Two pathways, one destination: TVET for a sustainable future

Background paper for the UNESCO-UNEVOC virtual conference, 22 October - 10 November 2007

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Introduction

As governments, industry, non-governmental organisations (NGOs) and the general public have become more aware of the urgency of sustainable development (SD), the vital role of education, learning and teaching towards sustainability is becoming more evident. This urgency has been reflected in the aim of the United Nations Decade of Education for Sustainable Development, (DESD, 2005–2014), which launched on 1 March 2005, and for which UNESCO is the lead agency (UNESCO, 2005a). This initiative seeks to ‘integrate the values inherent in sustainable development into all aspects of learning to encourage changes in behaviour that allow for a more sustainable and just society for all’ (UNESCO, 2005b). Different local and global initiatives in education, such as the inclusion of education for sustainable development (ESD) in pre-service and in-service courses, the reform of curricula and teaching programmes at different levels, sustainable school and university movements and many other activities indicate an increasing commitment towards an ESD agenda in education.

In addressing these issues at the level of technical and vocational education and training (TVET), the UNESCO-UNEVOC International Centre has been proactive and is playing a significant role. A number of experts meetings, consultations, conferences and publications have been initiated by UNESCO-UNEVOC to forward the sustainability agenda. Among the major events are the UNESCO International Experts meeting ‘Learning for Work, Citizenship and Sustainability’, which took place in October 2004 in Bonn. This meeting focused on the relationships between TVET and the sustainability of the economy, the environment and society. The four days of discussions at the meeting led to the Bonn Declaration that highlighted the need to “modernize TVET and ensure its enhanced status and sustainability”. The participants asked that “particular priority be given to TVET initiatives that alleviate poverty; promote equity, especially in relation to gender; arrest the spread of the HIV/AIDS pandemic; support youth in crisis; support rural communities and people in excluded groups; encourage north-south cooperation and assist the development of countries in transition and those in and emerging from crises and conflict. These TVET initiatives are pivotal to human-centred sustainable development”.

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The topic for this paper and the virtual conference arose from the analysis of papers presented at another event entitled ‘Integrating Sustainable Development Issues into TVET: Poverty Alleviation and Skills for Employability, Citizenship and Conservation in Asia and the Pacific’. This meeting was held in Bangkok, Thailand, in August 2005. Out of the 25 papers presented at the conference, 16 were available for analysis. Content analysis of the papers focused on the interpretation of SD/sustainability; the relationships between SD and TVET; issues addressed; and solutions proposed. The analysis revealed two general approaches towards interpretation of SD:

- Papers that examined opportunities to address SD issues through the content of TVET studies;
- Papers based on the assumption that quality TVET training that prepares students for the knowledge/information society will provide employment, and employment will be sustainable due to the quality of training and thus, provide social and economic sustainability for communities.

These approaches reflect two sides of the relationship between sustainable development and TVET: on the one hand, sustainable development should be addressed through teaching (a minority of papers focused on this, as there is probably still very limited experience in this area). On the other hand, the idea that TVET provides the means to address particular issues of sustainable development such as poverty alleviation and skills for employability, citizenship and conservation was widely accepted by the presenters. Thus, to some extent the papers focused on two different issues: the role of TVET in the sustainable development of communities and economies, and providing content that leads to sustainable development through TVET. Out of the 16 papers analyzed, only two focused on content development. Ten papers discussed the contribution of TVET to social, economic and environmental change through human and social capital development, and none focused on the changes required to TVET practices and institutions.

This paper considers content change and institutional change as two important pathways for achieving sustainable future.
Education for Sustainable Development (ESD)

There are a number of dichotomies that are used in discourses on SD and ESD, and two are particularly relevant to TVET:

- Conceptualising ESD as a policy and as a frame of mind, and the
- Technical fix - value change approach.

ESD as a policy – ESD as a frame of mind

Olssen, et al (2004) argues that “education policy must be contextualised both nationally and globally as a transformative discourse that can have real social effects in response to contemporary crises of survival and sustainability” (p.3). ESD policy formulation within the TVET system requires improvements within its elements such as: qualification standards and specialisation; articulation with general education; assessment and certification for achievements; methods of curriculum development; governance; labour market analysis; financing; legislation, access and admission; provision of training places; special target groups; institutional arrangements for delivery; information and guidance; or improvements in the system as a whole which is known as a systematic reform. Systematic reform is built upon the assumption that changing most or all elements of the system is more likely to lead to TVET improvement in relation to ESD.

In 1999, Benedict developed a model of a systematic approach to sustainable environmental education. Benedict proposed that for change to occur, teaching as an activity should take place in a multilevel system: teacher-student level, classroom level, school level, school system level, political level and outside world level. Benedict argued that teachers should consciously act at a range of levels, putting their efforts into a broad perspective. The same argument fits well within the TVET context. However, as argued by Huckle (2005), that ESD as a policy is not enough to achieve substantial change. Huckle made a distinction between two broad trends – (a) ESD as policy, and (b) ESD as a frame of mind and argued that it is extremely important to develop a particular mindset to be ready to behave in a particular way. Huckle (2005) based his position on Bonnett’s ideas (2002):

“If we are to enable pupils to address the issues raised by sustainable development rather than preoccupy them with what are essentially symptoms masquerading as causes, we must engage them in those kinds of enquiry which reveal the underlying dominant motives that are in play in society; motives which are inherent in our most fundamental ways of thinking about ourselves and the world. That such a metaphysical investigation will be discomforting for many seems unavoidable, but it promises to be more productive in the long term than proceeding on the basis of easy assumptions about the goals of sustainable development as though it were a policy whose chief problems are of implementation rather than meaning.”

What are your experiences/thoughts about policy- frame of mind analysis?
Technical fix – value change

Traditionally, the unity of humanity and nature was presented within the overall perception of the world by all cultures. Even today, some indigenous cultures have preserved this view by having a number of rules related to respect for and protection of spirits and nature. However, the historical development of mankind, particularly in the Western world, led to an accumulation of technically exploitable knowledge that became a threat to the authority of cultural traditions (Habermas, 1968/1971, p.95). Technological developments and an increase of technocratic ideology that is interested in the expansion of human power of technical control (Habermas, 1968/1971, p113) greatly contributed to environmental and social problems and, as a consequence, to the emergence of the discourse on sustainable development.

Literature on sustainable development records that the concept of SD emerged in the mid 1980s as an attempt ‘to bridge the gap between environmental concerns about the increasingly evident ecological consequences of human activities and socio-political concerns about human development issues’ (Robinson, 2004, p.370). Differences in views on sustainable development are rooted partly in different philosophical and moral conceptions of appropriate ways to conceive of the relationship between humanity and nature. A summary of environmental responses proposed by Robinson (2004) identified ‘technical fix’ and ‘value change’ as two major approaches towards SD. The debate about the relative importance of technology and individual human responsibility has been an emerging theme in the environmental literature: individual attitudes towards nature versus more pragmatic and collective approaches, oriented towards efficiency gains and improvements in technology.

Through content delivery and institutional change, TVET can implement both approaches. Development of more sustainable manufacturing processes, for example, can reduce the amount of water and energy used. Changing students’ attitudes through the sustainable practices of TVET institutions would also help. A close relationship between both approaches can be visible through the concept of appropriate technologies introduced by Schumacher in his book *Small is Beautiful* (1974). Schumacher defined appropriate technologies as ‘technologies with a human face’ that aim to enable people to earn a sustainable living. He proposed eight criteria to assess technology:

1. Appropriate technology best suits the needs and lifestyles of the people using it.
2. Appropriate technology should not damage the environment and ecosystem, and it should be sustainable.
3. Appropriate technology should keep costs within the economic means of a community.
4. Appropriate technology should use locally available resources as far as possible.
5. Appropriate technology should enable local workers to earn a living.
6. Appropriate technology should increase self-reliance.
7. Appropriate technology should use renewable sources of energy wherever possible, and should be economical in its use of non-renewable resources.
8. Appropriate technology should fit in its social and cultural environment.

As argued by Pavlova (2006b), a dialectic position between technical fix and value change is essential for the effective conceptualisation of SD for educational purposes. However, it will be different for different contexts.

In your context what is/will be a desirable mix between these approaches?
Content of TVET

The influence of an ESD agenda on TVET content is happening both through existing programmes and through the establishment of new ones.

Existing programs and courses

When developing new content for TVET, exiting programs and courses can be shaped to address SD issues and concerns by including new concepts, new processes and new teaching strategies. The best strategy depends on the type of skills required for particular countries. Estevez-Abe, Iversen and Soskice’s (2001) distinguished three types of skills: firm-specific (Japan, Korea), industry-specific (Germany) and general skills. In any economy, all three types of skills will be utilised. However, in some structured economies, the production of one of these skills types will predominate over the others. **Firm-specific skills** are the least portable, **industry-specific** skills are portable within industry, while **general skills** can be applied across a range of firms and industries. Each type requires different types of training and assumes particular kinds of economic development strategies. As argued by Lauder, Brown and Ashton (2006), a high level of general education is desirable for firm-specific skills. This is then used as the foundation for the in-house development of skills that the firms demand. Industry-specific skills require some interaction between the education and training system and industry for the training to be appropriate and up-to-date in supplying the skills required. For general skills, education at only a minimum level is required for the lower end of the flexible labour market (p.48).

It is thus possible to suggest that different approaches towards content development would be used for firm-specific, industry-based and general skills.

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<th>Firm-specific, industry-based and general skills – how are/can they be related to ESD in your context?</th>
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Firm specific skills

Countries around the globe are developing schemes on how to include ESD in general education that is required for firm-specific training. Some examples of this were presented by Maclean (2007) in his keynote address at the *12th International Business Forum 2007, Business and the Millennium Development Goals* in Washington (http://www.unevoc.net/fileadmin/user_upload/docs/KeynoteIntlBusinessForum2007.pdf):

**Toyota** provides an example of training along the supply chain in the more economically developed world. Toyota collaborates with the Coordinating Committee for Automotive Repair (CCAR) to host a website called CCAR-GreenLink. This website provides Toyota car dealers with environmental information and compliance assistance related to requirements for the storage and disposal of their waste steam...
materials, the way to implement their own waste management programmes and other ways of operating their businesses in an environmentally responsible manner.

The **construction industry in the North Rhine Westphalia** region of Germany comprises over 500 hundred companies. The industry association recognizes the challenges posed by looming energy shortages, climate change and the need for energy efficiency in buildings. It also recognises the business opportunities in responding to the fact that 75 per cent of Germany’s building stock was built before 1949 and is, therefore, highly energy inefficient. As a result, the construction industry has intervened in the curriculum of the Vocational Training Institute of the Construction Industry, North Rhine Westphalia, with the goal to bring “sustainable development education to every apprentice, trainer, expert and member company”.

Thus, it is now compulsory for all in the industry to understand:

- How to use the right materials in order to avoid unnecessary energy consumption.
- How to behave and work to minimize energy consumption.
- How to identify, source and use new, more efficient materials to save energy.

### Industry-specific skills

Every occupational activity (manufacturing, maintenance, service) uses resources in natural form (water, minerals, etc) and in processed form (materials, objects, electricity, etc). Thus every occupation directly relates to sustainable development in terms of the environmental component. Defining goals for ESD integration in TVET learning is an important step in addressing SD through training. There should be a clear link between occupation-specific skills and SD concepts and practices. In terms of the economic component, “the use of environmentally-friendly materials, low energy consumption, environmentally clean and sustainable processes, intelligent transport and logistics procedures and a waste management concept geared to waste avoidance can lead to a reduction in cost and, in the longer term, to an increase in corporate competitiveness” Haertel (2006, p.11).

Social sustainability can be addressed through ethical and legal aspects of a particular occupation, e.g. safety, discussions on how technology relates to power, control, access (Pavlova, 2006b).

As stated by Haertel (2006) [here](http://www.unevoc.net/fileadmin/user_upload/docs/Haertel.pdf) :“The ultimate goal of all environmental training [and I should add ESD] is the acquisition of a thorough proficiency in dealing with the aspects of sustainable development of one’s occupational activity. This proficiency can be described as follows:

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During the virtual conference, we welcome representatives of firms or former trainees to share their experiences with specific firm’s training that are relevant to ESD.
Accepting responsibility for sustainable development and being qualified to take action to protect it;

Having the ability to apply subject-related expertise and to share this with others;

Mastering the skills required for properly handling materials and processes which are a hazard for sustainable development;

Demonstrating sound conduct based on the principles of sustainability at the workplace and in one's private life, including in situations involving conflicting interests. (p.11).

Industry-based content development should happen for each industry identified in the International Standard Industrial Classification of All Economic Activities, Revision 3.1, (ISIC Rev. 3.1)  
http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=17&Lg=1

The following industries are classified:

- Agriculture, hunting and forestry
- Fishing
- Mining and quarrying
- Manufacturing
- Electricity, gas and water supply
- Construction
- Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods
- Hotels and restaurants
- Transport, storage and communications
- Financial intermediation
- Real estate, renting and business activities
- Public administration and defence; compulsory social security
- Education
- Health and social work
- Other community, social and personal service activities
- Activities of private households as employers and undifferentiated production activities of private households
- Extraterritorial organizations and bodies

A detailed structure is presented in Appendix 1.

For manufacturing, for example, the following aims identified by Pavlova (2006a,b,c) provided a broad framework for incorporating sustainability through teaching programmes:

- To know and understand SD problems/issues;
- Contribute towards the promotion of and increasing awareness about ideas of sustainable development through projects/activities;
- Design and make products in accord with eco-design principles;
- Work in accord with SD practices;
• Discuss and appreciate the relationships between aesthetics and ethics for sustainability;
• Consider aesthetics as a powerful feature of product design closely related to sustainable consumption.

The above aims relate to the systematic framework for developing SD curriculum and teaching materials proposed by Pavlova (in press). This framework has cognitive, practical and aesthetic dimensions. The cognitive dimension (the first two aims mentioned above) relates to knowledge and understanding of the principles of sustainable design, an understanding of what SD is, and why it is important to address. The practical aspect of social life (the third and fourth aim mentioned above) is addressed through designing and making products, systems and the environment. Aesthetics (the last two aims) relate to the appreciation of aesthetics for sustainability (current style, appearance of the product) and reflects upon the important role it plays in influencing young peoples’ identity.

Similarly, the criteria that the sustainable product should meet are:
• **Cyclic**: made from organic materials, and is recyclable or compostable, or is made from minerals that are continuously recycled in a closed loop;
• **Solar**: uses solar energy or other forms of renewable energy;
• **Safe**: non-toxic in use and disposal;
• **Efficient**: less material, energy, water;
• **Social**: manufactured under fair and just operating conditions (DEMI, 2003).

For the construction industry, an example of the design sustainability principles developed through the Design for the Environment Multimedia Implementation (DEMI, 2003) approach can be applicable. They include considerations of:
• efficiency - doing more with less
• scale - the right size for the right place involving the right people
• systems - connections within and between society and nature
• appropriateness - choosing the right thing
• sufficiency - how much is enough? Do I really need this?
• equity - fairness within and across all systems … not just human

What are /could be some examples of using ESD concepts and principles, approaches in your context?

**General skills**

General skills can be applied across a range of firms and industries. They include a general understanding of what SD is and how each of us can contribute towards it in everyday life and workplace situations. This important aspect of SD education can be addressed through any type of education or training.

A widely used definition of these skills comes from the World Commission on Environment and Development (1987) and can be found what is generally known as
the Bruntland Report. The Bruntland Report defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". This has led to a well-known approach for analysing sustainability that includes social, economic and environmental dimensions with equal priority. Although widely accepted, this approach has been criticised recently. The Forum for the Future argues that this approach is invalid in its current form:

“A popular way of understanding sustainability is the concept of the triple bottom line of economic, environmental and social accountability. This idea proposes that an organisation's licence to operate in society comes not just from satisfying stakeholders through improved profits (the economic bottom line), but by improving its environmental and social performance... Whilst this concept is useful, we feel it is limited by giving equal weighting to each of the three bottom lines. We believe that environmental sustainability is pre-conditional, because without it the other bottom lines can't exist!" (Forum for the Future, 2006)

People in many developing countries might give greater emphasis to the economic or social aspects of development. For Western societies, however, it is important to give the environmental bottom line particular significance. The model of sustainable development described here presupposes that the carrying capacity of the ecosystem (environmental limits) defines and envelops the extent of human action. The economy is tailored to work within this ecosystem’s capacity. The needs of communities to develop and maintain eco-efficient and sustainable technologies or ways of doing things have to work within the limits of natural ecosystems.

Sustainable development can be seen as a change for the better in which social, cultural and economic needs are met without plundering non-renewable resources or threatening ecosystems. The Forum of the Future defines sustainable development as “a dynamic process which enables all people to realise their potential and improve their quality of life in ways which simultaneously protect and enhance the Earth’s life support systems.” (Forum for the Future, 2006)

What is your opinion/experiences? Is the bottom line different for developing and developed countries?

**New qualifications**

As stated in the Bonn Declaration, the “increased scope for TVET is recognized in ‘sustainability industries’ such as environmental conservation, cultural heritage site preservation and renewable energy production” (point 4). Such new qualifications include recycling management, regional planning, marketing, waste management and community planning. They have become increasingly popular worldwide. Training for these qualifications has been undertaken through formal and nonformal TVET. For example, IWES is Australia’s leading workshop for environment

- **Principles of Wastewater Treatment**
  The aim of this course is to teach the key enabling fundamentals which underpin wastewater treatment processes. These are taught via real wastewater treatment problems and case studies.

- **Design of Biological and Advanced Wastewater Treatment Plants**
  This course focuses on the design of leading-edge treatment systems for both municipal & industrial settings – the sort of technologies and issues that are not easily found in textbooks.

- **Water Re-use for Urban and Industrial Applications**
  The course covers the tenets of the public health goals that govern water re-use regulations, non-potable recycling in irrigation and industrial re-use applications, and greywater and stormwater recycling in point of use applications.

- **Odour Assessment and Management**
  This course provides a practical grounding in the principles of odour monitoring (ambient and source), assessment and control. Regulatory frameworks for odour assessment and management are examined.

The work of IWES is a good example of providing focused training that is based on new technologies and best practice cases. IWES also established close links with the international charity WaterAid. WaterAid’s mission is to overcome poverty by enabling the world’s poorest people to gain access to safe water, sanitation and hygiene education. These basic human rights underpin health, education and livelihoods and form the first, essential step in overcoming poverty. WaterAid works with local partners who understand local issues and provide them with the skills and support to help communities set up and manage practical and sustainable projects that meet their real needs. [http://www.wateraid.org/australia/about_us/](http://www.wateraid.org/australia/about_us/). The collaboration between IWES and WaterAid is a good example of how TVET and community assistance organisations can develop a joint, systematic approach towards ESD.

| What are/ would be a set of new qualifications appropriate for your context? |
| What are some examples of joint work between TVET, non-formal-training and communities aimed at development more sustainable communities? |
TVET as an institution

The desirable outcome of TVET is that its graduates have an impact on social, economic and environmental sustainability within local and global communities. Thus, it is important to recognize how TVET as an institution can perform sustainably. Two examples (school and university movements) are considered in this context to facilitate the discussion. The aim is to identify up to 10 criteria for assessing sustainable performance of a TVET institution, set them up as a UNEVOC declaration and invite TVET institutions to sign it as the basis of their commitment to ESD.

Principles adopted by universities that could be adapted/modified by TVET institutions

The university sector is increasingly being considered as one of the important leaders in the movement of education for sustainability (ES). Universities’ multiple roles in preparing graduates for sustainable economies and lifestyles and generating knowledge about sustainable solutions and visions provide universities with a unique opportunity to incorporate sustainability in their programs. Since 1990, more and more universities have signed The Talloires Declaration to explicitly state their commitment to support sustainability efforts (http://www.ulsf.org/programs_talloires.html). As of May 2007, 342 universities from 48 countries have signed the Declaration (http://www.ulsf.org/programs_talloires_signatories.html).

The University Leaders for a Sustainable Future (ULSF) is a network of university academics and administrators who cooperate to implement a sustainability agenda. ULSF has argued that it has a responsibility to increase awareness, improve knowledge, create technologies and impart the moral vision that lead to a sustainable future and a high quality of life for future generations (Bekessy, et al, 2003, p.4). ULSF identified seven criteria for assessing sustainable university performance. A report on ESD at Australian and some international universities (Bekessy, et al, 2003, p.15) has developed the criteria further and added an eighth criterion. Characteristics that reflect a mature university approach towards sustainability as defined by Bekessy et al are:

- Articulation of social responsibility in the institutional mission and structures;
- Integration of social, economic and environmental sustainability across the curriculum;
- Academic research on sustainability, and consideration of social, economic and environmental sustainability issues in all other research;
- Outreach and services, including the development of partnerships with schools, government, non-governmental organisations and industry;
- Sustainable institutional operations, including effective monitoring and reporting;
- Staff development and rewards;
- Student opportunities; and
- Cultural inclusiveness.
These criteria present a list of requirements that can be adapted/modified by TVET systems.

In analysing your institution, can you apply/adapt/modify these principles? Can you add another one?

**Principles adopted by schools that could be adapted/modified by TVET**

‘We can all adopt sustainable development - respecting both man and nature - and alter our production and consumption habits. Everyone can make a difference, starting right now’.


The National Framework in the United Kingdom introduces eight ‘doorways’ through which schools may choose to initiate or extend their sustainable school activities. They include food and drink, energy and water, travel and traffic, purchasing and waste, buildings and grounds, inclusion and participation, local well-being and the global dimension. The Framework focuses on ways in which sustainable development can be embedded into whole-school management practices and provides practical guidance to help schools operate in a more sustainable way.

Each doorway may be approached individually or as part of a whole school action plan, and the doorways are interconnected. For example, an interest in food and drink may see schools start growing their own fruit and vegetables in the grounds, which ties into composting and conservation, both of which are features of the buildings and grounds component. This, in turn, may spark an interest in other activities such as waste and recycling (relevant to consumption and waste) or collecting rain water and renewable energy watering systems (the energy and water component). While a collective, whole-school approach is recommended, either track offers opportunities for improvement across the school’s curriculum and campus, and in its relationship with the local community.

Each doorway encompasses a long-term expectation clarifying where the government of the UK would like schools to be by the year 2020. Although every school will start from a different position, with different priorities and needs, all schools can take some immediate action to meet these targets.


Take, for example, the ‘energy and water’ doorway. By 2020, the government would like all schools to be models of energy efficiency, renewable energy use and water management. They should take the lead in their communities by showcasing wind, solar and bio-fuel energy, low-energy equipment, freshwater conservation, use of rainwater and other measures.

This doorway is described as follows: ‘The rising demand for energy and water across the planet is storing up problems for future generations. Increased energy use creates greenhouse gas emissions and climate change. Increased use of water is threatening the world’s underground aquifers, contributing to water scarcity in
many parts of the world. For this reason, energy and water conservation are two essential areas for schools to tackle.'

Eco-efficiency measures can help schools to reduce their need for energy and water, as well as reducing their environmental impact. Reducing the amount of energy and water a school uses can result in real cost savings. A carefully managed school may consume only half the amount of water a poorly-managed school consumes.

**Curriculum**
Schools can use the curriculum to cultivate the knowledge, values and skills needed to address energy and water stewardship – both at a local and a global level.

**Campus**
Schools can review their use of energy and water and establish policies for monitoring and reducing their use through good management and the deployment of appropriate technologies.

**Community**
Schools can use their communications, services, contracts and partnerships to promote awareness of sustainable energy and water use among their stakeholders.

In analysing your institution, can you apply/adapt/modify these principles? Can you add another one?
Conclusion

Sustainable development is not a fixed concept, “rather it is a culturally-directed search for a dynamic balance in the relationships between social, economic and natural systems – a balance that seeks to promote equity between the present and the future, the equity between countries, races, social classes and genders” (Fien and Wilson, 2005, p.277). Education for sustainable development can take different forms and shapes. This paper discusses two ways in which ESD can be addressed through TVET: through content modification and through establishing sustainable practices within TVET as an institution. Both should lead to TVET influence on poverty alleviation and skills development for employability, citizenship and conservation.

I would like to propose the following map for the discussion:

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<th>Specific context</th>
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<td>Environmental issues</td>
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<td>Economic Issues</td>
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<td>Content of TVET</td>
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<td>Existing programs</td>
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<td>TVET as an institution</td>
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<td>Performance criteria</td>
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<td>‘Doorways’</td>
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<td>Other approaches</td>
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<td>Contribution of TVET to sustainable communities and economy and environment</td>
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Through our conference, you are welcome to provide general comments on the paper and the topic, respond to the questions posed, issues raised and questions to be discussed by participants, and bring to our attention new resources and useful links. We are interested in your view of

- Sustainable development/sustainability
- The relationships between SD and TVET
- The issues addressed
- Solutions.
References


Pavlova, M. (2006a). Do we value values in technology education? The 4th International Conference on Technology Education Research December 7-9, Gold Coast, Centre for Learning Research, Griffith University.


Appendix 1

International Standard Industrial Classification of All Economic Activities, Revision 3.1, (ISIC Rev. 3.1)

A standard classification of economic activities arranged so that entities can be classified according to the activity they carry out. The categories of ISIC at the most detailed level (classes) are delineated according to what is, in most countries, the customary combination of activities described in statistical units. The groups and divisions, the successively broader levels of classification, combine the statistical units according to the character, technology, organization and financing of production. Wide use has been made of ISIC, both nationally and internationally, in classifying data according to kind of economic activity in the fields of population, production, employment, gross domestic product and other economic activities (Source: United Nations). ISIC is a basic tool for studying economic phenomena, fostering international comparability of data and for promoting the development of sound national statistical systems. Thus, despite the word "industrial" in its name, ISIC is not just a classification of industries.

(http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=17&Lg=1)

Click on any code to see more detail. Click here for top level only.

- A - Agriculture, hunting and forestry
  - 01 - Agriculture, hunting and related service activities
  - 02 - Forestry, logging and related service activities
- B - Fishing
  - 05 - Fishing, aquaculture and service activities incidental to fishing
- C - Mining and quarrying
  - 10 - Mining of coal and lignite; extraction of peat
  - 11 - Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
  - 12 - Mining of uranium and thorium ores
  - 13 - Mining of metal ores
  - 14 - Other mining and quarrying
- D - Manufacturing
  - 15 - Manufacture of food products and beverages
  - 16 - Manufacture of tobacco products
  - 17 - Manufacture of textiles
  - 18 - Manufacture of wearing apparel; dressing and dyeing of fur
  - 19 - Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
  - 20 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
  - 21 - Manufacture of paper and paper products
  - 22 - Publishing, printing and reproduction of recorded media
  - 23 - Manufacture of coke, refined petroleum products and nuclear fuel
  - 24 - Manufacture of chemicals and chemical products
  - 25 - Manufacture of rubber and plastics products
  - 26 - Manufacture of other non-metallic mineral products
  - 27 - Manufacture of basic metals
• **28** - Manufacture of fabricated metal products, except machinery and equipment
• **29** - Manufacture of machinery and equipment n.e.c.
• **30** - Manufacture of office, accounting and computing machinery
• **31** - Manufacture of electrical machinery and apparatus n.e.c.
• **32** - Manufacture of radio, television and communication equipment and apparatus
• **33** - Manufacture of medical, precision and optical instruments, watches and clocks
• **34** - Manufacture of motor vehicles, trailers and semi-trailers
• **35** - Manufacture of other transport equipment
• **36** - Manufacture of furniture; manufacturing n.e.c.
• **37** - Recycling

**E** - Electricity, gas and water supply
• **40** - Electricity, gas, steam and hot water supply
• **41** - Collection, purification and distribution of water

**F** - Construction
• **45** - Construction

**G** - Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods
• **50** - Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel
• **51** - Wholesale trade and commission trade, except of motor vehicles and motorcycles
• **52** - Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods

**H** - Hotels and restaurants
• **55** - Hotels and restaurants

**I** - Transport, storage and communications
• **60** - Land transport; transport via pipelines
• **61** - Water transport
• **62** - Air transport
• **63** - Supporting and auxiliary transport activities; activities of travel agencies
• **64** - Post and telecommunications

**J** - Financial intermediation
• **65** - Financial intermediation, except insurance and pension funding
• **66** - Insurance and pension funding, except compulsory social security
• **67** - Activities auxiliary to financial intermediation

**K** - Real estate, renting and business activities
• **70** - Real estate activities
• **71** - Renting of machinery and equipment without operator and of personal and household goods
• **72** - Computer and related activities
• **73** - Research and development
• **74** - Other business activities

**L** - Public administration and defence; compulsory social security
• **75** - Public administration and defence; compulsory social security

**M** - Education
• **80** - Education
• **N** - Health and social work
  • 85 - Health and social work
• **O** - Other community, social and personal service activities
  • 90 - Sewage and refuse disposal, sanitation and similar activities
  • 91 - Activities of membership organizations n.e.c.
  • 92 - Recreational, cultural and sporting activities
  • 93 - Other service activities
• **P** - Activities of private households as employers and undifferentiated production activities of private households
  • 95 - Activities of private households as employers of domestic staff
  • 96 - Undifferentiated goods-producing activities of private households for own use
  • 97 - Undifferentiated service-producing activities of private households for own use
• **Q** - Extraterritorial organizations and bodies
  • 99 - Extraterritorial organizations and bodies