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Vocational Training in Higher Education: A Learning Centred Approach to Integrating 'Educultures'

Jeff Ruigrok
Sheridan College

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Vocational Training in Higher Education

A Learning Centred Approach to Integrating 'Educultures'

Jeff A. Ruigrok

5/1/2017

For this endeavor, a selection of learning challenges will help guide the integration of 1) Ministry of Advanced Education and Skills Development Standards with 2) Ontario College of Trades Standards. A template will be created that centres on Technical Vocation Outcomes and will include Employability Skills and Apprenticeship Skills. The template is inclusive of different learning types and styles, thus it is a mutable curriculum development guide – not a fixed or frigid dictum of any sort.

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Heather Farmer, a colleague whose many insights into the values abyss rounded up to the ever so profound “Do you know what they take in their coffee? As always sustenance grounds and connects us!

Intended, miss-appropriated or otherwise, I would like to thank Nathaniel Barr (et al) for injecting just the right amount of contemptuous humor into the values conflict. For, if values are a function of our 6 year old selves, we need to laugh at them a little.

Susan Shepley, whose encyclopedic rendering of the challenges gave whatever blue-ribbon structure you may find to this -my blue-collar functions.

Kudos also go to Dave Wackerlin for keeping an open-mind-set in the face of the tensions between technological education and tradecraft training.

Cherie Werhun: It was she who, somehow and someday, identified a diatribe email -about threading iron pipe- as having academic validity.

Finally my gratitude goes to Iain McNabb, whose comments about keeping faith with my entrepreneurial roots simply inspire intelligent risk-taking, thus this publication... onward.

Each of these people is of incredible insight, patience and class.

Thank You

Jeff A Ruigrok

Dedication

This humble endeavor is dedicated to my Father, whose very nature taught me that accepting values as learning barriers is akin to giving up on humanity? To him, I dedicate this paper and my philosophy of education.

“Inclusive Values are Different by Nature”

Love Jeff

Abstract Overview:

The goal of this effort is to make plain any overlap between Post-Secondary Mechanical Technician Standards and Plumbing Apprenticeship Curriculum Standards. We'll investigate whether the overlap is significant enough to create a modern and updated classroom learning template. Mechanical Technician programs are generally 56 weeks in length. A Plumbing Apprenticeship is significantly longer. The essential question is: What portion of Technician Education equates to the first 100 to 200 weeks of Apprenticeship Training. If enough meaningful and actionable overlaps do exist there may be opportunities to strengthen real-world-connections to in-school lectures and labs.

The two key Standards that will be investigated include:

- 1) Ministry of Advanced Education and Skills Development - Mechanical Techniques / Technician Program Standards. (Queens Printer for Ontario, 2010)
- 2) Ontario College of Trades - Levels One / Two of the Plumbing Apprenticeship Standards. (Queens Printer for Ontario, 2007)

In the making of a Standards integration framework, a third -daunting- aspect must also be discussed. That is, how does the association between the Standards suit classroom stakeholders? Where primary technologies such as Plumbing are concerned, the teaching and learning environment can vary quite a lot. Among others, the differences between applied and liberal education and, rural and urban dwellers are notable, as is male verses female engagement in the trade. If a template can meet just a few of the challenges -by being classroom-usable in both Attawapiskat and Brampton- I will deem the results of this effort a success.

Readings and Literature Review:

Apprenticeship may seem little changed through the ages but, with a little reading, it appears that the Apprenticeship model and the purpose of tradecraft education has continued to evolve. So, what is written about Apprenticeship in this Millennium?

Graeme Stewart of Ontario's Higher Education Quality Council prepared a helpful paper entitled "Apprenticeship Training in Ontario: Literature Review and Options for Further Research (2009)".

The paper includes an excellent summary of “The Challenges Facing Apprenticeship Education”. I have paraphrased and annotated the key concepts here and will continue to address these challenges throughout the integration process.

The Challenges Facing Apprenticeship Education

Barriers to Entry

- Canadian attitudes towards manual labour trades, has necessitated the immigration of skills from well developed (European) countries. These same attitudes have students seeking career training in school. Doing so steers students clear of work experiences such as apprenticeships?!
- Canadian attitudes may contribute to a lack of information about the viability of labour based education. Additionally, there is a lack of diversity in Secondary Schools, as Teachers and Guidance Councilors can be sedentary learners. With a University background, Secondary School Teachers lack Apprenticeship knowledge or understanding. A lack of accessible marketing to employers can also limit Apprenticeship opportunities.
- Employer can often perceive costs such as wages, instructional time and lost productivity as too high.
- A lack of diversity, especially in the male dominated heavy trades; there may be a cultural or value conflict, or other incompatibilities with aboriginal, disabled, new Canadian, and female individuals.

Simply Stated: Ontarians are becoming physically-illiterate and unable to provide significant value to the skilled labour market. Ontarians may view their bodies as a hobby, with manual labour being reserved for recreational purposes. What little push-back there is against this psycho-somatic dysfunction seems rooted in the rituals of the male immigrant or euro-centric culture.

Remarkably author Robert Sweet (cited below) seems to support the current state of euro-centric male culture of the trades by reiterating a recommendation for “Guidelines for assertiveness training... for women”. The assumption seems to be that the Apprenticeship culture would go from good to great if a contemporary Malaysian / Canadian Women would adopt some attitudes and behaviors of a German / Canadian Man.

*A Community Fit for Children -
A Focus on Young Children in
Waterloo Region*

*“Approximately 1 in 3 children
is scoring low on at least one
domain... doing relatively well
in language and cognitive,
communication skills and
general knowledge and may
need additional support in
areas relating to physical
health and well-being, social
competence, and emotional
maturity.”*

(Holliday, 2016)

Issues with System Performance

- Apprenticeship has not expanded much beyond skilled labour trades of the 1900's.
- The training process requires that skilled workers attend an in-school program, where narrowly focused programs are time based. Narrow educational programming prohibits the development of a greater range of skills.
- De-emphasizing of literacy, numeracy and other workplace skills may limit the ability of possible hires to adapt to workplace environments. Making learners less attractive to the labour market.
- Not unrelated to the above challenges, there are low apprenticeship completion rates.

Simply Stated: Apprenticeship has been academically stereotyped as predominately hands-on. The in-school portion is accordingly defined and delivered with the narrow focus often being 1) attendance 2) discrete skills and 3) exam prep. Primarily prescriptive and behavioral, these outcomes can be militaristic in nature. Regardless, such a narrow focus is a dismissal of Ontario's diverse culture -thus the Journeyperson's requisite balance of cognitive, social, emotional and physical intelligence. Employers notice. Apprentices struggle.

External Factors

- Community based education -like Apprenticeship- is significantly dictated by the on / off business cycle.
- Poaching of trained or partly trained employee's can act as a disincentive.

Simply Stated: Precarious work impacts employment-heavy Apprenticeship more than any other form of learning. How this plays-out in a (so called) gig-economy may be influenced by overlapping and integrating the Standards.

Regulatory Factors

- Journeyperson-to-Apprentice ratios greater than 1:1 can restrict small and medium sized businesses from hiring apprentices.
- There is a lack of inter-jurisdictional coordination beyond - the few- Red Seal trades.

Simply Stated: Smaller Companies and rural Plumbers can struggle with the current ratios (2:1, Plumber-to-Apprentice). It may be

Roll Call at the End of Day

“At the end of day, the horn will sound at 1:45 PM. At this time the students will stop working, pack up their tools and put them away. They will return any tools they have signed out from the tool crib and police their work area. At 2:00 PM the student will muster at the West side of the piping shop, at their designated table, where their instructor will take attendance.

*At this time any announcements are made the students will be dismissed and can wash their hands and change. **NO STUDENT WILL WASH AND CHANGE PRIOR TO BEING DISMISSED.”***

British Columbia Institute of Technology – Student Orientation Manual, 2017

helpful if the Red Seal program was extended to a greater range of Apprenticeships.

Unfortunately, Stewart was unable to quantify results with a good and meaningful set of numbers and statistics. He did, however, provide additional readings. Specifically a McGill-Queen's University book entitled, "Integrating School and Workplace Learning in Canada (Schuetze, Sweet, and others, 2003)".

Schuetze and Sweet's book contains a treasure trove of insights into the challenge-opportunities that lie between 1) unrealistic abstract liberal knowledge and 2) realistic tactic professional or vocational know-how. In this way they juxtapose abstract school learning with tactic work experiences. They present the combination as "alternation education". Apprenticeship is a model of alternation education. Included with Schuetze and Sweet's insightful Introduction, the book also presented other terrific perspectives. Including:

- Alternation Career Paths for Teachers: Reconceptualising Educultural Alliances, written by Tom Puk.
- Bridging the Gap between Liberal and Applied Education, by Paul Axelrod, Paul Anisif and Zeng Lin.
- Apprenticeship in Canada, by Andrew Sharpe
- Women in Apprenticeship, by Robert Sweet (Including comments about female "assertiveness".)

Other good reads include those from the Canadian Apprenticeship Forum, such as:

- Female Participation
- Aboriginal Participation,
- The value of essential reading, writing and math skills,
- Employer Needs / Wants

The above readings will have a direct impact on the dissertation and integration of the Apprenticeship Training and Technician Education. These will be imbedded in the text throughout the discussion.

*Showcasing Water Innovation
– FYNE Membrane Pilot Study*

"There are numerous challenges in finding suitable processes and technologies for upgrading and operating a water system in Attawapiskat including:

- *Limited access to skilled water operators"*

(for)

"equipment breakdown"

(and)

"technical support"

*Attawapiskat First Nation,
2015*

Additionally, there are tons and piles of excellent edu-babble that offer a lifetime of reading for those interested. I will note these in side-bars as / if they become significant to the integration task.

Plumbing in Ontario:

For much of the 1900's the Provincial Plumbing Regulation (Code) was part of the Water Resources Act administered by the Ministry of Natural Resources (MNR). This trade connection to the health of the natural and rural environment faded as people continued to migrate toward larger towns and cities. Midway through the century the natural environment faded from Ontario's lexicon and the urban environment strengthened when propaganda art portrayed Plumbers as being second only to Medical Doctors in "Protecting the Health of the Nation" (Standard Sanitary Manufacturing Company, 1938).

Late in the century the trade was further urbanized when the Code was removed from the Water Resources Act altogether. Today the Ontario Plumbing Code is administered by the Ministry of Municipal Affairs and Housing under the Building Code Act.

Plumbers are regulated by the Ontario College of Trades. According to the College...

"A Plumber installs, repairs and maintains piping systems, fixtures and other plumbing equipment used for water distribution, drainage and disposal."

Gone are any direct references to the health and environmental aspects of plumbing.

That said, others still feel that Plumbers play a leading role in the health and security of overall communities and water systems. Among others, the World Health Organization (WHO), World Plumbing Council (WPC) and Green Plumbers support Plumbers as playing a leadership role in the safe and sustainable use of water resources. A short list of such initiatives could include:

World Plumbing Day, WPC, March 11th – supports a professional plumbing approach to health of the environment and communities, as well as worth-while employment.

World Water Day, WHO, March 22nd – A focus of the Sustainable Development Goals (SDG's): In 2017 the focus of World Water Day was on how people view waste water and how it might be reduced, harvested and reused.

Freedom at Midnight

"India's town-bred intellectuals, (Gandi) warned, were forming a new elite, drawing up their schemes for the nations industrialization without regard to the interests of his beloved villagers.

...he proposed 'with their town bred bodies' be sent to the villages. Let them 'drink the water from the pools in which the villagers bathe, and in which the cattle wash and roll; let them bend their backs in the hot sun as they do'. Then they might begin to understand the villager's concerns."

(Lapierre and Collins, 1975)

Water harvesting is also high on the Green Plumbers to-do list. As is the desire to engage Plumber's in other forms of conservation / environmental action leadership.

The OBC is changing too. In 2012 language surrounding recycled water opened the Code up to creativity and innovation. Where it once required best or known and usual water re-use practices, it now simply states good practice is required, and provides a list of re-use system development resources.

Could it be possible that Plumbers be Change Agents!?

Apprenticeship Backgrounder:

There are some questions about whether Apprenticeship programs are working. Sharpe states:

“Persons intimately involved in the apprenticeship programs may feel that the system is working from their perspective, and even feel threatened and defensive when outsiders with little practical knowledge of the system (“And, I might add, outliers with much....”) assert that it is in crisis on the basis of statistical analysis which -from the practitioners' viewpoint- is of little value. On the other hand, persons with comparative knowledge of different educational systems may find the apprenticeship system is not keeping pace with other types of post-secondary education.”

Historically the level of personal commitment to Apprenticeship has been high. Skills were often inherited along family lines or via some form of master and boy servitude. In both of these rather binding instances, skill acquisition was assured but, unregulated by Governments.

By the early 1900's a personal choice or efficacy paradigm and a capitalist business model emerged. Ontario began supporting and regulating Apprenticeship when the Apprenticeship Act was created in 1928. The 2009 version of the Act delegates governance to The Ontario College of Trades.

The Apprenticeship system today has the same originating purposes.

- Developing skilled workers for the business labour market

Health Aspects of Plumbing

“The three roles a competent plumber must assume are:

- *To design, install and maintain drinking water supply and waste removal systems;*
- *To manage the health and financial risks associated with plumbing;*
- *To help conserve limited supplies of safe drinking water.”*

World Health Organization, 2006

- Help individual youth successfully transition from school to work

Today, individuals who wish to learn the plumbing trade need to find an employer / sponsor willing to train them then, together, meet with a representative of the Ministry of Advanced Education and Skills Development (MAESD) where all parties commit to a 9000 hour training agreement, and the Apprentice is registered with the College.

Peppered throughout the 9000 hours are three Levels of in-school training blocks or commitments.

Additionally, as participants learn specific performance tasks, they and a supervisor sign-off on a list of Apprenticeship (Performance) Standards. Once complete, the Apprentice is awarded a Certificate of Apprenticeship (C of A).

The hope and expectation is that Apprentice Plumbers then write an Inter-Provincial examination and are awarded a Provincial Certificate of Qualifications (C of Q) with a National (Red Seal) designation. Now qualified as a Journeyperson, individuals may practice anywhere in Canada.

Plumbing Apprenticeships represent a manual labour value system that has been academically stereotyped as being an inferior learning process. These academic stereotypes are not universally accepted.

“Vocational training through apprenticeship is a valued form of higher education in Germany, free of the stigmas found in Canada. Germany has a much higher retention and completion rate than other peer jurisdictions (I.e., developed nations). However it is generally agreed that Canada lacks the historical structures necessary to support a system similar to the German model.”

(Lehmann, 2005; Sharpe & Gibson, 2005)

In order to overcome academic stereotypes, successful Apprentices must develop an array of social, emotional, cognitive and physically-literate intellects. It is this coming-together of learning types and styles that the education system and some educators may find unnecessarily balanced, unfocused, integrated, expensive, time consuming and high-risk. Such a balanced intellect -and requisite maturity- may be the reason that the average completion rate is 39% and average age of Canadian Apprentices is 29 years (See, Canadian Apprenticeship Forum).

Excellence - Can we be Equal and Excellent Too

“An excellent plumber is infinitely more admirable than an incompetent philosopher. The society which scorns excellence in plumbing because it is a humble activity and tolerates shoddiness in philosophy because it is an exalted activity will have neither good plumbing nor good philosophy. Neither its pipes nor its theories will hold water.”

(Gardner, 1961)

Reason and Rationale:

Before Apprenticeship training and higher education cultures can be integrated effectively, there appears to be a values conflict that needs to be addressed.

Training is often narrowly focused on the learning or acquisition a discrete task or skill. It is most often associated with practical knowledge that is applied in the workplace or home.

Higher Education is often viewed as academic knowledge that is associated with the learning, testing and determination of in-school theories.

Apprenticeship is not often perceived as Higher Education. The underlying assumption of this paper is that integrating Training and Education cultures will create a third culture that I refer to as Higher Learning. The challenges facing diversity and inclusiveness in education run deep.

Training Cultures and Values:

I experienced training values overwhelm high-learning when it was suggested that pipe threading techniques could be harmonized across an entire Plumbing program. The idea was to reduce threaded pipe joinery to a single theory or perspective. This would allow a simplified training experience or 'teachable moment' to be repeated numerous times, for the entire duration of the program – by all stakeholders, instructors and students.

This industrialized take on 'Master and boy' training might work well if the same 'Master' always worked with the same 'boy'; piping materials remained unchanged and, plumbing shop equipment was always new. But in an institutionalized environment there are...

- many different teachers / learners, thus learning types / styles
- a diverse range of materials are used, that age in character and dimension
- tools and equipment that age quickly as the many different learners use them

Taxonomy of Educational Objectives – What is knowable?

“There is also a geographical and cultural aspect to knowledge in the sense that what is known to one group is not necessarily known to another group, class, or culture. It must be clear from all this, that knowledge is always partial and relative rather than inclusive and fixed.”

(Bloom and others, 1956)

- Additionally, in the post-industrial era of the new millennium, materials can be sourced globally and be inconsistently manufactured.
- Finally, increasingly so, routine tasks are automated.

So, while this ritualized type of training worked well in the past, the idea of teaching the same or unchanging task for the entire program has become far less valuable.

Attempts to harmonize around a single ritualized training concept, skill and lesson plan impacted the teaching and learning environment in the following ways:

1. People argue or right-fight about which single training technique is right.
2. Right-fighting limits diversity and diminishes the academic freedom to pursue truth and perspective.
3. Lacking perspective, group-thinking generates lesson plans full of “pseudo-profound bullshit” (See side-barr).
4. Bullshit limits the need to read about, comprehend or understand the task of threading pipe; thus limiting any connections or synergies between 1) textbooks, 2) Building Codes and 3) realistic plumbing practice and role-play.
5. Bullshit limits the ability and / or motivation for faculty, staff and students to grow and develop.
6. Evaluations and assessments begin to appear as pseudo-profound bullshit. Thus only those indoctrinated into the ritualized training could make any sense of a pipe threading assessments.
7. Did I mention that people right-fight about which single training technique was right.

The ending result of a narrow and overly directive or industrial training environment is that many Students and Faculty will be robbed of the ability to think critically and solve problems, and develop or grow.

“(They will) lack the intellectual resilience to learn new skills, cope with uncertainty, or even change fields (and) are potential casualties in the world of employment” (Lipman-Blumen, 1995).

On The Reception and Detection of Pseudo-Profound Bullshit

“...bullshit as something that is designed to impress but that was constructed absent a direct concern for the truth. This distinguishes bullshit from lying, which entails a deliberate manipulation and subversion of truth (as understood by the liar).”

“Thus (bullshit) implies but does not contain adequate meaning or truth.”

(Barr and Others, 2015)

Education Cultures and Values:

An alternative to overwhelming forms of training might be when only the principals of threading techniques were to be explored. In this case, sedentary plumbing students might learn about the anatomy of pipe fitting joinery.

Plumbing Students may learn about the psychology of right-fighting and group-thinking and other aspects of the Organizational Behaviour; the socio-economics of diversity; the enlightened epistemology's of academic freedom and truth; Students might take English language studies, perhaps in technical (textbook) writing and (Building Code) legal ease or, perhaps students would learn how to write a test question that isn't ritualized... Plumbing students could then be said to be highly educated.

“Education, on (this) other hand, involves the internalization of different theories...” and is designed to expand and enrich the already established culture, to critically reflect on whether the norms (and rituals) of that culture need changing and how such change might be brought about.”

(Puk, 2003)

While the syntax and sentence structure may be correct, Plumbing education of this sort is equally “pseudo-profound bullshit”.

The position of this endeavor is that neither the training nor higher-education ‘educultures’ is standalone excellent. Alone, each of these cultures is academic in the sense that they are ‘best’ applied in the classroom or laboratory. They are not a consistent real-world truth.

“Just as vocational and professional educators are well advised to (re)discover the importance of liberal education, so social science and humanities teachers ought to acknowledge the interest of students in experience-based learning. Charles Schroeder found in a study that the majority of today's students succeed best in an academic environment based on direct, concrete, experience, moderate to high degrees of structure and a linear approach to learning (cited in Sorum 1999).”

The Discipline of Integrative Thinking

“Integrative Thinking is the ability to constructively face the tensions of opposing models, and instead of choosing one at the expense of the other, generating a creative resolution of the tension in the form of a new model that contains elements of the individual models, but is superior to each.”

(Rotman School of Management)

The Student

There are options:

“Practitioners are quite aware that one can always find an opposing perspective to any other point of view. Teaching and learning are complex and ambiguous behaviors. One solution to relying on a single-focus research is to conduct research that uses pluralistic paradigms (Booth 1979, Puk 1990, 1992) or what Schwab (1970) referred to as polyfocus conspectus (uniting elements of multiple theories into one).”

An option to Training and Higher ‘educatures’ is a learning perspective called differentiated instruction. For this I have selected four related but distinct learning engagement categories.

- Directed⁽¹⁾ and structured cognition
- Participative⁽¹⁾ meta-cognition
- Supportive⁽¹⁾ social relationships and emotional intelligences
- Achievable⁽¹⁾ physical-literacy

These four points have been distilled from myriad of theories; Ariely, Ward, House⁽¹⁾, Wollfolk, Bloom, Tudor, McCarthy, Forsberg, Thaler, and many more.

In Bloom’s framework of Affective, Psycho-Motor and Cognitive learning, the four points range from the least complex verbs such as de-contextualized abstract cognitive content memorization, then along the continuum toward the complexities of critical thinking and realizable goal setting.

I fully realize that Inclusive Values are Different by Nature but believe that these perspectives are close to being Inclusive. These teaching and learning types and style will be used to help bridge the gap between the liberal and applied -they are student centred higher-learning.

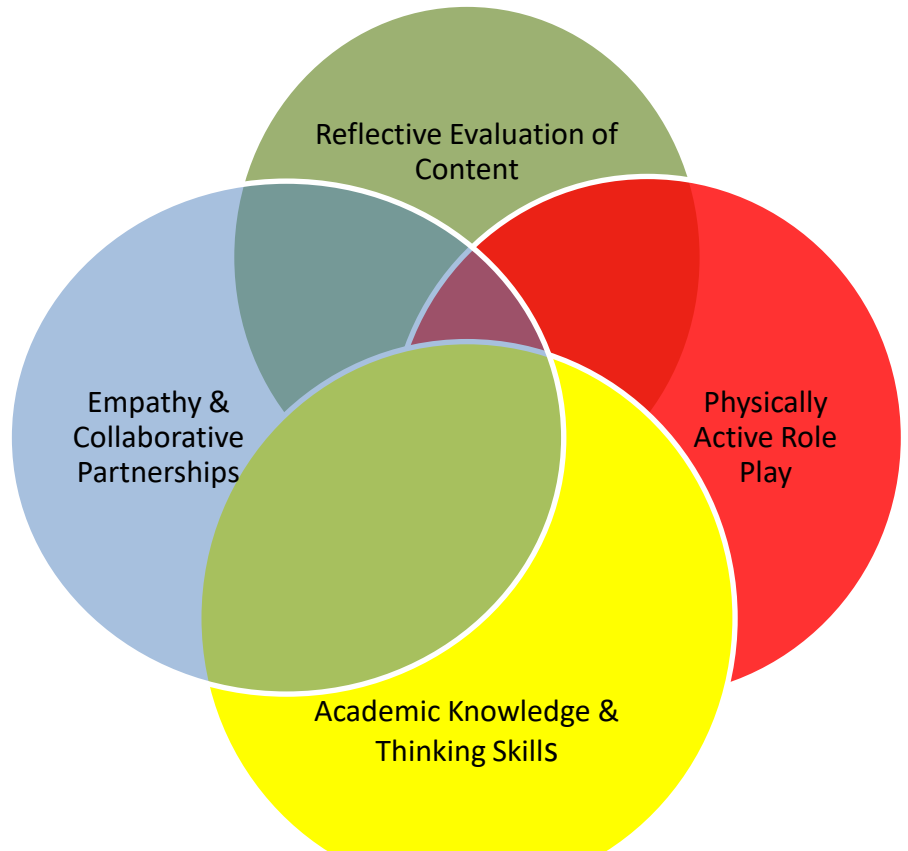
(1) House’s Goal-Path Theory posits that leaders engage in a variety of pathways based on motivation goals. As leaders, Plumbing Instructors would, utilize motivations and goals and create pathways that fill in learning needs. Combined, these would create a motivated learning environment.

(I would suggest that a consequence of a motivated learning environment is that the instructor also learns.)

Lesson Planning

An example of motivated learning...

1. Structured Cognitive –a guided / instructed reading of a section of the Ontario Building Code
2. Physically Active Literacy - assemble / build a piping system 'to Code'
3. Participative Met-cognition – test the piping system and assumptions about the meaning of the Code
4. Supportive Social / Emotional – collaborative teams rebuild a 'better' system and 'deeper' understanding



Inclusive Values are Different by Nature, Jeff A. Ruigrok

The Standards:

Mechanical Technician Program Standards (MAESD, 2010):

The Techniques and Technician Standards are nearly identical and are presented as 3 interrelated but distinct skill categories. Simply stated the categories are:

- II. Vocational Standards
 - 1 Complete all work in compliance with current legislation, standards, regulations and guidelines
 - 2 Apply quality assurance procedures to meet organizational standards and requirements
 - 3 Comply with current health and safety legislation, as well as organizational practices and procedures
 - 4 Apply sustainability best practices in the workplace
 - 5 Use current and emerging technologies to support the implementation of mechanical and manufacturing projects
 - 6 Analyze and solve mechanical problems by applying mathematics and the fundamentals of mechanics

- 7 Interpret, prepare and modify mechanical drawings and other related technical documents
 - 8 Perform technical measurements accurately using appropriate instruments and equipment
 - 9 Manufacture, assemble, maintain and repair mechanical components according to required specifications
 - 10 Contribute to the planning, implementation and evaluation of projects
 - 11 Select, use and maintain machinery, tools and equipment for the installation, manufacturing and repair of basic mechanical components (From Techniques Standards)
- III. Essential Employability Skills
- Communication
 - Numeracy
 - Critical Thinking and Problem Solving
 - Information Management
 - Interpersonal
 - Personal
- IV. General Education
- 1 Art in Society
 - 2 Civic Life
 - 3 Social / Cultural Understanding (Cultural Intelligence)
 - 4 Personal Understanding (Meta-Cognition)
 - 5 Science and Technology

Vocational Standards are at the heart of the post-secondary trade. Therefore “Vocational Learning Outcomes” will be reconstructed.

Employability Skills are the crux of higher-learning and individual / social well-being and success. Therefore The Employability Skills will be reconstructed at the “Skill Category - Defined” levels.

General Education will not be reconstructed. Water is older than time and sanitary waste and water systems have a rich human history, thus water has a significant impact on each of the General Education requirements. However easily General Education might fit into Plumbing education, these aspects of the trade are not generally taught by Journeypersons -or to Apprentices. Therefore these requirements may appear from time to time but, General Education requirements will not be reconstructed.

Mechanical Technician Program Standards - The Expression of Program Standards as Vocational Learning Outcomes

“Vocational learning outcomes represent culminating demonstrations of learning and achievement. They are not simply a listing of discrete skills, nor broad statements of knowledge and comprehension. In addition, vocational learning outcomes are interrelated and cannot be viewed in isolation of one another. As such, they should be viewed as a comprehensive whole. They describe performances that demonstrate that significant integrated learning by graduates of the program has been achieved and verified.”

MAESD, 2010

Plumbing Apprenticeship Curriculum Standards (OCOT, 2013):

These Curriculum Standards have not kept pace with Ontario Building Code changes. In fact they are three Code generations old. In an attempt to limit irrelevant data, we will avoid the Specific Outcomes in favor of Overall Outcomes. The Level One and Two Overall Outcomes will be reconstructed. The topics are:

Level 1

S00021.0 – Workplace Safety, Rigging and Hoisting

S00022.0 – Plumbing Systems

- Pipe and Fitting Materials, Pipe Supports and Hangers
- Drainage Systems
- Waste Pipe Systems
- Venting Systems
- Codes, Regulations and Standards

S00023.0 – Tools and Piping Methods

S00024.0 – Trade Calculations

S00025.0 – Trade Documentation

S00026.0 – Welding

Level 2

S00027.0 – Plumbing Systems

- Pipe and Fitting Materials, Pipe Supports and Hangers
- Drainage Systems
- Waste Pipe Systems
- Venting Systems
- Water Distribution Systems
- Plumbing Fixtures, Appliances and Equipment
- Codes
- Properties of Water and Heat Transfer

S00028.0 – Drain Waste and Vent Piping Systems

S00029.0 – Trade Calculations

S00030.0 – Trade Documentation

S00031.0 – Welding

Vision

To be world class providers of innovative and creative learning

Mission

To provide students of all ages with the knowledge and skills to thrive in a rapidly changing world

Values

- *Academic Excellence*
- *Commitment to Lifelong Learning*
- *Creativity and Innovation*
- *Inclusiveness and Diversity*
- *Service and Accountability*

*Sheridan College
Institute of Technology
and Advanced
Learning*

Structure:

The challenge is to design a plumbing curriculum template that can bridge learning gaps created by the following situations:

- Narrow Apprenticeship training traditions developed in concert with the habit of recruiting European Journeymen.
- Education systems focused on higher cognitive development or sedentary (liberal) learning and the stigmatizing the (applied) manual labour or hands-on learning as inferior.
- Youth, leaving high school ill equipped for the physical, social and emotional labour required to “Reconceptualize Educultural Alliances” (Puk, 2006).

The chosen challenges are intended to juxtapose the **Plumbing Apprenticeship Curriculum** with Post-Secondary **Mechanical Technician** education. Each form of education contains incredible value that –when alone- can create barriers to learning. We have defined higher-learning as an education structure that combines social, emotional, cognitive and physically literate components. It is my hope that this pairing of outcomes with stakeholders will help to create more inclusive and barrier free instruction.

With the ideals of the 4 higher-learning goal-pathways foremost in mind... the table will begin with 7 **Essential Employability Skills** in Column One of a tabled matrix. As sweat-equity is a learner type and a Deployable Skill, I will add physical-literacy to Column One of the table. The four learner types that coincide with these 7 **Essential Employability Skills** are...

1. Directed Cognitive Academic Structure
 - **Communication**
 - **Numeracy**
 - **Information Management**
2. Participative Meta-Cognitive
 - **Critical Thinking and Problem Solving**
 - **Personal**
3. Affective Social Relationships and Emotional Intelligence
 - **Interpersonal**
4. Achieve Psycho-Motor Role-Play

Mechanical Technician Program Standard - The Development of a Program Standard

“In establishing the standards development initiative, the Government determined that all postsecondary programs of instruction should include vocational skills coupled with a broader set of essential skills. This combination is considered critical to ensuring that college graduates have the skills required to be successful both upon graduation from the college program and throughout their working and personal lives.”

MAESD, 2010

- **Physical Literacy**

Column Two will contain 22 topics and 125 overall outcomes of the **Apprenticeship Curriculum Standards** -beginning with **Level One**, followed by **Level Two**. These Standards have not been updated since 2007 (three generations of Building Code) so the specific outcomes are somewhat outdated. We will deconstruct the overall outcomes (Not Specific Outcomes).

Column Three will be a construct the 11 **Vocational (Technician) Outcomes**.

It must be noted that the **Vocational Outcomes** column will not include any verbiage or added distinctions from the (28 week) Techniques Program Standards. It will instead use the more simply stated terms of the **Technician Program Standards**. Example: Technique Outcome - ~~“contribute to the application....”~~ will be replaced with “apply...” from the **Technician Outcome**.” Again, this should be more inclusive of physically-literate learners and plumbing in general.

Finally, Techniques Outcome # 10 **“Machinery, Tools and Equipment”** has been added to the Column Three as Item #11. This reflects the ongoing education in tools that (surely) does not stop at the conclusion of the Techniques Program?!

Summary Conclusions

Keeping in mind that this review was of Overall Outcomes, there was limited overlap between the Standards as written. The weights used to create the matrix were: 4 Learning / Leadership categories; 7 Essential Skills, 22 Apprenticeship Topics with 125 Apprenticeship Outcomes; and 11 Vocational Outcomes. Excepting “Workplace Safety Rigging and Hoisting”, there are a limited number of overlaps between the Apprenticeship and either of Technician Outcomes. Additionally, there was very little diversity in engaging student learning types and styles – again, the exception to this is Workplace Safety.

Perhaps a lesson could be taken from the Safety Outcomes?

“Nothing happens until something (some-body) moves.”

Einstein

I suspect MAESD know this as they included a foreword to the Level Two Curriculum Standards that reads, in part: “However, because the Apprenticeship Training and Curriculum Standards documents were developed under either the Trades Qualification and Apprenticeship Act 1990 or the Apprenticeship and Certification Act 1998, the definitions may no longer be accurate and may not be reflective of the Ontario College of Trades and Apprenticeship Act 2009 as the new trades legislation in the Province. The College will update these definitions in the future.”

Regardless, the Apprentice Standards seemed to support both the Narrow Apprenticeship training traditions AND overwhelming volumes of sedentary cognitive memorization, perhaps for ‘exam-prep’. In the instance of Level One “Pipe and Fittings”, none of the 12 Overall Outcomes overlapped with any of the Vocational Standards.

Had we reviewed more Specific Outcomes each category would have been expanded 5 to 10 times the current weight (Considering the disparity between the OBC and Apprenticeship Outcomes and, time constraints... a near impossible task.). However a quick scan of the Level Two Apprenticeship Curriculum Standards revealed that simple cognitive outcomes based on the term “identify” occurred 162 times; the more complex term “apply” occurred 14 times. Contrast the Apprenticeship Standards with the Mechanical Technician Program Standards, which contained the word “identify” for 3 occurrences and “apply” 26 occurrences, and the exclusion of complex learner types and styles becomes evident.

The ‘narrowness’ of the Apprenticeship Standards may have been effective in a different time or in a different culture but globalization and artificial intelligences are causing the ‘wheel’ to be reinvented regularly.

Even European’s can struggle with the pace of growth and change...

“Moreover, the German system relies on early and intensive streaming in secondary school, on a much larger scale than in Ontario. In addition some analysts (for example Heinz, 2003) suggest that Germany’s apprenticeship system is becoming increasingly unwieldy in the context of a global economy, and in fact limit innovation and flexibility in vocational training.”(Stewart, 2009)

In closing I must note that the Apprenticeship Curriculum seems over-simplified, frigid and out of date with current Plumbing, Teaching and Learning. I find that the Techniques / Technician Program Standards would / should form the basis of any integration of more Specific Outcomes.

Below is a summary of the effort.

<u>Learning Leadership / Student Engagement</u>	<u>Essential Employability Skills / Physical-Literacy</u>	<u>Number of Overlaps, out of 125 Overall Apprenticeship Outcomes</u>
Directive Cognitive Structure	Communication	76
	Numeracy	14
	Information management	2
Participative Meta-Cognition	Critical Thinking & Problem Solving	9
	Personal	1
Supportive Relationship	Interpersonal	6
Achievable Role-Play	Physical literacy	18

<u>Level One Topics (Overall Outcomes)</u>		<u>Number of Overlaps</u>	
		<u>Essential Skills, of 7</u>	<u>Vocational Outcomes, of 11</u>
S00021.0 – Workplace Safety, Rigging and Hoisting(19)		6	7
S00022.0 – Plumbing Systems	Pipe and Fitting Materials, Pipe Supports and Hangers(12)	1	0
	Drainage Systems(13)	1	0
	Waste Pipe Systems (6)	3	2
	Venting Systems(8)	1	0
	Codes, Regulations and Standards (1)	1	1
S00023.0 – Tools and Piping Methods(7)		2	2
S00024.0 – Trade Calculations (5)		1	1
S00025.0 – Trade Documentation (5)		2	2
S00026.0 – Welding (4)		2	2

<u>Level Two Topics (Overall Outcomes)</u>		<u>Essential Skills, of 7</u>	<u>Vocational Outcomes, of 11</u>
S00027.0 – Plumbing Systems	Pipe and Fitting Materials, Pipe Supports and Hangers(2)	1	0
	Drainage Systems (3)	2	2
	Waste Pipe Systems (6)	2	2
	Venting Systems (5)	2	2
	Water Distribution Systems (7)	1	1
	Plumbing Fixtures, Appliances and Equipment (3)	1	1
	Codes (2)	1	1
	Properties of Water and Heat Transfer (4)	2	2
S00028.0 – Drain Waste and Vent Piping Systems (2)		1	1
S00029.0 – Trade Calculations (4)		1	1
S00030.0 – Trade Documentation (6)		2	2
S00031.0 – Welding (2)		2	2

<u>Synopsis of Vocational Outcomes</u>		<u>Number Apprenticeship Outcome Overlaps</u>
1.	Complete all work in compliance with current legislation, standards, regulations and guidelines	5
2.	Apply (or contribute to) quality assurance procedures to meet organizational standards and requirements	9
3.	Comply with current health and safety legislation, as well as organizational practices and procedures	2
4.	Apply sustainability best practices in the workplace	0
5.	Use current and emerging technologies to support the implementation of mechanical and manufacturing projects	0
6.	Analyze and solve mechanical problems by applying mathematics and the fundamentals of mechanics	6
7.	Interpret, prepare and modify mechanical drawings and other related technical documents	3
8.	Perform technical measurements accurately using appropriate instruments and equipment	7
9.	Manufacture, assemble, maintain and repair mechanical components according to required specifications	6
10.	Contribute to the planning, implementation and evaluation of projects	5
11.	Select, use and maintain machinery, tools and equipment for the installation, manufacturing and repair of basic mechanical components	5
Total		48/125