Design and Technology Education: An International Journal

22.3

Enduring Learning: Integrating C21st soft skills through technology education

Paul Snape, University of Canterbury, New Zealand

Abstract

As times change we need to continually review what our education systems offer and where priorities might lie. The Technology and Knowledge Ages of the twenty-first century have brought about new understandings, new ways of doing things, and an array of new career and workplace opportunities. Employees today are expected to bring more than an accumulation of traditional knowledge acquisition. Increasingly important today are a plethora of attitudinal skills and dispositions that enable workers to engage in much greater collaboration, communication, problem-solving, and critical thinking. What are these newly emphasised skills and dispositions and how should they be addressed within the education system? Meaningful learning of these 'soft skills' will occur best in authentic and integrated programmes where explicit teaching identifies the required learning. This paper will investigate the nature of the skills, consider some implications and barriers and then demonstrate connections between the nature of technological practice and 'soft skills'. An essential consideration of this new learning focus is how it might be assessed. A new authentic assessment practice within a Technology Education tertiary education programme is introduced as an example of how knowledge and 'soft skill' acquisition can be combined and achieved.

Key words

Technology Education, C21st skills, problem solving, critical reflection, collaboration, soft skills

Introduction

To be resilient and effective in society today demands a much broader and diversified set of skills and a wide range of behavioural and value-based dispositions than ever before. Ken Kay, President of Partnership for 21st Century Skills (www.p21.org) has identified we are at a tipping point in public education. Significant technological changes and developments in brain and learning research are causing a rethink of the role, content and direction of education in schools (Bellanca & Brandt, 2010). Increased globalisation and the development of a knowledge economy (Gilbert, 2005) have led to a greater need for enhanced cultural understanding, awareness, and empathy, and consideration of a set of different skills, dispositions and attitudes. The nature of today's work environment and requirements from employers demand an increase in flexibility, performance, willingness to take responsibility, and overall capability in an increasingly diverse range of skills. Many academics have called for the need for a more explicit approach to teaching a set of affective or dispositional attributes (Bolstad, 2011; Claxton, 2007, Hipkins, Bolstad, Boyd & McDowall, 2014). Barron and Darling-Hammond (2010) (in Dumont, Istance & Benavides, 2010) identify that students will not necessarily develop an aspiration to analyse, think critically write and speak effectively, or solve complex problems from traditional education practices alone. To effectively learn these abilities specific programmes and approaches will be required. A change such as this will have implications for assessment practices as well. Masters (2013) emphasises that assessment and reporting practices in schools drive classroom teaching and learning indicating that there will need to be a change from the current focus on mastery of traditional school subjects if development of broader life skills and attributes is to be achieved.

Our understanding and perception of knowledge (Gilbert, 2005) has changed and employers are looking more at how prospective employees could otherwise enhance the workforce they will enter by bringing new skills that will complement the organisation's existing structure (Jacobs, 2010). Claxton, Chambers, Powell and Lucas (2011) suggest that mastering of these enduring skills to create robust, resilient, resourceful and reflective citizens with ability to compete for and win places in the workforce should be an important focus for successful teaching and learning programmes. Organisations employing staff expect more than an understanding of the nature and knowledge of the business. To add value to business employees must be adaptable, digitally savvy, and well versed in a range of affective skills and abilities. Significantly potential employees are being interviewed and required to complete a range of psychometric type testing to validate their suitability to the workplace and identify both strengths and potential weaknesses. We might well ask whether our education systems and programmes are preparing learners for this additional and often pivotal challenge. Technology Education is an example of a discipline that provides an excellent platform for the development of a wide range of attitudes and dispositions as well as the development of technological knowledge, know how, and technological outcomes of practice. The creativity, decision-making, discernment, practical applications, and communication required to meet clients' needs and the development of outcomes require a high degree of technological expertise and the consideration of a range of insightful, values-laden and affective capabilities.

It is essential that teaching and learning focus on the explicit development of the 'soft skills' that will withstand times of change and promote new knowledge creation (Bolstad, 2011). Children need to prepare themselves for increased collaborative work, be significantly more engaged in their learning and develop the will and enthusiasm (Riggs & Gholar, 2009) to maximise opportunities. Teachers may need to question their existing beliefs of teaching, learning and assessment to prepare programmes that will allow for a blended approach of content-knowledge and skills, dispositional development and student-led learning utilising a plethora of new-age technologies. Programmes of work in Technology Education are ideal to meet these new demands. This paper will explore the nature of these 'soft skills' to provide insight into how teachers may enhance opportunities for children and students in our schools and consider how assessment practices might need to change to identify future learning needs and give a clearer picture of more holistic student capability. The paper will also highlight how Technology Education programmes can utilise and develop broader skills and dispositions in an integrated manner through problem-solving or inquiry-based pedagogies. Institutions will need to develop innovative and informative assessment and reporting practices (Masters, 2013) to cater for these C21st learning needs and ensure students, parents and caregivers, subsequent teachers, and future employers can evidence the capabilities of these new-age learners.

New-age Capabilities

'Soft skills' have been identified, described, and defined by many researchers (e.g Dweck, 2006; Claxton et. al., 2011, and Hipkins, Bolstad, Boyd & McDowall, 2014), organisations (e.g. OECD, Partnership for C21st, and AC21), and governments (e.g New Zealand's Ministry of Education and the United Kingdom's National Career Service). All have looked to explore future-focussed needs and requirements for twenty-first century learning although the difference between 'soft skills', attitudes and dispositions has not always been clear. Williams (2011) and Claxton, et al. (2011) both see the distinction relating to actions with a tendency towards soft skills and dispositions demonstrating behavioural outcomes. While learners may have an ability and understanding of particular skills they will not necessarily use them consistently, accurately, or effectively. Perkins (2009) believes that people are often lacking in 'sensitivity to the occasion' in that while they may have or understand the skill they are not able to link it appropriately to the situation. Learners must be ready, willing and able to use their skills when the time is right (Claxton et. al. 2011) or as automatic responses to insecure and uncertain situations (Williams, 2011).

Research shows that this emphasis on teaching skills, dispositions and attitudes has gained momentum in order to promote learning and introduce experiences that citizens require to face the on-going needs, changes, and challenges of an increasingly global and technological world.

Wagner (2008) in The Global Achievement Gap, was an early leader in the promotion of dispositions and attitudes for the 21st century, and has advocated seven survival skills that students need to attain:

- Critical thinking and problem solving
- Collaboration across networks and learning by influence
- Agility and adaptability
- Initiative and entrepreneurialism
- Effective oral and written communication
- Accessing and analysing information
- Curiosity and imagination

Claxton, et al. (2011) in their work on Building Learning Power (BLP), have identified four key overarching domains in what they call the 'Supple Learning Mind'. These qualities of mind are the dispositions, and attitudes that effective learners can utilise and which, if they are to be used successfully, need planned intervention (Hattie, 2009).

- Resilience – the learner's emotional and experiential engagement with subject matter including: absorption, managing distraction, noticing and perseverance
- Resourcefulness – embracing the main cognitive skills including: questioning, making links, imagining, reasoning, and capitalising
- Reciprocity – covering the social and interpersonal side of learning and including: interdependence, collaboration, listening/empathy, and imitation
- Reflectiveness – covering strategic and self-managing aspects and including: planning, revising, distilling and meta-learning

Claxton et al. 2011, p. 40-41

In a world of constant and diverse change the ability to be resilient, resourceful, understanding and reflective is incredibly important if citizens are to successfully cope, continue to progress, and respond to life's challenges they will face. There is greater expectation that people will take greater personal responsibility to solve their own problems and although many governments offer support services to help, there is still an expectation that people will use their initiative and awareness to make the first move.

BLP also includes a second framework or *Teachers' Palette* relating to these learning domains and capability dispositions to help teachers develop strategies to assist pedagogical direction and student learning. It includes:

- Commenting – nudging, replying, evaluating and tracking
- Orchestrating – selecting, arranging, target-setting, and framing
- Explaining – informing, reminding, discussing, and training
- Modelling – reacting, learning aloud, demonstrating, and sharing

Claxton et al. 2011, p. 44

The inclusion of these two frameworks in classroom practices will go a long way toward incorporating a culture of learning with a strong emphasis on the promotion of enduring life-long learning.

From a United Kingdom employer's perspective, the National Careers Service (as cited in http://www.nationalsoftskills.org/skills-employers-seek/) include: communicating, making decisions, showing commitment, flexibility, time management, leadership skills, creativity and problem-solving, being a team player, accepting responsibility, and ability to work under pressure as complementing sound technical skills and knowledge as important skills, dispositions and attitudes to complement ability in the particular employment field. These abilities can often determine a candidate's 'point of difference' or provide the competitive edge when qualifications, experience and expertise are similar. Extroverted and socially adept people who can market themselves well are more likely to be successful in competitive situations and will therefore become more employable (Schultz, 2008).

The New Zealand Curriculum (2007) revision acknowledged the rapid pace of social change, an increasingly diverse population, more sophisticated technologies and more complex workplace demands as key drivers for a different approach to developing a curriculum based on what learners need to know and be able to do. To achieve its vision to develop confident, connected, actively involved and life-long learners the curriculum proposes the inclusion of Values and Key Competencies along with eight different disciplinary learning areas. Values such as excellence, innovation, inquiry, curiosity, diversity, equity, participation, ecological sustainability and integrity, and the Key Competencies of: Thinking, Managing self, Participation and contributing, Relating to others, and Using language, symbols, and texts, all strongly link to affective domain soft skill dispositions and attitudes. While these are broad and generic, and made up of many separate components they incorporate a wealth of dispositions and attitudes important to positive, robust, and sustained engagement in society.

An extended 'soft skills' list might also include other aspects such as the following:

Oral and written communication skills	Responsibility	Conflict management
Critical and structured thinking	Honesty/Integrity	Willingness to learn
Problem-solving skills	Following directions	Negotiating skills
Strong work ethic	Creativity	Cultural awareness
Etiquette and good manners	Teamwork capability	Empathy
Organisational skills	Computer literacy	Time management
Courtesy	Self-esteem	Sociability
Professionalism	Reliability	Self-confidence
Inter and Intra-personal skills		

Implications and Barriers

Employers have expressed concerns about how well prepared school leavers are for the workplace (Masters, 2013). An example of how employers see the need for these New-age skills, dispositions and attitudes can be found in a *New Zealand Technology Online* resource (http://technology.tki.org.nz/Resources/Case-studies/Technologists-practice-case-studies/Resistant-materials-hard/Rob-O-Keeffe-Joinery/Pathways-What-

Rob-looks-for-in-an-employee). Rob, the owner of a small joinery business proclaims that for him practical skills are not the most essential ability. While experience is important the specific practical work-related skills can be developed over time. Often pre-conceived ideas the potential employee brings can be detrimental to successful assimilation into a business and a degree of unlearning needs to occur before the employee can fully become a member of the team. Rob consistently looks for workers who take pride in their performance, work well in a team, use their initiative, communicate well in oral, written and visual ways, are well-organised with good planning skills, and are able to work independently. He claims… "As a company we're selling ourselves all the time and we need people to be impressed by the quality of our workers."

Clearly Rob is looking for more than practical ability and requires that his workers have a high level of affective dispositions to effectively represent the business. It is important that schools contribute to the development of these wider skills in their programmes so that students' learning better prepares them for work and societal integration. Educators therefore will need to consider how these dispositions are taught, how progress is monitored and how this progress and achievement is acknowledged.

There is a great opportunity within the school curriculum for schools to include these affective and dispositional factors in an open and explicit way to signify their importance and identify that education today is much more than an accumulation of knowledge and technical skill. Students today are going to confront many different challenges than their parents and grandparents may have endured in their working careers and family life and will need this wider range of life skills and dispositions.

These New-age capabilities transcend the traditional model of curriculum where an academically focussed base seemed clearer and where often a dominating perspective was prioritised and certain political ideals prevailed (Bolstad & Gilbert, 2008). Bolstad and Gilbert also suggest that if curriculum extends to shape individual, group, and national identity significant questions will need to be answered about what this might entail. A broader curriculum will require elements of explicit teaching if dispositions and attitudes are to become more than randomly or haphazardly developed in students at school. The curriculum best supporting these attributes and dispositions is vastly different from the traditional nature of learning and action of teachers. It requires a much more student-driven approach and involves significant engagement in rich, inquiry, project and problem-based activity.

Gardner (2006) and Pink (2006) as cited in Bolstad and Gilbert (2008) also note that today's society needs people to be big-picture thinkers, pattern recognisers and meaning makers, and be more right-brain thinkers capable of thinking metaphorically, simultaneously, aesthetically and contextually. They will have an ability to connect with others using a range of well-developed people and relationship-building skills.

A focus on learning rather than performance has significant effects on results in tests (Watkins, 2010 and Hattie, Biggs & Purdie, 1996). The successful development of skills, attitudes and dispositions is heavily reliant and dependent on a positive, respectful, inclusive and encouraging classroom culture. The classroom teacher is required to do everything they can to support and promote programmes that model the practice in what they say and what they do. An appropriate classroom culture must encourage and integrate the physical, cognitive, and socio-emotional environments in play. It is essential that this be inclusive of students in every way with them being of considerable influence in its establishment but obviously led and refined by the teacher.

The new Knowledge Age has seen an advance in the requirement for creative and innovative design of products and services to meet the developing needs of society and to solve the problems that they face. Trilling & Fadel (2009) have identified four powerful forces converging on and portraying life-long learning in this age: knowledge work, thinking tools, digital lifestyles and learning research. Much of this development is

now conducted by globally-based collaborative teams and while the ability to master the knowledge and skills required by the practicalities of the work is important, it is frequently more contextualised and acquired within employment. This new skill-set must be utilised by workers as successful employees to cope with the intricacies of an ever-changing world. Fig. 1 demonstrates some of the influences that these forces have had over several generations.

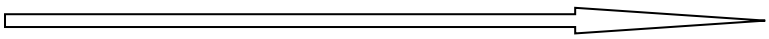
	Anita	Peter	Lee
Work environment	Assembly line 1950s & 1960s Tedious and noisy No qualification	Fascinated by robots Mechanical engineer 1980s & 1990s Designs and installs robotic assembly arms 2008 global financial crisis – new job	Tinkered in design Active environmentalist 2008 designs components for hybrid car solar panels Exciting and demanding work Online collaborative design with a global team
Changes over time	 More - digital devices - advance technologies being used - collaborative ways of working Work - increasingly less routine and manual - more abstract, knowledge-based, and design-oriented		

Fig. 1 Three generation analogy adapted from Trilling & Fadel (2009)

The shift from 'knowing stuff' to 'doing stuff' requires a wide range of different skills, dispositions and capabilities to be developed. Changes need to be made to create a learning focus that is broad, multi-faceted, engaging and purposeful, and where richer assessment practices will provide students with the formative feedback necessary to acknowledge growth and clarify next steps learning. To best support these changes

school curriculum needs to be more interdisciplinary, integrated, inquiry or problem-based. It will engage and excite students through a student-centred paradigm (Snape & Fox-Turnbull, 2011).

Another key development in 21st century understanding is a new focus on the nature of learning development itself. There is a need for wider public awareness of the gap between the kinds of learning students are exposed to and what is actually needed (Bolstad et al., 2012). The most prominent theory of learning today is a socio-constructivist theory. De Corte (2010) indicates that this learning needs to include individualistic acquisition and social participation engagement. De Corte describes socio-constructivist development as learning being; constructive, self-regulated, situated by being embedded in social, contextual and cultural environments, and quintessentially collaborative in nature.

Delors et al. (1996) claim that 21st century learning should be focussed around four fundamental types of learning: learning to know, learning to do, learning to live together, and learning to be. Bolstad et al. (2012, p. 13) see "a need for students to build their senses of identity, become self-reliant, critical and creative thinkers, be able to use initiative, be team players, and be able to engage in ongoing learning throughout their live."

Assessment practices often determine the teaching approach in the classroom (Masters, 2013). In traditional paradigms this has often led to a more didactic teaching style where students are prepared for assessment and teachers become anxious over league table accountability and high-stakes school performance. There is evidence that explicit teaching and learning of key competencies and values acquisition is insufficient, undervalued, and not seen as part of the learning progression (Bolstad, Gilbert, McDowall, Bull & Hipkins, 2012). Many schools continue to focus learning and assessment disproportionately on content knowledge and traditional beliefs about assessment, the transformations we are seeing and needs of future employees are indicating a change of focus to student assessment and disposition analysis is required.

"Traditional assessment methods typically fail to measure the high level skills, knowledge, attributes and characteristics of self-directed and collaborative learning that are increasingly important for our global economy and fast-changing world."

(Griffin, McGaw & Care, 2012 pp. v-vi)

Wiliam (2011, cited in Dumont et al.) ascertains that assessment is central to learning. Feedback will give the learner an understanding of their current abilities and this can then be used to identify subsequent learning requirement or direction. Broadfoot et al. (as cited in Wiliam, 2011) argue that this use of assessment to promote learning depends on: providing effective feedback, involving students in their learning, using assessments to determine subsequent teaching, recognising the influence of assessment on motivation and self-esteem, and students engaging actively in self and peer-assessments. Engagement of these formative assessment practices where there is greater inclusion of the learner in the learning process will require the use of 'soft skills' in which case promotion of, and feedback on the development such abilities must become part of everyday classroom practice.

While many of these implications are beginning to make some traction in learning institutions there remain many forces working against more widespread acceptance of the changes required.

Trilling and Fadel (2009) identify these forces as:

- Industrial Age education policies delivering mass education
- Educational accountability and standardised testing systems particularly measuring reading and mathematics

- Teaching practices based on transmitting knowledge through direct instruction
- Educational publishing companies making income from textbooks
- Educational organisations believing a focus on rigorous content will be undermined by new skills and
- Preferences of parents who learned through traditional approaches and have successful careers.

It will be important that these forces are considered appropriately to determine what changes may need to made to ensure that dispositions and attitudes are prominent in life-long learning.

'Soft skills' in Technology Education

Design infers a degree of change. This may be some form of development, extension, inclusion of advanced components or invention. Through design, human possibilities are enhanced and expanded, and needs and opportunities are realised. If one relies only on the existing knowledge available how does this development happen? It is clear that many other forces, particularly from the fields of psychology and sociology are associated. The problem-based nature of Technology Education encourages students to employ an array of activities: making judgements, decision-making, critical thinking and emotional actions (Ritz & Moye in Barak & Hacker, 2011). Ritz and Moye go on to state how authentic activity in Technology Education, which is frequently collaborative, provides the relevancy often sought by students in their learning. The multi-disciplinary, attitudinal, and dispositional nature of Technology Education encourages an integrated and meaningful way of learning. The need for students to engage in creativity, innovation, and critical thinking is evident in technological practice. While we often expect students to use these abilities in their work we must ask what we need to do to enhance their ability to do so. Certainly the nature of technological practice will provide opportunities, however students will only improve their ability when new insights are introduced and this requires explicit teaching and wider engagement. Explicit teaching where the students are made aware of the significant learning will help them to grow their existing ideas while contextualised activity will provide the meaningful and purposeful motivation and inducement to engage. Teachers who promote the nature of the significant learning and focus on the reflection and celebration of the learning will help students identify the broader influences and essence of 'soft skill' development.

Kimbell et al. (1991) have provided a particularly clear model of technological practice which explores practice beyond the technical and practical. His reflective/active capability philosophy exposes many of the softer skills employed while developing technological outcomes. Fig. 2 below shows where 'soft skills' can be incorporated into technological practice. Teachers can be active participants in their students' learning and success through utilising the dispositions of the Teachers' Palette (Claxton et al., 2011). Claxton et al. conclude that through commentating, orchestrating, explaining and modelling teachers will assist students in improving their thinking and performance

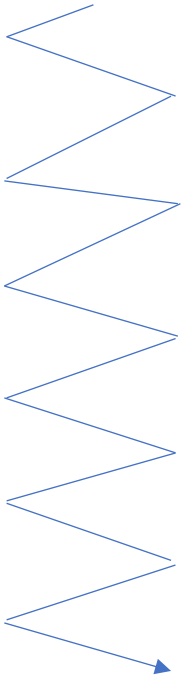
	Reflective Capability		Active Capability	
	Imaging and Modelling Inside the Head	**Scenario**	**Confronting Reality Outside the Head**	
Key Soft Skills				**Key Soft Skills**
Problem-solving, professionalism, self-confidence, responsibility	Exploring and clarifying the problem or brief		Discussion, stakeholder interviews, visits and research	*Communication, commitment, etiquette, leadership*
Creativity, perseverance responsibility, integrity	Seeking a solution and making value judgements		Brainstorming, existing ideas, product evaluation, planning	*Organisation, work ethic, teamwork, time-management*
Willingness to learn, reflection	Hazy impressions		Sketches, drawings, notes, discussion	*Computer literacy, decision-making, following directions*
Critical and structured thinking	Speculating and exploring		Concepts, early modelling in solid	*Collaboration, negotiating skills*
Reliability, flexibility	Clarifying and validating		Refining models, prototyping solutions	*Decision-making, teamwork capability*
Critical thinking, courtesy	Critical appraisal, evaluation, market research		Developed solutions	*Modesty, self-esteem*

Fig. 2 Kimbell's APU Model (1991): The Interaction of Mind and Hand (adapted by Paul Snape, 2016)

Assessment

The New Zealand Curriculum (Ministry of Education, 2007) states that a primary purpose of assessment is the improvement of students' learning and that this is best achieved as a result of an ongoing interaction between teaching and learning. Evidence of soft skill and dispositional learning is unlikely to be achieved through traditional standardised-norm referenced testing or other high-stakes testing regimes (Reeves in Ballanca & Brandt, 2010). Interpreting students' learning in C21st skills will require more authentic methods that cater for variability, collaboration, and openness.

Reeves identifies that authentic tasks that relate to the student's environment and life are what is needed. He notes that assessment practices need to be developed to identify how students engage in these soft skills, acknowledge how they perform and help students become aware of what they have learned and determine their next learning steps.

Five essential core realms that Reeves sees as important in C21st assessment include what and how they: learn, understand, create, explore, and share. The realms promote a good balance of content knowledge development and consideration of how students can utilise skills to develop a new and important knowledge and understanding of essential dispositions within authentic tasks and developments. Reeves discusses how

success in employment today is often seen as team ability rather than individualistic acknowledgement and as such should be represented in assessment through team activity and collaborative performance.

Reeve's view of C21st assessment has been adopted in a new assignment within a Technology Education course as part of an Initial Teacher Education qualification in New Zealand. Students work in pairs on all aspects of the assessment and complete it in parallel with course content development and practice over the ten-week duration of the course. The course itself has been developed using elements from the PTTER Framework (http://technology.tki.org.nz/Teacher-education/Pre-service-technology-education-framework) which includes students developing: an understanding and ability in Technology Education's Philosophy, Rationale, Curriculum and Pedagogy, and Implementation of classroom programmes. The assessment combines knowledge construction, critical reflection, and communication with technological practice. As students engage with the assignment and each other they utilise the full range of 'soft skills' introduced earlier in this article. Aspects of the critical reflection require that they consider the nature of their participation equally with the process and development of their technological practice.

An authentic needs-based scenario is given that presents students with a wide range of opportunities and options for technological outcome development. Students develop a portfolio of their technological practice with interspersed reflections that outline and acknowledge their planning, decision-making, links to knowledge, outcomes, and connection to the 'soft skill' dispositions they utilise. The first two phases of the course cover content relating to the philosophy and rationale for this curriculum learning area. Here each pair develops a construct of what they believe Technology and Technology Education to be and why it is an important part of the school curriculum. In this section they negotiate, question, reason, collaborate, listen, and create their construct. They share this through a forum and are then required to submit a response to the constructs of two other pairs. This requires communication, critique, critical thinking, and interpersonal engagement. Completion of this first part of the assessment requires significant connection to 'soft skills' understanding, appreciation, and participation.

The course then moves on to develop students' understanding of content, pedagogy, and technological practice. This includes engaging with the nature of the curriculum and then the research, planning, product development, modelling, construction, and evaluation phases of technological practice. In parallel the students will work on and evaluate their own practice seeking assistance and further learning as they go. This incorporates an element of formative assessment and an opportunity to continue their understanding and demonstration of the 'soft skills', knowledge and dispositions that will promote better achievement and appreciation for the discipline.

Spaced throughout the portfolio are more opportunities for students to reflect on and identify 'soft skill' and technological understanding as they apply their views of technological practice to their outcomes. Reflections are collaboratively written to promote discourse and consistency of understanding. The students are given a range of reflection tools and ideas to help them unpack their thinking and activity. Two de Bono style 'thinking hats' are introduced to help students consider what their practice means to their own learning development and what implications it may have to how they would perceive or complete it in the classroom. Another technique requires that students validate their learning and practice by linking it to readings and theory introduced in the course. They will also link it to the NZC Key Competencies, Values and Learning Areas (Ministry of Education, 2007) to analyse how their work is connecting to what is deemed important for a well-rounded education in New Zealand. Key Competencies and Values link particularly to the 'soft skills' identified in this work.

In New Zealand a significant aspect of classroom life is the inclusion and experience of bi-cultural perspectives. Bi-culturalism here refers to the relationship between indigenous Māori culture and that of more

Western influences (Pākeha). Students learn and practise aspects of Te Reo Māori (language) and tikanga (principles, values, traditions and cultural protocols). The assessment incorporates this with students integrating forms of Māori design into their outcomes and linking their practice to a range of values practised by Māori. These values link especially to 'soft skills' including spirituality, sharing of knowledge, reciprocity, respect and understanding, tolerance, caring, and cooperation.

This authentic assessment practice allows for students to demonstrate their learning, understanding and capability in a way that connects closely to Reeves's view of what is important in C21st learning. Through their participation, reflection, and understanding of Technology Education they can learn, explore, create and share the 'soft skills' and dispositions that are essential for meeting the new needs and requirements of employers and enable them to become robust and resilient citizens.

Conclusion

Significant change is occurring in what employers require of their workers and also in what is needed for people to become resilient, resourceful and responsible citizens able to cope in different times. Education systems must respond to these needs and promote programmes that will best prepare and engage learners. While major change in education policy and curriculum is a high-stakes matter and schools must ensure they are preparing their learners for what they will confront in life and instill a thirst for life-long and expansive learning. Such an approach will require a change to more effective teaching and learning pedagogies, student engagement, and assessment practices. Technology Education is a meaningful and multi-disciplinary activity which can promote active engagement and incorporate a wide range of affective, collaborative and practical skills while requiring a strong sense of problem-solving, creativity and critical thinking. As such it offers the ability to promote the dispositions and 'soft skills' that will make our learners successful participants in society.

References

Barron, B., & Darling-Hammond, L. (2010). Prospects and challenges for inquiry-based approaches to learning. In H. Dumont, D. Istance, & F. Benavides, (Eds.). *The nature of learning: Using research to inspire practice*. Paris: OECD/CERI. Griffen, McGaw and Care (Eds.)

Bellanca, J., & Brandt, R. (Eds.). (2010). *21st century skills: rethinking how students learn.* Bloomington, IN. U.S.A: Solution Tree Press

Bolstad, R., & Gilbert, J. (2008). *Disciplining and drafting, or 21st century learning? Rethinking the New Zealand senior secondary curriculum for the future*. Wellington: NZCER Press

Bolstad, R. (2011). *Taking a "future focus" in education—what does it mean?* An NZCER working paper from the Future-Focused Issues in Education (FFI) project. Wellington: New Zealand Council for Educational Research.

Bolstad, R., Gilbert, J., McDowall, S., Bull, A., Boyd, S., & Hipkins, R. (2012). *Supporting future-oriented learning & teaching – a New Zealand perspective.* A report to the Ministry of Education.

Claxton, G. (2007). Expanding young people's capacity to learn. *British Journal of Educational Studies*, 55, (2), 115-134

Claxton, G., Chambers, M., Powell, G., & Lucas, B. (2011). *The learning powered school: Pioneering 21st century education.* Bristol, GB: TLO Ltd.

Corte, E. de. (2010). Prospects and challenges for inquiry-based approaches to learning. In H. Dumont, D. Istance, & F. Benavides, (Eds.). *The nature of learning: Using research to inspire practice*. Paris: OECD/CERI. Griffen, McGaw and Care (Eds.)

Delors, J., Mufti, I. A., Carneiro, R., Chung, F., Geremek, B., & Gorham, W. (1996). *Learning: The treasure within*. Report to UNESCO of the International Commission on Education for the Twenty-first Century. Paris: United Nations Educational, Scientific and Cultural Organisation.

Dweck, C.S., (2006). *Mindset: the new psychology of success*. New York: Random House

Gilbert, J. (2005). *Catching the knowledge wave? The knowledge society and the future of education.* Wellington: NZCER Press.

Griffin, P., McGaw, B., & Care, E. (Eds.). (2012). *Assessment and teaching of C21st century skills.* Dordrecht: Springer

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. London: Routledge

Hattie, J., Biggs, J., & Purdie, N. (1996). Effects of learning skills interventions on student learning: A meta-analysis. *Review of Educational Research*, 66(2), 99-136

Hipkins, R., Bolstad, R., Boyd, S., & McDowall, S., (2014). *Key competencies for the future.* Wellington: NZCER Press

Jacobs, H.H. (2010). *Curriculum 21: Essential education for a changing world*. Alexandria, VA: ASCD

Kimbell, R., Stables, K., Wheeler, A., Wozniak, A., & Kelly,V. (1991). *The assessment of performancein design and technology*. London, UK: Schools Examinations and Assessment Council.

Masters, G.N. (2013). Reforming education assessment: imperatives, principles amd challenges. *Australian education review:* no. 57

Ministry of Education. (2007). *The New Zealand Curriculum*. Wellington: Learning Media.

National Careers Service. (2015). *Soft skills employers seek.* Retrieved August 12, 2017 from http://www.nationalsoftskills.org/skills-employers-seek/

New Zealand Technology Online (n.d.). *Pathways - what Rob looks for in an employee.* Retrieved March 2017 from http://technology.tki.org.nz/Resources/Case-studies/Technologists-practice-case-studies/Resistant-materials-hard/Rob-O-Keeffe-Joinery/Pathways-What-Rob-looks-for-in-an-employee

New Zealand Technology Online (n.d.). *PTTR framework.* Retrieved March 2017 from http://technology.tki.org.nz/Teacher-education/Pre-service-technology-education-framework

Perkins, D.G. (2009). Making learning whole: How seven principles of teaching can transform education. San Francisco: Jossey Bass

Riggs, E.G., & Gholar, C.R. (2009). *Strategies that promote student engagement* (2nd Ed.). California: Corwin Press

Ritz, J.M., & Moye, J.J. (2011). Using contextualised engineering and technology education to increase student motivation in the core academics. In M. Barak & Hacker, M. (Eds.). Fostering human development through engineering and technology education. Rotterdam: Sense Publishers

Schultz, B. (2008). The importance of soft skills: Education beyond academic knowledge. *NAWA Journal of Language and Communication*, June 2008.

Snape, P.M., & Fox-Turnbull, W.H. (2011). Twenty-first century learning and technology nexus. *Problems of Education in the 21st century*. 34: 149-161

Trilling, B., & Fadel, C. (2009). *21st Century Skills: Learning for life in our times*. San Francisco, CA: Jossey-Bass

Wagner, T. (2008). *The global achievement gap: Why even our best schools don't teach the new survival skills our children need and what we can do about it. New York*: Basic Books

Watkins, C. (2010). Learning, performance and improvement, international network for school improvement. *Research Matters,* 34. London

Williams, P.J. (2011). Dispositions as explicit learning goals for engineering and technology education. In M. Barak & M. Hacker (Eds.) *Fostering human development through engineering and technology education.* Rotterdam: Sense Publisher