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BCIT

Learning and Teaching Centre

Post-Pilot Report:

Revising and Resequencing EAP Level 1 and Level 2 Learning Guides Project

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Post-Pilot Report: Revising and Resequencing
EAP Level 1 and Level 2 Learning Guides Project

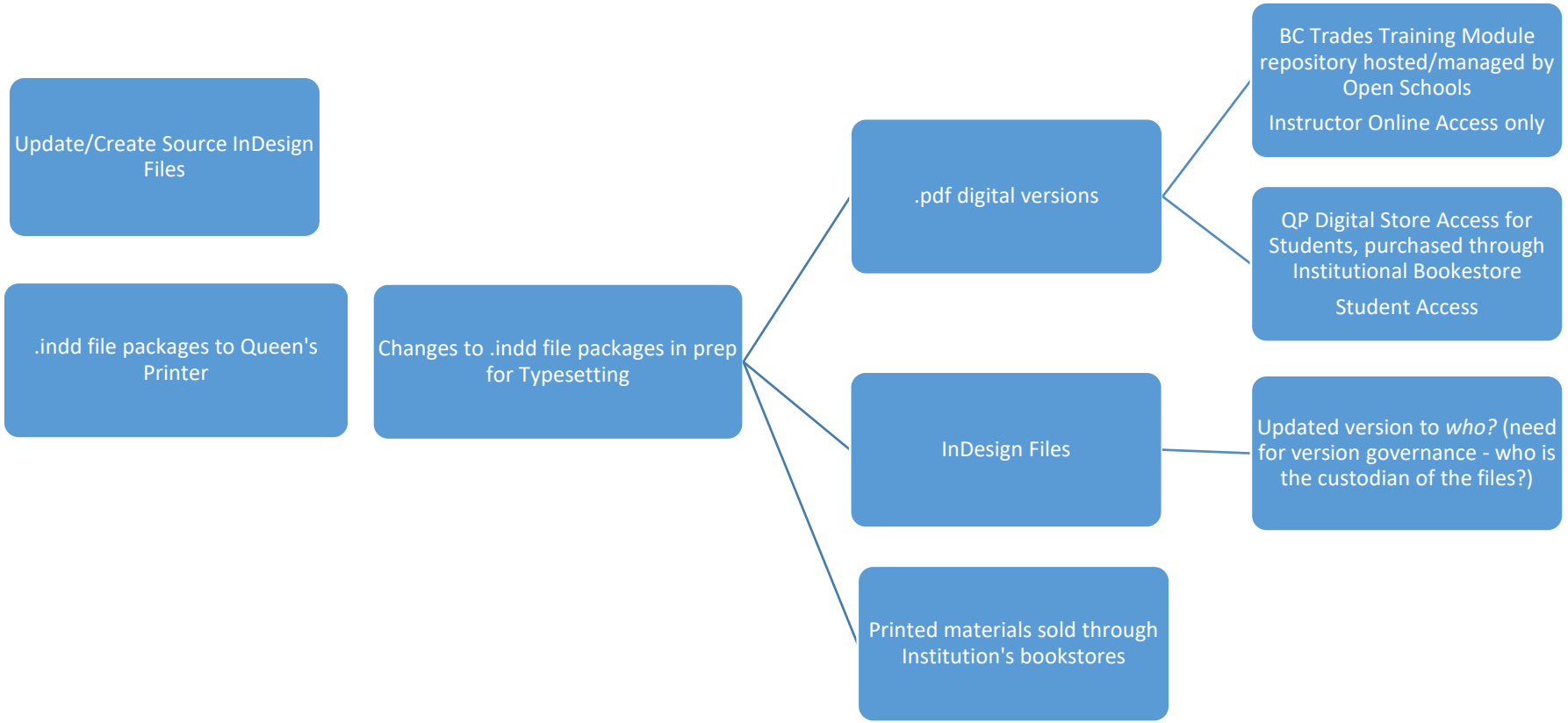
From January to November, 2018, the Learning and Teaching Centre at BCIT undertook the re-sequencing and updating of Level 1 and Level 2 Electrical Apprenticeship Program Learning Guides. The Level 1 EAP Learning Guides consists of 23 separate booklets which collectively totals about 1500 printed pages. Level 2 EAP Learning Guides consists of 20 separate booklets which collectively totals about 1000 pages.

Overview of the Process for 2018 Pilot:

There were two rounds of development: for Level 1, work started in January and completed in October, and for Level 2, work started in June and completed in November. What follows is a break-down of the general process.

a. Received current files from Open Schools team
b. Files are produced in InDesign
c. Received map of changes from ITA/Articulation committee
d. Identified areas that require new materials
e. Reached out to instructor community via the Articulation Curriculum Sub-Committee chair for participants to write new materials. These instructors come via their institution to the project; TTBC pays their institution for their release.
f. Assigned instructors write new materials.
    a. Uneven quality and degrees of completion resulted in advance of Sprint
g. Reached out to instructor community via the Articulation Curriculum Sub-Committee chair for participants in a 4-day work Sprint. Purpose of Sprint to review and revise new materials, and finalize.
    a. In practice, much material drafted during the Sprint itself.
    b. Also, Sprint participants advised on final mapping of resequencing owning to unevenness/lack of clarity from original.
h. LTC team works on final production:
    a. Creating new files based on old files, re-sequenced, new materials added.
    b. Identifying errors in original files (especially .eps files), and fixing them
    c. Multiple iterations of creation/review
    d. ISBNs request to Legislative Library/Tracking numbers from Queen's Printer, corresponding barcodes then generated and added
i. Final InDesign files sent to Queen's Printer
j. Queen's Printer received proofs from printers, undergo multiple rounds of revising the proofs
k. Final proofs sent to LTC, final review, errors corrected, final sign-off
l. Hard copies produced, sent to bookstores. Digital copies added to Queen's Printer content management system.
m. Digital copies sent to Open Schools to add to the instructor-access only digital repository.

Level 1 and Level 2 Electrical Apprenticeship Program Learning Guide Pilot: File Management



What we learned and observed with recommendations

1. On the Design-side:

The design of learning materials should be informed by the intentions of their use. Good design for learning materials should be informed by an understanding of where the materials fit into the learning eco-system, the parametres of the system and the different agents who work within the system. I will look at the design of the material from two angles: where they fit into the learning eco-system and how their design aligns with those assumptions.

The first question is: how are these materials meant to be used in the trades learning eco-system? The answer to this question drives design decisions which then drive the production values/costs of the materials upkeep.

a. Pedagogical Eco-system:

How are the learning guides meant to be used in the learning system? They are currently used to support the in-class, instructor-supported training portion of apprenticeship. However, the materials design has features of materials that typically support self-directed distance learning. Are the materials meant to be a textbook, a manual, a manual for instruction, a self-directed learning guide, a classroom aide or some/all of these things?

Competencies, Learning Outcomes and the Program Outline

The EAP Learning Guides are very closely aligned with the Industry Training Authority's program outline. The program outline is organized around a competency framework that is aligned with the national competency framework (Red Seal Occupational Standard). In general, competency frameworks are meant to be articulating what an individual can do at the end of their development, and typically are used as a means of communicating to industry.

From an educator's perspective, it is often necessary to translate competency frameworks into teaching outcomes, as the goal of training providers is to support apprentices in their development towards attaining competencies instead of working with individuals who have already attained them (which is the case for employers). A successful translation often requires two elements: figuring out the development path needed towards a competency, and re-configuring the competencies into a chunks that are meaningful to the practice. For example, while "Read and Interpret Drawings and Manuals" and "Install Low Voltage Distribution Systems" are listed as separate competencies in the framework, in practice, it is authentic to practice to read and interpret drawings in the context of installing low voltage distribution systems.

An issue arises when this translation either does not fully happen or it happens and becomes a prescriptive, singular view of how teaching should be approached. The program outlines in BC contain a version of translating the competencies into a learning pathway which is comprised of the Learning Tasks listed under each sub-competency for each level. This translation, however, retains the compartmentalized organization of the competencies. The concepts, skills and processes that transcend these categories get arbitrarily assigned to a single category. The Learning Tasks are also written in an unofficial code, where any outcome that begins with 'describe' indicates a theory area and is therefore assumed to be taught as such and assessed with multiple choice tests. Upon closer analysis, for many of

the program outlines that use this informal code, the actual learning outcome represents a far greater complex cognitive task than simply describe. A third issue is that the suggested topics aligned with the Learning Tasks are often generated in a context that assumes that they are a suggested list, while they are interpreted in practice as being an prescriptive list.

Aligning the learning guides with the program outline in a one-to-one relationship between a learning guide and a sub-competency/line item means that the materials reflect a highly granular, decontextualized and highly compartmentalized organization. And each time there is a change to the program outline, a corresponding change is made to the materials to reflect the change. I am wondering if this expense is worth it, considering the nature of the materials and how instructors have to re-configure their use in their teaching anyhow, in order to re-contextualize the materials to reflect authentic practice.

Influence of Historical Evolution of the Materials

It appears that there has been a historical evolution to how things have come to where they are right now. I am surmising that the immense volume of materials that were created in the 1980s for the Training Access (TRAC) initiative have been reused to become the materials of today. Certainly over the intervening 30 years the materials have been updated, reformatted, re-sequenced, and new materials added. However, it appears that the materials have retained the same pedagogical design that reflects how they were originally designed for TRAC.

The TRAC initiative (Cowin, 2012) intended the materials to be used for:

- Continuous intake/exit
- Individualized competency-based training plans
- Students to be able to study at their own pace
- Common standards and assessments

Accordingly, the materials were designed to reflect the close alignment to competencies and embody a distance education design that compensates for an absent, mediating instructor in order to enable self-directed learning. These two key design features remain today.

It is instructive, even today, to learn of instructors' reaction to TRAC at that time:

> "TRAC was a radical innovation that neither industry nor instructors supported. It was viewed by instructors and their associations as complicated administratively. Whereas before they could focus more on prescribed final course competencies to accomplish however they chose to teach them, TRAC involved a variety of small modules that had to be tracked for individual students, all of whom were at different stages of their training." (p.27, Cowin, 2012)

Essentially, the materials were designed with the expectation that an instructor would not be the intermediary to learning experiences during the formal training periods. Even later, in the early 2000s, there was a time in the learning eco-system that apprentices would have periods of home-study, self-directed learning. This excerpt from the 2000 ITAC Millwright Program Outline describes it:

> "APPRENTICE SELF-TRAINING
>
> The apprentice must study the materials identified for each level of technical training.

In addition, the apprentice must acquire the intersessional materials required for each level (1-2, 2-3,3-4) of apprenticeship. At the start of level 2, 3 and 4 technical training an exam will be given to ensure that the apprentice has completed and comprehends the home study component. That mark will be part of an overall school report, thus will contribute to the passing mark for each level of Technical Training.

Failure to do the apprentice home study may result in failure to pass the school training. Becoming a millwright will depend on the effort the apprentice puts into the intersessional home study material, technical training provided by the school and the on-the-job training."

Impact on Teaching and Learning

There is nothing inherently good or bad about the way the materials have been designed. What is at issue is the cost and sustainability of how they are designed and if that cost is necessary when considered how they are used today.

Specifically, aligning the format of the learning guides with the program outline follows this format:

a. Program outline learning task as title of section
b. Reading materials that support the explanation of the topic
c. Self-test questions based on the topic

The advantages of this design is that there is:

a. Alignment with program outline
b. A high degree of granularity, which allows for easy access and cross-referencing
c. Scope of coverage
d. Modularity
e. A common, provincial format to teaching a trade

The disadvantages of this design is that it:

a. Enables the prescription of the teaching done during contact time.
b. Can be seen as attempt to "teacher proof", where instructors follow the learning guides rather that curating the learning guides to support the direction/scoping/sequencing of their own lesson planning.
c. Creates dependence on the materials as the curriculum source instead of putting the instructor in charge of determining scope/sequence/timing, etc..
d. Becomes one source of expertise rather than the multiple voices, remains unchallenged as source of authority.

A risk of this material design is that the materials become the sole basis for the theory portion of in-class time to the degree that instructors depend on them to be their lessons, instead of using them to support their lessons. To support that approach, the materials must contain content for more and more details that are added to the program outline, and must reflect a close fidelity to the program outline. Doing so might mean that instructors become less confident in their own teaching and their own lesson planning. Typically, in general, teachers and instructors accommodate gaps in textbooks and available materials via their own teaching and compensate for gaps by either sourcing other materials, creating their own,

or use various teaching methods for students to learn these outcomes via other means (eg. discovery techniques such as problem-based lessons).

b. Materials design:

The organization of each learning guide is as follows:

- Individual learning guide publication is one sub-line in program outline. Eg. A1, A2, A3, B1, B2….
- Each learning guide is determined by what are the non-practical learning tasks from program outline
- Each Learning Task's 'chapter' is divided into sub-headings that are often linked to the program outline, although not always
- Each Learning Task's 'chapter' has a self-test with answers in the back.

This format reflects the self-study design that appears to be the original intention.

Another impact of the degree of granularity impacts the material aspects of the learning guides. During the updates of the Electrical Apprentice Program's Level 1 and Level 2 Learning Guides, we discovered that the some guides ended up being over 180 pages, while others were less than 12 pages. Working with instructors, we determined that some learning guides could be combined into one book, in order to make it a worthwhile purchase for students.

With each change of program outline, the entire series of guides changes. We question the sustainability of this model; it is a lot more effort than just, within the publishing software of InDesign, to say, click once to update all mentions of A line to D line. It is much more detailed and complicated than that due to the anchoring and referencing structure of document production, for example.

Moving forward, then, it is vital that the decision is made as to what is the role of these materials in the learning eco-system. Are they meant to be used as self-study, truly *Learner* Guides, or are they meant to be textbook references used within an instructor-supported learning environment, where curating and guiding are assumed to be present? They could be both and have been used to date as both. However, at a certain point the cost of sustaining this model in order to remain accurate and current may no longer pay off in terms of learning benefits.

2. On the Production-side:

Briefly, on the technical side, for the Electrical Apprenticeship Program Level 1 and Level 2 Learning Guides:

- The files are produced in the publishing program, InDesign, but these files are built upon many old legacy files particularly for graphics
- InDesign requires a team member with document specialist capability to use and is beyond the capabilities of most instructor/subject matter experts

The specific issues we encountered with the InDesign learning guide files were:

- Images: thousands of them are in the .eps file format, which is a Typescript file that is no longer being updated. There were issues with how these files were being rendered when we exported to .pdf (as required by the print technology).
- Some of the fonts used in the original files have not been updated and not supported by InDesign.
- The equations were created as separate graphics in the old .eps format, and a single equation that appears as such on the page could be comprised of 3 or 4 separate graphic images arranged together. This fact compounded the .eps issue mentioned above.

These issues required us to perform repeated page-by-page proofing with each version to find and fix improper file rendering. The total pages for Level 1 is approximately 1500 pages and there are approximately 1000 pages for Level 2. As a result, the effort to find and fix issues added about 25% more time to the schedule for Level 1, and 4 weeks of effort to Level 2.

For future projects, as the new materials are built using the old, previous files, we recommend that project scoping must account for the state of the files before moving forward. Further, we recommend that future projects might also add the further deliverable of re-creating the legacy graphic files into updated formats as they may no longer be supported in the future, and would compound future problems. And equations can be re-built using more efficient equation formatters such as MathType.

3. On the Project Management-side:

The project team comprised of a team of instructors, an instructional designer/project manager, a graphic artist, a technical writer/editor, and a document specialist. This team also worked with the team from Queen's Printer and from TradesTrainingBC.

Reflecting on the project, the project team thought that:

- A single team working together worked very well to update/produce the revised materials.
- Sitting close together allowed us to resolve things quickly, without emailing or waiting for a meeting, etc..
- In-person check-ins and meetings, setting deadlines, and working to meet them, kept us on track.
- Working with instructors who were sent by their institution worked well, instead of contracting directly with them. We would have liked to have had an instructor on stand-by to ask questions during development.
- Pre-drafts done before the Sprint didn't really work. It would be better to have drafts done during the Sprint, and then someone to ask afterwards.
- For Level 1 it worked well to re-sequence them based on the directions from the gap analysis; however, for Level 2 it didn't work in advance of the Sprint because the directions were not as good and were vague, which meant we had to re-do the resequencing after the instructors during the Sprint confirmed.

Reflecting on the process and their participation, the instructors thought that:

- Two people working concurrently on review during the Sprint was good; writing with more than one person was difficult, though.
- Recommend scrapping the first drafts done on contracts done ahead of the Sprint, as most of the new material done ahead of it was not good. Prefer that instructors who've done work before or recommended by their institutions participate in the Sprint, and that there should be more people, perhaps 6-8 to do it in Sprint format all at once.
- Recommend that before getting started, another check-in with the scope before any new work starts, especially in context of work done in previous levels
- The gap analysis document was poor, so perhaps in the future, the gap analysis should be re-visited during the Sprint.

4. Known History of the Materials:

The following is what I could glean from existing materials and old files:

Materials that originated from the work of the Centre of Curriculum and Technology Transfer	**Current Whereabouts**
Electrical Apprentice Program – 2000-2001 Province of BC, ITAC & C2T2, (based on TRAC)	ITA/Open Schools Repository, sold through Queen's Printer
Carpenter – 1991 – Province of BC, Ministry of Education, Skills, and Training, 1998 – Province of BC (ITAC, Centre for Curriculum and Professional Development), 2002 – Province of BC (Ministry of Advanced Education, C2T2)	ITA/Open Schools Repository, sold through Queen's Printer
Construction Mobile Crane	Not known
Hydraulics	Not known
ITAC Boom Truck	Not known
ITAC Building Maintenance	Not known
ITAC Heat Frost	Not known
Millwright – 1980 Manual of Instruction for the Millwright Trade Province of BC Apprenticeship Training Program, Millwright Manual, 1996 – Province of BC, Ministry of Labour,	ITA/Open Schools Repository, sold through Queen's Printer
Plumber: 1999-Province of BC (ITAC, C2T2))/ 1998 – Province of BC (Ministry of Education, Skills & Training (OLA, C2T2))	ITA/Open Schools Repository, sold through Queen's Printer
Plumbing: Manual of Instruction for the Plumbing Trades (1977 – Canada Employment and Immigration, 1982 – BC Ministry of Education),	ITA/Open Schools Repository, sold through Queen's Printer
TRAC Joinery	Province of BC, now sitting at BCIT
TRAC Machining/Millwright	ITA/Open Schools Repository, sold through Queen's Printer
TRAC Piping – 1986 – Province of BC, Ministry of Post-Secondary Education,	ITA/Open Schools Repository, sold through Queen's Printer
TRAC Plumbing – 1989 – Province of BC, Ministry of Advanced Education & Job Training, reprinted 2002, Ministry of Education, Skills, and Training (OLA),	ITA/Open Schools Repository, sold through Queen's Printer
Trades Common Core – 2000, Province of BC, ITAC/C2T2 (based on TRAC, 1985)	Province of BC, to Camosun College, openly CC-licensed,

Materials that originated from the work of the Centre of Curriculum and Technology Transfer	Current Whereabouts
	openly available on SOL*R at BCcampus.
Others: - HortEd is managing Landscape Horticulture - Professional Cook – materials on Open Repository, bccampus (copyright is Go2BC) - Boilermaker – Province of BC, now sitting at BCIT	

5. Recommendations and Possible Futures:

The following discussion is centred on ideas to inform planning for a sustainable model that could sustain and improve upon the current portfolio of learning guides.

Governance Structure for Material Stewardship

Creating a governance structure whose goal is to steward the materials would create the space for consultation, collaboration and decision making around all of the topics discussed in this report. Key stakeholders include instructors, apprentices, the post-secondary institutions both public and private, the Industry Training Authority, Ministry of Advanced Education and Skills Training, Crown Publications (Queen's Printer), and Trades Training BC.

A governance structure could include tapping into current Articulation Committees to play an advisory role, but inclusion might be broader, to include trades that do not have published materials in the portfolio. A structure could determine the proper bodies to consult regarding decisions around the look and feel/material design, questions around the scope of content, as well as budget questions.

This project proceeded by replicating the model that was used before. While we did ask both individuals at the ITA and members of the Articulation Committee for advice and direction, had a consultative body within a governance structure existed, we would have been able to follow-up appropriately regarding issues and concerns that arose rather than working in the ad-hoc contingent manner that exists now.

Determine the future of the current design

As I have discussed at length, aligning learning guides closely with program outlines has necessitated a small industry that is required to re-sequence materials and update headers, pages, etc. which is not insubstantial work. I recommend some thought to re-organizing materials, and reformatting them so they can be resilient to dynamic changes in the outline.

I recommend keeping the outcome/content/self-test format, in keeping with the original self-study nature envisioned for the materials. However, I think some thought could be put towards reverting to a topic/chapters organization, such as that of the Millwright Manual from the early 2000s. Letting the content itself drive the design organization, rather than the competency outline, will not only create greater resiliency to changes in the program outline, it will also allow for topics to be addressed holistically, encompassing a greater proportion of skills/topics organized under one topic.

Determine a production model that facilitates easy updating

Consideration must also include the state of the production files themselves. Converting files to proprietary file formats is risky in the long-term, as such formats may no longer be supported. On the

other hand, the materials are graphic-heavy, so the software used to generate the print files should be able to handle controlling the formatting of images on the page.

I recommend examining the potential change to file formats that are easy to use for most people so that there is less reliance on specialists. Without a doubt, the print copies have very good production values, and these values should be maintained. A document specialist should always be in control of the final versions, as well as assisting and cleaning-up working copies that others have generated. However, in the current, granular model of document design, the document specialist spends a lot of time converting files back and forth, from Word documents to InDesign for new original content, and then from InDesign to .pdfs for non-specialists to review and act upon. If everyone could be working in the same file format, it would reduce some of the confusing file version control and accessibility issues.

Considerations for changing what is used to produce the files might also include making adjustments to the document formatting style to simplify it.

Consider models that are financially sustainable

It appears that most of these materials were created with an investment from government. Since then, the current material upkeep is being paid for from the royalties from sales of materials to previous students. This model has managed to sustain the materials to date. However, new monies have not been invested in trades that were not part of the original investment. Further, if instructors and institutions choose not to adopt the materials for use by their students, the royalties diminish.

One option is to consider making the learning guides open, where digital versions would be free for students. They could be licensed under Creative Commons with a license that may or may not allow commercial use.

Making them open is not without its complications. Who will pay for their upkeep and where will they be housed? What follows are some ideas to consider:

- A nominal fee could be added to students' tuition, such as a materials fee, collected and put towards material development.
- The ITA and/or other stakeholder bodies could make an initial one time investment to kick-start development and then a nominal fee could be charged on materials to sustain them.
- Colleges and institutions can come together and each take turn to sponsor a revision of a particular trade/level, where they could host sprints, and recruit their own instructors to make the updates and revisions. This approach would be more straight-forward if the materials are produced in an easily accessible and changeable format.
- Creation of an Open Innovation Fund from the Ministry:
    - TTBC could manage the fund, with the money earmarked for special grants that can only be used for Open Ed resources
    - The fund could be government Special Purpose fund for redevelopment of learning resource materials
    - The materials could be openly licensed, which does not preclude making money if they are not licensed non-commercial.
- Partnering with a larger organization that already has the infrastructure in place to house the materials. An example of this is the Ohio Manufacturing Association who partnered with SkillsCommons to develop a repository of materials (http://oma.skillscommons.org/). Skills

Common itself is part of a larger California State University initiative (www.skillscommons.org) that is part of CSU's MERLOT program (https://www.merlot.org/merlot/index.htm). MERLOT provides both technical and organizational infrastructure that a single organization could not sustain without significant financial investment. In partnering with an existing and far larger organization that already has the infrastructure in place, the maintenance of the materials has proven to be sustainable. A made-in-BC approach could be partnering with BCcampus to add to their SOL'R repository where the Common Core already exists (https://open.bccampus.ca/2015/11/04/new-open-textbooks-common-core-trades/)

- If the funding is coming from a public source, then should be able to justify why would make students pay for it again if the materials are not made open.
- Licensing them openly means that others can pick them up and re-develop and re-release them. This process means that the materials can grow by others investing effort into them.
- The Ministry of Advanced Education, Skills and Training has, in the last number of years, included in institutional mandate letters the goal to reduce student costs via the use of open educational resources.

The portfolio of learning guides that support the largest trades in the province are a legacy of sustained and passionate effort by countless trade instructors and supporters over thirty years. They represent the sum of detailed knowledge and best practices and are a trove of processes, procedures, illustrative diagrams, drawings, images, and exercises. Working with the materials today is literally the experience of standing on the shoulders of giants. Finding a sustainable future for the materials is imperative.

Sources

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de Langen, F. (2018). Sustainability of Open Education through Collaboration. *The International Review of Research in Open And Distributed Learning, 19*(5). doi: http://dx.doi.org/10.19173/irrodl.v19i5.3548

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