Chapter 11
Vocational and General Technology Education

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This chapter explores the interactions between vocational and general approaches to Technology Education, proposing that the vocational–general divide is not always clear. Often, this reflects the tension between training for specific skills competencies, and educating for more generic core competencies. With schools increasingly being held accountable for the performance of their graduates, and rising unemployment, Technology Education as strictly general education is being questioned and vocational education is being infused with liberal arts characteristics. Globalisation, rapid changes in technologies and work places, and growing understanding of the nature of learning and transfer of learning will all influence the future Technology Education curriculum. While integration of vocational and general approaches is problematic at the level of single classes, at the programme level it may provide meaningful education pathways.

Introduction

This chapter is concerned with issues arising from the vocational and general elements of Technology Education. In many countries Technology Education is a component of the core curriculum in both primary and secondary schools, providing a sequence of experiences that are judged to be useful for all students in preparing them to play a full role in society and to achieve to their full capability. In addition, many schools offer students more specific forms of Technology Education focussed on a particular vocation or group of vocations. These classes are not intended for all students, but only those interested in pursuing a specific vocation. In developed

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PJ. Williams et al. (eds.), *The Future of Technology Education*, Contemporary Issues in Technology Education, DOI 10.1007/978-981-287-170-1_11

countries, these vocational options tend to be offered at the upper secondary level; in less developed countries they may be offered at lower levels of schooling.

However, the vocational–general divide is not always clear. Many subject areas that are now included in the technology learning area at the secondary level have had a vocational orientation in the past, such as those subjects dealing with hard materials. These subjects tended to have a quasi-vocational status: while they were seen as providing an orientation to various vocations, there was no explicit connection with industry, and no industrial accreditation.

In addition, in many ways there is a blurring of the boundaries between the two approaches to Technology Education. They are often taught in the same facilities to the same students, it is often the same technology teachers who teach both general and vocational subjects, and the transposition between the two approaches to Technology Education is not always easy.

The trend from a vocational to a general approach to Technology Education in schools, and the differentiation between the two, has taken place over a long period of time, and in many instances, still continues—often resulting in confusion and tensions. The popular inclusion of vocational technology options at post-compulsory levels of schooling—particularly when attempts have been made to offer the two approaches simultaneously—has necessitated a clear rationale for both approaches (see Chap. 8, this volume, by David Barlex).

Issues arising from the differentiation between vocational and general Technology Education are explored in this chapter. Also considered is the notion of transfer, which is fundamental to the effectiveness of vocational education. When the nature of learning is considered in the context of the transfer of capabilities from one context to another, a complex interaction of factors comes into play.

Definitions

The first form of Technology Education, in early civilisation, was probably vocational, involving the development of competencies using technological artefacts to achieve specific goals. Competency testing was probably quite rigorous, and judged by whether one survived or not. The system of competency training would have been informal, although there may have been small groups of people who practiced with different tools under a master–apprentice type of structure. Technology Education as a form of general education came much later, and quite recently (maybe the past 30 years) was accompanied by the recognition that society is essentially technological, and in order for schools to prepare students for such a technological society, Technology Education needs to be included as part of the school curriculum. ‘Technology’ is the most recent iteration of this educational focus; prior to this it was ‘Industry’ that was recognised as a valid focus, and prior to that ‘manual skills’ were seen to be important for all students to develop.

The *study* of technology as a vocational or a general approach is longstanding. Maclean and Wilson (2009) consider that “the study of vocational education has a longstanding history, beginning in the 1880’s when urbanisation, mechanisation and industrialisation became the major forces driving societies” (p. lxxxviii). However, it could probably be traced a lot further back, maybe to the ideas of Comenius and Locke in the 1600s, and then Pestalozzi and Froebel in the early 1800s, who all developed theoretical positions on aspects of what we now call Technology Education.

The approach taken in this chapter is that Technology Education is the broad curriculum area, under which a vocational or a general approach can be taken to the delivery of content. The level of vocational education that will be discussed in this chapter is that which occurs in schools. While this narrows the field of discussion somewhat, there is still significant diversity across international education systems. This diversity ranges from unstructured work preparation experiences offered to primary school students in developing countries for whom the completion of primary school represents the end of their formal education, to structured and externally-certified attainment of specific competencies at the upper secondary level, which are then transferred to advanced standing credit toward a tertiary qualification.

Despite the agreement at the second International Congress on Technical and Vocational Education in 1999 that the term Technical and Vocational Education and Training (TVET) should be used as a way to unite the field (UNESCO 1999), there remains a diversity of terminology. Some terms are used in particular geographical areas, while others represent specific characteristics. The terms include technical/vocational education (TVE), vocational education and training (VET), career and technical education (CTE), occupational education (OE) and continuing vocational education and training (CVET). The definition of TVET adopted by UNESCO (1999) is "the study of technologies and related sciences, and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupants in various sectors of economic and social life" (p. 2).

A similar level of diversity exists in the provision of Technology Education as a component of general education. Many jurisdictions around the world have a K–12 (early years to the end of secondary) structure for the delivery of Technology Education. However, others combine technology education with science at some levels, separate primary and secondary structures, or only address some levels within the K–12 spectrum. Adding to the diversity, what actually happens in schools may bear little resemblance to formal curriculum requirements, with some schools paying lip-service to the curriculum and others making technology a school priority and using it as an integrating mechanism across the curriculum. The meaning adopted in this chapter is that Technology Education as general education is the study of technology in which students learn about the processes and knowledge of technology in order to develop their technological literacy. This is accomplished through exploration and experience of a wide range of technologies in a variety of contexts in which students work creatively and analytically to critique, design and develop products and systems.

Response to Context

The contexts to which both vocational and general education respond are dynamic. Vocational Technology Education responds to the needs of a range of industries, which in a global sense change slowly over time but in a national or regional sense can change more rapidly as economic priorities change. General Technology Education is responsive to the technological nature of society, which changes more rapidly as the technology innovation–infusion cycle becomes increasingly shorter. An issue for both these approaches to Technology Education is that educational structures (curriculum, equipment, facilities) change slowly. There is not the economic imperative for rapid change in education that drives commercial sectors. From this differentiation, a number of issues arise.

All countries are at different stages of social and economic development, and the focus on vocational education reflects the stage of development. Those developing countries striving for a basic level of literacy for all may not have a focus on vocational education, or may integrate it into primary education (see Chap. 12, this volume, by Frank Banks and Vanwyk Chikasanda, for a discussion on technology education in Bangladesh and Malawi). On the other hand, as countries progress through universal access to secondary education, there may be a focus on the provision of post-secondary pathways in vocational areas. There is some evidence that this focus (i.e., low income countries focusing on primary education) represents the best returns on investment for country development (ADB 2009).

Another context that increasingly demands an educational response is related to globalisation. As technology facilitates the movement of jobs from countries with an excess of skilled labour (USA and some European countries) to those with an excess of low skilled labour (India and China), vocational education plays a role in both. It is a means of increasing the skill level of the population in the former countries and so maintaining acceptably low levels of unemployment; in the latter countries it is a fundamental plank in the economic development of the nation.

Statistics seem to indicate a positive correlation between vocational education as a national component of human resource development, and national economic growth (Sabadie and Johansen 2010). However, there are some significant exceptions. On one end of the spectrum is Japan, with high GDP per capita (US$28,000) but low participation of secondary students in vocational education (25 %); at the other end there is Indonesia, with high participation rates (37 %) but low GDP per capita (US$2,600).

An alternative view was put forward by Pritchett (2006) after analysing rich and poor countries over 27 years: that economic growth precedes education, rather than the reverse. Chang (2010) also concluded that there was very little evidence that more education (resulting in higher rates of literacy) leads to greater prosperity, after analysing the relationship between literacy rates and per capita income. Another alternative view is that information learned in school has little impact on worker productivity, even in jobs where the application of a degree is obvious—a mathematics degree in investment banking, for example:

> Employers hire university graduates over high school graduates because a college degree suggests general intelligence, self-discipline, and organization. It's not what you've learned, just the fact that you went to college, got passing grades and graduated that counts—specialized knowledge is usually irrelevant. (McNerney 2013)

Nevertheless, the argument for the provision of vocational education as a form of human capital development is a persuasive one, and as a mechanism for both developing countries and countries requiring significant economic adjustment to stimulate economic growth, the provision of vocational education is a response to these needs.

Specific and General Competencies

Within vocational education, there seems to be a tension between training for specific skills competencies and more generic core competencies. On the one hand, many industry groups and individual employers state that they want general competencies in new employees, such as working with others and in teams, solving problems, communicating ideas and information, and using technology (Mayer 1992). Many countries have consolidated lists of key general competencies for employment—variously called workplace knowhow, life skills, essential skills or employability skills—which tend to encompass similar types of attributes and generally address communication, problem solving, self management, numeracy, information technology, and work ethics. In 2008, the establishment of the Asia-Europe Meeting research network (http://www.aseminfoboard.org/) to identify core competencies and to explore the ways in which they operate is an indicator of a developing focus on general competencies. There is also some evidence that students tend to value their general employability skills, rather than their specific competencies after high school completion (Bowskill 2012).

On the other hand, individual industries develop lists of specific competencies that are required to be mastered in order to obtain a qualification in that industry. For example, in the Australian Metals and Engineering training package, competency MEM8.3C includes:

Elements and Performance Criteria

1. Identify electroplating requirements
   - 1.1 Electroplating requirements are identified.
   - 1.2 Untreated materials and required electroplating treatment are identified.
2. Prepare for electroplating process
   - 2.1 Materials and racking arrangement are checked for non-conformance to specifications/job requirements.
   - 2.2 All plant and equipment relevant to process are checked for compliance with safety and operational requirements.
   - 2.3 Instrumentation/gauges are checked for operation.
   - 2.4 Condition of solution is checked.
3. Perform electroplating
   - 3.1 Operation steps are carried out in correct sequence

The assessment structure privileges the specific competencies. As mastery of these competencies needs to be verified in order to grant the qualification, this is the focus of both the teaching and assessment. General competencies are not specifically assessed, despite employers stating that these are the most important, and many industries support specific skills training once they employ someone.

Some attempts to foreground the general competencies are occurring. For example, in Singapore, specific courses are offered in the ten foundation areas (literacy and numeracy, communication, problem solving, initiative and enterprise, communications, lifelong learning, global mindset, self management, life skills, and safety) as a form of alternative entry into technology certificate courses for those without formal qualifications, but this approach is not common.

In summary, while vocational assessment and certification are based on specific competencies, employers are more interested in general competencies—although these are not often explicitly addressed by schools.

Nature of Learning and Transfer

Research on the transfer of learning indicates that transfer is difficult to achieve for many reasons (Perkins and Salomon 1992). While it is obvious many skills, such as literacy and numeracy, can be taught for transferability, the mastery of other skills in a school context is no guarantee that a specific skill can be transferred to a different school context or to a situation outside of school. This is problematic for vocational *and* general technology education, where the foundational validity for the subject's existence rests on notions of transferability—either the transfer of specific skills and competencies to a workplace context, or the exercise of cognitive skills, such as problem solving, critiquing and thinking creatively in a range of situations outside of school.

Traditional notions of transfer were based on the work of Thorndike (1924) and argued that if the situation to which the skills or knowledge is being applied is similar to that in which it was learnt, then transfer would be automatic. Research has since indicated that this understanding is overly simplistic and mechanistic, and does not consider factors such as the cognition that is needed to support transfer, the context of the learning environment, the generalisability of learning principles, and the nature of learning.

An elaboration of Thorndike's (1924) notion of transfer is that of near and far transfer (Perkins and Salomon 1996) in which near transfer relates to the contextual similarity of the learning and the applied situations. Conversely, far transfer is the application of learning into a context which is quite dissimilar from that in which the knowledge was gained, and the dissimilarity implies that far transfer is more difficult that near transfer. Leberman et al. (2006) point out that far transfer is becoming more critical because of the rapid changes in knowledge, technology and workforce opportunities, rendering many workplaces increasingly different from school contexts.

In the early 1990s there was recognition that the development of skill practice with a view to transfer required more than just the repetition of tasks until mastery was achieved (Griffiths and Guile 2004). Inquiry-based learning was consequently introduced to support learners to critically observe their work and reflect on their observations. Allied with Kolb's (1984) idea of the experiential learning cycle, this led to broader understandings of the nature of learning for transfer, which related to the individual's personal and social development. This is supported by Lave and Wenger (1991) who assert that situated learning is neither an educational form nor a pedagogical strategy, but rather legitimate participation in a community of practice. In other words active engagement in, and acceptance into a community ensures transfer into that community.

Johnson et al. (2011) contend that any notion of transfer that does not consider cognitive ability and function, but just focuses on the context, is inadequate. They elaborate on metacognition, mental representations and analogical reasoning as important cognitive concepts which contribute to successful transfer, and that teaching for transfer involves cognitive attention at both the initial and the receptive ends of the transfer spectrum: "Teaching for transfer involves linking new knowledge to existing schemata, naïve theories and mental models of students, and reorganizing these cognitive structures where necessary" (p. 64).

Griffiths and Guile (2004) drew on literature from sociology, management and innovation systems in an attempt to theorise the new economic and technological conditions for shaping the knowledge economy and how this impacts on vocational learning for transfer. One of their conclusions was that learners need to learn how to draw on their theoretical knowledge to interrogate workplace practices, and on their everyday knowledge to interrogate theory. Without this iterative process of interrogation, or metacognition, vocational learning will not easily transfer.

An alternative framework (though sympathetic to these previous notions) through which to analyse transfer is that of activity theory (Engeström 1987): that learning is not really being transferred from one context to another, but the individual is continually learning through one changing situation to the next, or from one activity system to the next, each one being increasingly complex. From this view, the ability to move between different activity systems (e.g., school and workplace) and become active and useful members of each system reflects the ability to transfer knowledge between contexts. While the basis of the analysis of transfer is the system rather than the individual, the unit of analysis is the activity itself, which takes into consideration social and cultural aspects of the setting.

This leads to Beach's (2003) notion of consequential transition, in which the application of knowledge is never decontextualised from social organisation. There are parallels here with Vygotsky's notions of social constructivism. The elements of transfer become the sequence of processes that form the interplay between individuals and social organisations, both of which are dynamic and can be represented by the fluidity of an activity system.

Consequently, Guile and Young (2003) argue that in preparing future employees for the workplaces of contemporary and global economies, the focus should be on distributed work rather than specific and narrow skills and competencies.

Student participation in a range of activity systems (e.g., school and workplace) helps develop boundary-crossing skills through the modification of, and contribution to, daily practices that are a way of developing knowledge. Students therefore should be actively involved in their learning systems, rather than simply copying skills or learning information. This provides the rationale for school programmes such as day release for students into industry, which gives them the opportunity to experience a range of social organisations. However, without scaffolding, a student's ability to integrate and become an active and effective member of each system is not guaranteed.

This logic leads to an observation by Säljö (2003) that there may be no need for theories related to transfer because such notions are accommodated within theories of learning. Take, for example, Piaget's concepts of cognitive constructivism and Vygotsky's social constructivism in which learners actively construct knowledge through assimilation and accommodation in the former (Bettencourt 1993), and collaboration and social interaction in the latter (Powell and Kalina 2009).

In developing their own skills and understandings, students are cognitively active in applying critical thinking processes to solving problems or responding to issues through the application of skills. The information they draw on originates from many sources—their teachers, information technologies, experts, social others, and their own previous experiences. The information which is applied from their own experiences or understandings is, in effect, transfer. This notion of transfer, as an integral aspect of learning, is only valid in contexts of active learning. If the learning is passive, or the learner is not fully engaged, then neither the skills copied off the instructor nor the rote learning of information will facilitate ease of transfer. Thus, the learner must be critically engaged in both the development of learning to provide the basis for facilitating transfer, and also in the learning to which prior understandings and skills are applied. If either context is not an activity (in terms of an activity system) then transfer is problematic, and in this context, alternative notions of transfer need to be developed. However, if students are active in their learning, then constructing knowledge across the boundaries of activity systems encompasses notions of transfer.

Within a concept of social constructivism, it is not specific skills or knowledge that are transferred, but the reconstructed incarnation of the original skills or knowledge that is critically applied to the new learning context. The implication is that learning must be active, designerly, inquiry-based, and problematic (or some other form which fosters engagement) in order for students to have the mindset and ability of reconstruction.

A framework aligned to that of social constructivism is Wenger's (1998) communities of practice, in which social participation in a community is essential for learning to take place. Through interaction with members of a community, an individual comes to learn the practices of that community and develops an identity as a member. The concepts of 'practice' and 'participation' are critical to this framework in conveying the notion of *active* engagement in the community. The framework does not support passive learning or rote repetition of skills and understandings, with the implication that this does not represent true learning and, in the context of this discussion, would not facilitate transfer.

Transfer, from a community of practice perspective, involves the individual moving from one community to the next, and integration into that community involves the adoption of the rules and practices of the new community. Vocational and Technology Education school classes are communities of practice in which the possession of skills, rules and understandings are characteristics of membership of the community. One of the rationales for the existence of these communities is to ease the transfer of individual members into other related communities. For example, a VTE school community that focuses on the development of skills and understandings related to hospitality is preparing its members for transition into communities of practice such as hotel management, tourism planning or bartending. The similarities of the communities being transitioned, and the shared concern and passion for what is done within a community (Krishnaveni and Sujatha 2012) facilitate the application and restructure of prior learning.

The need for 'work process knowledge' has become a feature of some EU vocational systems (Boreham and Fischer 2002), in which product data, the organisation of labour, the social ecology and systems of the workplace have been incorporated into educational programmes. Such an approach recognises that contextual understanding is an important facilitator of transfer, together with a combination of theoretical and practical learning.

While the notion of transfer is explored in different ways within various sociocultural frameworks, as described above, there are some commonalities (Crafter and Maunder 2012):

- Transfer is a complex and fluid process of individuals and contexts involving the reapplication or restructuring of learning rather than its direct 'copy and paste' transfer.
- Active social interactions are a crucial factor in the initial learning stage and also in the applied context.
- Transfer is individually transformative and the processes of reflection and identity construction change the individual as they cross boundaries and move between communities.

A theoretical model of school to work transition based on social cognitive career theory (Lent et al. 1999) was used by Masdonati (2010) to research student readiness and success in transiting to employment. The model comprised elements of self perception, perception of social support, and institutional resources and barriers. A programme based on the model improved participant readiness for the workplace.

Instead, then, of viewing transfer as the re-application of skills and knowledge from one context to another, it should be seen as a process of boundary crossing that involves consequential transitions in which learners are engaged in a variety of quite different social, intellectual and manipulative tasks in different contexts. Effective transfer, then, involves theory and practice of the skills and knowledge of the vocational domain, self organisation and workplace enculturation, and mediation between these relationships.

Role of ICT

Information and communication technologies (ICTs) are playing an increasingly significant role in education, and the indicators are that this will continue to include vocational education. While the content of many vocational areas becomes increasingly complex, the synergies in presenting technology through the use of (information) technology become clear. Having now bypassed the early and ill-informed arguments about the cost of online provision of learning resources, the need for appropriate pedagogies and the role of the teacher, the use of ICT can be informed and targeted.

Information technologies are enabling the elimination of boundaries that were shaped by the forces of previous paradigms. For example, the categories of ‘developing’ and ‘developed’ countries are less of a distinction in the global knowledge-based economy in which global networks are becoming more of an organising principle. The move from a knowledge society to a social society is reflected in the increasing use of social media and networking.

ICT literacy is a necessary component of both vocational and general technology education. It constitutes one of the general competencies of vocational education, in preparation for an increasingly digital and competitive workplace market. It is also an aspect of technological literacy for all students, to enable continual improvement and lifelong learning.

Further, as the rate of technological change continues to increase and globalisation pressures come to bear on many commercial sectors, changes in workforce requirements become more dynamic, and consequently the workforce needs to be flexible. Career changers can generally ill-afford time off from employment to re-train, so the affordances of ICT in delivering information to enable workforce transitions are relevant.

The reasons for incorporating ICT into the delivery of technology courses are similar to the more general reasons for incorporating digital technologies into learning—flexibility, experiential opportunities, cost savings, and the integration of theory and practice (Manir 2009). Studies show that e-learning is being used to complement and support traditional learning with the outcome of a blended form of learning rather than fully online courses.

There are advantages to incorporating e-learning into technology education because of the nature of the subject area. It is possible to develop sophisticated simulations of situations that students would not otherwise be able to access. For example, there is a safety advantage in developing a familiarity with dangerous tools and machinery, and while simulations will not enable the developments of competencies they do provide a level of awareness that may not otherwise be possible.

A perennial issue for technology education, particularly vocational, is the cost of developing in students competencies that require access to sophisticated and expensive equipment and machinery. Of course business and industry have a commercial rationale for the purchase of equipment, which is not generally available to educational institutions. e-Education may provide a partial solution to this problem through the provision of virtual experiences to students.

Convergence of the Vocational and General

Even when focussing on the development of technical skills, a relevant and vigorous vocational education community will engender a range of other attributes. For example, after meeting students from a successful agricultural science programme in Arizona, Klein (2012) observed that "These students also knew how to make an impression; they had learned the soft skills necessary to be good employees. They looked you in the eye, introduced themselves and shook your hand."

I made a case in 1998 (Williams 1998) that in Technology Education, the generalisation of vocational education and the vocationalisation of general education was resulting in the confluence of their goals. I maintain that this confluence continues. The requirements of progressive industries for new employees are similar to the desired outcomes of Technology Education as a component of general education. There could be a number of reasons for this harmony in development, in that similar factors have impacted on both education and industry. For example:

- increasing significance of technology in society,
- common economic conditions providing the stimulus for change,
- globalisation,
- increasing unemployment and increasing student retention rates,
- the recognition of a diverse range of learning styles,
- increasing quality of teaching and learning,
- the need for accountability, and
- social pressures on schools for graduate employability.

These influences have resulted in the entry-level core competencies of industry and the nature of general Technology Education having a number of parallels, such as:

- multidisciplinary in nature,
- standards developed as a guide to quality,
- similar personal development goals, such as flexibility, creativity, critical thinking, innovative and adaptable,
- individual responsibility for personal development, and
- team work skills.

In other words, there are two broad initiatives that to a certain extent overlap, but have been developed by different sectors of society: the changes and developments in Technology Education have been largely influenced by educators; the descriptions of the core competencies that are required at entry level in industry have been developed largely by industry. In both initiatives, politicians have played a significant role, but mainly in instigating the developments. The types of outcomes of these developments have been similar.

With schools increasingly being held accountable for the performance of their graduates, and unemployment rising, Eechnology Education as strictly general education is being questioned and vocational education is being infused with liberal arts characteristics. It may be necessary to equate general education more with vocational *education*, as distinct from vocational training. Discussions about these and similar terms reflect a movement to infuse technical education with some of the traditional liberal arts characteristics. Higgerson and Rehwaldt (1990) support this with the following types of arguments:

- technological changes are so rapid that any education that is limited to technical training is soon outdated; how to think and learn for future self education is more important,
- professionals need a combination of the liberal arts and the useful arts (Boyer 1987),
- technical education largely ignores the human factor but almost all workers need to deal with people, and
- technical training is inherently specialised, but technology is contextualised.

Others identify similar changes over time, but within a different frame. For example, Pavlova and Maclean (2013) attribute changes in vocational education to countries shifting focus from social concerns, whereby vocational programmes helped promote the inclusion of less privileged groups, narrowed education gaps and avoided social fragmentation; to a focus on economic issues within which vocational programmes become part of a human resource development agenda in order to enhance economic development. According to Karmel (2007) this has resulted in a VET system that has become industry-led rather than educationally driven.

Nevertheless, there seems to be a convergence of vocational and general technology education goals. This has implications for the ways schools structure their Technology Education offerings.

Integration of Vocational and General

There are two levels of integration that relate vocational and general Technology Education approaches to each other. The first is classroom integration and involves teaching for both vocational and general outcomes in the same class. The second is at a programme level, where students are able to select from vocational and general options to construct a course that suits them.

Classroom Integration

Teaching for both vocational and general outcomes in the same class is problematic, although for many schools it is perceived as a way of maximising the options available to students in cases where there may not otherwise be sufficient students to make up full classes.

The approach occurs where there is overlap between the vocational and general technologies that are offered, for example, in an engineering design course, which may be offered as a general education option, but which will cover some of the competencies needed for a vocational qualification, such as aspects of fabrication, for example. This connectedness is rarely a complete match in that the general education approach would be unlikely to cover all of the competencies required for a vocational qualification simply because the goals of the two approaches are different. The organisation of content would also be different. In a vocational approach, a structured set of activities would be organised so as to provide opportunities for the demonstration of mastery of competencies, whereas in the general, design-based approach, the content needed in order to address the design problem may not be known at the beginning of the class.

Of course, assessment varies between systems, but for a vocational approach that is part of a qualification, it is often in the form of mastery of competencies. Students are provided with a number of opportunities to demonstrate mastery, and when achieved, it is so recorded. Assessment for general education purposes would typically be different and could relate to achievement of an outcome or a standard at a particular level where judgements might be made based on a variety of sources of evidence, such as a portfolio, interview and project.

The pedagogical approach taken in a vocational class will also typically be different from that used in a general class. With a focus on vocational competencies, there is less opportunity for a student-centred approach because all students are working toward the same set of externally devised competencies. However, in a more design-oriented general approach, each student may be working on a different problem, or interpretation of a problem, so the prevailing pedagogy essentially becomes student centred.

In other words, the content (general vs. specific), goals (general vs. vocational), pedagogy (student centred vs. other centred), and assessment (outcomes vs. competencies) are quite different, and to try and combine them will result in doing neither well.

Programme Integration

As a way to enhance the quality of delivery of vocational education, and to address the findings of Polesel (2008) that, at least in Australia, most vocational programmes are poor quality and do not provide students with either general or specific vocational competencies, Pavlova and Maclean (2013) suggest the inclusion of a component of general education "which focuses on the development of general/employability skills . . . as well as linking theory and practice to develop a holistic understanding of practices by the students" (p. 49). This second form of integration is more at a programme level, where students can take subjects from both vocational and general streams to devise a programme of study that suits them. For example, in the Republic of Korea, 40 % of secondary students are enrolled in vocational classes, and in some schools vocational and general education students share as much as 75 % of a common curriculum. Part of the rationale for this is to overcome the perception that studying a vocational sequence of subjects precludes later entry into other forms of tertiary education.

An increasing proportion of the workforce are in positions where there is no guarantee of lifetime job security. In this context, developing competencies for a specific vocation seems a bit short sighted, and the integration of general education into vocational programmes may be a more useful preparation for employment opportunities that unfold over time. As a result, particularly advanced countries are making upper secondary vocational programmes more general by integrating more academic content so that students can be more versatile in the occupational options they consider.

Conclusion

Based on this discussion of issues surrounding vocational education, it is possible to make some reasonable projections into the future:

- Vocational programmes will become more student oriented as a broader range of subjects become available for selection across both vocational and general technology areas.
- The organisation of vocational education will become less centralised, which will enable schools to develop more flexible responses to local labour market needs.
- The provision of vocational education will become more flexible through the use of electronic networks. ICTs will enable a broader range of experiences, and simulations will provide a deeper awareness of vocational contexts.
- Deeper understandings of the nature of learning will facilitate transfer of attitudes, skills and competencies more effectively.
- The recognition that vocational education will need to become more generic and that proficiency in technical and para-professional skills will not be enough in most jobs will have the effect of standardising Technology Education to focus on generic skills.

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