Future Schools and How Technology can be used to support Millennial and Generation-Z Students

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Abstract. A generational cohort is the term used to describe a group of people born within the same time span. Having experienced similar life events during their formative years, these individuals tend to have similar attitudes, adaptabilities and traits. In this paper we look at generational groups, contemporary cohort changes and how technology-savvy Millennial students need a different approach to learning. We also discuss a ubiquitous school system which has the potential to provide individual support in future schools. It offers every child a personal educational assistant - a discreet, unobtrusive helper. The educational assistant will be available through the computer network, both within the school system and externally through the Internet. It will be able to traverse time and space, and be of assistance at any time and any place..

1. Introduction

About 50% of an individual's personality, character and behaviour is believed to be influenced by genetics and family environment. In her research, Twenge (2001) explored a third possible influence to account for much of the remaining 50%. She proposed that the environment outside the family, predominantly birth cohort, has a major impact on a person's development. Groups of people born within the same time span are referred to as generational, or birth, cohorts. In each cohort-group, individuals share a group identity with a common social history. The people within these cohorts experience similar events as they grow up and tend to have similar attitudes and traits.

Each generational cohort spans about 20 years. According to Strauss and Howe (1997), whose research looked at generational similarities and differences over the last 550 years, generations proceed through four stages, called *turnings,* every 80 years or so. Every four turnings make up one cycle of history. Each generation may have a number of smaller sub-generations. The last four generations of the Twentieth Century, and those which make up most of the current World population, can be seen (in bold) in table 1, below. Some slight variation exists in the span of years used for each group.

Table 1. Demographics by Generation

Cohort	Year of Birth
20th Century	
G.I Generation	1900 to 1921/1924
The Silent Generation	1922/1925 to 1943/1946
The Baby Boomers	1944/1947 to 1960/1963
Generation-X	1961/1964 to 1978/1980
Millennial / Generation-Y	1980/1982 to 2000/present day
21st Century	
New Silent Generation / Generation Z	2000/2003 to 2020 /?

Most of today's tertiary students, and children in primary and secondary school, are Millennials. They are comfortable with technology, and are often more proficient with it than their teachers are. The majority of those born in the 1980s have used computers since they were teenagers, and many of them were computer-literate before they were ten years old. Kruse (2004) reported that 85 percent of students in this generational group own and regularly use at least one computer; 72 percent check email daily; and 26 percent use instant messaging. They have different attitudes and aptitudes to their predecessors. Their outlook is sometimes called the "information-age mindset", and is characterised by the ability to multitask; and a belief that computers are not technology, and that the Internet is an essential part of life. They also use mobile phones and SMS extensively.

It is evident from research that today's students are very different from those of yesteryear (Kruse, 2004; Oblinger, 2003; Tapscott, 1998), yet our system of education remains based on a traditional model. Surely, as the student population evolves, so should our schools.

2. Traditional Teaching and Learning

Traditional methods of teaching saw children taught rote fashion in a group. However, times change and technology advances, resulting in the fact that the traditional style, which was very effective in its time, is no longer adequate for today's (and tomorrow's) students. Today's children are accustomed to a fast-paced world. The proliferation of television, mobile phones and the Internet has contributed and many people now have little tolerance for things or experiences that take time. Children reflect this trend and concentration can easily lapse when mental stimulation is inadequate. They need individualized attention. The school of the future, incorporating ubiquitous technology, allows children to work at their own pace and get help and motivation when required.

The traditional group teaching style of education grew out of the economic demand in the 18th and 19th Centuries. Illiteracy was high and education was not as accessible, or relevant, to the lower classes whose livelihood depended on physical skill and strength rather than academic ability. Children of the wealthy were often taught at home by private tutors or sent to expensive church-run, or secular private schools. Few countries had widespread systems of education; however, over time, education gradually became available for more than the privileged few.

As education became more accessible, more schools were built and children were encouraged and expected to attend. At school, the emphasis was on learning the basics of reading, writing and mathematics – the 3Rs (**R**eading, w**R**iting and a**R**ithmetic!). To make schooling more practical and efficient, children were divided into groups according to age, and the traditional group teaching style was introduced. It has endured and evolved over several centuries to what most of today's adults are so familiar with now.

However, what has endured and worked in the past is not necessarily appropriate for the future, as reflected in this quote from Bill Gates when he spoke at the 2005 National Education Summit on High Schools in the USA:

> "... our high schools – even when they're working exactly as designed – cannot teach our kids what they need to know today" and
>
> "Our high schools were designed fifty years ago to meet the needs of another age. Until we design them to meet the needs of the 21st century, we will keep limiting – even ruining – the lives of millions of Americans every year. " (Gates, 2005)

It is clear, that to ensure our children and grandchildren receive the schooling appropriate to their needs, we must make some drastic changes now.

3. The Generations

Zeitgeist, from the German word meaning the spirit of the time, denotes the cultural mood, taste and outlook of a particular era. It refers to the ethos of a group of people born within a certain span of years, usually representing one generation. Strauss and Howe (1991) propose that, for each generation, despite diverse socio-economic backgrounds, a cultural climate dominates. The major generations of the twentieth century were: the Baby Boomers (1946~1963); Generation-X (1964~1980) and Millennials/Generation-Y (1980~2000); preceded by the Silent Generation (1925~1945) and the G.I. Generation (1900~1924). The

year guidelines are not strict so some variation exists, according to country and theorist. Those born since 2000 are being referred to as Generation-Z or the New Silent Generation (2000–2020), although the names and year-range may change in the future.

3.1 Baby Boomers

The term "Baby Boomers" is used to describe the generation of children born after the Second World War. It refers to the significant rise that occurred in the birth-rate due to several factors. They include the sense of relief that people felt when the war ended, leading to optimism about the future; and the improvement in economic conditions that made it possible for people to afford to have a family. Baby Boomers make up a sizeable portion of the consuming public, so their habits and lifestyles have a powerful influence on the economy.

3.2 Generation X

Often shortened to "GenX", this generation refers to people born in the 1960s and 1970s. This period saw the fall of the Berlin Wall, the end of the Cold War, the decline of colonial imperialism, and the rise of hippies and countercultures across the Western world. By the time older Generation-Xers became teenagers, the personal computer revolution had begun.

3.3 The Millennials, Generation-Y or Net Generation

The children born from 1980 to about 2000 are known as the *Millennials*, *Generation-Y* or the *Net Generation*. They are the most technologically-savvy generational group so far, with those in Western cultures, being brought up entirely in the age of personal computers and electronic gadgets. They are relaxed and confident with all forms of technology, mobile phones, PDAs, computers, dedicated game machines, and many more. They use the Internet for research, use the Internet extensively for their school work, use SMS and instant messaging to stay in touch and chat with friends, use email and instant messaging to contact teachers and peers, and tend to prefer the Internet over the telephone (Oblinger, 2003). Millennials are also ambitious and optimistic about the future.

Although some consider that Generation-Y expands to the present day, others believe that a new generational cohort, Generation-Z, began in about 2000. They believe it may end between 2020 and 2029, making way for the next new cohort.

4. Teaching and Learning in the 21st Century

A lot of research and development has been devoted to bringing technology into the classroom. There are various reasons for this, such as: making the education system more efficient; providing timely delivery of learning material; and reaching more students geographically, to name a few. However, by considering the changing attitude and aptitude of students through time, we must look at emerging technologies as not just relevant and beneficial but absolutely imperative to foster the natural ability and traits of today's students.

Emerging ubiquitous technology has the potential to offer an enhancement to learning that is appropriate to today's students. Calm, effective educational support for children within the school setting can be accomplished with Ubiquitous Agents (UAs) helping each and every child as they progress through their school day. These new technologies can be applied in a school setting to help make the classroom experience more adaptive to today's students. UAs are virtual entities based on software agent and robot technology which reside in ubiquitous space.

4.1 21st Century Schools

So what will a 21st century school be like? To meet the needs of students, teachers will need to nurture the individual talents and abilities of every child. Education will become more individualised (Marx, 2002). Fully networked school systems will allow electronic educational assistants to enhance the classroom experience. Every child will have their own helper. The 21st century classroom will consist of both physical and virtual systems. Ubiquitous technology and UAs can offer appropriate alternatives and enhancements to traditional teaching methods. UAs are virtual entities, based on software agent technology, that can provide anytime-anyplace service through communication with a network and, in some cases, other UAs.

4.2 21st Century Students

Early 21st century students include Millennials and the more recent Generation-Z. Millennials are also known as the Net-Generation or iGeneration, because they were surrounded by digital technologies from a young age. Predictably, Generation-Z will be every bit as technology-savvy as the Millennials. Computers, the Internet, online games and mobile phones are as normal to them as television was to Generation-X. These children have a much higher need for technology-based stimulation than previous generations, leading to a disinterested attitude to traditional methods of education.

The comfort level of technology for many teachers is relatively low, compared with that of their students. This coupled with the fact that many schools are drastically under-funded and unable to deliver the high technology which is imperative to these students, leads to an apathetic and indifferent attitude among students. Most would rather be at home using their own high-tech computer or game machines. Unfortunately, this could be misinterpreted as a lack of intelligent rather than a lack of interest.

5. A New Approach

There is quite a lot of emphasis on higher education and improving the technology available to today's tertiary students. But somehow, along the way, primary and secondary schools are being overlooked. This could be attributed to the fact that higher education, even when Government subsidised, is expensive, so universities need to be competitive and offer high quality facilities, in order to attract students to their institutions. When students choose which universities to apply to, their decision is usually influenced by what the university can offer in quality of education and facilities, as well as reputation and track-record.

Parents typically select private schools for the same reasons – quality, facilities and esteem. That is fine for the more affluent of our society, but what about those who cannot afford a private school education for their children? With state-run primary and secondary schools, proximity is the key factor. Most children attend state schools in their immediate vicinity, close to where they live or where their parents work. As a result, the majority of school children are restricted in the quality of education they can receive, being dependant on the funding available for their particular school.

Our research is looking at these schools. Under-funded state-run schools cater for the majority of Millennial children (and Generation-Z children in the future) and here is where we need to have the most impact. So, what can be changed in these schools?

5.1 Ubiquitous School Network (USN)

Today, many schools run a school computer network. This is typically used for administration, maintaining a library catalogue, student computer laboratories and some teaching. However, these networks can also be used to support children and their teachers in an inconspicuous and unobtrusive way. Using current technology, UAs can be incorporated in a school network, to create a Ubiquitous School Network (USN). As long as every child has access to a networked computer, this innovation is possible.

Students can be given unique network profiles, allowing them to be identified and to access their own specific settings, designed to suit their individual needs. Relevant information about each child and their

preferences will be stored in the system. Mobility is essential, so the system must ensure that the information moves with the child. Each child will have a personal, mobile, virtual helper, which will always be on hand when needed.

Individual privacy can be maintained by establishing access levels within the system. Although the USN will hold personal information, such as medical details, and how to contact parents or guardians, specific learning profiles, and any relevant behavioural problems and patterns; only pertinent and appropriate information will be accessible from the classroom. The system will provide twofold access in the classroom – by the teacher and by the child. Using a computer, the virtual helper will be able to interact, both verbally and visually with the student to help and to guide them. UAs combine the attributes of autonomous, adaptive, mobile and flexible agents. Being software-based, they have no physical mass, which allows for fewer restrictions of time and space. They are mobile within a network and interact with other systems. This enables them to available, not only within the school network, but also online, through the Internet.

5.1.1 Input / Output Methods

The input methods used by the USN include:
− Voice - using voice recognition and voice identification
− Keyboard, Mouse/Joystick;
− Gestures and Eye/head movement input offer non-verbal communication and interaction. Although not widely used as yet, as schools improve their technology with cameras and wireless sensors this input method will be more practical and comprehensive.

Output methods include:
− Voice - Verbal communication is natural and can also support development of language skills;
− Sounds - Using built-in speakers, various sounds and music can be produced;
− Screen (monitor) - good for visual learners, and useful for showing visual media;
− Gestures: This form of output can not only provide more meaningful communication and understanding between child and helper, but can also be useful when demonstrating physical concepts. Gestures can be viewed on a computer screen. However, when roaming school robots become commonplace, this type of output will be used a lot more in schools.

5.2 The Use of UAs in the Classroom

At this stage, the introduction of UAs is not intended to change what is taught in schools. It is meant to act as an enhancement to help provide adequate stimulation, interaction and motivation for students. It will also provide an outlet for students when concentration wanes. They can have their own personal helper, not unlike a virtual friend or avatar.

Students will be able to access their personal UAs in the classroom. The amount of access time allowed per student will depend on the number of computers available and student age. For instance, older primary school students may spend more time at the keyboards than first and second graders who are still mastering other basic skills. The teacher can arrange classes so that students are working on various problems or projects and can access the UNS to gather or send information. UAs can travel through the Internet to obtain information the student may need. They have various functions, which include: study assistant, an avatar friend, or a virtual robot or messenger to contact other friends or their agents.

When a student sits in front of a school network computer and logs on, their personal UA will become visible on the computer screen. When the student logs off and moves to another classroom, or computer laboratory, the student can logon there and the UA will be available at the new location. In the near future, UAs will also be able to move into a selection of specialised mobile systems such as: robots and avatars. This system can be used at all levels of schooling, and when older students are using portable wireless devices, such as PDAs or mobile phones, UAs can be embedded in order to assist them on the move.

Another use of UAs is in behavioural therapy. Research is underway into their use by children with Obsessive Compulsive Disorder (OCD), a problem affecting 1-2% of the student population. To these children a virtual helper, tailored to their specific preferences has the potential to offer calm, effective support within the school setting. The UAs can help these children cope with their fears and anxieties, without exposing them to others or the fear of being teased (Jones, Hunt and Jo, 2006).

6. Conclusion

In this paper we have discussed generational cohorts, a term used to describe a group of people born within the same time span. Having a common social history, each cohort-group shares a group identity, and has similar attitudes, adaptabilities and traits. The majority of today's students fall into the generational group, Millennials. In order to provide the best possible educational environment for these students we should be implementing appropriate technology suitable to their adaptive style. We also discussed a ubiquitous school system, which includes a USN, and has the potential to provide individual support to these students. Using current technology a personal educational assistant can effectively support every child in a school setting. The minimum requirements are already installed in most schools, and this system could be implemented through in-expensive software-based UAs. Able to traverse time and space, the educational assistants could be available throughout the school as well as externally through the Internet in the form of virtual helpers, tailored to the preferences of the individual student.

This approach is a realistic and achievable goal for schools in Western Civilizations and some parts of Asia, such as Korea, which is known for its advanced technological culture; and Japan, a country that embraces technology with gusto. Millennials readily embrace innovation and are intense users of technology (Kruse, 2004). Future innovations in schooling will include the use of robots which will roam the classroom. They will be equipped with sensors, actuators and communication modules, and have embedded UAs to communicate with the students (Jones, Jo and Han, 2005).

The Millennials' use of technology is dramatically intensified and different from preceding generations. To accommodate these differences, it is vital that educational curricula be transformed, rather than renovated. With the changing face of education, it is essential to implement new and emerging technologies in order to keep pace with the needs of the techno-hungry and techno-savvy Millennial and Generation-Z students!

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