

### Training Across Realities

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#### Abstract

**Industries of all types are racing to adopt augmented and virtual reality technologies to enhance workplace outcomes.** Conestoga College has recognized the disruptive potential of this technology and has embraced it through the creation of its Virtual and Augmented Reality Lab (VARLab). During the 'Training Across Realities' presentation, the VARLab team explored case studies in applied research and curricula, and learned how the capabilities being developed from student talent are being fed back into classroom learning. We offered several VR stations where attendees investigated and tried out our in-house VR Training demos.

#### Article History

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#### Overview

The creation of Conestoga College's VARLab has enabled students, faculty and college administrators to join forces to expand the talent pipeline with disruptive augmented and virtual reality technologies. Curriculum delivery and research capacity were both advanced through the assignment of co-op students to the lab's numerous projects in 2018-2019. The core tenets of polytechnic

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education were upheld and proven to be a significant source of motivation for the project.


The Training Across Realities presentation at Polytechnics Canada's 2019 Annual Showcase (Foubert & St. Maurice, 2019) described Conestoga's "realities" across the aspects of administration, faculty and student interests by discussing several case studies and key learnings that proved instrumental in launching this new capability centre for the college.

#### The Positioning of Augmented and Virtual Reality Technologies and Polytechnic Education

It is important to outline the specific factors of augmented, virtual and extended reality technologies that allowed Conestoga to advance its commitment to polytechnic education. Media reports on the exciting and vivid nature of mobile games like Pokémon Go! or the appearance of virtual reality (VR) games like Beat Saber on *The Tonight Show Starring Jimmy Fallon* (National Broadcasting Corporation, 2019) capture the interest of millions and support how popular these technologies have become in the field of entertainment.

What is perhaps less often reported is the significant inroads these technologies are making into workplaces of all types. AR/VR applications can be created to enhance the visualization of new equipment prototypes, allow sales teams to share transformative experiences with a company's

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**\*Presentation Summary** These brief reports are summaries of the presentations that were given during the annual conference, May 15-16, 2019, in Richmond, B.C.

new products and even allow corporate employees to quickly and more effectively train on new procedures.

Polytechnic institutions and their many industry partners are now seeing augmented and virtual technologies provide new means of immersivity through the exploration of augmented analytics, digital twinning and smart spaces. These sample domains have been identified by Gartner as among the top strategic technology trends (Panetta, 2018) and are examples of key application areas for polytechnic institutions to adapt into their curriculum and research capabilities.



Figure 1. Conestoga VARLab Studies VR for Curriculum Delivery

## Curriculum Support and Intentional Skill Development

Conestoga's VARLab team worked throughout 2018 and into 2019 to ensure that efforts taken to bring AR/VR technologies into the college would be supportive of curriculum delivery. A key component in the early stages of the effort was to ensure partnership between the technical leads who could master the hardware and software components of AR/VR projects and the groups with subject-matter expertise and the key use cases for immersive, experiential learning.

The inaugural partnership involved faculty from the School of Health and Life Sciences & the School of Applied Computer Science & IT, partnering several students on co-op work terms in what would become the VARLab. The first project involved students in a multidisciplinary manner—a combination of software developers (Computer Programmer/Analyst and Software

Engineering Technology diplomas) to cover the technical development, and several analysts from the Bachelor of Applied Health Information Science acting as subject-matter experts and domain researchers. The results from this early collaboration produced a Virtual Reality Restaurant Inspector application for the college's Bachelor of Environmental and Public Health program (BEPH).

The VR Restaurant Inspector solution was demonstrated to the audience during the presentation at the 2019 Annual Showcase. In December 2018, the VR Restaurant Inspector was presented to 45 students from the BEPH program. In order to assess the perceptions of the value of such VR training, the upper-year students were surveyed prior to trying the VR solution and then again following their experience. Some of the key findings discussed during the 2019 Annual Showcase were:

- Students were generally quite positive about the experience.
- Very few students encountered more than minor and temporary discomfort.
- Many students saw tremendous value in “practicing skills we had only discussed in class.”
- A reasonable number of students expressed concern about having to become adept “gamers” in order to succeed at the VR trainer or, along similar lines, there was concern that the VR trainer be used as an assessment.
- While there was excitement for the new technology, all but three of the surveyed students had never experienced a virtual reality application before.

Polytechnic education has long offered students effective, experiential learning opportunities, and the immersive nature of AR/VR technologies can now take students and faculty alike much deeper into scenarios that could not be realistically delivered in the past.

## Research Partnerships and Talent Development Pipeline

In addition to efforts to explore how AR/VR can impact curriculum development and intentional skills development, the VARLab served as a test bed for the rapid development of prototype VR simulations that

addressed a range of potential needs among the college's many industry partners. Several of these short projects would eventually lead to funded applied research projects in mid-2019:

- Factory Safety Trainer
- MRI Procedure Simulator
- Forklift Safety Inspector
- Police Services Traffic Stop Safety Simulator
- Interactive Case Studies

Additionally, the VARLab provided hardware and software support for student capstone projects across several programs from January to April 2019. A sample of these capstone projects includes:

- AR Remote Assistance for Cannabis Cultivation
- Observation Collection Assistant for Early Childhood Education
- Resiliency/Tonal Analysis Trainer for Early Childhood Education
- AR Policy and Procedure Trainer for Early Childhood Education
- 360 Video Job Interview Coach
- AR Campus Tour for International Students
- VR Procedure Trainer for Medical Cannabis Cultivation

The extent of the VARLab's support for applied research activities was propelled by the efforts of student workers on their co-op work terms or on part-time work-study funded opportunities. This "in-house" approach to deploying talent from within the college's student body to achieve these results is entirely supportive of the polytechnic mandate and has been hailed by Conestoga's industry partners as essential to developing a talent pipeline for graduates who can address the need to develop immersive content for experiential learning in their fields.

## **Mobilizing Support**

During the presentation, the presenters spoke about the tremendous challenge of starting the VARLab and the tremendous support from Conestoga College to do so. The retrospective view provided at the 2019 Annual Showcase was arguably overlooking the problems and risks that

any one group might have experienced on delivering this capability on its own.

The Centre for Smart Manufacturing & Digital Innovation remains the key supporter of the VARLab for developing opportunities to undertake funded research opportunities with industry partners in the field of AR/VR development. On its own, the CSM-DI can face staffing challenges when looking for qualified co-op student labour—some key programs at Conestoga provide co-op students only at the start of May each year. Projects looking to start in November, for example, would typically face delays.

The academic centres of the college, such as the School of Applied Computer Science & IT, might relish the enhancements to curriculum development that the VARLab might bring. Certainly, with a growing number of students and employers asking for access to these tools and technologies, the need was always clear. The justification of the funding model was arguably less clear. With both significant hardware costs and the potential for idle semesters or weeks for that hardware, there was initially some assurance missing from the recommendations to go forward with the VARLab.

Finally, faculty researchers who had compelling projects in the AR/VR space expressed concern about finding funding for the many smaller prototype development opportunities sought by the college's industry partner. Prior to the VARLab's inception, for example, most applied research projects involving faculty researchers and co-op work term student researchers were required to fit a four-month/15-week template, which was not always conducive to various funding agencies. Without the flexibility to undertake several smaller projects within those larger time frames, many of the initiatives would not even have started.

The formation of a working group for AR/VR was critical to successfully resolving these problems. By providing a forum where different stakeholder groups could collaborate, provide and receive support, and share potential opportunities to strengthen the initiative, Conestoga has developed a successful strategy for

deploying a consistent talent pool of co-op student researchers who can be allocated between internal curriculum support projects and funded research projects, with very little turnaround time. The VARLab receives investment from the academic centres of the college and through CSM-DI-driven applied research in a manner that is mutually supportive of curriculum development and expanding the college's capacity for research. Lastly, the students currently involved and those waiting to become involved as they advance through their programs are the ones receiving the lion's share of benefit. They are already becoming sought after by industry and are truly becoming the Highly Qualified Personnel (HQP) we have committed to train as a polytechnic institution.

### **Summary and Recommendations**

A project like Conestoga's VARLab is a key model for any polytechnic institution to consider when looking to address skills development, curriculum support and applied research capacity in the field of AR/VR technologies.

Admittedly, our colleagues at some of the other polytechnics have taken differing approaches that focus, for example, on one or two key industry partners to enable their AR/VR capacity, versus generating the capacity through significant upfront internal investment. Regardless of how different opportunities may come together, the key points the authors feel are significant across all polytechnic institutions are as follows:

- 1) Cultivate wide support within the institution. AR/VR technologies can be applied to many different domains and are becoming increasingly accessible in terms of lowering the hard skills required to experience engaging and immersive educational content. It stands to reason that needs for this technology across, for example, schools of business, health, information technology and trades education can complement each other and are relatively easy to align and merge. Doing so at Conestoga has negated the possibility of investment and resources being spread too thinly.
- 2) Take the multidisciplinary approach to building student project teams for applied research and curriculum-based projects (e.g., capstone projects). This point harkens back to the extremely immersive nature of AR/VR technologies. Software development students are not likely to be well-versed in the nature of the hospitality industry, so partnering them up with hospitality program students will result in much more effective and immersive projects. Additionally, adding students with a focus on graphic design or user experience is another approach that Conestoga's VARLab has shown works quite effectively.
- 3) Move quickly. This point is made with full acknowledgement of the need to constantly manage risk in our large academic institutions. The call to action is clear, however: the talent pipeline is now being built that will provide industry with the HQP needed to develop immersive AR/VR experiences for a wide range of applications. By 2025, much of this technology will be significantly changed and much more pervasive in daily life. Polytechnic institutions must develop their capacity in today's AR/VR technologies to be prepared to support tomorrow's iterations.

### **September 2019—Update**

Since the 2019 Annual Showcase, Conestoga's VARLab has completed a significant Virtual Reality training prototype for a key industry partner under an Ontario Centres of Excellence-funded applied research project. This multi-player VR trainer allows three workers to rehearse the steps to complete automotive parts assembly as members of an assembly team. This and two additional funded applied research projects will soon have the potential to cover over 50% of the staffing costs of the student workforce deployed to the VARLab. The student team, a multidisciplinary group combining software developers, subject matter analysts and 3-D digital artists, now totals 12 individuals, an increase of over 600% from the first year's staffing levels.

## References

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