Human capital comprises the individual and collective knowledge, skills and competencies that can be used to advance personal, societal and economic wellbeing. While Michael Porter (2004) has argued national prosperity is a function of the way “a nation uses its human, capital, and natural resources” (p.50), most commentators now agree with Becker (2002) that the 21st Century is “the age of human capital” because “human capital is by far the most important form of capital in modern economies” (p.3).

However, research to date on human capital and development has been contested, indeed often unhelpful, in at least two ways. First, and ideologically, some retreat from the notion that humans are “resources”, just another form of capital to be invested in the economy. Second, and educationally, human capital research has concentrated on returns-on-investment in education, using quantity (the number of years in formal education) as the key variable. Critiques of this approach emphasize the quality of education through the development of higher-level cognitive skills (e.g. critical thinking and problem-solving) and social skills (e.g. communication, leadership, team work). These are essential 21st Century skills for life and employability in a rapidly changing world. Global warming and other environmental issues are increasingly driving many of these changes, and the movement towards “greening the economy” is impacting on the skills needed for employability. This is the green skills agenda in education.

The aim of this paper is to explore the emerging synergies between these two important movements in education, especially in relation to their implications for applied learning through Technical and Vocational Education and Training (TVET). Our plan is to do this in two ways. First, we will present brief highlights of four related research projects to illustrate where our ideas have come from, and then we will discuss the growing convergence between the green skills and 21st Century skills movements.
Antecedent Projects

A comprehensive review of these projects is provided in Fien & Maclean (2018) in the *Handbook of Sustainable Development in Asia*. Due to space restrictions in this paper only brief summaries are provided here.

The first project was a review of international developments in TVET for sustainable development during the UN Decade of Education for Sustainable Development. This resulted in two outputs: the book, *Work, Learning and Sustainability: Opportunities and Challenges*, and an evaluation report on progress in the greening of TEVT across the Decade. As Table 1 shows, this was not a favourable evaluation despite the exciting lighthouse examples we found in many countries.

![Table 1](image)

Table 1 Progress in the Status of ESD in TVET in 2005 and 2013 For Member States (in Fien 2014)

<table>
<thead>
<tr>
<th>Description</th>
<th>Rating</th>
<th>2005</th>
<th>% of MS</th>
<th>2013</th>
<th>% of MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not included in policies or programmes</td>
<td>1</td>
<td>28</td>
<td>40%</td>
<td>4</td>
<td>6%</td>
</tr>
<tr>
<td>Emerging interest</td>
<td>2</td>
<td>17</td>
<td>24%</td>
<td>10</td>
<td>14%</td>
</tr>
<tr>
<td>In progress</td>
<td>3</td>
<td>9</td>
<td>13%</td>
<td>24</td>
<td>34%</td>
</tr>
<tr>
<td>Significant progress</td>
<td>4</td>
<td>2</td>
<td>3%</td>
<td>13</td>
<td>19%</td>
</tr>
<tr>
<td>Completely integrated</td>
<td>5</td>
<td>2</td>
<td>3%</td>
<td>8</td>
<td>11%</td>
</tr>
<tr>
<td><strong>Averaged rating</strong></td>
<td><strong>1.84</strong></td>
<td><strong>3.19</strong></td>
<td><strong>6.04</strong></td>
<td><strong>5.23</strong></td>
<td><strong>9.27</strong></td>
</tr>
</tbody>
</table>

Some of the light house examples were very innovative and included, for example, national policies (South Korea, Germany), an infusion of sustainability thinking into a redefinition of “competencies” (South Africa), contracts with the private sector to train slum dwellers in business skills for recycling (Egypt), green covenants (Victoria, Australia), training for supply chain integrity (China) and new methods of evaluating entrepreneurship education (Colombia). Despite this, the picture was one of slow but gradual change with little systemic impetus to scale up or mainstream the light house examples.

In the second project, in Australia, we sought to find out why this was the case. We were commissioned to find out what was needed in “Supporting the Uptake of Skills for Sustainability in Australia”. The two-year project was initiated by the Gillard government in 2012 but completed and submitted after the Abbott election victory – and the entire Green Economy and Green Skills sections in the federal government were disbanded – which no doubt explains why you have not heard of this research. However, we thought you might be interested in the four factors that the sector nationally told us were needed to support the uptake of skills for sustainability in Australia: (i) government and business support of a greening economy, (ii) policy coherence, (iii) leadership, and (iv) curriculum and pedagogical reform. See Figure 1.
This Australian project was actually a national response to an Asian Development Bank Project, led by Maclean, on “Education and Skills for Green Jobs”, which examined opportunities and barriers to skills development for sustainable and inclusive development in four Asian countries: Indonesia, Vietnam, India and Sri Lanka (Maclean, Jagannathan & Panth 2017: two volumes). This large-scale study involved quantitative analyses of industry and labour force trends and qualitative case studies of government, industry and TVET initiatives in the four countries. It also evaluated the legislation, standard, and social demand in key economic sectors (such as construction, tourism, etc.) in the four countries in order to understand the ways in which different industrial sectors are trying to respond to emerging needs and key issues, including areas impeding a transition from traditional to green practices.

The result was “a dispersed but disconnected narrative of skills training for sustainable and inclusive development in Asia”. Initiatives by individual VET teachers or colleges were found to play only a very minor role in the transition to sustainable and inclusive development. Instead, three factors were found to be influential as either barriers or enablers: government regulations and incentives, the size and foreign orientation of firms, and the perceived cost versus perceived consumer demand.
The fourth project commenced earlier this year and aims to identify ways in which TVET can contribute to a sustainable and inclusive knowledge economy through a case study of TVET responses to global and national drivers of change in Qatar. To achieve this aim, the study will:

- identify drivers of change and the resultant human capital needs from the perspective of government, industry and training sectors in Qatar;
- assess how well these are being addressed in TVET;
- identify and assess any potential reforms that might improve TVET responses;
- recommend policies and strategies through which this can be achieved.

We do not know of such a comprehensive national study of human capital and sustainable development being undertaken previously in any country, but acknowledge the small size and relative prosperity of Qatar makes this task easier than conducting it elsewhere. In the balance of this paper we would like to share one of the early conclusions of this project – one we have not been surprised by given the other projects we have described.

This conclusion is that human capital for a sustainable and inclusive knowledge economy requires an integration of green skills and 21st Century skills for wider employability – and that these are overlapping and mutually reinforcing. We can see this in the development of the green skills and the skills for wider employability movements, which we analyse in the next section of this paper.

### The 21 Century Skills Movement

Both the green skills and the skills for wider employability movements can be traced to more narrow and simpler forms than their current manifestations as TVET for sustainable development and education for 21st Century Skills, respectively, as educators and policy makers in TVET sought to respond to early and evolving signs of what, today, we would call national and global “drivers of change”. For example, the need to develop skills for wider employability was a response to economic restructuring in the 1960s – 1970s, which was brought about by the impacts of the first waves-of post-WWII globalization. This restructuring took many forms (e.g. shifts of manufacturing in most parts of the Global North to countries of the Global South, the rise of consumer and service industries, etc.) but required workers to be more flexible and prepared to change jobs, places and locations for employment, and even careers. The days of a job for life, let alone a single career were rapidly passing. There is an increasing movement towards skills development within a lifelong learning framework involving stakeholders such as business, industry, and educational institutions which is crucial to developing the human capital of cities and regions (Wheeler, 2017, p. 245).

The response in TVET was to develop curriculum frameworks that sought to develop generic and transferable competencies beyond the skills required for specific occupations. The Mayer competency framework in Australia (Mayer Committee 1992) and similar ones in other countries
are examples of this search for employee flexibility and wider employability skills. Education for life skills, global citizenship, entrepreneurship and digital literacy are parallel developments, reflecting responses in general education and TVET to other social and economic changes.

Today, these are coalescing into the 21st Century Skills movement, although this concept is not yet being widely discussed in TVET. However, an NCVER report by Kearns (2001) discusses the history of these changes in Australia and is a very good contribution to thinking in the field as is Leone Wheeler’s (2018) summary of the wide range of contemporary frameworks of 21st Century Skills from many countries. Lamb, Doecke and Maire (2018) provide a synthesis of these in terms of nine 21st Century Skills that have “received close and concerted attention from policy makers, researchers and practitioners” worldwide (p. 3):


The Green Skills Movement

A similar development of nature and conservation studies into environmental education and, more recently, education for sustainability (Fien 2002) can be seen in the development of what has become known as the green skills movement in TVET. The 2005-2014 United Nations Decade of Education for Sustainable Development adopted a multi-dimensional view of sustainability, which helped expand the focus on the greening of TVET (e.g. through training for resource efficiencies and energy conservation) early in the Decade to also include issues of poverty alleviation, rural transformation and sustainable livelihoods as the Decade progressed (Fien, Maclean & Park 2008; Fien 2014). Volkoff (2008) summarised the resultant changes in TVET required for sustainable development as including:

- Transforming TVET culture to embrace sustainable development;
- Providing equitable access and support for learners from diverse socio-economic status, ethnic and religious groups to build sustainable livelihoods;
- Developing adaptable and flexible curriculum which is woven from not only relevant vocational knowledge and skills strands but also integrating strands that provide for the development of:
  - Respect and harmony among diverse populations;
  - Technological literacy without denying or diminishing existing cultural capital;
  - New skills while valuing and building on learners’ existing knowledge and skills;
  - Entrepreneurship skills;
  - Learning to learn capabilities and a lifelong learning orientation;
• Generic employability skills imbued with values to support exploration of options and ethical decision-making in the context of an uncertain future;
• Understanding of the potential environmental impacts of work and the skills to make informed and value-based decisions to promote sustainable development;
• A knowledge culture that acknowledges the changing nature of work and embraces uncertainty and change.
• Devising appropriate pedagogies to promote the diversity of learning outcomes required for sustainable development.

Such changes were described in the Shanghai Consensus from the Third International Congress on Technical and Vocational Education and Training (Shanghai, May 2012) as significant in developing the cross-cutting 21st Century skills, such as problem solving, critical thinking and entrepreneurship (UNESCO, 2012). These skills were amply demonstrated in the findings on research into 16 case studies of school-community learning partnerships for sustainability in Victoria, Australia (Wheeler, Guevara, Smith, 2018). This trend was reflected in Goal 4 on Education in the Sustainable Development Goals, which seeks to “Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all”. Target 4.4 for Goal 4 requires TVET to address economic, social and environmental well-being by:

• Developing the skills youth and adults need for employment, decent work and entrepreneurship;
• Promoting equitable, inclusive and sustainable economic progress; and
• Supporting transitions to green economics and environmental sustainability.

Thus, in its recent Recommendations on TVET, UNESCO called on countries to reorient TVET in such a way that it became a key contributor to “sustainable development by empowering individuals, organizations, enterprises and communities and foster[ed] employment, decent work and lifelong learning so as to promote inclusive and sustainable economic growth and competitiveness, social equity and environmental sustainability” (UNESCO 2016, p. 2).

Towards a Conclusion

The Qatar project has recognised the convergence of the green skills and 21st Century Skills movements, and developed deeper thinking about these than we have had space for in this paper (see Fien & Guevara 2018). It has also used this thinking to synthesise a draft set of 21st Century Skills for TVET. Perhaps, the best way to conclude this presentation would be to display this draft and ask for your opinion of these.
The skills are organised in four categories, which are detailed in Figure 2:

1. Higher order thinking skills
2. Personal and social skills
3. Technological skills
4. Skills for sustainability

This framework for skills for Qatar has been derived from a review of the literature we have outlined, and re-contextualized for social, environmental and economic strengths of, and challenges facing, Qatar. The listing of skills in the framework has been pilot-tested with a small number of industry, government and education specialists. However, it remains a draft framework that will be tested in the next two phases of the research project.

First, a detailed labour market analysis for Qatar will be conducted. This will map the current industry profile and occupational structure in the country against scenarios for economic change to 2030. This will consider variables such as the nature and rate of change in the energy and construction industries in Qatar and the success experienced in diversifying the economy under the 2018-2022 Second National Development Strategy.

Second, surveys will be conducted with leaders of the energy, built environment/construction, finance and tourism industries – two long-standing and two newly establishing industries. These leaders will be asked – via surveys and follow-up interviews and workshops – for their views on changes taking place in Qatar industry and workplaces and the possible, consequent changes in employment patterns and skill demands. A similar set of surveys and interviews will be held with program managers and senior leaders of post-secondary applied learning programs and institutions.

These two studies – the labour market analysis and the survey/interview work – will then be synthesized to produce a comprehensive analysis of current and projected patterns of skill demands in Qatar, including recommendations for revising this framework of 21st Century skills for a sustainable and inclusive knowledge economy and society in Qatar.

Acknowledgements

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References


https://www.envisionexperience.com/blog/13-essential-21st-century-skills-for-todays-students


Table 2: Overview of 21st Century Skills (Wheeler 2018)

|-------------|-------------|-------------|-------------|-------------|

**Ways of Thinking**
1. Creativity & innovation
2. Critical thinking, problem solving, decision making
3. Learning to learn,
4. Metacognition

**Ways of Working**
4. Communication
5. Collaboration (teamwork)

**Tools for Working**
6. Information literacy
7. ICT literacy

**Living in the World**
8. Citizenship – local & global
9. Life & career
10. Personal & social responsibility – including cultural awareness & competence

1. Collaboration & teamwork
2. Creativity & imagination
3. Critical thinking
4. Problem solving
5. Flexibility & adaptability
6. Global & cultural awareness
7. Information literacy
8. Leadership
9. Civic literacy & citizenship
10. Oral & written communication skills
11. Social responsibility & ethics
12. Technology literacy
13. Initiative

3. Perseverance
4. Self-control
5. Meta cognition
6. Social competence (leadership & social skills)
7. Resilience & coping
8. Creativity

2. Research skills & practices
3. Creativity, curiosity, imagination, innovation
4. Perseverance, self-direction, planning, self-discipline, adaptability, initiative
5. Oral & written communication, public speaking & presenting, listening
6. Leadership, teamwork, collaboration, cooperation
7. Information & communication technology (ICT) literacy
8. Economic & financial literacy, entrepreneurialism
9. Global awareness, multicultural literacy
10. Scientific literacy & reasoning, the scientific method
11. Environmental & conservation literacy, ecosystems understanding
12. Health & wellness literacy, including nutrition, diet, exercise, & public health & safety

**Cognitive Competencies**
1. Cognitive processes & strategies: e.g., critical thinking, problem solving, reasoning, decision making
2. ICT literacy
3. Oral & written communication
4. Creativity & innovation
5. Intellectual openness – flexibility, adaptability, artistic & cultural appreciation, personal & social responsibility...

**Intra-Personal Competencies**
6. Work ethic/conscientiousness, e.g., initiative, self-direction, responsibility

**Inter-Personal Competencies**
8. Teamwork & collaboration, e.g., communication, teamwork, cooperation, interpersonal skills
9. Leadership
10. Responsibility, self-presentation, social influence
Skills for a sustainable and inclusive knowledge economy in Qatar

**Higher Order Skills** – learning to learn, critical thinking, creativity, mathematical reasoning....

**Personal and Social Skills** – Communication, leadership, collaboration......

**Technological Skills** – digital literacy, monitoring equipment, adapting to new technology....

**Skills for sustainability** – citizenship, cultural awareness, environmental responsibility.....
Figure 2: Skills for a sustainable and inclusive knowledge economy in Qatar (draft) (Fien and Guevara 2018).

<table>
<thead>
<tr>
<th>Higher Order Thinking</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Learning to learn.</td>
<td>Searching out and understanding information independently</td>
</tr>
<tr>
<td>2. Creativity and innovation</td>
<td>Ability and inclination to come up with new ideas</td>
</tr>
<tr>
<td>3. Critical thinking, problem solving, decision making</td>
<td>Ability to question claims, analyse issues and problems, devise solutions and overcome obstacles.</td>
</tr>
<tr>
<td>4. Mathematical reasoning</td>
<td>Ability to use and apply mathematical formulae and draw conclusions from answers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Personal and Social Skills</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Personal presentation and self-awareness</td>
<td>Ability to make a positive impression and see yourself as other’s see you and respond positively</td>
</tr>
<tr>
<td>6. Conscientiousness and perseverance</td>
<td>The level of effort applied to one’s work and persist with difficult tasks</td>
</tr>
<tr>
<td>7. Communication</td>
<td>Reading and listening with understanding and writing and speaking clearly</td>
</tr>
<tr>
<td>8. Collaboration (teamwork)</td>
<td>Willingness and ability to work as a member of a team</td>
</tr>
<tr>
<td>9. Leadership</td>
<td>Ability to motivate and encourage others in a positive way</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technological Skills</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Digital literacy</td>
<td>Skills in using IT software for communication and work planning</td>
</tr>
<tr>
<td>11. Use of monitoring equipment and interpretation of data.</td>
<td>Ability to use instruments to collect data systematically and understand implications</td>
</tr>
<tr>
<td>12. Adapt to new technologies</td>
<td>Ability to learn new technologies to improve efficiency of operational practices</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Skills for Sustainability</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>13. Citizenship – local and global</td>
<td>Being open to taking actions to help improve society</td>
</tr>
<tr>
<td>14. Cultural awareness and competence</td>
<td>Openness and empathy with people from different cultures</td>
</tr>
<tr>
<td>15. Perspective taking and fair-mindedness</td>
<td>Capacity to see alternative points of view and willingness to treat everyone on their merits</td>
</tr>
<tr>
<td>16. Environmental responsibility</td>
<td>Conscious of the value of nature and natural resources and the importance of protecting them</td>
</tr>
</tbody>
</table>