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Lack of Fusion; Updating Apprenticeship Instruction Without the Expense of Learner Outcome

by

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Abstract

Educating the skilled trades has at times been at the forefront of training in Alberta. These training programs have, however, continued to offer their skills to students with little change or growth in the delivery over the last 50 years. This is a brief look at the history of trades instruction, considerations for implementing blended learning, a look at the upcoming generation of learners who will be entering these classes in the very near future, and the implications of providing instruction and training to digital learners whose influence from technology may vary significantly from that of those instructing them.

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Introduction

The recent resurgence of interest in training skilled trades workers, through the lens of Welding education in Alberta, in conjunction with forced changes due to the recent pandemic restrictions on gathering (e.g., get togethers, congregations) has led to the wider use of online structures. During the pandemic, these structures were added in on an *ad hoc* basis in a rapidly changing environment. Even though the pandemic restrictions have been lifted, the use of online formats has tended to remain. However, a recent report by the Canadian Apprenticeship Forum (CAF, 2023, p. 10) highlights that education quality in the skilled trades has deteriorated at a moment where there is a forecast of a looming critical shortage of qualified people in the trades. To alleviate this scarcity in qualified and proficient tradespeople as mentioned by Vogt (2014, p. 6), institutions have increased the number of students, and maintained the use of online instruction with minimal formal support for faculty in addition to limited resources and capital which have only exacerbated this decline.

Technology in the classroom, while not a new concept, will continue to be a learning curve for trades instructors who have much greater experience with the technology of their trade, rather than that found in a classroom, with the emergence of new devices, software, and environments. Technology deployed as the classroom is a more recent development. In 2013, Xu and Jaggers (p. 23) wrote about the non homogenous classrooms in relation to the abilities with the use of technology and how this will influence the outcomes for learning, implying "that the continued expansion of online learning could strengthen, rather than ameliorate, educational inequity" (Xu & Jaggers, 2013, p. 23). In my experience, applying technology online to teach is not as straightforward as reconstructing an in-person classroom online. Nonetheless, this is often how trades faculty transition to an online environment, delivering the same lessons in the same manner, with the same delivery, the same presentation, but with a camera and on (or off) screen.

Unsurprisingly, it has been my experience that this has not translated into improved success for learners in these programs, but in fact, has had the opposite effect where deliberate, measured application of online learning has not been factored into the training program. The implementation of new instructional tools for use in Alberta's post-secondary trades programs have remained largely stagnant where the available technologies have far surpassed those in daily use. For example, in my current institution, the media created for use in the classroom was created a decade earlier and hadn't been updated aside from minor changes in the intervening time. Based on my own experiences and noticed deficits in the instructional material, this capping project explores: (1) the kinds of barriers that are restraining the currently available technologies for use such as learning management systems and tablet computers, and (2) the pedagogical practices that could enhance outcomes for students. Vogt, (2014, p. 86) wrote of the need to research supports on the use of technology to benefit students using online components in their studies when used with intention and meaningful learning experiences. "Institutions should examine characteristics of each phase of the process" (Schweiger, 2018, p. 45) to ensure expectations of students are met. Unclear in the research is how trade instructors develop their own knowledge about effective teaching practices in their online classes that are related to their field in addition to amplifying effective opportunities to promote learning and retention for students. Alternatively, what holds them back?

This review takes a brief look at the historical development of trades instruction and the evolution into the instructional practices used in today's virtual classrooms. With the current level of public access to widely available technologies, this review will also explore the practices that can be easily incorporated into instructional design to benefit learners. Focusing on the gamification literature, a review of some recent literature to see what changes could be

considered for generation alpha (those born from 2010-2024) who are hyper connected and visual learners, in addition to being more comfortable with the use of technology and considerably more adept at its use than previous generations in the classroom. The outcome of this project will be recommendations for future research on the benefits and challenges of online learning environments or blended environments in providing pedagogically sound instructional practice for current and future students in the postsecondary world of apprenticeship training.

Method for the Literature Review

The literature review process for this capping paper initiated with a search for materials on the topic of 'online instruction in trades education' with several variations. The review of the literature included the U of A Library and EBSCO, Canada Commons, and ProQuest. Based on the limited results (four initial results, including Vogt, 2014) and using some of the results that were out of context yet could provide relevant additional search terms (e.g., language instruction in place of trades instruction), the search was expanded and eventually limited to search terms on gamification, Generation Alpha, online learning, and trades education. Of the results returned, the search was then modified to limit for peer reviewed papers on the major topics, yet for the historical trades education documents, there were still very few results and as such the peer review limit was removed to include the grey literature, such as opinion papers. From these results, the following literature reviews from Fernando and Premadasa (2024) and Lister (2015) were identified as having valuable information from two distinct time periods within the last decade to help delineate validity of recent information and provide a sense of change that may or may not have happened over the past decade. This review then expanded into research that was specific to the individual search terms and evaluated for relevancy to trades education.

Purpose of the Literature Review

The idea of expanding into online instruction to support in-person instruction was the original purpose of the literature search as the basis for this paper. I am currently working in trades instruction and have noted that students are offered either online, or in-person instruction at my institution, with very little currently offered as supportive information, or alternate approaches for students to supplement their learning. Additionally, the learning management system in place is simply acting as a repository for instructor access only and is completely underdeveloped. It was hoped that the literature would illuminate work of researchers who understand trades education in combination with online teaching practices that are beneficial to students. I had noticed however, that while I had seen resources on these topics independently from each other, there has been noticeable a lack of research on the conjoined topics.

Findings in the Reviewed Literature

To support my own practice, and that of others who find themselves in the same learning environment, the history of trades instruction and supporting previous generations, the upcoming group defined as generation alpha, the tools for 21st century learning, and gamification of learning were searched for. What follows is a result of those findings and the topics are presented together with an acknowledgement that more research will be needed.

History of Trades Instruction

Originating in the cottage industry setting, individuals embarking on learning a tradecraft would hone and perfect their skills as an apprentice, and Townsend (1904, p. 161) wrote about the need for specialized learning at a special school to acquire proficiency in a trade. As skills needed to compete successfully in a trade expanded beyond the repository of knowledge that a

single master craftsman could provide, the need for vocation specific training similarly evolved. Early programming often was offered based on the knowledge of the specific instructor or locale and therefore was as varied as those edifying students. Writings referring to the teaching of vocations that show some comparisons to our current systems of instruction can be discovered in the early 1900s. Most of these have the appearance of opinion articles (Townsend, 1904; Haney, 1909; Workers' Education, 1932), with no supporting information provided. Yet while there are similarities to mid-century research (Strauss, 1968) and more recent research (Stoner, et al., 2011) there are still some obvious differences. For example, as would have been the norm in the early 1900s, there were very clear delineations between possible career choices based on gender, as well as one's physical and academic abilities. These societal boundaries are today only beginning to erode and crumble as we are seeing the initial stages of transition where these career paths are starting to hold value with the greater community and gender differences are slowly being eliminated. Interestingly, in 1904, Townsend wrote about promoting the trades at the age of 14, not far off from our current endorsement of skilled programs to students through the Registered Apprenticeship Program (RAP) and Dual Credit certification programs to students in secondary school at the age of 16. Currently we are in alignment with the suggestion by Haney in 1909 who refuted the earlier age suggestion and proposed no entry until the age of 16. "Vocational training should… follow the general manual training of the elementary school [in grade 8]. It should rise out of such training and look not to general but to special development of the pupil's ability and skill" (Haney, 1909, p. 24). Haney also leans into the value of specific apprenticeship style training to provide students with an advantage over those who have not taken formal instruction which aligns with modern concepts of training which should offer relevant and useful wisdom to learners. "The emphasis (of grade school) on mental rather than

on manual achievement. The pupil who is brilliant mentally, prospers and has [their] work commended, but the pupil who leans toward vocational work, and who lacks the ability or interest in mental performance comes in for serious criticism" (Haney, 1909, p. 24). This publication is also the first noted instance of writing which considers formalized apprenticeship training as the beginning of knowledge development with the bulk of learning to be completed on the job and suggests short training periods followed by extended work periods. This is for most students today the program path that is followed such as, for example, the welder program of eight weeks of formal 'technical training' with the balance of the year spent on the job.

Literature from the middle of the century begins to take note of both the needs of student and faculty. The pedagogical roots of trades instruction begin to emerge with the observation that "classwork was impractical, irrelevant, boring, and a waste of time" (Strauss, 1968, p. 219). With a sense of the feeling for the material and its corresponding delivery, programs can now begin to look at the interplay between student, instructor, and material. For their part, "the apprentice, like many other vocational students, expects to get little out of [their] classroom experience, and so [s]he develops attitudes which make classroom success difficult" (Strauss, 1968, p. 220). Further, once this set of attitudes is embedded in the psyche of the student, it becomes a much greater challenge to overcome. With the advent of the 'workbook' and self-directed learning (which included a variety of lessons aimed to simultaneously support multiple students with differing abilities) instruction could be facilitates simultaneously by individual students. "The workbook method requires apprentices to study alone and to learn from books – study methods which would seem particularly inappropriate for students who are often undermotivated … and resentful of anything smacking of book learning" (Strauss, 1968, p. 226). Being mindful of the norm for students in apprenticeship training (for the vast majority of

students) simply reading and working through workbooks can quickly becomes tedious and off-putting. “With notable exceptions, apprentices are reluctant learners; they feel little intellectual challenge in their work, and they have little desire to learn more than is absolutely essential to do their present job” (Strauss, 1968, p. 220). This then, adds more weight to the improvement of instruction and instructional methods to support and enable students to engage with the material.

“A great deal more research and financing are needed to develop curriculum materials and teaching methods which are realistic and meaningful to students who seem particularly unamenable to traditional classroom methods” (Strauss, 1968, p. 235). Interestingly, current practice more than 50 years later in Alberta, where using Individual Learning Modules (ILM’s) students are either in a lecture setting where an instructor disseminates the information to the students from the ILM, or the students utilize the books as they are designed: as workbooks. Because of the need to improve achievement in students where motivation may have been problematic, “in 1969, there was great concern for quality of training and a need for an increased number of skilled trades workers” (Stoner et al., 2011, p. 28). This coupled with the relative difficulty in finding quality instruction only increased the difficulty in meeting the needs of industry. “Good instructors are hard to find, especially in trades like ironworking… Relatively few craftsmen have the temperament, interest, or ability to teach” (Strauss, 1968, p. 224).

Interestingly, in the historical documents noted, there are striking similarities to the issues of note in current research papers. “Today, the call exists … to create innovative avenues and approaches for technical training that will encourage positive attitudes of the skilled trades worker” (Stoner et al., 2011, p. 28). Why is it that we are still seeking innovation and change? Our learners are ever-changing and the social order of our world is constantly evolving around them. However, we are still not preparing in advance for the upcoming changes that are

anticipated with digitally embedded students. There is clear research documenting the present need for modernizing content, delivery, and even faculty. "Transforming the educational work that occurs in technical and vocational education and training is no easy task. Time and timing, funding and matters of instructional content are just some of the issues that arise" (Maurice-Takerei, 2017, p. 556). One point of modernizing trades instruction is with our classroom instructors. "Given the depth and breadth of the trade teaching role, teacher education and training that has cognisance of the complexity inherent in the trade teaching role is vital" (Maurice-Takerei, 2017, p. 570). "If we acknowledge the trade knowledge and skill of a master tradesperson, then this requires that we acknowledge trade-based knowledge about how the learning of that trade occurs" (Maurice-Takerei, 2017, p. 571). Above all, we need to be prepared to offer learning in a manner that suits all learners in our programs. As stated by Strauss (1968, p. 236), "the quality of related instruction must be upgraded".

Instructors, mentors, and teachers are through the requirement for training and/or experience, seldom of the same generation as those they educate. By learning and understanding the history of instruction (in much greater depth than offered here) and the methods for supporting their students we may be able to better prepare for upcoming generations that we have yet to work with. After all, "a learning experience is one of those things that says, 'you know that thing you just did? Don't do that" (Adams, 2002, n.p.). As we will soon see generation alpha enter postsecondary, I will elaborate on this generation of learners to provide some insight on the research about where we are headed.

Generation Alpha

Looking toward the next generation of learners entering trades instruction, Generation Alpha "is the latest generation of digital natives [where] kids belonging to this generation spend

a considerable amount of time with games and technical devices" (Fernando & Premadasa, 2024, p. 114). Not only are they comfortable with using technology, but they are also fully embedded with the processes and uses of the same in their everyday lives. Parents are increasingly supplying technology to their children for use in school and social life such as Chromebooks, cellphones (from my own experience in K-12 education, approximately 90% of my students carried at least one cellphone, cordless headphones, and many of those also had a smartwatch), and other ubiquitous devices which when absent are deeply felt by the individual. "The parents of generation alpha are being more aware of both advantages and disadvantages of early exposure of their children to technology" (Ziatdinov & Cilliers, 2021, p. 785; McCrindle & Fell, 2020, p. 14). "While these parents embrace the benefits of the technology advances, they are likewise aware of the skills that the generation alpha student would need in future, especially pertaining to social competencies, entrepreneurial skills, strength and coordination, financial literacy, innovation, and resourcefulness" (Ziatdinov & Cilliers, 2021, p. 785; McCrindle & Fell, 2020, p. 14).

Due to their heavy connection with technology, and the likely use of technology throughout primary and secondary training, "learning styles will be heavily connected with technology" (Fernando & Premadasa, 2024, p. 115). While we are beginning to see technology users (e.g. generation alpha) in post-secondary trades programs, the lag prior to incorporating technology in the classroom has been significant and "educators are looking for methods to integrate technology in classrooms in order to engage learners" (Lister, 2015, p. 1). While these current students may be embedded with technology, "and while academic institutions and universities are currently exploring delivery options, better student engagement and ways to enhance the student experience, it is clear that technology is heavily infused in the culture and

environment of generation alpha" (Ziatdinov & Cilliers, 2021, p. 784). The difficulty confronting those teaching skilled trades is the continued enrollment of students who are not technologically savvy and struggle with switching to a tech-based learning system intermixed with those who will consider technological learning methods as traditional. This indicates that we will need to "take into account more complex learner profiles, that include more specific learning data, such as learner expertise, learner skills as well as learner player types" (Hallifax, et. al., 2019, p. 11). "Generation Alpha students are more responsive to learning when educational materials adopt game-like elements. This underscores the clear necessity of restructuring … education curricula to effectively incorporate content gamification and meet the learning preferences of Generation Alpha" (Fernando & Premadasa, 2024, p. 120). How then do we codify the theoretical component of trades learning to promote game like systems where appropriate while also providing the needed resources and learning styles for those that prefer to avoid technology or who simply learn better without it? "Previous research suggests that reinforcement of learning is amplified when students are given … opportunities to practice and apply what they have learned" (Lim & Morris, 2009, p. 282). For many trades programs the opportunity to practice basic skills of their craft is built into the program. What is missing, is often the volume of theoretical information that is not directly represented in practice such as the large amount of theory in the welding apprenticeship program that cannot be simulated during instructional periods without increasing program budgets far in excess of those seen currently. Can simulation become part hands on and part online game? "Visual, auditory, and kinesthetic tools will support the future teaching-learning environment, to provide a real experience" (Ziatdinov & Cilliers, 2021, p. 787). Where these are simply not reasonably available for hands on use, online options may be reasonable facsimiles.

Online Learning

Online learning for the purpose of skilled trades instruction is currently mostly limited to the sharing of theoretical knowledge, yet there is ample room for sharing of practical knowledge in addition to the theory that students must learn. There are, however, significant problems associated with online instruction as it is currently presented. “One of the main tasks … is to identify strategies to make learning experiences effective and efficient, and to improve knowledge retention” (Petrovic-Dzerdz, 2019, p. 25). If we are employing technology simply to replace classroom instruction, what resources are being used to determine the effectiveness of how we are replacing classroom instruction and improve upon those results? Anecdotally, it has been my experience that most students in the trades who have encountered online learning speak of their online classroom as though it was an in-person classroom, but with all the additional distractions that being in their own space can add such as having family or friends present, email, cell phones, television, etcetera. This simple change of venue misses the mark as most of the benefit from online technology is unutilized which then does not hold the attention of the student in the class sufficiently to peel them away from external distractions. To alleviate this gap in the ability to use all the tools that are at our disposal, there are a few changes that are essential to be considered. “Tertiary teachers remain unprepared and often unsupported to manage the rigours of diverse classroom environments resulting from increased participation in tertiary education and the growing diversity of the student population” (Maurice-Takerei, 2017, p. 562). Preparing teachers to understand the online environment and the challenges of operating such a system is a good start to exploiting the full potential of learning management systems for the benefit of students. Faculty skill and knowledge is however insufficient as the online system also has many

other facets that could be better applied to training such as “increased options for using electronic media to provide related technical instruction to apprentices. This change is designed to take advantage of technological advances that allow for distance learning and other technology-based instruction” (Stoner et al., 2011, p. 28). Care must be taken however, to avoid the trap of inundating students with extraneous material that is not needed in the false belief that it is better. Rather, the measured application of recall mechanisms, visual cues, and auditory dissemination of information should enhance outcomes, not detract from them. “There is little acknowledgement that trade educators require specific skills in the training and education of a vital component of the … skilled trade workforce” (Maurice-Takerei, 2017, p. 560). From my own experience, all the training provided to switch from working in the trade to becoming a trade instructor amounted to a two-day instructional workshop where I was taught how to diaper a doll. “The opportunity to develop oneself as a skilled, adaptable, flexible practitioner is limited when the content and provision of education and training are focused on processes and standards, and this leads to a disconnect from the perceived purpose of educational work” (Maurice-Takerei, 2017, p. 561).

“For some [instructors] working in the trade and teaching the trade were seen as the same” (Maurice-Takerei, 2017, p. 563). Unfortunately, this is far too often a limiting factor where the abilities of the instructors and the skills and knowledge they bring could be accessed in a much more effective manner given the right proclivities in the right individuals. “The recognition of the specific pedagogies that exist within vocational education, related to specific areas, professions or vocations, is important” (Maurice-Takerei, 2017, p. 561). To become fully effective, “employers, skilled trades associations, governments and educators should partner in

this effort, making sure to acknowledge the velocity of change and the impact of technology" (Stoner, et al., 2011, p. 28).

Gamification

Learning content requires both motivation as well as the means of acquiring knowledge. Most grade-school learning provides the means of knowledge gathering, and for many teachers, encouraging motivation in students is done through a variety of methods. For some, feedback mechanisms may be as simple as receiving high grades and thus enjoying the reward of success, where others may need encouraging words, kindness, or sometimes something as simple as a verbal reward. Much like our best teachers who have the skill to apply the correct rewards at the best tome for greatest effect on student motivation, games seek to do the same where a well-designed game generates more enthusiasm from players than a poorly designed game. "By carefully manipulating our internal mental reward system (assisted by brain transmitters often called 'pleasure chemicals,' such as dopamine), game mechanics keep players 'hooked' in a continuous task-failure-success upward spiral contrary to our natural inclination to give up when the task seems unachievable or after repeated failure" (Petrovic-Dzerdz, 2019, p. 27). In order however to avoid breaking this upward spiral, a game must "include instant feedback, freedom to fail, progression, and narrative stories" (Lister, 2015, p. 6). Without the correct balance however, the game environment becomes dull and unappealing. "In game-based learning, the course content is mapped into a game, to provide a virtual environment of learning, improved self-learning, continuous interaction and feedback which can increase the interest and motivation in learning. Game based learning is an educational strategy that blends game activities with stated learning outcomes and improves teaching, learning, assessment, and evaluation with computer

games" (Fernando & Premadasa, 2024, p. 115). How then do we define what a game or game elements are?

"A game is a rule-based environment that is responsive to the player's actions, offers an appropriate challenge to the player, and keeps a cumulative record of the player's actions, while an educational computer game is a technology-supported game that is intended to result in a desirable change in the players knowledge" (Lister, 2015, p. 2). Two types of gamifications are considered by Fernando and Premadasa (2024). Content and structural gamification with "Content gamification [as] the most employed technique in gamification studies, accounting for seventy percent of its applications" (p. 120). How then, do these two types differ? "Structural gamification describes the application of game elements into a learning environment without altering the original learning materials. Content gamification is the application of game elements, game mechanics, and game thinking to alter content to make it more game like" (p. 115). So, why do games have so much success in learning? "Games have been shown to be effective for learning partly because learning takes place within a meaningful context, which allow for application and practice" (Lister, 2015, p. 2). For trades instruction, that could include gaming in an online environment simulating their knowledge and skills that they need to acquire to be successful. Therefore, educators can take advantage of the learning systems in use and if possible effectively incorporate gaming into student learning. If learners can be persuaded to switch to educational games with the corresponding reward of enhanced knowledge that is applicable to their vocation, it can be suggested that there may be a healthy uptake of such applications. "Many Canadians play video games on a regular basis with 90% of 6-17 year olds and 59% of 18-34 year olds reported having played a computer game within the last four weeks" (Lister, 2015, p. 2). A big drawback, however, is the lack of direct feedback to the teacher, such

as the non-verbal cues that a skilled educator will notice in the classroom when working in-person with students providing the opportunity to immediately modify instructional practice to benefit students. Games, on the other hand, rely on algorithms which may, or may not, be effective in providing support to learners, but more than likely, games rely on simple tactics to continue to engage students. "Points can be awarded for a wide variety of tasks such as completing quizzes, attending lectures, taking part in class exercises, solving puzzles, creativity in assignments, completing practice questions, or correct answers" (Lister, 2015, p. 8). While some "students found a points-based gamification system to be somewhat motivating and quite engaging" (Lister, 2015, p. 8), other students may find the idea of earning points at best silly, or worse, repulsive. For those that are engaged, "this typical game activity structure is very conducive to learning, which naturally requires taking on challenges at a progressively increased cognitive level, so it comes as no surprise that gamification strategies are becoming more popular in education" (Petrovic-Dzerdz, 2019, p. 27). "High levels of frustration and anxiety are best avoided by carefully designing tasks and learning activities with appropriate levels of challenge. Careful sequence of the progression of learning helps to ensure that learners do not experience high levels of frustration" (Lister, 2015, p. 14). Arrington (2022, p. 12) reminds us that students have some transferrable 21st century skills, with the caveat that the negatives also need to be addressed. "Integrating technology in teaching will not have the expected added value unless objectives are clearly set and tasks are well-designed" (Alhumaid, 2019, p. 18). How are we to ensure learning is effectively designed? This suggests further study is still needed specific to the results in trades instruction. These should "help with identifying if the impact on learners is due to gamification in general" (Hallifax et al., 2019, p. 12) or if the impact is even related to online education. Hallifax (p. 12) suggests two directions to quantify effectiveness: as

a result of learner motivation or impact of gamification on performance with motivation as the more difficult to assess as metrics such as test results can be used to demonstrate performance. Experimental results from Lavoue et al. (2019, p. 26) "suggest that user motivation and user participation are two factors that can be influenced independently by different game features". This and potential future studies should help understand 21st century results, yet understanding the 21st century learner also requires some preparation to use those technologies that they are not familiar with even as those who have been surrounded by technology since birth.

21st Century Learning

"Students, such as young apprentices, are quite different today than just a few years ago because the majority of them know a world where the Internet is part of their everyday life and always has been" (Stoner, et al., 2011, p. 30). This again, can be useful to the educator as when appropriately used, active online learning can be beneficial to an ever-increasing proportion of students. "Recent findings have provided strong evidence that practicing active retrieval (recall) enhances not only long-term memory but also long-term meaningful learning, supporting the claim that these types of learning strategies could be more effective than many currently popular 'active learning' strategies (Petrovic-Dzerdz, 2019, p. 25). "Three major application problems present challenges to the implementation of this learning strategy: 1) a lack of student awareness about the effectiveness of a study method, 2) a lack of student willingness to repeatedly retrieve material, and 3) student inability to correctly evaluate the success of their retrieval attempts" (Petrovic-Dzerdz, 2019, p. 26).

Gamification, and the use of game theory may offer a solution where the game provides the recall mechanism to students and offers rewards to those that effectively access that tool. As Petrovic-Dzerdz (2019, p. 25) states, "one of the main tasks … is to identify strategies to make

learning experiences effective and efficient, and to improve knowledge retention". Vanbecelaere et al. (2020) remind us however that " the empirical evidence regarding the effectiveness of digital educational games is [unclear]. "When we think about how to utilize technology to improve learning, the key is to focus on what we can do with IT that we cannot do without it. Technology can create environments that provide individualized learning approaches that serve each person in ways that he or she can most benefit" (Stoner et al., 2011, p. 30). Unfortunately, the volume of study in online learning and gamification of training is still limited and there has not been a consensus on a standardized model for online instruction all while we still have a shortage of skilled practitioners in these online environments who have the ability to mentor the upcoming (and current) group of online educators in effective practices for teaching and learning in the trades sector. Also of concern is the difficulty of maintaining currency with the rapid progression of technology and tools available to learning programs. Eventually sufficient time will elapse, and those who have been surrounded by technology since birth will become the educators, though it is impossible to predict what the technology will be at that time and if they will be familiar and comfortable enough with their own contemporary tools to adequately use them. How students connect with their training and the "type of technical training" (Laporte & Mueller, 2011, p.33) does however impact student completion which imparts significance to the quality of instruction regardless of format.

The Future of Trades Instruction

"Understanding how post-secondary education systems are responding to the increased demand for skilled labor in the province is important within the larger scope of Canadian tertiary education" (Vogt, 2014, p. 86). For some institutions, the temptation is to move to an online classroom where student numbers are no longer limited by the physical space of the classroom

and enroll as many students as is possible. “While many institutions have adopted the use of learning management systems to support online/blended learning, very little is known about how these systems are being used and if they are helping instructors change their customary classroom practice” (Vogt, 2014, p. 86). “Blended models of online learning have been defined as the … integration of thoughtfully selected and complimentary face-to-face and online approaches and technologies” (Vogt, 2014, p. 86). “On account of their beneficial influence, implementation of gamified environments into post-secondary classrooms is worthy of consideration; however, course instructors and instructional designers ought to consider the profiles of the learners and ensure that steps are taken to mitigate any impacts of gamification on learners who do not find gamification beneficial” (Lister, 2015, p. 14). “Not all research reported a positive relationship between points and student motivation and performance” (Lister, 2015, p. 8). Sharpe and Gibson (2006, p. 64) refer to criticism which included comments on outdates and antiquated academic training. “There is limited research upon which to draw a conclusion about the impact of gamification on student academic success and performance” (Lister, 2015, p. 14). “On average students in online learning environments perform modestly better than those receiving the same instruction in a face-to-face environment although these positive effects should not be accredited to media, but rather the incorporation of mechanisms that promote student interaction” (Vogt, 2014, p. 93).

> Although university participants view these changes as having a largely positive impact, many institutions struggle with the twin challenges of rising information technology costs and the need to avoid technological obsolescence. In addition, insufficient resources, al lack of adequate instructional design staff and other technological support issues can also impede the adoption of new technologies. (New Media Consortium, 2008, p. 5).

"Administrators will need to weigh carefully how budget funds are spent, decide what emerging technologies show the most promise, and determine how best to support these technological advances" (p. 16). Indeed, "technology may be a disruptive innovation in ways not intended [as] pervasive multi-tasking between laptop, smartphone and other technologies in the classroom often distracts students" (p. 14). Thus, we must be careful in how we engage online environments while understanding that expectations focus on trade specific relevance and that activities are seen as related to the learning outcomes (MacDonald-Jenkins, 2015, p. 16).

Conclusion

Currently skilled trades is already experiencing, or will soon experience, a shortage in the number of qualified individuals (Vogt, 2014, p.6; Stoner et al., 2011, p. 28) due to attrition from retirements and skilled people transitioning to different careers. These positions could remain unfilled as the number of new workers required are simply not available. The possibilities for filling these positions will come at a cost, either more apprentices will need to be trained, or new models of training could be developed that provide the skills, knowledge, and attributes that employers are seeking. This will require an in-depth look at our training systems, and those who are providing the training (Maurice-Takerei, 2017, p. 571). Additionally, we will need to understand the learning needs of those who we will be training to understand how best to provide a quality learning experience that meets the needs of employers. With the arrival of generation alpha in the next few years we may need to leverage the ever-present technology (CAF, 2023, p. 4; Maurice-Takerei, 2017, p. 571; Petrovic-Dzerdz, 2019, p. 37) to provide that learning quality to efficiently train new apprentices. This paper does not preclude that there are or could be better learning methodologies and pedagogies that align with the classroom of the near future, yet it

does present a possibility with the use of gamification and online learning provided that the transition is done through intention, understanding of the learner, and likely a high cost. There is a cost conversely of not having enough qualified skilled labor available to do the work that needs completing.

To conclude this capping project, I have adopted a set of rules from Douglas Adams (2002, n.p.) that describe our reactions to technologies based my reflections on the literature I have reviewed, as well as drawing on my own experiences as a trade instructor.

1. Anything that is in the world when [you are] born is normal and ordinary and is just a natural part of the way the world works.
2. Anything that is invented between when you are fifteen and thirty-five is new and exciting and revolutionary and you can probably get a career in it.
3. Anything invented after [you are] thirty-five is against the natural order of things.

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