

Technical-Vocational Education for Sustainable Development in Manitoba

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Introduction

In June 2012, the Province of Manitoba released *Tomorrow Now: Manitoba's Green Plan*. This eight-year strategic plan is designed to ensure a prosperous, environmentally conscious economy for the future of Manitoba. The plan recognizes the need to instill “green skills, knowledge and values within our existing and future workforce.” This will require, among other things, “advancing . . . technical and vocational education and training [TVET] in support of the transition to a green economy” (Manitoba, 2012).

In preparation for making this commitment, Manitoba Education undertook the following exploration into how technical-vocational schools and programs across the province are incorporating sustainable development into the education and training of their students, including school policies, management and teaching practices. The review identifies promising practices and barriers and presents a number of suggestions for strengthening Education for Sustainable Development (ESD) in TVET. This report will be used in tandem with the *Green Jobs and Sustainable Development Careers* Report to improve education and career training that supports the development of a green economy in Manitoba.

This work is part of Manitoba's commitment and contribution to the United Nations Decade for Education for Sustainable Development (DESD), 2005–2014. UNESCO defines Education for Sustainable Development as follows:

Education for Sustainable Development allows every human being to acquire the knowledge, skills, attitudes and values necessary to shape a sustainable future.

Education for Sustainable Development means including key sustainable development issues into teaching and learning; for example, climate change, disaster risk reduction, biodiversity, poverty reduction, and sustainable consumption. It also requires participatory teaching and learning methods that motivate and empower learners to change their behaviour and take action for sustainable development. Education for Sustainable Development consequently promotes competencies like critical thinking, imagining future scenarios and making decisions in a collaborative way. (UNESCO, 2011)

The DESD is intended to facilitate the mainstreaming of sustainability into educational institutions and programs, and has:

- Provided an organizational framework for promoting ESD
- Encouraged collaboration between various stakeholders
- Provided an impetus to governments to adopt ESD principles in their educational systems

Manitoba Education is considered to be a world leader in championing ESD, and is committed to the “whole school” approach, in which not only does the curriculum address sustainable development, but the school itself serves as a model learning environment, demonstrating how sustainable development can be addressed in school policies, operations and management.

A significant driver for ESD in the province has been the leadership of the Deputy Minister for Manitoba Education, Gerald Farthing. Under his guidance, the Department has fostered a multistakeholder approach through the Manitoba Education for Sustainable Development Working Group, with particular attention to engaging school districts and administrators in taking on the challenge of incorporating ESD across the school system. Manitoba Education has

provided support for professional development for administrators through the Sustainable Education Academy (SEdA); funding for new, more environmentally friendly infrastructure; small grants for school projects (in partnership with Manitoba Hydro); in-service and pre-service ESD professional development; and has incorporated sustainable development into the learning outcomes from kindergarten through to Grade 12. In addition to the above, technical-vocational education is to be reoriented to support moving to a green economy, all public buildings in Manitoba, including schools, must be built to the LEED¹ silver standard, and work has been done regarding compiling information about green jobs in the economy now and in the future. In recognition of his leadership, the Deputy Minister serves as the chair of the United Nations Economic Commission for Europe's ESD committee.

The International Institute for Sustainable Development (IISD) has worked closely with the Department over several years on a number of research projects designed to inform and support the Department's progress on ESD. The following study was undertaken by IISD at the Department's request, in consultation with the Technical-Vocational Initiative (TVI), Conservation Manitoba, and the Technical Vocational Leadership Council.

Goals and Methodology

The study focused primarily on how education for sustainable development has been mainstreamed into technical-vocational schools and K-12 schools that offer technical-vocational and practical/industrial arts courses in Manitoba. An initial scan was also conducted of how technical-vocational institutions in other jurisdictions, as well as international TVET-related programs, are responding to the DESD. This context-setting piece also informs the suggestions for Manitoba Education going forward.

Following this preliminary research, three survey instruments were designed to collect information from several categories of respondents:

- Telephone interviews were conducted with 17 administrators and teachers in Manitoba technical-vocational schools to assess their knowledge of sustainability education and to discover any work that has been done to make these schools more sustainable (Appendix A).
- A web-based survey for TVET teachers was implemented, with 30 responses (Appendix B)
- Discussion groups of students and teachers were facilitated in three schools (Appendix C) to collect information on promising practices and students' awareness of sustainability.

The interviews, web survey, and discussion groups collectively sought to answer the following questions:

- What promising practices exist in Manitoba for ESD in technical-vocational secondary schools, and how can these be supported and replicated?
- What is the level of knowledge about or engagement with ESD held by technical-vocational teachers in Manitoba?
- What interests, concerns, or other observations do students have regarding their training?

¹ Leadership in Energy and Environmental Design (LEED) is a third-party certification program for energy efficiency and use of environmentally sustainable materials in building construction and retrofitting.

- Have students considered how their technical skills might contribute to protecting or improving the environment?
- Are students looking for trades, employers, or opportunities that are “green”?
- Would students choose an “environmentally friendly” trade or vocation if they knew more about what was available and what they needed to learn?

International and National Technical–Vocational Education and Training Initiatives

The DESD has encouraged the development of new and innovative approaches to sustainability education in TVET. These initiatives provide examples of promising practices that could be adapted to the Manitoba context. Several promising international, national, and provincial responses to the DESD are described below.

Global Initiatives

Multilateral agencies such as the United Nations Educational, Scientific and Cultural Organization’s (UNESCO’s) International Centre for Technical and Vocational Education and Training (UNEVOC), the European Centre for the Development of Technical Training (CEDEFOP), and the International Labour Organization (ILO) have done extensive work to ensure that ESD considerations are incorporated into technical training at the global level. Such organizations have produced reports, developed policies, and offered high-level training programs that provide guidance to technical-vocational institutions wishing to mainstream ESD. Some highlights of this work are outlined below:

- i. The UNEVOC project has offered an assortment of training programs for administrators, education ministers and teachers throughout the world; the project also seeks to develop cross-country networks to facilitate the sharing of best practices. UNEVOC also provides knowledge resources on ESD in technical and vocational education and training (TVET) on its website (<http://www.unevoc.unesco.org/sustainability.0.html>) (UNESCO-UNEVOC, 2011).
- ii. CEDEFOP coordinates numerous related conferences and events, such as Technical–Vocational Education and Training for a Sustainable Future; Developing Human Capital for Sustainable Economies; and Building Sustainable Communities through Partnerships. They also have an extensive database of research and publications on ESD in TVET (European Centre for the Development of Vocational Training, 2011a).
- iii. The Organisation for Economic Co-operation and Development (OECD) has developed tools to assess sustainability within TVET through their Centre for Effective Learning Environments. They have created a “Green Star” rating tool for school facilities, and developed a “Sustainable Schools” resource database. In conjunction with CEDEFOP, the OECD hosted a conference on green skills and training, *Skills for a Low Carbon Economy*, in February 2012 (OECD, 2011; European Centre for the Development of Vocational Training, 2011b).
- iv. The ILO has developed a Global Programme on Green Jobs, through which it offers a variety of programs and training projects. In 2009, the organization collaborated with CEDEFOP to produce the global report “Skills for Green Jobs”: the ILO also coordinated the international Green Job Learning Forum in 2011 (ILO, 2011).

National Initiatives

In response to the DESD, countries in both the developed and developing world have begun to mainstream ESD into TVET. To outline the range and breadth of these ongoing initiatives, examples from Germany, China, and Kenya are described in detail below.

Germany has very well-developed ESD programming in technical-vocational training courses. Environmental protection was integrated into German curricula in the late 1980s, and this focus has since widened to encompass the three pillars of sustainability (economic, social, and environmental). The German TVET system promotes sustainability using several techniques: regular curriculum review, the development of a “train the trainer” model that includes teaching aids to support educators, and the use of demonstration plots to teach students about sustainability in practice. The TVET curriculum is routinely assessed to ensure that training prepares students for jobs in the green economy, and demonstration schools have been created to train students to make their trades more sustainable. These schools contain compost facilities, gardens, solar power generators, and energy-efficient program equipment. Students are instructed in sustainability principles, and invited to investigate how their trade can become more sustainable through their interaction with the school environment.

China has less-developed ESD/TVET programming than Germany. However, between 2007 and 2009, China’s Ministry of Education collaborated with UNEVOC to review and revise the TVET curriculum to incorporate ESD (UNESCO-UNEVOC, 2009a; UNESCO-UNEVOC, 2009b). In this process, sustainable concepts and activities were included in 27 TVET programs and subjects, including accounting, machinery, and irrigation technology. The Ministry of Education has also embarked on a program of teacher training in collaboration with UNEVOC and nine other Asian countries (UNESCO-UNEVOC, 2009c). Through this program, these nations have identified key sustainable development issues to include in their teacher training programs and presented best practices that can be replicated by teachers. China is now in the process of reorienting the teacher training curriculum to reflect these findings.

Like China, Kenya recently conducted curriculum reform in vocational polytechnic schools to develop training that “more effectively enhances skills for sustainable livelihoods.” (Dubois et al., 2011). The Ministry of Education also introduced new programs and initiatives at the school level to promote sustainability. These include the creation of demonstration projects like tree nurseries, solid-waste management systems, and solar/bio-gas energy generators, as well as a service learning program in which students do peer education in their communities (on health, community cleanups, and solid-waste disposal) (Dubois et al., 2011). Finally, the Ministry of Education also conducted a study to assess barriers to sustainable development mainstreaming in these institutions. They discovered that Kenyan teachers are aware of ESD, but that further training is necessary to help them to apply it (Dubois et al., 2011). A retraining initiative is currently being considered.

These examples show that the international response to the DESD has been strong in both the developing and developed world. Some of the most successful responses have involved a multipronged approach to mainstreaming ESD that addresses the needs of teachers through training and curricular reform and students through the use of demonstration plots and applied projects. The following section will continue to focus on best practices by illustrating the work that has been done in Canada to mainstream ESD into TVET.

Provincial Canadian Initiatives

Education in Canada is administered at the provincial level. As such, there is no central Ministry of Education that could coordinate efforts to mainstream ESD. This has made it more challenging for proponents of ESD to develop a coherent, pan-Canadian policy and implementation strategy (Swayze, 2010). However, the Council of Ministers of Education Canada has established an ESD working group, and a number of activities are underway to provide more knowledge sharing and foster coordination across jurisdictions to reinforce and build on existing provincial and territorial commitments. Provincial and territorial efforts do vary with respect to addressing ESD or ESD-like concepts (including environmental education) generally across K-12 curricula, although much work has been done. It is, however, less apparent that ESD has been incorporated specifically into technical-vocational schools. Manitoba's efforts to mainstream ESD into the technical-vocational system are, thus far, at the leading edge, together with British Columbia. Manitoba has commissioned the development of new curriculum incorporating ESD into a number of technical-vocational subject areas, as selected by the Technical-Vocational Initiative (discussed further in the next section). British Columbia has developed ESD projects and initiatives for TVET, but does not yet have a provincial strategy specifically for ESD in TVET. In other jurisdictions, there may be individual actions at school divisions and in schools, but there are no mechanisms to identify, monitor, and share the outcomes of those actions. There is therefore no directory of promising practices for government planners, school administrators, or teachers to draw on; part of the rationale for this report was to begin to fill this research gap.

The absence of national- or provincial-level strategies for ESD in TVET has led to inconsistencies and gaps in ESD mainstreaming. In Alberta, the Career and Technology Studies Senior High School Program organizes courses into clusters that represent occupations with "broad industry commonalities." Sustainability is mainstreamed into the natural resources cluster, but not mainstreamed in other relevant clusters such as trades, manufacturing and transportation; or health, recreation and human services (Alberta Education, 2011). Without a comprehensive provincial or territorial plan to include ESD in the technical-vocational curriculum, opportunities may be missed. The Nunavut Department of Education has recently developed partnerships with private-sector companies in the extractive industries to offer secondary-level career training courses that are completed on-the-job and lead to immediate employment (Nunavut Department of Education, 2010). These training placements are ideal targets for mainstreaming ESD, but nothing is currently being done to ensure these students and future employees are aware of the importance of sustainability. This is likely to change in the near future, however, as provincial and territorial efforts to mainstream ESD in K to 12 curricula are beginning to be applied to TVET in secondary schools. The Yukon Department of Education's 2011-2016 Strategic Plan, for example, emphasizes the need to review and adjust vocational and apprenticeship courses "to ensure that Yukon workers have the knowledge and skills to succeed in the 21st century green economy" (Yukon Department of Education, 2011).

TVET in Manitoba: Findings and promising practices

Manitoba Education has done extensive work to support the incorporation of ESD into education. In 2004, sustainability education was declared to be one of their priorities, and a Sustainable Development Coordinator position was created to oversee the Ministry's efforts (Swayze, 2010). This work has focused on four key areas: integrating ESD into curriculum; identifying and promoting learning resources to support ESD; increasing the professional development opportunities in ESD for educators; and providing systemic support for ESD through the provision of grants and information resources (Swayze, 2010). In addition to the above, technical-vocational education is to be reoriented to support moving to a green economy, all public buildings in Manitoba, including schools, must be built to the LEED silver standard, and work has been done regarding compiling information about green jobs in the economy now and possibly in the future. Further information on Manitoba Education's work on ESD can be found on Manitoba Education's ESD website, at <http://www.edu.gov.mb.ca/k12/esd/>.

However, as in other provinces, little research has been done to illustrate how ESD initiatives have affected TVET in Manitoba. The research findings outlined below begin to answer this question. They also provide an overview of existing promising practices for incorporating ESD into TVET.

The Views of School Administrators

Awareness of ESD

Interviews were conducted with 17 administrators and teachers, representing 14 of the 31 technical-vocational secondary schools and programs in Manitoba—just under 50 per cent of all TVET programs. These discussions revealed a basic level of knowledge and interest in ESD. However, while administrators' awareness of ESD is strong overall, there is significant variation in the extent to which ESD has been incorporated into TVET between schools. Some schools have done extensive work greening their facilities, ensuring that TVET teachers have access to professional development in ESD (supported through TVI's professional development grants) and integrating ESD into program delivery. In other schools, incorporation of ESD has thus far been limited to basic environment initiatives such as recycling materials and encouraging use of blue boxes. In the majority of schools, ESD efforts have concentrated on environmental sustainability, and little coordinated work has been done to mainstream issues related to social or economic sustainability. The discrepancy between schools has much to do with the level of individual teachers' interest and involvement in ESD, since it is teachers rather than administrators who are typically the leaders of ESD projects or initiatives. Administrators identified several common barriers to the integration of ESD into TVET: insufficient teacher education and training; teacher workload; and insufficient funding to purchase relevant tools and infrastructure for learning about ESD in practice. Northern and remote Manitoban schools are particularly disadvantaged by the inaccessibility of relevant professional development and higher infrastructure costs. Some administrators suggested that the creation of relevant policies at the divisional or provincial level would help them to justify the costs and time involved in incorporating ESD into TVET programmes.

The majority of technical-vocational administrators are able to describe the three pillars of sustainability and explain the significance of ESD to their school. Some administrators focused primarily on the environmental aspects of sustainability:

"All I know is that [ESD] is about teaching the three R's [reduce, reuse, recycle] and being environmentally conscious."

"[We] practice SD in all aspects of the school with regard to helping kids learn about the three Rs. [. . .] It's about good ecological practices within the division."

However, the majority offered definitions that showed an advanced understanding of the connections between social, environmental and economic sustainability within ESD:

"[The concept of ESD] has been evolving over the last decade almost. All of a sudden you heard it every time you met someone from province, but no one knew what it meant. Then as it became more apparent that it was a combination of green initiatives, social justice, and economic equity, it started making more sense."

"My understanding is that it's a multipronged approach to living sustainably and helping kids develop practices that enable them to do that. It's about people, [the] environment and understanding the global context. The goal is to reduce the harm we're causing to future generations."

Administrators learned about sustainability from several sources. Manitoba Education and TVI were frequently mentioned as the reason for administrators' familiarity with the concept, either directly or indirectly. Some administrators attended TVI or provincial meetings at which ESD was discussed, or received information on ESD directly from the province. Others were encouraged to research the concept after discovering that they could potentially get funding for ESD initiatives through the province, or because ESD was integrated into the K-12 social science and science curricula. Other sources for administrators' knowledge include teachers who shared what they learned at PD sessions; divisional strategic plans; and external partnerships (for example, with Ducks Unlimited).

Application of ESD in TVET and Promising Practices

While administrators' understanding of ESD is fairly uniform, the extent to which they have applied this understanding in their schools is less so. There are significant differences between schools when it comes to integrating ESD into TVET, in the areas of school environment, opportunities for students to learn in practice, and curriculum.

The area where there is the least discrepancy between schools is that of the school environment. All administrators interviewed outlined changes that had been made within their school environment to make it more of an environment for learning about sustainability in practice. These changes ranged from small initiatives, such as blue box recycling, to major projects, such as designing new facilities to meet a high LEED standard (an environmental and energy rating for building design). Administrators identified two main barriers to making changes to the physical environment of schools: the most commonly stated was insufficient funding, and the difficulty of finding the time and resources to apply for the ESD grant available to schools (\$700.00² per school to assist with ESD initiatives, available once yearly). However, some remote schools also cited the inaccessibility of recycling facilities or "green" building materials:

"Because of our location, we don't have disposal systems or ways of getting in new products. Our community has no recycling programs. In the high school they now are attempting to recycle plastic bottles and tin cans—this was a drive from one of the student leadership groups. They collect these items and try to get them onto one of the transport trucks going South. In the vocational programs like power mechanics they have to store all their old oil because they have trouble getting it picked up. We had a program before that was coordinated through school trustees, in which dangerous goods were picked up and disposed of. But in the last two years the fee for this has become much higher and the school can't afford it, so we're storing it all."

² All figures in Canadian dollars.

“Several times over the last several years our school has applied for a gardening grant, with support from the University of Manitoba. We were denied. Last year we applied for a renewable energy grant for a greenhouse but we were again turned down, so the changes aren’t being made.”

“Often it comes down to money. Our school would do more if there was support from the provincial government. We look for grants, but this takes time and money, and often isn’t successful. If the province wants to make [ESD] more effective, they should make it so schools have the necessary funding to make changes, instead of having to write grants all the time.”

In spite of these barriers, some schools have created environments that facilitate student learning about ESD in practice. Because buildings and operations are typically overseen by school divisions, certain common initiatives, such as the use of environmentally friendly cleaning products and installation of high-efficiency lights and low-flow toilets, have been introduced by the division, to be implemented across all schools in the division, including technical-vocational schools and programs. For example, Winnipeg School Division has “done a complete revamp of its water, waste, and lighting systems to reduce energy use and waste in the last five years.”³ Both Garden Valley School Division and Hanover School Division are in the process of building new schools that will be LEED certified:

“Steinbach Regional Secondary School is in the process of building a new school. We’re going to attach it to the current school, so we’ll have a junior and senior academy. Right now we’re working with Stantec [an architecture and engineering consultancy firm] to get LEED certification. So the plans involve thinking about sustainability, about how to be environmentally friendly, because we have to ensure certain level of sustainability. Some of these changes will be incorporated into the old school as well—things like getting lights that turn off when there’s no movement. We would like to create a greenhouse on the new school roof if possible. We’re hoping that the new building can be used as a teaching tool: for example, students will be able to access the monitoring systems of the building to learn about water and electricity consumption.”

Demonstration plots have also been created by a number of schools in the province (independent of divisional support) to facilitate student learning about ESD. One school is currently designing a garden to put on top of the school’s roof: when established, the garden will be used by students in the foods program. Another school created a tall grass prairie area that is used both as a green space and to teach students: compost from the school’s food waste is used to support the soil nutrition of the green space. Such facilities offer students the opportunity to see the connections between multiple aspects of sustainability: waste management, green space, recreation, healthy food, and sustainable agricultural practices. TVI has been asked to support a joint horticulture program between a Winnipeg inner-city school and a rural school.

Practicum placements and applied projects offer another way for students to investigate the relationship between sustainability and their future career. Unfortunately, there are very few practicum placements or apprenticeships in Manitoba that have integrated ESD. This is largely due to the fact that apprenticeship placements are done in external organizations: while some placement sites do extensive work to mainstream sustainability into their own operations, others do nothing, and thus students’ experiences are highly variable. However, within the classroom, schools in Manitoba offer a wide range of applied projects and assignments that integrate ESD. Examples of how sustainability has been incorporated into applied projects from four common technical and vocation programs are listed below:

³ Further information is available online at <http://www.wsd1.org/SustainableDevelopment/SustainableDevelopment.htm>.

- *Culinary Arts*: Sourcing local or organic food; participating in Food Matters Manitoba's Locavore Iron Chef Cook-off; using reusable, recyclable or compostable packaging; donating used cooking oil to be turned into biodiesel; composting and using compost to maintain green spaces; assisting in maintaining a school garden and using its produce; participating in "Grow a Row," a program where students with access to a farmer's field can grow and donate a row of produce; raising money for Winnipeg Harvest or other charities. TVI has provided funding for more energy-efficient equipment for Culinary Arts programs.
- *Automotive Technician*: working on electrical or hybrid cars; organizing a demonstration class in which students learned about a biodiesel-powered bus; experimenting with solar power; training students in safe disposal of oils and other materials; using water-based spray booths, paints and parts washers that have less of a negative environmental and health impact; recycling automobile parts; doing low-cost repairs for people in the community; providing "green oil changes" (recycling oil) to community members; donating repair and oil change services as prizes in charity fundraisers.
- *Electrical*: Inviting guest speakers to talk about alternative energy technologies like geothermal and water turbine generation; competing in the wind turbine design competition; experimenting with solar power for heating systems; tracking consumption of energy at the school and developing strategies to reduce energy use.
- *Building Trades*: Using solar-powered generators to work machinery; assisting on building projects for Habitat for Humanity; collecting wood waste (sawdust and tiny scraps) so that it can be used by community members in wood-burning fireplaces; collecting sawdust so that it can be used by local farmers as bedding for animals; avoiding buying new materials for building construction and instead reusing old materials; using electronic testing to reduce paper usage. The new curriculum will cover LEED specifications for building construction and retrofitting.

In addition to incorporating ESD into existing applied work, some schools have sought to make revisions to their TVET programs in order to include issues of sustainable development. These changes are typically informal, and have been initiated by teachers in responses to industry: for example, automotive students are now frequently taught to work with and repair hybrid cars, or to use environmentally friendly spraying techniques and paints, because the industry requires new workers to have these skills. Several schools mentioned that they would be interested in developing programs that are more specific to ESD, but that they are "tied in to government programs" because they do not have the time or resources to develop school-initiated courses. Many administrators indicated that the inclusion of ESD in the provincial TVET curriculum will provide a strong impetus to teachers to incorporate it into their classroom practice. This inclusion is underway through the TVI-led curriculum renewal process.

Curriculum renewal is one of the six core pillars of action on which the creation of TVI, as a joint department initiative, was predicated. TVI is developing new curriculum for 19 technical-vocational subject areas. The draft curriculum for seven of these TVET subject areas (starting with the most frequently offered programs and totalling 61 full credit courses) has been completed and posted online at www.edu.gov.mb.ca/k12/cur/teched/sy_tech_program.html. These curricula will undergo voluntary implementation in September of 2012 to facilitate teacher adaptation. New curriculum in other subject areas will be released at the beginning of each school year. There is a goal eventually to create a new curriculum for each of the approximately 50 TVET subject areas in Manitoba. Each of these subject areas is typically composed of nine courses. The curriculum for each course describes "learning outcomes": skill, knowledge, and attitude targets that students are required to meet before they are qualified to graduate. Each course in the new curriculum includes an overall goal related to sustainability (for example: "demonstrate awareness of sustainability as it pertains

to nail technicians and the industry”) and several related learning outcomes (for example: “describe the impact of human sustainability on the health and well-being of Nail Technicians and clients”). As the example illustrates, these learning outcomes are not only environmental, but include social sustainability and sustainable business practices as well. Overarching learning outcomes are supplemented with grade-specific learning outcomes. Samples from Nail Technology include:

- “Demonstrate setting up manicure and pedicure workstation in an ergonomic manner to prevent strain or injury.”
- “Demonstrate informed decision-making skills in the selection and use of artificial nail products and the impact these decisions will have on the environment.”
- “Identify techniques used to promote economically sustainable artificial nail services during financially difficult times.”

Manitoba Education, in collaboration with Manitoba Advanced Education and Training, Manitoba Entrepreneurship, Training, and Trade, and TVI, has also funded the development of a new technical-vocational program in alternative and sustainable energy. The course will be housed at W.C. Miller Collegiate in Border Land School Division, which is part of the Red River Technical Vocational Area (RRTVA), a group of five school divisions in south-eastern and south-central Manitoba, which together offer a variety of courses and programs to students in the area. Further information on the upcoming course offering is contained in Box 1.

The Technical-Vocational Initiative has been working for a number of years to address other concerns raised by administrators in this study. Since 2004, TVI has provided in the order of \$4 million in TVET equipment upgrades funding to schools, with a view to providing environmentally friendly equipment. Another core pillar of TVI is teacher professional development to ensure up-to-date teaching content.

Barriers to Advancing ESD in TVET

While much has been done by TVI and schools in the areas of curriculum redevelopment, equipment renewal, improving the school environment, and creating opportunities for students to learn about ESD in practice, administrators identified several significant barriers to mainstreaming ESD into technical-vocational education. These barriers fall into three broad categories: lack of financial and time resources, lack of teacher training, and lack of provincial-level guidance. The most commonly described challenge facing administrators is financial. Teaching technical-vocational students about sustainability in practice requires the regular purchasing of new equipment that meets environmental standards. Several administrators noted that teachers who are interested in training students to work with electric motors, for example, are unable to do so because they are restricted to working with the materials they have at the school: “Funds are our biggest problem—the teachers are committed, they want to work with the most environmentally friendly equipment, and they try to encourage students to look at how sustainability issues fit into the work they do. But without the money for equipment that can only go so far.” Thus, students continue to learn using less sustainable machines, and are therefore unable to gain the skills that would enable them to find work in a green economy. A second commonly cited barrier is lack of knowledge on the part of teachers. Many administrators interviewed said that their technical-vocational teachers had received no training or professional development (PD) at all in the area of ESD; others said that one or two of their staff had received training. Several administrators also noted that this training gap is accompanied by a lack of relevant curricular materials that would enable teachers to make changes to their in-class practice.

BOX 1: ALTERNATIVE ENERGY TRAINING IN THE RED RIVER TECHNICAL-VOCATIONAL AREA

Manitoba has a dynamic and growing alternative energy sector. Manitoba Hydro and the St. Joseph's wind farm near Altona are perhaps the most visible producers of alternative energy, but the province also produces geothermal exchange systems, solar thermal systems, and biomass heating systems. Thus, there is an increased demand for skilled workers in these areas. The Red River Technical-Vocational Area (RRTVA) has sought to train students to meet this demand by developing an eight-course program in Alternative Energy, to be offered at W. C. Miller Collegiate in Altona starting in September 2012.

Overview

Manitoba Education's commitment to ESD and the growth of alternative energy in the region led the Coordinator of the RRTVA to encourage the development of a course focusing on sustainable energy. Program development work was done in close consultation with the TVI, which also provided significant funding support to the effort. In 2010-2011, a literature review of existing programs was conducted to support the development of such a course. In 2011, a full-time staff member was hired by Border Land School Division to develop the course curriculum and to create an advisory board for the program with industry and government representation. The resulting Alternative Energy program will provide students with the skills necessary to gain entry-level work in alternative and renewable energy jobs, and the knowledge to succeed in higher education programs (such as engineering) related to the alternative energy field.

Challenges

The course is unlike traditional technical-vocation programs in that it is an "exposure-level" program, rather than direct career training. As such, the course developer noted that "communicating what [qualifications] students will walk away with after the course" has been a challenge. Parents and students are unfamiliar with the field, and uncertain about the employment advantages such a course will offer their children. The course developer has sought to address this by structuring the program to facilitate a number of certifications, such as solar and wind installation and various safety certifications, but information for parents and students about jobs in this field is also necessary to ensure reasonable rates of enrollment.

Promising Practices

In designing the course, the developer contacted representatives of a wide range of stakeholders in the alternative energy sector in Manitoba. These representatives have acted as an advisory board for the course, and have helped to ensure that it is relevant to the current needs of industry. In June of 2012 the program developer was part of a Manitoba delegation, led by the Executive Director of TVI, which visited several bioenergy sites in Lower Saxony, Germany and held discussions with school and industry. These efforts have been particularly important as the program has no precedent in Canada at the secondary school level, and thus there were no pre-existing models on which the RRTVA could build.

Some interviewees attributed the lack of teacher awareness to overwork and insufficient support from Manitoba Education:

“I tend to think that ESD is another flavour of the month in the education system. It’s important, but if the province is serious about it, it needs to be embedded in policy and curriculum, because it won’t stand alone.”

“If I were a teacher . . . well, there are great ideas and initiatives provincially throughout the year. Things like student voice, communications, new report cards, sustainability. These all add value, but nothing is taken away to give teachers time to implement these changes. There is not enough professional development either. These things have to be done over time with less pressure. The province needs to provide guidance in terms of what is most important—if ESD is key, what can they take away. This will help us focus on doing it less superficially and doing a better job of the things that are most important.”

“[Incorporating ESD] takes support from government bodies. Either the provincial or the school government needs to give teachers and administrators the tools to make this happen: by providing relevant curriculum, changing policies, and financially supporting these initiatives.”

Policies around the integration of education for sustainable development can assist administrators by increasing the legitimacy of efforts to mainstream ESD and providing guidance as to how this can be done. The technical-vocational schools with the most successful and comprehensive ESD programs were typically those which have supportive policies at the divisional or school-level. However, at present, few school divisions and schools have sustainability policies that extend beyond procurement and waste disposal:

“Our division has policies to purchase and dispose of goods in ways that support SD principles. We follow these and have changed our purchasing and waste disposal accordingly. It would be helpful to have more ESD issues put into policy because we do follow the policies.”

“[The division] has policies that support sustainability. These provide a general direction and focus, but give no specific strategies about integrating ESD into teaching—that is left up to individual schools. I would like to see suggestions and examples from other schools; it would give us the opportunity to make those strategies work in our building. It would be great to share this at the next VTAM meeting.”

“[The division doesn’t have ESD policies] that I’m aware of and I know the policies. [New policies] would be helpful as a way of planning and allocating funding.”

Such comments are fairly representative of administrators’ attitudes. They illustrate that administrators who have not made changes to incorporate ESD are not necessarily uninterested in the approach. Rather, they are unsure of how to prioritize it and how to integrate it successfully. This suggests that it would be useful for divisions to create policies and guidelines that could assist administrators in managing the changes necessary to integrate ESD.

The Survey of Teachers

Awareness of ESD

As noted by administrators, and as described by teachers themselves, incomplete knowledge and lack of capacity on the part of educators are significant barriers to mainstreaming ESD into technical-vocational programs in Manitoba. Of the 30 teachers who completed the online survey, 13 per cent described themselves as having “no knowledge at all [of the concept of education for sustainable development],” and 50 per cent said they had “heard of the concept, but have no detailed knowledge of it.” Only 3 per cent of respondents felt they knew the concept “very well” (see Figure 1).

The reason for this is likely the absence of training: 63 per cent of respondents had neither read about nor received training on how to incorporate ESD into the technical-vocational curriculum (see Figure 2). The majority of those who had sought more information on the subject did so independently: 27 per cent had read about it, and 7 per cent had received training outside of the division. Of the latter, two noted their professional associations as the source of information:

- Attended the North American Council of Automotive Teachers (NACAT) conference twice and a hybrid workshop.
- I was introduced through the International Technology and Engineering Educators Association (ITEA) conferences I have attended.

One respondent also noted the Manitoba Education website information about ESD. Only 10 per cent of respondents received division level training that could guide efforts to incorporate ESD into their teaching.

Although one respondent did comment that “I just finished my vocational teaching certificate and they talked about it there,” it would appear that there is insufficient preparation in SD for pre-service technical-vocational teachers. The Chair of Teacher Education at Red River College suggests that sustainability training for pre-service technical-vocational teachers is still in the early stages of development. Nevertheless, there is real interest in incorporating sustainability into pre-service training. A meeting was held in January 2012 with representatives of Red River College and the Technical-Vocational Initiative to discuss opportunities for collaboration on sustainability programs. While nothing has been finalized, one option is to develop a summer sustainability training camp for secondary vocational students, which would be held at the Red River College campus. Other training in specific environmental issues and practices exists, but little else has been done to mainstream ESD. The Chair suggested that such training could be included as a topic in the Technical Facilities course that all pre-service teachers take, because this class has a relevant focus on classroom environment and management. –

Figure 1: Are you familiar with the concept of Education for Sustainable Development (ESD)?

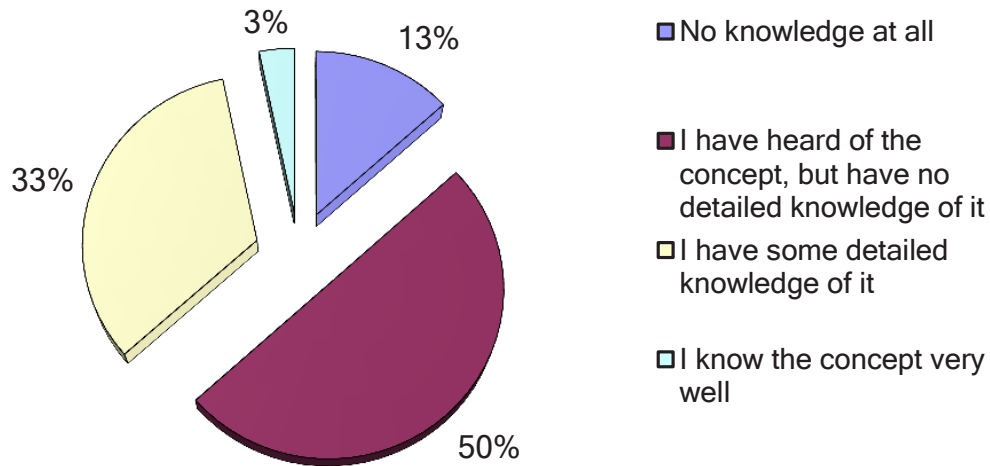
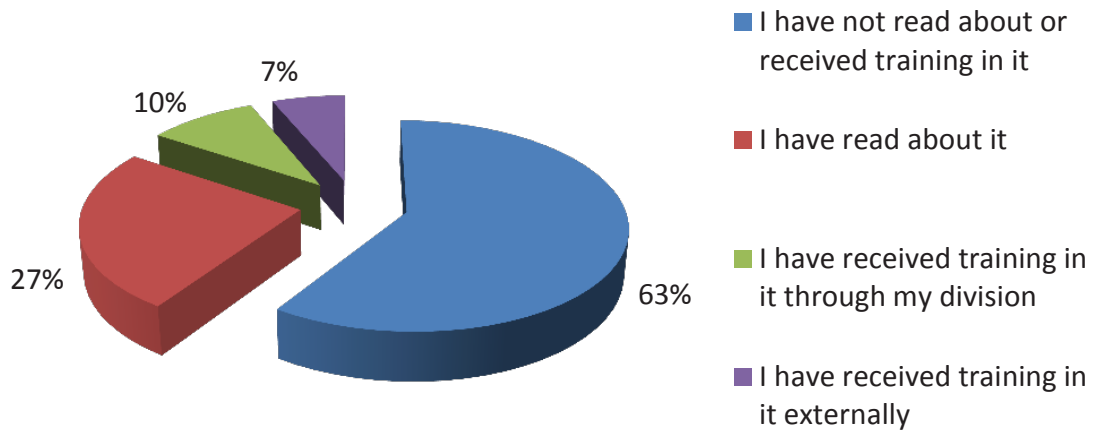


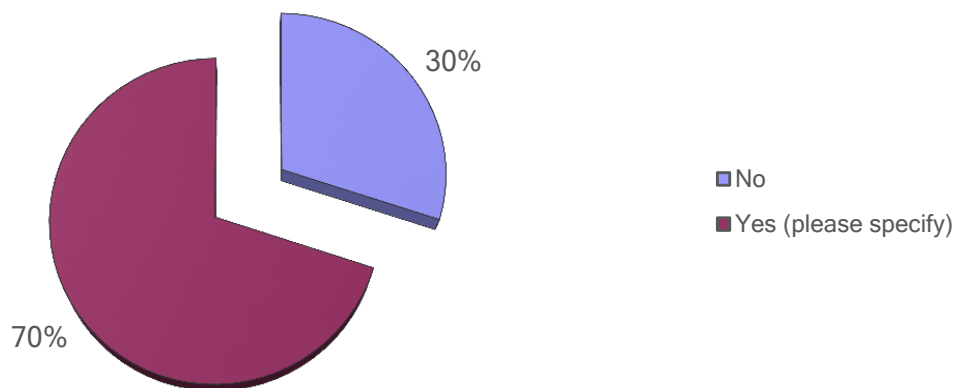
Figure 2: Have you read about or received training on how to incorporate ESD into the technical-vocational curriculum?



Application of ESD in the Classroom

The respondents to the survey did indicate a commitment to incorporating sustainable development into their teaching practice: Over two-thirds indicated that they do try to teach students about social, environmental and economic responsibilities (Figure 3).

Figure 3: Do you teach students about environmental, social, and economic responsibility as part of their technical and vocational training? (For example: the choice of sustainably-produced building supplies in construction)?



Of those who did, however, the majority described lessons that focused on environmental issues, particularly recycling and renewable energy:

“We discuss the benefits of Hydro, wind, and solar power [compared to] coal, oil, gas or nuclear power.”

“I discuss how at the students’ age they can create change by setting examples and getting into the practice of reduce, re-use, recycle.”

Several responses demonstrated a more sophisticated understanding of sustainability, and engagement with its social and economic aspects, with particular attention to workers’ considerations:

“[In culinary arts] we discuss local versus imported food, organic versus non-organic food, composting, poly versus monoculture and we visit local farms.”

“The program explores for example the impact (environmental, social, and economic) of utility scale energy facilities such as hydroelectric and wind farms.”

“... labour laws, pollution, etc.”

“VOC [volatile organic compounds] regulations and safety equipment.”

Although they acknowledge limitations to their familiarity with education for sustainable development, teachers feel that they can apply some (57 per cent of respondents) or most (17 per cent of respondents) of what they do know. In keeping with this, nearly half of respondents had made changes in their classroom practice based on their knowledge of ESD. For most respondents, this took the form of reducing, recycling or reusing materials:

“Accept drawings digitally, rather than print, for several assignments.”

“I reuse engines for students to learn on.”

“We try using recyclable resources and products when [we are] able.”

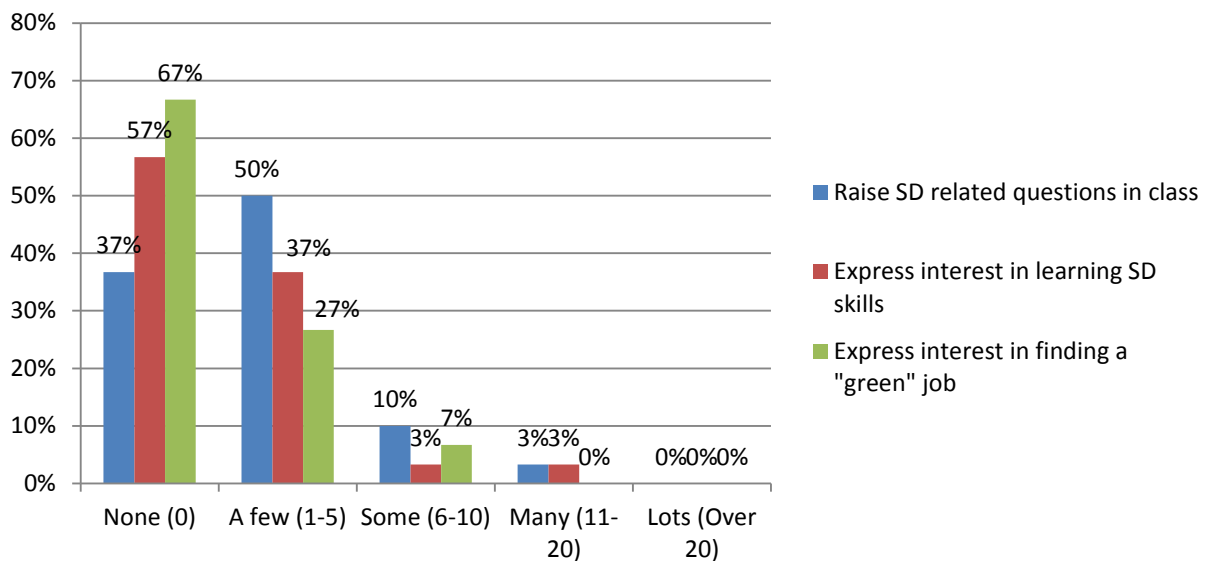
“We recycle more now and will be composting when possible.”

Several teachers described several unique lesson plans that address issues of sustainability. One culinary arts teacher designed a “Locavore Iron Chef cook off,” and a field trip to a food conference, as lessons intended to make students aware of sustainable kitchen practices. Several teachers working in the automotive field have begun adding hybrid and fuel cell technology units to their curriculum, and one electrical teacher noted that he has begun to teach students about wind and solar power.

The “whole school approach” to ESD in technical-vocational schools does have a foundation in school operations: over three-quarters of respondents indicated that their schools have made efforts to become more sustainable, although when asked for details, the majority of respondents noted only recycling programs. A few noted improvements in water and energy systems.

Data from the teachers survey suggests that student interest in sustainability is low but that there is a foundation there of a few students in many classes beginning to explore sustainable development in their lives and work (see Figure 4). When asked “how many of your students have raised environmental, economic, or social issues in the classroom?” 50 per cent answered “1 to 5”; although another third indicated that no students have raised these types of questions.

Figure 4: Student Interest in Sustainable Development



Fewer students have expressed interest in learning skills that could make their future work more environmentally, economically, or socially responsible: 57 per cent of teachers said that none had expressed interest, while 37 per cent of respondents said only 1 to 5 students had. Lastly, 67 per cent of respondents said that no students had expressed interest in finding a “green job” in their field, while 27 per cent said that only 1 to 5 students had expressed interest in this field. These findings are contradicted somewhat by interviews with students (see below), in which the level of interest would appear to be higher.

However, the survey illustrated that teachers themselves are unsure about what constitute “green jobs.” When asked about likely future opportunities for green jobs in Manitoba, nearly half of the respondents indicated that they were unsure of the definition of green jobs or where the opportunities might be; other responses, like: “in agriculture”; “anything related to environmental studies”; and “trades” were vague. A few respondents were more specific, identifying ecotourism and renewable energies as potential sectors for green jobs for their students. However, only two respondents had made “green job” work placements available for students (in electrical generation alternatives, and in the building trades). It may be that opportunities for students to learn about sustainability and green jobs in practice are still limited, and this may affect students’ interest in discussing these issues with their teachers.

Barriers and Opportunities

Teachers involved in both the surveys and the discussion groups had various suggestions for how their capacity can be improved:

- i. *Manitoba Education should provide curriculum resources that indicate how sustainability can be incorporated into the technical–vocational curriculum.* This was the most common request by teachers: 80 per cent of survey participants identified this as a need, and those involved in discussion groups also expressed interest in having practical resources for incorporating sustainability into classroom practice.
- ii. *Divisions should provide in-service training on ESD that is specific to technical–vocational instructors.* Many of the teachers currently involved in sustainability initiatives became interested in ESD as a result of in-service training and professional development; in addition, 77 per cent of survey respondents indicated a desire for such training.
- iii. *Manitoba Education should provide teachers and students with information on “green” technical–vocational jobs and “green” career opportunities in Manitoba.* Based on the results of the discussion groups, there is strong interest among students in learning more about “green jobs.” Teachers do not have the capacity to educate students about these opportunities, and 73 per cent of survey respondents indicated that they would like further information on the topic.
- iv. *Manitoba Education should provide teachers with information on how schools in Manitoba or other jurisdictions have mainstreamed ESD into technical–vocational training.* The majority of school administrators and 70 per cent of survey respondents expressed interest in resources that outline “best practices” from within Manitoba or other jurisdictions.

The Discussion Groups with Students and Teachers

Group discussions with students and teachers were held at the following schools:

- W.C. Miller Collegiate
- Steinbach Regional Secondary School
- Technical Vocational High School (Tec Voc)

From these discussions, it would appear that technical-vocational students have a strong basic understanding of sustainability but less able to connect their understanding of sustainability to their specific trade or vocational training. While there was significant interest in “green jobs,” students were generally unsure of how to get such positions, or how their vocation could be made more environmentally responsible. Most importantly, the level of student awareness of and interest in sustainability varied significantly between the three schools, and to a lesser degree varied according to program and grade level.

While a few students were hesitant to define the term “sustainable development,” or conflated sustainability with environmental initiatives, the majority were aware of the three pillars of sustainability. Some sample definitions given by students include:

“[Sustainability is about] developing the world’s societies so that they function in a way that won’t damage the earth over a long time. It means making resources last.”

“It’s a focus on the future, about making things endure. We’re not sustainable right now. We need to use resources so that they are replenishable.”

Students’ knowledge of sustainability comes from many sources. When asked how they learned about these issues, the majority named their Grade 10 science classes, particularly geography, in which they “learned about environmental, economic and human sustainability for the future.” They also frequently described their school’s recycling programs, and the influence of friends and media personalities like David Suzuki, in making them more aware of environmental issues.

In two of the three schools, students identified specific technical-vocational classes in which teachers talked about sustainability. These classes covered a broad range and included: culinary arts, drafting, construction, power mechanics, electrical, and nail and hair care. The students gave several concrete examples of how their classes had addressed sustainability issues, or how sustainability could relate to their vocational training:

“[In my electrical class] we learned about sustainable energy sources, things like wave technology in France, solar, wind farms . . .”

“In animal production and farming, and I think in geography class, they talked about using farm products for energy. So, for dairy they clean out the manure and break it down into energy for the farm, they capture the methane. We also talk about stuff like not using herbicides.”

“In diesel mechanics the garage recycles oil, and we just got an environmentally friendly parts washer. I learned about it when we had to use it—it doesn’t use solvents, I think it cleans itself.”

“We compost all the food, and it goes to farms around here. We learned a bit about local food too, and had a competition with local food recipes.”

“In aerospace, we recycle everything: nothing gets thrown away. You get in trouble if [the teacher] catches you throw something away!”

“In culinary arts we use biodegradable plates and stuff, and we try to get food that’s organic. We also did research on a country’s food and culture, so that could be social sustainability.”

As these examples show, the majority of in-class ESD learning relates to the environmental pillar of sustainability. Students are very familiar with the three R’s (recycling, reducing, and reusing), and with issues like sustainable resource use, pollution, and clean energy. However, in all three schools, students needed to be prompted to talk about how issues of social and economic sustainability related to their trade. They were generally less certain about this, but when given the example of building houses for Habitat for Humanity in building trades, they were able to provide suggestions and comments.

Two schools described social sustainability initiatives that were specific to their technical-vocational program. In one, students from several technical-vocational classes worked together to help build houses for Children’s Camps International: “We work with a company that builds the houses. My [electrical] class did the wiring, and the other classes did stuff too. [Children’s Camps International] helps kids in poor countries that wouldn’t otherwise get to go to camp.” Another school held a funding drive for Relay for Life. To support the drive, technical-vocational students used the skills they had gained to create prizes for a silent auction (for example: a free manicure; a haircut; car servicing; products from wood-working courses). They also offered some of these services to participants in the relay, providing pedicures and manicures to runners at the end of the line. This is a creative example of how vocational programs can encourage students to become involved in social issues.

However, for the most part, students’ awareness of social sustainability was developed through their involvement in courses outside of TVE or extracurricular activities, programs and clubs coordinated through the school. In one of the schools, students described a community service course in which they could earn credit hours for volunteering in the community (available as an option for all high school students, not just TVET students). Students in two of the schools talked about WE Day, a training day for young people that focuses on creating social change. WE Day is typically followed up by events coordinated within the school with both a local and global focus although only two of the thirty students interviewed were aware of follow-up activities. Students also described several fundraising campaigns, which were for the most part coordinated by service clubs within the school, such as raising money for charities like the Christmas Cheer Board, Helping Hands, and Pennies for Heaven; or to support people affected by natural disasters like tsunamis and earthquakes.

Students were not able to give many examples of in-class projects and work placements that related to sustainability. The majority said that they had not learned about sustainability in an applied way during practicums, although several students noted that their places of training recycled, or tried to minimize waste. Sustainability was discussed in-depth in one practicum:

“I did a work practicum at a salon in the city—it used all Aveda products, which are environmentally friendly. I liked that. I told the school we should do that too in [the demonstration salon], but I think cost might be an issue.”

This comment illustrates the potential impact that practicums and applied projects can have on students' awareness of sustainability. When students see that professionals in their field are committed to environmental issues and social change, they begin to recognize the relevance of sustainability to their future career; as such, practicums are an important site for building interest in and commitment to sustainability. The creation of placement sites for students in which they can experience education for sustainable development should be prioritized for this reason. This requires working with and involving industry and business as partners as they are the ones to create work placements for students. TVI has worked closely with industry and business to develop these necessary partnerships.

In spite of the absence of work experience programs that highlight sustainability in an applied context, most students were able to give numerous examples of how their careers could be made more "socially, environmentally, or economically sustainable." Their replies typically focused on environmental sustainability rather than economic or social sustainability:

Broadcasting: "We use lots of energy for the machines . . . although not much paper, [broadcasting] is good for that! I guess there could be a focus on social activism too, depending on where you work."

Culinary Arts: "Kitchens can compost scraps to be used on local farms. Some kitchens use leftover oil for biodiesel, but we haven't learned much about this in class."

Hair and Cosmetology: "We can cut down waste by buying reusable canisters for hair colour, using chemicals that are more environmentally friendly. The industry is pushing this—a lot of big companies are trying to supply environmentally friendly products now."

Electrical: "We look at alternative energy sources like solar and wind. Hydro is important here, but there are also issues with dams up North. They have an environmental impact . . . fish get killed and stuff. And there are some problems for communities living there. "

Students from certain trades felt more comfortable than others identifying how their career could be made sustainable. Students from the "heavier" trades, and from vocations that did not involve procurement of products, were less able to describe changes that could be made at their workplace to improve its environmental, social, or economic impact:

Welding: "I don't really know how you would do that in welding, to be honest"

Educational assistant: "I guess we're not very environmentally friendly, but I don't know what I would be able to change. It would have to be [initiated by] the school."

This reinforces the comments of several teachers, who were aware of and supported the concept of sustainability, but were unable to relate it more concretely to the work for which they were preparing students. The addition of sustainability outcomes to the curriculum for certain vocations (see "Administrators" section) will hopefully help address this gap. However, in the near future, curriculum revisions will only be completed for 11 of approximately 50 programs. As such, it may help teachers and students to develop a database with examples of how sustainability can be integrated into different trades. This would need to be done with involvement from business, industry and the trades.

Such a database could also help support teachers who are seeking to advise students about "green job" opportunities. The majority of students were unfamiliar with the term "green job," but understood that it implied a career in which

environmental issues are taken into consideration. When asked if they would look for such positions after finishing school, a significant proportion of students explained that they were interested, but were unsure of what “green job” opportunities are available and the kind of qualifications they would need:

“It would be nice to know how many jobs are green, or where I can go to get training”

“How do I get a green job? Can I ask what kind of training you did?”

“There’s not a lot of choice in construction, most environmental decisions are made according to industry standard. I’m not really sure how a ‘green job’ in construction would work. But if I could find one, it would be a deciding factor for me personally.”

“We didn’t learn much about this until later on. It would be nice to know more about ‘green jobs’ earlier so we can decide.”

“I met a man who was an ecological engineer, and it sounded like my dream job. I got really interested in that, but I still have to figure out what I need to take.”

“I want to work in the medical field . . . I really want to be a missionary doctor, to work helping people, so that fits with the social sustainability, but is that ‘green’?”

“It’s a good idea, but I’m not sure where to find work like that in diesel mechanics.”

The level of interest in “green jobs” from the students in the discussion groups was surprisingly high, in contrast to what the teachers reported in the survey (see Figure 4). Once the revitalized TVE curriculum begins to be introduced and adopted, more training will be needed to prepare teachers and guidance counselors to meet the demands of students interested in finding employment in a green economy. The Ministry has already taken steps to address this, by drafting the “Manitoba Education: Green Jobs and Sustainable Development Careers” report. This report will provide background information on green jobs and sustainable development careers; an overview of the current green labour market, with more specific descriptions of key sectors; and an outline of relevant post-secondary education opportunities at the university, college, and certification levels. The report will be made available through the Manitoba Education website.

Suggested Actions

Manitoba's Green Plan, *Tomorrow Now* (2012), commits to the advancement of technical and vocational education and training in support of the transition to a green economy in the province. This report finds that technical-vocational secondary schools and programs in Manitoba have begun the process of incorporating sustainable development into their programming, and several schools have made significant progress in this regard. However, the report also identifies several barriers that have to be lifted for sustainable development to be integrated uniformly into technical-vocational education across all schools and programs. Particular attention should be given to the development of "green" technical and vocational skills that will be needed throughout the province. In many, if not most trades, these "green" skills will need to be linked to existing trade skills.

The following section outlines a number of suggestions to enable Manitoba Education to meet these challenges and fulfill the objectives set by the province under the Green Plan.

1. Manitoba Education should work with industry sector councils, employers and employee associations, both those that traditionally hire graduates of provincial technical-vocational programs and prospective employers and associations in new "green" industry sectors, to identify emerging demands for green skills.

A green economy is not built solely on those jobs related directly to environmental products and services. There is a view that every job could be considered a "green job," supporting sustainable development, if it is based on sustainable development principles and incorporates social, economic and environmental considerations. More specifically, however, for technical-vocational education, there will be a need for skills in three general areas:

- Jobs working with new environmental technologies, products and services.
- Jobs related to the reduction and remediation of impacts from existing enterprises.
- Jobs related to cleaner, healthier and more sustainable ways of operation in all enterprises.

The Department should, in consultation with industry sector councils, employers and employee associations (including unions), undertake research directed at identifying emerging demand for sustainability-related skills and potential barriers to the development of a "green collar" workforce. A number of specific sectors have been identified in the Green Plan as key to economic development and the Department should work to ensure that students are acquiring the necessary skills to meet demand in those specific sectors.

The Department should, further, promote and partner with "green" industries and trades in Manitoba to offer summer internships, co-op placements and practicums to technical-vocational students interested in learning more about "green jobs." The development of such partnerships should also be encouraged at the divisional and school level.

2. Curriculum development, support for technical-vocational teachers, and access to funds for new equipment should be advanced.

Given the impending restructuring of TVI as a unit within Manitoba Education, the following actions are suggested for the Department. The Department is encouraged to finish developing new curricula for all technical-vocational courses, ensuring that sustainability outcomes continue to be created for each course. Funds that TVI currently provides for professional development for teachers as well as for equipment renewal should be continued and promoted to the school districts. Next steps might include:

- Produce accompanying curricular resources to support teachers, with initial attention to the 11 program areas that will have a new curriculum starting in 2012.
- Implement, as proposed by TVI, a process for curriculum “evergreening,” so as to ensure program currency and relevance.
- Provide in-service training on ESD targeted specifically towards technical-vocational teachers, with concrete examples of how ESD can be integrated into specific technical and vocation programs/courses. This may require revisiting school districts and schools where ESD orientations have been conducted, but where the technical-vocational teachers might not have participated, or not felt that there was sufficient applicability to their own courses.
- Increase the number of professional development opportunities in ESD that are available to technical-vocational teachers and administrators. TVI has played a major role in supporting these efforts through activities under its Pillars of Action. Continuation of these activities is encouraged.
- As indicated in the Green Plan, produce the Green Jobs and Sustainable Development Careers Guide and circulate it to schools with technical-vocational programs, and hold information sessions for teachers and administrators to outline the findings of the report and its relevance to technical-vocational students.

3. The Department should work closely with school divisions and administrators to explore how a “whole school approach” to ESD can influence, include and support technical-vocational programs in schools.

School recycling, energy efficiency, transport, food gardens and other initiatives could benefit from the inclusion of technical-vocational students in design and implementation. Funding that is already available to schools for ESD projects through the categorical grants and Manitoba Hydro should be promoted more specifically to technical vocational teachers and administrators.

This effort could be supported through the creation of a “green Tec Voc teachers network,” to share experience and best practice, both in teaching and “whole school” demonstration projects. Administrators and teachers often work on ESD initiatives in relative isolation, and recognition and support is necessary in order for their efforts to be sustained and potentially replicated in other schools.

TVI participates in the Manitoba ESD Working Group (MESDWG). The Department also may wish to champion the creation of a Tec Voc subcommittee within MESDWG to advance progress already made in TVET.

4. The Department should inform parents and students of new opportunities for technical-vocational program graduates to contribute to building a green economy.

Develop information pamphlets for students and parents about Green Jobs and Sustainable Development Careers. These pamphlets should explain what “green jobs” are, provide an overview of “green job” opportunities in Manitoba, and describe the kinds of training necessary to obtain these positions.

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Appendix A: Administrators Interviewed

The following TVET schools and programs participated in this study:

Dauphin Regional - Principal	Les Ellchuk
Garden Valley Collegiate	Scott Jantzen
Garden Valley Collegiate: Teacher	Rick Schroeder
Helen Betty Osborne: Principal	Agnes Mowat
Kildonan East: Principal	Diane Posthumus
Lord Selkirk Secondary: Principal	Vicki Cielen
Louis Riel Arts and Tech: Principal	Brian Cameron
Louis Riel Arts and Tech	Bunny Mitchell
Maples Collegiate: Principal	Gwen Birse
Maples Collegiate: Principal	Blair Peppler
Murdoch McKay Collegiate	Darwin Macfarlane
Portage Collegiate: Principal	Greg Waldvogel
R. D. Parker Collegiate	Wally Itson
Steinbach Regional: Principal	Luis Riel
Sturgeon Heights Collegiate: Principal	Brent Corrigan
Technical Vocational High School (Tec Voc): Principal	Gordon Crook
W. C. Miller Collegiate	Jonathon Toews
MB Education: Consultant	Gilles Landry

Interview protocol for administrators

Provide a brief explanation of the research project, including an overview of our expected output and why it will be useful to them. Then use the questions below to structure the interview.

1) What is your understanding of ESD? How did you learn about ESD?

If “no knowledge” – provide a brief explanation of a) what ESD is; b) MB Education’s commitment to ESD; c) examples of what constitutes ESD in a TVET context.

2) How are you incorporating or planning to incorporate ESD concepts or sustainability initiatives (such as waste reduction, procurement, worker safety, equity, etc.) into technical-vocational education and training (TVET) at an administrative level?

- 3) Do you require your schools to produce sustainability audits? If so, do you develop an action plan based on the data?
- 3b) Have any of your teachers expressed interest in ESD?
 - 3c) Have your teachers had PD on ESD (please provide details)?
 - 3d) Is ESD currently incorporated into the Tech/Voc curriculum? If so, how?
 - 3e) Have you added or do you plan to add new material to your curriculum in response to the emerging green jobs sector? (For example: offering new courses in clean energy technologies)
 - 3f) Is ESD incorporated into the projects that students do?
 - 3g) Do you have any partnerships with the private sector (e.g., for student practicums)? If so, have these partners identified green skills as a training gap, or expressed interest in having students trained in green skills?
 - 3h) Do students have the opportunity to gain practical experience in green jobs through practicums, apprenticeships, etc.?
- 4) Manitoba supports a “whole school” approach, in which classroom teaching is supported by the surrounding physical environment. In your school or school division, what steps have you taken to increase sustainability? (e.g., Energy efficiency, transportation, water use, green space)
- 4b) What else could be done to make the school an environment for learning about ESD in practice?
 - 4c) Are there policies within the school or at the division level related to ESD that are relevant or helpful? (If no - is there a need for such policies?)
- 5) What are some of the barriers to incorporating ESD into TVET at your school? What are some of the opportunities?
- 6) We are planning to develop a directory of best practices for ESD in TVET. Are you aware of any existing initiatives (other than those already described) that we should include? (e.g., in other schools). If so, please describe. Could you provide us with the contact of the person responsible for the initiative?

Appendix B: Online Survey for Teachers

The following survey is designed to gather information on Education for Sustainable Development (ESD) in technical-vocational institutions in Manitoba. Information collected in the survey will be used to produce a report, which will be made available to you. We expect that you will be able to use the report in several ways:

- To learn what has been done to mainstream ESD into technical-vocational education in Manitoba.
- As a directory of best practices that can be used to replicate or develop new sustainable development initiatives.
- As a resource to support curriculum.
- To prepare technical-vocational students for “green jobs.” “Green jobs” include not only environmental technologies, but also jobs in which environmental issues are taken into consideration (e.g., the building trades and new transportation technologies)

The survey will take approximately 5-10 minutes to complete. Please contact Susan Taylor with any questions (staylor@iisd.ca).

Thank you for your time.

1) Are you familiar with the concept of Education for Sustainable Development (ESD)?

- 1- No knowledge at all
- 2- I have heard of the concept, but have no detailed knowledge of it
- 3- I have some detailed knowledge of it
- 4- I know the concept very well

2) Have you read about or received training on how to incorporate ESD into the technical-vocational curriculum? (Check all that apply)

- 1 - I have not read about or received training in it
- 2 - I have read about it
- 3 - I have received training in it through my division
- 4 - I have received training in it externally. (Please specify _____)

3) Are you able to apply your knowledge of ESD in the classroom?

- 1 - I am not able to apply it
- 2 - I can apply some of what I know
- 3 - I can apply most of what I know
- 4 - I can apply all of what I know

4) Have you made any changes to your classroom practice based on your knowledge of education for sustainable development?

Y/N - if yes, please provide details

5) Do you teach students about environmental, social, and economic responsibility as part of their technical-vocational training? (For example: the choice of sustainably-produced building supplies in construction) Y/N - if yes, please provide details.

) How many of your students have raised environmental, economic, or social issues in the classroom?

None (0)

A few (1-5)

Some (6-10)

Many (11-20)

Lots (Over 20)

7) How many of your students have expressed interest in learning skills that could make their future job more environmentally, economically, or socially responsible?

None (0)

A few (1-5)

Some (6-10)

Many (11-20)

Lots (Over 20)

8) How many of your students have expressed interest in finding a green job after completing their education?

None (0)

A few (1-5)

Some (6-10)

Many (11-20)

Lots (Over 20)

9) Which of the following resources do you need to develop your capacity in ESD?

Information on how schools in Manitoba or other jurisdictions have mainstreamed ESD into technical-vocational training (Y/N)

Curriculum resources for teaching ESD in a technical-vocational context (Y/N)

In-service training on ESD for technical-vocational instructors (Y/N)

Information about green jobs and careers for technical-vocational students (Y/N)

Other: please specify

10) Has your school made any changes to increase the sustainability of its operations? (For example: compost programs, energy reduction programs)

Y/N - if yes, please provide details

11) Do you know of any ESD initiatives in other technical-vocational institutions in Manitoba?

Y/N - if yes, please provide details

12) Where do you see the greatest opportunities for green jobs in Manitoba (sectors or job titles)? (Please specify)

13) Have you explored the issue of green jobs in your curriculum or discussions with students?

Y/N - if yes, please provide details.

Appendix C: Student-Teacher Discussions

Group discussions were held at the following schools:

- W.C. Miller Collegiate
- Steinbach Regional Secondary School
- Technical Vocational High School (Tec Voc)

Discussion Questions for Students

NB: Students were selected by administrators to represent the various vocations taught at the school.

1. How would you define sustainability? Where did you learn about it?
2. How does sustainability relate to your vocational training?
3. Have you done any applied work (projects, practicums, etc.) in which you learned about sustainability?
4. What could be done to make your trade more socially/economically/environmentally sustainable?
5. How would you define a “green job”?
6. Will you look for a “green job” after finishing school? (Why/why not?)

Discussion Questions for Teachers

NB: Teachers were selected on the basis of their participation in sustainability initiatives.

1. Could you please describe the work you have done on sustainability initiatives?
2. How did you become involved in this work?
3. What are some of the challenges you have faced? How did you address them?
4. Going forward, what are some of the opportunities for ESD in TVET at your school?

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