse who can problem solve, meet challenges in care, research, think critically, and strive to make a difference to improve health. The well-educated nurse needs to be also careful to keep the humanity in caring, to nurture nursing intuitiveness, whilst trying to ensuring caring is evidenced-based. Today nurse educators in many countries have to be prepared to change their practices to deal with the expectations of the Net Generation, those youngsters who have grown up with technology and want the latest technology to be incorporated in their learning<sup>2</sup>.

Technology is not new to us. As a profession we have been especially affected by the degree by to which it has been harnessed in medical science, but often the technological innovations of nurses have not been recognized<sup>3</sup> by nurses or others. Since modern nursing began in the middle of the 19<sup>th</sup> century, nursing has continuously imported innovations, transforming practice and care: new forms of bandaging and wound care, IVs, even the humble bedpan changed shape and size over decades. But technology has both benefits and disadvantages, which we need to keep in mind at all times when trying to improve education. Nurses often pride themselves on trying to do all things for all people, alas sometimes to our detriment. Often nursing has imported technology under pressure from industry and business who are involved in lucrative markets opening up, from governments, and from university systems that want to remain ahead of the game, at great cost. However, technology has such a rapid turnover that it is often difficult to have good longitudinal studies on the impact of its use. As nurses became more educated they imported more technology into practice and education, especially over the last 30 years. We have come a long way from chalk on the blackboard, and handwritten transparencies for the data projector.

## **The challenge of poverty**

Let me explain one serious impact of technology that needs to be at the heart of our discussions about nursing education. For many nurses around the world the greatest

challenge of the 21<sup>st</sup> century is dealing with the effects of poverty. Many do not have the time or luxury to be able to dwell on philosophical or practical aspects of how to implement new technologies into practice, education or administration. Instead, they have the more immediate task of trying to deal with human suffering and survival using the very few resources at their disposal. Nurses can practice in settings that range from the highly technical settings to desperately poor clinics. Technology has great power to make a difference. So when we think of the human condition, of the need for caring with a human touch, we cannot forget those who are living in poverty. Judith Oulton, CEO of the International Council of Nurses reminds us that it is incumbent on all nurses to help break the link between ill health and poverty<sup>4</sup>. It is also salient to remind ourselves that one of the major impacts of globalization is the unequal access to appropriate technology by the poor and marginalized. I am reminded of this when I teach in China and The Philippines. In China, the temperature can be several degrees below zero and the classroom is unheated during bitter winter snows, so my coat, hat, and scarf are left on as I distribute photocopies of articles to students that I have brought with me. They cannot get access to international journals nor afford many photocopies themselves, sometimes sleep many students to a room, and sometimes they and their families have to endure very difficult learning situations that many of us could not begin to imagine. I have to teach many times using the blackboard and chalk when routine power cuts intervene in class time. In The Philippines there are only two doctoral programs in nursing, one at a university college of over 1000 students of nursing, where there is only one nursing faculty member with a doctorate. Graduate students can travel up to 48 hours to get to my doctoral classes, by boat, bus, and walking, and in the university library there is access to only one international journal. Equipment in the clinical nursing laboratories is frugal and sometimes quite outdated. There are no simulated laboratories, nor banks of computers that students can use, no DVD players, and often there is constant downtime on the Internet due to server

problems. If you visit such places to teach, and I hope you do someday to share your knowledge and skills, you might like to forget taking your fancy multi-media presentation for the present, because of outdated or non-existent equipment. One important lesson for us as educators in fairly privileged societies is that our sharing of knowledge and resources is important if we are going to make a difference to global health.

We also need to get over some of the competitiveness that has entered the higher education sector, and share better with those more in need and mentor our colleagues wherever we work so that costly teaching technologies are understood and implemented in a more altruistic fashion, sharing the benefits and reducing the disadvantages. The technology that aids globalization and helps improve living standards for some, also dehumanizes and oppresses others. There is nothing more dehumanizing than poverty. My thoughts might seem idealist to you but I am sure you will agree that to be truly caring involves being true to our professionally-stated values.

## **Relationships between nursing and technology**

When we look at the literature concerned with the relationship of nursing and technology, there is a polarization between these, often resulting in a care-cure debate<sup>5</sup>. While this debate is important it may sidetrack us from drawing distinctions between the inevitability of technological innovation, and important and pragmatic decision-making about the design, implementation, and evaluation of technology that is appropriate for use in clinical or education arenas. Using technology in nurse and midwife education, and teaching others about that technology in practice and its impacts on care, has and will be a continuous experiment for us as educators. Using technology in education and practice is no longer optional, and technology knows no boundaries. None of us can foresee what lies ahead with its exponential growth and as the outer boundaries of science and technology continue to expand. Many of us understandably

feel that it is difficult to keep up with it all, especially those who have not grown up with digital technologies. However as educators I argue quite strongly that we do need to be part of technological innovations in education and practice where it is clearly shown that these save lives, improve health, and enhance learning and access to learning. It is disappointing to me that I rarely see nurses in the places I visit engaging in serious in-depth dialogues that get to the heart of the issues in technology in nursing education. In shifting from apprentice-style nursing practice into universities and colleges of nursing in many countries we have been so busy in developing curricula, trying to look credible among peers in other disciplines, learning how to research, how to raise standards of practice, educating ourselves and others, and at the same time dealing with a huge leap in knowledge production and reproduction, often through technological innovations that have rapidly changed the way we do business as educators. After 25 years in nursing education I conclude that we must find more time to critically interrogate the technologies that are being employed in education and practice, and clearly understand the implications of them, and if and when they should be used. Good research on some of these technologies and their impact on caring and nursing education is still quite scant. As a profession nursing has not yet come to grips with some of the IT-based educational approaches that have been imported as universal remedies to issues such as high class sizes, or the propensity of the Net Generation to engage more in digital technologies, nor the impact of technology on our working conditions. For example, over the last 3 years I conducted in-depth interviews with over 100 nursing scholars in the Asia-Pacific on the facilitators and barriers to developing nursing scholarship. The majority of these highly intelligent scholars complained that rather than making their work more efficient, some aspects of technology often added to their workloads. They are expected to respond quicker to student, faculty and university information requests, and where online learning is being used, some have their working hours extended well into the evening trying to keep up with student learning needs. The only time they

get to do research is on the weekend.<sup>6</sup> Many have had to learn using high fidelity patient simulation, or fully computerized mannequins in learning laboratories. What has changed markedly in education is the move from static experiential dummies to highly sophisticated pieces of equipment programmed that have the capacity to mimic human health conditions. Examining the reasons just why we incorporated such technologies in the first place is very important, for example the limited access to live patient clinical practice that has caused inconsistent and unpredictable student learning experiences; saving money; budget limitations for clinical practice; and enrollment in traditional nursing programs not meeting the needs of the savvy Net Generation; increasing efficiency in learning. We have therefore sought to make clinical settings realistically simulated in laboratories, and so controlling the learning experience, with no threats to patient safety; and saving resources by being able to centralize regional laboratories<sup>7</sup>.

It is only since around 2005 that educators have started writing about simulations. For example, in Canadian nursing education programs high fidelity human patient simulations were implemented without research into the pedagogical or educational philosophies appropriate to guide this technology-based learning tool.<sup>8</sup> Although simulation laboratories have been used in training pilots and branches of the military for some years, the jury is still out on the proven efficacy and efficiency of simulations in educational settings in nursing and midwifery. However they are being increasingly used in the USA, Canada, UK and Australia to combat a serious lack of quality student clinical experiences. A survey of boards of nursing<sup>9</sup> in the USA and Puerto Rico, examined the willingness of regulatory authorities to allow clinical practice to be substituted with simulated learning, and gathered data on the status of regulation changes concerning the use of high fidelity patient simulations. Of the 44 boards responding, 16 states had already given approval for simulations, but only Florida had stipulated that a certain percentage of time was to be allocated for their use with nursing programs; five states and Puerto Rico had

made changes to allow simulations in nursing education, while 17 states indicated regulation changes were contemplated in the future. Recently my American colleagues tell me their use is becoming quite widespread. Major reasons given for the use of simulations in education were patient safety and quality concerns and the shortages of nurses who could supervise students at the bedside. However, although many educators believe that simulation teaching is superior, there is no conclusive data that validates the belief that undergraduate students learn better through simulation technology. At conferences I have heard speakers caution that simulations are an adjunct to learning, and should not be a significant substitution for clinical experience with real people. When I have searched the literature on research on simulations there were very few studies on large cohorts of students.

## **Technology, practice and education**

Sandelowski<sup>1,10</sup> contended that nurses have often been troubled by the semiotic relationship between themselves, their practice, and technology. Technology and nursing have been seen both in opposition to one another, or the nurse has been seen as part of the technology, as the technician, or actually *part* of the machine. The use of the machines or equipment can be seen as a metaphor, a troubling dehumanizing force that has the potential to objectify and reduce the sense of true caring for the person who is entrusted to us. In the same way many educators might feel that technology can be seen as a force that is dehumanizing education. With the corporatization of education has come the presumptions that many of us will work harder, work smarter in delivering education to larger groups of students, respond quicker to tasks using the Internet and digital technologies, and produce or replicate knowledge in the form of curricula or research papers quicker than we have done before. Our discomfort levels with technology in nursing education becomes greater when there is rapid change of technologies that we are using – often before we have had a chance to embark on stringent research that evaluates the outcomes of the learning

process using the technology.

Sandelowski<sup>10</sup> noted that since the end of the 2<sup>nd</sup> world war there has been greater tendency for nurses to nurse the equipment, rather than the patient. I can attest to this. I remember my knees trembling as I had to learn how to give safe and effective renal dialysis as a new graduate, and became very frustrated in clinical settings where my psychological skills could not be put into practice due to concentration on the technology and not the patient.

As technology transformed care, so did technology transform nursing education, and I argue that in some ways that academics do contribute to education as a dehumanizing experience. We often do not communicate face to face. Do you think I am generalizing too much? Take the emails we receive and send each day. It has become so much easier to deal with information by email rather than in person. I am sure all of us are guilty of sending emails to someone whose office is down the corridor rather than actually taking the time to talk with them. And rather than having face-to-face, and perhaps time-consuming conversations with students about their queries, it is much quicker sometimes to exchange emails. And please be truthful, who among us has time these days to sit in the staff room and have healthy and important intellectual debates over lunch? It is interesting to note that in Japan where I work, a country that is known globally for its profound contributions to the development of technology, learning technologies are surprising low-key in nursing education compared to say the USA, Canada, the UK, and Australia. Yes, there are some simulations in some nursing laboratories, and we all use computers and the Internet, but actually visiting the library and reading books is still the norm for students; there are very few instances of online learning courses, video-conferencing, or web-based assessments. When close observations are made about this, it is clear that shortages of clinical placements, or reductions in the ratio of academics to students have not yet become such a major concern in nursing education. Nor have we as nursing educators in Japan been affected by corporatization, having to become entrepreneurs to earn money to support

university funding. Being forced to take in larger student numbers into courses is certainly not done.

What the science of technology tries to do is to make the unpredictable predictable, and sometimes this is very important. For example, technology that assists clinicians to reduce medication errors using bar coding, smart IV systems, and computer-described order entry is very beneficial<sup>11</sup> to the wellbeing of patients when there are unacceptable errors in practice. However, unlike some fields of science, such as technology, engineering, mathematics or biology, the outcomes for the arts and sciences of human care and education are not always predictable. Students of nursing for example learn in different ways and we cannot predict the outcome of an educative process because they are human beings. We cannot predict if all our graduates are going to deliver safe quality care, in the same way that it is not always possible to predict the post-operative wellbeing of a patient, or the health promotion behaviors of a person in the community. Nor can we predict the outcomes of health policy and financing of health, education or technologies accurately into the future. At various conferences I have heard Dr Jean Yan, Chief Nursing Scientist of the World Health Organization, tell nurses that the profession needs to be much more at the decision-making table about health care policies and financing. I suspect the same is true for nursing educators who are being swept up in the revolutionary technologies in health and education without sustained and sufficient input into the policy-making, financing, and distribution of technologies in our workplaces.

Technology is seductive to many, and seen as a quick fix to issues. In many countries, the use of health care technologies has helped to reduce the inpatient stays in hospitals. For example, in Australia the average hospital length of stay for general patients in 2007-2008 was only 3.3 days<sup>12</sup> which has a profound effect on learning abilities of nursing students in clinical areas. What technology and modern care has not done is transform health care into being a truly preventative system. Health dollars are still largely channeled into ill health and curative care and caring,

and primary health care and health promotion has not yet been well established in communities that make a significant difference to the health of populations. In the same way many nursing curricula are outdated, not preparing graduates for use of potential technologies in practice in primary health care settings, and often not fully adjusted to be responsive to reducing the morbidity and mortality of people at ground level, for example to combat the growing trends in obesity and diabetes. In reviewing recent literature there is considerable interest in health literacy for populations, and information literacy for health professions. We still are not comfortable with all of our learners being able to use learning and health technologies. As a group of workers nurse educators are ageing in many countries and facing shortages, and our capacity to keep up with technology is limited to the resources at our disposal and our capacity to be able to engender more appropriate ways of preparing graduates for the future.

Around the world too nurses are assuming new sets of language to go along with technology, some of which is alienating to people, especially those not familiar with technology or who are patients in our care. In practice in hospitals and communities some nurses are starting to use smart phones, hand held computers, and many wireless devices. In some sophisticated hospitals there are robots for meal deliveries and laundry services, workflow management systems, care protocols, the Internet, highly sophisticated patient management systems, and fingerprint or face recognition to enter secure sterile areas. Some workplaces also have multimedia systems to educate patients about their conditions. In nursing education we now have a new set of language to describe web-based learning, e-books, internet hosted tools, simulated learning experiences such as high fidelity clinical simulations, various forms of digitalized learning tools, education-based technology needs assessment tools, video-conferencing, virtual reality simulations, the list goes on. Somewhere among all this are meant to be the humans that we care for and the people we are educating. In this transforming and transitional period, we have to take

care not to alienate the person.

## **Negative effects of technology**

The power and extension of the Internet has created new educational and communication opportunities for many, and has added to the knowledge explosion, but one unfortunate impact is that nurse educators and editors such as myself have to remain aware of the potential in our learners or authors for plagiarism of information. Technology has created a wide range of legal, ethical, psychological and social problems that concern us all. The health of people can certainly be affected by cybercrime, cyberbullying, pornography sites, spam email, illegal access to sensitive health information, and the isolating effects of long-term computer usage. Indeed, in the same way that television has significantly reduced the socialization of families and communities, personal computers have added to issues of people isolating themselves from real human contact and touch in our modern world. There is now an increased tendency for people from different age groups, including nursing educators and our students, to spend more hours in front of computer screens or hand held i-pods, making contact with people all over the world, but often failing to make contact with families or next door neighbours. Technology can be seductive, and I worry for the mental health of workers. Many of us cannot resist reading work emails when we are meant to be resting on free time and on holidays. Keeping up with it all seems to engender a sense of guilt when one has not dealt with the daily email. This unfortunate aspect of the technological age has affected those in nursing education who need down time to relax. Somehow we seem to have forgotten that we do have lives to live away from the workplace. Technology affects other people in other ways, for example, through Internet connections, suicides pacts that have occurred among the disillusioned, depressed and isolated.

## **The way ahead**

Rather than feel a sense of hopelessness that

technology is overwhelming, I want to engender a sense of power for educators to encourage them to take a proactive stance, to be part of the decision-making about what technologies are relevant and useful in nursing education, or in human care. Too often, due to lack of knowledge or skills about technology, or not taking part in policy-making and decision-making, nurses accept the status quo and work harder in a reactive fashion under known and unknown powers that have a vested interest in ensuring that rapid technological innovations are implemented without serious scrutiny.

Today nurse educators are arguing that it is possible to promote real world learning experiences and to increase students' digital age skills so that they can synthesize information better and create effective communications. Moreover, advancing technology in health care and social education has enabled education and training to be more accessible to people who live remotely from teaching sites or cannot attend traditional forms of education onsite. However, have we really addressed the issues surrounding the potential for social isolation or social distancing for those who study remotely from nursing education sites? Many educators have not come to terms with programs that are largely taught by distance in practice disciplines like nursing. Does the focus of education now involve more of an emphasis on teaching technological skills rather than the human skills of caring? This is an important question, for I am not sure that in implementing technology into nursing and midwifery education we have grounded our curricula in solid foundations that are informed by philosophical and pedagogical foundations. In 1938 Dewey<sup>9</sup> cautioned that if curriculum were developed without a sound philosophical foundation, educators would be left at the mercy of the latest educational and technological fads without thinking about why it is appropriate, relevant or even pertinent to the teaching and learning process. It seems Dewey was right. The development of nursing technologies is a way of developing nurse-sensitive indicators which can be measured, however while nurses espouse patient-centred,

holistic care they often work in environments which do not support this. The result is that nurses become focused on 'the work' and see it as a schedule of tasks. The terms 'medical technology' and 'nursing technologies' have been discussed in the literature but are not clearly defined, leading to an incomplete description of the nursing contribution to care<sup>6</sup>.

There is no doubt that growing technologies in robotics will profoundly affect our future lives. Sophisticated robots are now being used in many workplaces, not just car factories. Robots in laparoscopic surgery, have proved efficient and effective, and in telesurgery, being guided by surgeons distances away from the operation site. In Japan for example where aged people now number 22% of the population, aged care is facing a crisis. There are less health professionals to actually provide care. It is only recently, and somewhat too late, that there has been some attempts to recruit significant numbers of carers and nurses from overseas for aged care. The solution by industry and some sectors of government and academia is seen as technological: to promote robots as a user-friendly means of caring for growing numbers of frail elderly people in their homes. This seems accepted as inevitable by the Japanese profession, which is not actively involved in decision making about such inventions, and some of my colleagues deem these robots as 'cute'. Multinational companies such as Toshiba, Toyota and Mitsubishi, and universities are investing significant resources in research and development with user friendly robots. The end result might be that nurses and carers will be replaced by robots, in the same way that workers have been replaced in factories.

## Conclusion

Advancing technologies that are implemented that create a human dependence and objectify the human experience of caring are not conducive to good caring and the psychological, social and cultures of humans. It is critical that we keep having dialogues and develop strategies about technologies in our practice arenas if we are to overcome some of the more dehumanizing and unethical issues of

technology. In many places around the world, nursing educators need to be active to ensure they have a place at the decision-making table about many aspects of their work, including the importation and use of technologies. We need to foster better understandings in nurses and educators about what the implications of technology are for nursing practice. Aligned with this is the need for us to have in-depth analysis and debate about the philosophical aspects of nursing and technology. Nurses and midwives pride themselves on doing, on being ahead of the pack when it comes to responding to crises, on developing new ways of doing things. However I believe one of our greatest failings as a profession is that we often respond and initiate changes in practice rather than engaging with contemporary changes in a

contemplative fashion about the profound effects technology will have on the way we do things. This contemplation should involve good research. Clearly, we need to place increasing emphasis on how we can maintain human touch or contact, and humanized care, but use new technologies to advantage in education and practice. Therein, I believe, lies the real challenge.

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