Overseas Keynote Lecture

Impact of New Technology on Teaching and Learning in Technology Education: Opportunity or Threat?

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Abstract

The impact of new technology on teaching and learning in technology education is undeniable. Whether it results in opportunities or threats is an important question for us to study. The development of technology education in Hong Kong, a city lacking natural resources and whose development relies heavily on industrial production and economic activity, provides a good opportunity for us to gain an understanding of the relationship between technological and educational changes. This paper reviews the background and development of technology education in Hong Kong. By tracing the changes of technology education since the 1930s, and introducing the most recent education policy 'Education Reform', the paper explores the impacts of technological factors on teaching and learning in technology education. This paper further discusses the opportunities and threats which Hong Kong technology education has faced during several generations of change, as well as those it will face in the future.

Keywords

technology education, new technology, opportunity, threat, education reform

Introduction

Hong Kong lacks natural resources, and its development relies heavily on industrial production and economic activity. As a result, Hong Kong society reacts in a sensitive and dynamic manner to social, economic and technological changes in other countries and regions. For example, since the 1960s, Hong Kong has changed its focus from being originally an entrepôt trading post to a manufacturing-oriented economy, then to a combination of manufacturing and service industries, and finally to become the international financial centre it is today. Due to the decline of the manufacturing industry, the government expects Hong Kong to develop its high-tech industry. Technology has become the significant factor affecting not only Hong Kong's industrial development, but also its education policies and directions, as well as the whole development of the city. As clearly indicated in the Policy Addresses of the Chief Executive of the Hong Kong Special Administration Region, Tung Chee Hwa, regarding his expectations of education: technology is the major driving force of economic growth. Hong Kong people need to be prepared to cope with technological change.

Hong Kong's education policies and curricula have changed time and time again in order to keep pace with the rest of the world. Technology subjects have changed many times along with changes in society: from traditional craft and technical subjects in the early 1930s, to design and technology in the late 1970s, and then to the new technology subjects under the current education policy, 'Education Reform'. Among various factors, new technology affects technology education significantly. It affects not only the instruction methods for and the curricula of technology subjects, but also the nature of the students studying them. In fact, each change in technology education has brought both opportunities and threats to technology education in Hong Kong.

Craft and technical subjects for skill training

Apart from the traditional Chinese-style apprentice training, formal technology education in Hong Kong can be traced back to the craft subjects offered in the 1930s. The first industrial school, the Aberdeen Industrial School, established in 1935, is a good example illustrating the early technology education development of Hong Kong (more correctly: craft, apprentice, and technical training). At that moment, the school (the only one existing at that time) offered apprentice courses (three or six years) in mechanics, cabinet-making, tailoring, and shoe-making to students after their elementary studies. Besides providing industrial training, the school was also designated as a reform institution by the government. In 1952, the Aberdeen Industrial School was renamed as the Aberdeen Trade School. This change marked a milestone in skill training, that the industrial school would no longer strive for practical correctional training. The subjects offered at the trade school included handwork, with the following subject elements: bookbinding, carpentry, metalwork, pottery, leatherwork, paperwork and carving (Aberdeen Technical School, 1985). In 1957, the school also took the first step towards becoming a technical school, that is, Aberdeen Technical School (a secondary level school).

At that time, more technical schools were established. From 1955 to 1964, students in technical schools could take the craft subject handicrafts, in which they could select two out of six choices, including pottery, toymaking, leatherwork, bookbinding, weaving, and embroidery. students could also take one of the technical subjects:

(a) woodwork or metalwork
(b) geometrical and mechanical drawing
(c) dressmaking.

In 1960 and 1961, there were five 'modern schools' established for providing craft and technical subjects. They claimed to provide prevocational training at the secondary level. They also offered craft and technical subjects similar to those offered at the technical schools. After 1963, these modern schools were also renamed as technical schools. In fact, the name 'technical school' is still used now, though most of them changed their names to 'secondary school' in 1997. The major reason for this change is that many schools also offer science and arts subjects, so that 'secondary school' more accurately reflects the nature of the schools. Nevertheless, at their peak, there were 27 technical schools in Hong Kong. From 1965 to the late 1970s, woodwork, metalwork, practical electricity, and technical drawing became individual subjects and were offered in technical schools. This is also the longest period in which the syllabi of the technical subjects did not undergo great changes.

In short it is clear, as implied by the names of the industrial, trade and technical schools and the subjects they offered, that the core education aims of the subjects were providing skill training. Students (sometimes called apprentices) were mainly expected and required to acquire skills and obtain practical experience in preparation for earning a living (Siu, 1997). Even until the mid 1970s, students in technical schools (and some prevocational schools) also attended classes for skill training with a large amount of 'routine' and 'repetitive' drills. The performance of students was mainly assessed on their familiarity with certain skills, and their accuracy in required work (that is, with predetermined solutions and outcomes).

Regarding the curricula, the subject matters of these craft and technical subjects were adopted from the UK curricula, and had not been revised for many years. For example, the curricula in woodwork and metalwork were used for several decades and did not undergo any great changes until the 1970s. At that time, many workshop facilities were also imported from the UK, such as machines, hand tools and furniture, to fit the UK curricula and teaching and learning materials.

Regarding the examination of craft and technical subjects, public examinations for woodwork, metalwork and practical electricity started in 1955. The examinations for each subject consisted of three papers:

(a) Drawing
(b) Theory
(c) Practice.

The contents were skill- and practise-oriented.

Impact of technology on teaching and learning
Since the 1920s, particularly in the period of raising the position of modernism, 'scientific invention' and 'technological development' have become near–myths, not in school but also in the wider world. Industrialisation resulted in the training of skilled labourers becoming one of the core aims of many schools, in particular those offering education to the lower-class sections of the population. Further, in countries or cities such as Hong Kong, which lack natural resources, training manpower to service the mass production industry seemed essential in education, and sometimes the only reason for its existence.

To train students to meet social and industrial needs, the Hong Kong government invested a large amount of money in technical schools. Compared with secondary grammar schools, industrial, modern and technical schools were larger in size and had more teachers and workshop technicians, together with heavier investment in equipment for training purposes. Actually, the abstract term 'technology' was not popularly used in schools at that time. People were seldom concerned about or interested in discussing the meaning and purpose of 'technology'. Instead, 'new' and 'updated' equipment (that is, machines) was the schools' major concern. The success and standard of these schools generally depended on the quality (for example, size, power, ability to meet industrial standards) and amount of new and updated equipment which allowed teachers to train students to work in industry. A school would be classified as 'outdated' if its equipment was not able to meet the requirements of workmen in the industrial market. In short, technology in terms of equipment was mainly considered to be a teaching aid and a tool for providing practical experience to students.

Opportunities and threats
From the 1930s to the early 1970s, educational goals were simple and more direct. Students were trained in skills which met the needs of *local* industry. At that time, changes in technology (in terms of machines and knowledge) in Hong Kong were not as rapid or dramatic as today, though scientific inventions and technological developments quickly blossomed after the Second World War. Thus, the curricula and subject materials of craft and technical subjects did not need to be constantly revised, and the facilities available in schools did not become outdated as quickly and easily as they do today. The area of coverage of the curricula was also not as wide as today. This situation is easily noted by observing the number of subjects taken by students at that time. Unlike students today, who have many choices in selecting the subjects in which they are interested, students before the 1970s were required to concentrate on a few subjects and learn skills for a particular area or several particular related areas.

All of these resulted in a more stable education policy and curricula of craft and technical subjects, and produced students whose skills fit the needs of society. It also allowed schools to survive long enough to educate more students (that is, there was no need to use vast amounts of financial resources to update facilities when Hong Kong's economy was weak and education investment by the government was very limited). The government and schools also received little pressure from the public (including parents) to revise curricula and learning and teaching activities.

However, these factors also resulted in criticism that the curricula did not allow students to develop diverse interests. Teachers whose knowledge and experience regarding new technology was outdated controlled students' learning, ensuring that it was limited/bound by the teachers' knowledge and experience. The major role of students was just to *follow*, with little opportunity to explore for themselves. Students thus might not have had the ability to catch up with the technological changes in the world.

Design and technology
After about 20 years with few changes in the technical subject curricula, a new concept of technology education (or more accurately at that time: technical education) was introduced in mid-1975. To promote the 'creativity' of students in order to meet the new educational objectives and new needs of the industry, a new subject, design and technology (with wood and metal biases) was introduced and implemented concurrently with the traditional technical subjects, Wwoodwork (now phased out and in which the last examination was conducted in 1991) and metalwork (being phased out and in which the last examination will be conducted in 2003). In 1975, design and technology was offered to Secondary 4 students who had taken traditional woodwork and metalwork, and as a new subject to Secondary 1 students. The subject has been offered until now, though the syllabus has been revised several times.

As in the past, the curriculum and subject materials were mainly adapted from those used in the UK. The major difference between the traditional craft and technical subjects and the new design and technology subject is that, instead of emphasising skill training, the new subject claims to strike a balance between 'design' and 'technology'. It was also at this time that the curriculum started paying more attention to the design process. The project approach was more highlighted. Since the 1990s, the curriculum has also been planned/revised to provide more opportunity for teachers to explore design and technology from a wider perspective.

The first design and technology examination was held in 1977. The examination consisted of three papers:

(a) design
(b) technological studies
(c) practical.

In 1978, the 'practical' paper was cancelled and substituted by the 'project' paper. The core rationale behind this change was to provide more project experience to students, instead of only skill drilling and technique assessment. Instead of requiring students to memorise the subject matter and present particular skills, the examination claims to assess students' design and technological capabilities.

When design and technology was introduced from the UK into Hong Kong in the mid-1970s, its Chinese name was '*She Yi and Gong Yi*'. The last two Chinese characters, '*Gong Yi*', are literally translated as 'arts and crafts' rather than 'technology'. This may reflect the fact that in the 1970s and 1980s, design and technology was still more related to craft and technical training. In 1994, the Chinese name of design and technology was translated as '*She Yi* and *Ke Ji*'; '*Ke Ji*' reflecting more accurately the meaning of 'technology'. One of the major reasons for this change was that curriculum planners and teachers had started (albeit a little late) to realise that craft and technical training could not correctly reflect the nature of design and technology. They had also started to understand that the traditional master-and-apprentice way of training technical subjects could not fulfil the new educational needs, in particular because society (that is, tertiary institutions and work-places) has changed to require school graduates to be more creative and critical in design thinking, rather than only performing perfect craftsmanship.

Impact of technology on teaching and learning

When design and technology was first implemented in the mid 1970s, there was in fact no great change in teaching and learning activities compared to the traditional technical subjects. Although there were some changes in classroom settings and facilities, and heavy machines were phased out, many schools still emphasised skill training. The only difference was that many schools claimed that they ran the curriculum according to the project approach, which was a red-hot topic in the UK and many other countries.

Since the 1980s, there have been some changes in teaching and learning in design and technology. Firstly, new teacher-education graduates (including some who have graduated from other countries) bring a more design- and technology-oriented approach to the subject.

Secondly, the revised curriculum and examination syllabi (for the woodwork and metal biases) allow more opportunities for teachers to plan activities suitable for their students' particular needs.

Thirdly, as mentioned before, Hong Kong has changed from its original status as an entrepôt trading post to become a manufacturing-oriented economy, one based on a combination of manufacturing and servicing industries, and finally the international financial centre it is today. All these changes bring new social and industrial needs, as well as expectations of school-leavers and in turn, education policy and aims. Students taking design and technology are expected to have more critical minds to enable them to serve in industry, and to further their studies in tertiary institutions (in particular those expected to study abroad, as many foreign universities require students to show more initiative and creativity in their thinking).

Finally, new technology has affected the instruction methods for design and technology. Using computers as a media and web-teaching tool for delivering materials has become more common in the subject. Computer-aided tools have made changes in the curriculum so that students have no need to spend so much time learning traditional technical skills, for example, conventional technical drawing. Unlike the traditional implementation of final products (that is, physical objects), students also submit their work by using different means, such as 2-D and 3-D computer graphics and models. The role of teachers has also changed in that they are not the *only* source of knowledge for students. Students are encouraged to explore/find out answers by themselves by using new technology and inventions (for example, computers and the Internet).

Opportunities and threats

Reviewing the new technology as an educational means, subject materials and instruction media for design and technology, we find that it brings new directions and opportunities to the curriculum. For example, computer-aided tools and machines allow students to spend more time developing broader and more diverse interests in the subject, instead of repeating routine technical drills with a narrow scope. New technology and discoveries around the world change the focus of subject objectives so that subject contents and materials are no longer only related to local issues, but also to global ones. For example, in the past, nearly all students were expected to study locally and serve the local industry. Today, many of them have more opportunity to study and work in foreign countries. They are expecting to do so and are prepared to meet the curricula and job requirements of other countries.

New technology also eliminates some barriers for students with individual differences. Many traditional craft and technical subjects in the past were only suitable for boys and those with good physical ability. This was also the reason why, until the 1990s, attendance at Hong Kong technical schools was dominated by boys. New technology today brings new curricula, subject contents, and assessment and examination criteria. All of these allow girls and people with special needs to have more opportunity to study technology subjects. It also presents a new image of technology to society, emphasising that it is not a subject for the 'working class'. For example, in the past, many Chinese parents did not like their daughters to study craft and technical subjects. They believed and understood that these subjects could not be handled easily by girls. They also had a perception that their daughters would end up becoming 'workers' – who were thought of as rude, lower ranking in society, and 'without a future'.

On the other hand, new technology brings difficulties in technology education. The first and most obvious one is the endless border/scope of the subject contents. It is difficult for curriculum planners and examiners to set up the syllabi. This is why the design and technology curriculum has been revised frequently and some alternative syllabi for the subject have been set up since the 1990s. Moreover, teachers today are required to take more initiative in deciding subject contents and planning classroom and workshop activities. Rapidly changing technological knowledge drives teachers crazy in tracing technological developments. This is why some (older) teachers keep on using the old syllabi, teaching the old subject matter, and using conventional teaching and assessing methods. (Siu, 1997/1999a) Sometimes, even when they claim to use the new syllabi, the 'contents' provided/prepared by them actually have not changed. Obviously, this can make it easy to survive in the classroom and minimise their workload. However, it is clear that students learning in such environments controlled by such teachers cannot keep up with societal changes and new needs.

Short lifecycle and continuously changing needs of equipment increase the expenses incurred by technology education. Reviewing the expenses of the design and technology subject, for example, a large portion of the school establishment grant is given to the facilities used in this subject. However, the government still has to inject a lot of money into schools in order to upgrade and update the facilities for the subject. Although this kind of education expense in Hong Kong supposedly increases every year, the mass media and educators still complain more and more about the increasing gap between the standard of facilities in schools (and even universities) and those in the real world (for example, industry). It is thus an important but also endless tracing game if schools want to keep in line with the *high-tech* and *updated* standards of facilities used in industry.

New technology subjects in 'Education Reform'

Nature of the subjects

Since the late 1990s, the Hong Kong government has been seriously reviewing education policy (including technology education) and has realised the need to prepare students to be more capable of meeting rapidly changing local and global needs (in both education and industry). There are three major education goals. First, the government clearly states that what students learn should not be outdated. Their knowledge and experience should also meet the standards required/expected by society, including the industry.

Second, instead of only preparing students to meet the existing, present and well-defined needs of society, the government expects our education system to prepare them 'to learn how to learn', in order to meet the future, unexpected and ever-changing needs of society. In this way, technology education no longer serves to train students to meet the present needs in education and industry, since it appears that graduates find what they have just learned at school to be quickly outdated. Instead, technology education should be more to nourish students to acquire the ability to adapt to societal changes, particularly technological change. For example, in the Consultation Document for Key Learning Areas (Technology Education) (KLA(TE)), the Curriculum Development Council (2000) clearly states its core vision: 'technology subjects should prepare students for a life-long and life-wide education to meet the challenge of emerging technology … [and] should prepare students for life in the ever-advancing technology world by imparting them technological capability, understanding and awareness to help them apply and appraise technology advancement and to make innovations.' (p. 5) Hence, the committees of the Council set up short-, medium- and long-term proposals and goals in order to 'entitle *every* student to learning opportunities to acquire know-how and knowledge of technology, as well as to develop the ability to critically appraise the impacts of using technology, technological advancement, and becoming technologically innovative.' (p. 2)

Third, all students should be entitled to technology education, that is, 'technology for all'. Students with talents in different areas 'would be provided with the opportunities to develop their potentials to the fullest to lead a quality life'. (Curriculum Development Council, 2000: 5)

Impact of technology on teaching and learning

To meet the first education goal, the government further states in detail that technology education should provide 'industrial-standard' experience to both teachers and students. This means that the education department, the curriculum development council, the quality assurance department, the examination authority, schools, as well as teachers and students, should have closer communication and a closer relationship with industry in order to understand and gain experience related to new technology. Reviews of the curriculum should also be carried out more frequently. More flexibility in subject matter and the teaching and learning activities provided in schools should be permitted.

For the second education goal, 'technology' should be understood and considered in a new and different way, not as an 'unchanged element' in the curriculum and teaching and learning activities. In detail, in the curriculum, technology should not be considered as some well-defined/determined matters for students to learn. Technology changes day by day, so the contents of technology subjects should also be changed day by day. Taking it to a further extreme, an invention or discovery of today might be considered as an outdated fact (or history) by students tomorrow. Thus, the curricula and subject contents of technology subjects should have different scope, directions, approaches or ways of exploration for students at different levels and with different individual interests. Based on these, technology education should be more student-centred and problem-based, so that students can discover and explore knowledge by themselves.

In other words, students' role has changed. In general, by adopting Stoll and Fink's (1996) ideas about school and curriculum change, there are three levels of students' learning in technology: *knowing*, *doing*, and *being*. At the 'knowing' level, students studying technology should acquire knowledge of a specific topic or project from their first-hand experience. At the 'doing' level, students should actively participate in processes such as initiating the topic of the project and their involvement, acquiring problem-solving skills, using different technologies in collecting data and learning to collaborate with others through the project. Lastly, at the 'being' level, they learn to be caring for others, act responsibly and accept others in the process of doing the project. In more detail, for example, students should 'respect cultural differences and the rights of others, as well as developing a sense of social responsibility in performing technological activities'. (Curriculum Development Council, 2000: 12)

The technology teacher's role must also therefore be changed in order to match the students' changing role. Teachers have to be creative in offering additional opportunities to cater for a wide range of student interests and ability levels. As mentioned by Glasgow (1997), teachers' roles must now be to coach or guide students through a variety of experiences in which the 'process' of reaching the outcome is more

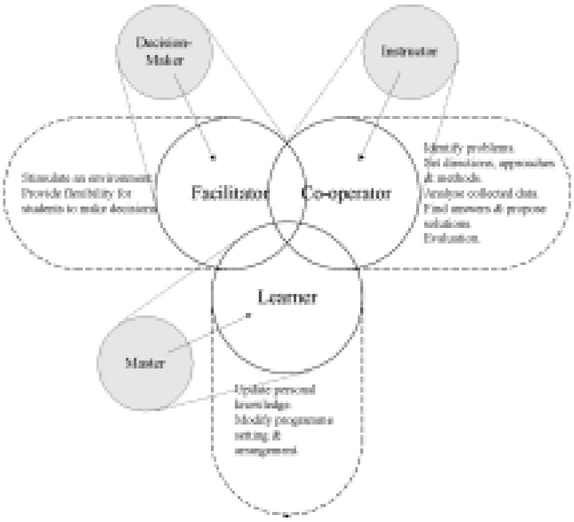

Figure 1: The shift of the technology teacher's role.

Figure 2: Traditional woodwork workshop in secondary school.

Figure 3: Traditional metalwork workshop in secondary school.

Figure 3: Modified workshops in secondary school.

Figure 5: Computer aided design workshop in secondary school.

Figure 6: Computer control machines in secondary school.

Figure 7: Remote site for production of students' projects (Industrial Centre, The Hong Kong Polytechnic University).

Figure 8: Machines in the remote site for production of students' projects (Industrial Centre, The Hong Kong Polytechnic University).

Figure 9: Student visits at the Industrial Centre of The Hong Kong Polytechnic University.

Figure 10: Industrial training for technology teachers at the Industrial Centre of The Hong Kong Polytechnic University.

important than the actual outcome or work product. In brief, the roles of teachers have been shifted: (a) from decision-maker to facilitator, (b) from instructor to co-operator, and (c) from master to learner (see Figure 1) (see also Siu 1999b).

The third educational goal is actually the extension and further confirmation of the goal of design and technology mentioned in the previous section. Instead of offering technology subjects to girls and students with special needs piecemeal by certain schools without a good planning and official policy, the new curricula put this goal in a more formal way and claims curricula and schools should minimise barriers to students wishing to study technology subjects. Although this long-term goal (2010 and beyond, according to the Curriculum Development Council) is still not a compulsory policy due to constraints existing in some schools, this goal on the one hand affects the resource arrangements of schools, such as timetabling, teacher arrangements, facilities for helping students with special needs, while on the other hand further confirming that technology is a 'core' subject, or, in the words of the Curriculum Development Council', a 'key learning area' for *all* students.

Figure 11: Industrial training for technology teachers at the Industrial Centre of The Hong Kong Polytechnic University.

Opportunities and threats
The opportunities offered by new technology are obvious. In the practical sense, new technology helps students to explore more and have better communication and more contact with the outside world (including industry). Today, some schools set up communication networks with other schools in Hong Kong and other regions. This kind of learning activity on the one hand can allow students to obtain more knowledge and experience from the outside world, and on the other motivates students to learn (Siu, 1999a), in particular to undertake more self-learning activities. In addition, learning is not only limited to school hours.

New technology also allows more sharing of resources among schools, as it decreases the huge expense of updating and upgrading facilities as mentioned above. For example, the Hong Kong Polytechnic University (PolyU) and the Hong Kong Institute of Education (HKIEd) have established an industrial-standard system (with some high-tech equipment and technical support) in the Industrial Centre of the PolyU. Through the Internet, students and teachers from different schools can share the system, submit designs for production, inspect the whole process, and discuss with experts in the Industrial Centre and students in other schools. Apart from the breakthrough in time constraints mentioned above, this also implies a change in technology education, in that learning and teaching activities are not only limited to a/some particular locations and inside schools. For example, for secondary students, through the Internet, the learning space can be remote sites in other neighbourhood schools, universities, factories, and schools in other regions. It is clear that without new technology, this kind of high-standard sharing system would be impossible for students (particularly lower form students) to experience, and this kind of flexibility in learning would not be available. In fact, since the early 2000s, this kind of sharing system, combining the advantages of the inventions of new technology, is increasingly common in Hong Kong.

New needs under the impact of new technology and its effects on the new needs and requirements of society and industry allow — *push* — the curriculum and teaching and learning activities to change. In the past, students were only required to have better capability in technical skills. Today, technology education aims to develop better 'technological literacy' in students through the cultivation of *technology capability*, *technological understanding* and, most importantly, *technological awareness*. This change results in a broader, curriculum catering for broader social needs and students' interests. Moreover, to be learning to learn implies that students are required (or forced) to take more initiative. This educational requirement prepares students to meet the ever-advancing world of technology more easily after they leave schools.

Furthermore, 'technology for all' implies inclusive technology education. To be successful in being 'inclusive', it relies on two factors: the meaning and definition of technology and whether new technology brings advantages to technology education. Today, firstly, new technology brings a new meaning and definition for 'technology'. Unlike in the past, when technology (or, say, technical) meant heavy, dirty, rude, low-class and meaningful for 'men' only, technology now means precise, fine, clean, high-class and important for 'all'. This allows technology (education) to be more widely accepted and widespread (at least, it results in a great change in perception among Chinese people). Secondly, new technology also brings convenience and support to overcome and eliminate the conventional constraints which prevent some students (for example, girls, students with disabilities) from studying technology subjects. For example, computer-aided design and manufacturing tools assist students to overcome many physical limitations and constraints. Students with different abilities can also study in the same place and follow the same curriculum (with a high degree of flexibility) while approaching diverse goals. This situation is different from the past, when students were 'ranked' and 'classified', and some subjects were forbidden to some students.

Obviously, as the Chinese saying goes, 'a needle does not have two sharp ends'. All the opportunities mentioned above also have negative effects if we cannot handle them well. Firstly, although more common use of high-tech facilities and sharing of resources can decrease educational costs, it is a fact that investment in technology is still a relatively higher portion of investment in education. If we do not have a good plan and management system, it will be very difficult to achieve a high degree of cost-effectiveness as the government claims.

Secondly, sharing resources and being involved in collaboration with other sectors such as universities and industry are all good ideas. However, according to some experience in Hong Kong, this kind of advantage is sometimes only available to particular schools. For example, Hong Kong's industry always likes to work with elite schools. The industry is also passive and not willing to invest money in education. Collaboration between industry and schools relies heavily on the initiative of teachers. However, it is a fact that quite a number of teachers do not take the initiative, and sometimes they cannot find ways to collaborate with industry. Moreover, universities cannot possibly cater for all schools. Thus, the development of technology education is easily biased and the quality of technology education among schools easily reaches a high degree of variation. In short, the gaps between different levels of school arise easily. However, these gaps are generally difficult for students to control or change, and usually cannot only be reduced by teachers or schools.

Thirdly, as stated, new technology curricula require students and teachers to take more initiative. This factor is difficult to manage and improve. Students in Hong Kong are commonly quite passive. To make changes requires time and support. One of the key supports is the teacher, and the quality of teachers relies heavily on the quality of teacher education. Thus, without prior improvements to and investment in teacher education, no matter how good the missions of technology education and its objectives and intentions, it will still be doomed to fail.

Fourthly, new technology give advantages for 'technology for all'. However, it also easily causes an effect whereby technology subjects can easily become compulsory subjects which only have the notion of 'compulsory' without that of 'education'. The education experience of some compulsory subjects in Hong Kong tells us that it is easy for students to feel they are only being forced to study the subject, without any motivation. For example, as in other countries, mathematics is a compulsory subject for all students in Hong Kong. However, not all students are motivated to study it. This only results in a situation where many students do not know 'why' they need to study the subject, and therefore they look like they are sitting in a prison cell when attending a mathematics class. Moreover, as mentioned above, the success of 'technology for all' relies heavily on whether supporting facilities and resources are 'available in all (schools)'.

Conclusions

Reviewing the technology education history of Hong Kong since the 1930s, it seems that new technology has had impacts not only on instruction methods and curricula for technical/technology subjects, but also on the nature of the students studying them. As the Chinese saying goes, 'water can float a boat, but it can also turn it over'. New technology really brings new opportunities to technology education, allowing students to cope with social changes, giving benefits and convenience in teaching and learning activities, minimising the limitations and constraints of students in studying technology. However, it will likely fail if we do not have good plans, clear objectives, good teacher education, higher educational investment, good, fair and balanced management of resources, good communication and collaboration with industry, serious and frequent reviews of curricula to meet local and global needs, and also new and creative learning and teaching methods.

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