Final Evaluation Report:
Building the Skills of the Trucking Industry for the Future Using Innovative Technology

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Executive Summary

Introduction

This is the final evaluation report for the *Building the Skills of the Trucking Industry for the Future Using Innovative Technology* Future Skills Centre-funded project. The Centre for Employment Innovation (CEI) within the Coady Institute at St. Francis Xavier University partnered with the Trucking Human Resources Sector Council Atlantic (THRSCA) to conduct an evaluation of the training activities[1] as outlined in the original funding proposal, as well as accompanying research concerning the use of virtual reality technology in driver training/retraining. The project was initially to run from July, 2019 – June, 2021; the delays due to Covid had a significant impact on the project design and duration, and it was extended to end on May 31, 2023. This is reflected in the following report.

Background

The trucking industry, both nationally and regionally, is facing a shortage of skilled workers, especially professional drivers; it is estimated that there are 10,000 unfilled jobs within the sector in Atlantic Canada alone (THRSCA). This shortage not only significantly impacts the trucking industry, but the economy as a whole. Thus, it is imperative that the existing labour shortages within the trucking industry be addressed. To do that, recruiting activities need to broaden their focus beyond the traditional labour pool of white males to attract workers from various under-represented groups, such as African Canadians, Indigenous Peoples, other racialized groups, and persons with disabilities, into the sector. Equally importantly, there is a need to focus efforts on the retention of the existing workforce. One of the challenges with the latter is that up to 50% of the sector's experienced, older workers demonstrate a lower level of essential skills; this is most evident in the reaction to the increasing use of technology in the transportation sector as a whole. Older drivers are often choosing to retire rather than having to learn or upgrade their computer skills It is critical that a sector which plays such a critical role in the economy works to identify strategic opportunities to strengthen the skills and knowledge of the existing workforce, as well as finds innovative ways to recruit new workers, especially those from underrepresented populations, into the industry.

Context

The THRSCA was funded by the Future Skills Centre (FSC) in 2019 to conduct a pilot project to determine the effectiveness of using an innovative technology – a portable virtual reality training simulator (VRTS) – to provide skills enhancement for experienced professional truck drivers, as well as to train new drivers. The THRSCA partnered with iMVR based in Beamsville, Ontario, to provide the VRTS units, design software / programs specific to the trucking industry (starting with modules on Circle Checks, Backing, and Driving), as well as to deliver the train-

[1] The Future Skills Centre also conducted an evaluation of the project as a whole, in the context of all the projects in this specific funding stream. While there is some overlap between the two evaluations, this report is focused more on the training process and impact, as opposed to the project itself.

the-trainer sessions, and provide on-going technical support and software upgrades as needed based on participant feedback.

Pilot Objectives and Desired Outcomes

The overarching objective of the pilot was to determine the VRTS's effectiveness in enhancing drivers' skills through pre- and post-training road assessments. It also explored emergent and exemplary training methods for using VRTS with diverse populations, especially older workers, in a way that supports varied learning styles. A secondary objective of the project was to see if these smaller units provided effective, affordable training not just for trucking schools, but for the trucking companies themselves to use in-house.

The pilot's desired outcomes were to:

1. improve retention of older drivers and under-represented groups,
2. increase recruitment levels into the industry
3. improve the productivity of drivers today, and
4. prepare the workforce for future technological advancements

Initial Project Design

The initial project[2] design allowed for comprehensive data collection to provide a robust analysis. The THRSCA partnered with a number of employers from the sector who were asked to recruit a total of 150 participants from their driver pools. The estimated training time was 4 - 6 hours maximum, and was spread out over a number of training sessions, dependent on the participants' availability. A document review of the training materials (e.g. the manual developed by iMVR, the software development company) to be used in the VRTS training was assessed to identify potential limitations and gaps of the training to the participants. Essential skills assessments were conducted prior to drivers moving into the pilot to ensure that drivers met the baseline levels of required skills for training success and driver safety prior to undertaking the training. Those who did not meet the criteria were offered skills enhancement prior to participating in the pilot. In addition to this, participants took part in the THRSCA's existing recognition of prior learning (RPL)-based skills assessment program (see https://THRSC.com/essential-skills/ for details) prior to undergoing the VRTS training. This program determines the participant's existing skills through a road assessment, industry interview, Test of Workplace Essential Skills (TOWES), and experience validation. Drivers who required upgrading in any of the areas identified from the results of the test would have the opportunity to obtain training prior to the VRTS training. This was required to ensure that all participants in this project have the same baseline set of skills prior to taking the VRTS training. In addition, post-training assessments were to be conducted to measure drivers' skills acquisition and transfer of learning from the training. Drivers' behavioural and physical changes were also to be measured to assess training effects. Post-training evaluation was to be conducted in three phases – after three, six and twelve months for both drivers and employers – through surveys and interviews with drivers as well as employers, in order to evaluate

[2] This section discusses the way the evaluation component of the project was designed for the proposal. In a later section, the impact of the Covid pandemic and ensuing shut-down(s) on the evaluation design will be covered.

improvement in performance. A wrap up focus group was to be conducted, if possible, to obtain drivers' overall feedback of the training program. The VRTS Trainers were also to be interviewed for their perceptions of the training and how older workers and other cohorts adapt to it.

Impact of Covid

The impact of Covid on this project cannot be overstated. The training sessions and data collection/evaluation activities had just gotten underway when the global Pandemic and resulting lockdowns were declared in March, 2020. Trucking was seen as an essential service and as a result there were no drivers available to take the training, either due to illness or being needed to fill in for others who were sick. Over the next two years many older drivers retired, burnt out from the working conditions or recovering from Covid. The remaining drivers had to step into the resultant gaps; in an industry already facing acute labour shortages, this left little time for training or driver development, and so the in-person training part of the project had to be put on hold. However, THRSCA continued to recruit companies, conduct essentials skills assessments, carry out road assessments, and continue to familiarize the existing trainers with the VRTS, as well as recruit additional trainers. This included learning the ongoing modifications / updates done by iMVR over this period. Ultimately, it was not possible to continue with the pilot until the fall of 2022. THRSCA was successful in obtaining extensions from the funder, and working with the CEI/Coady, was able to adjust the pilot design to allow for sufficient data to be gathered to still provide a comprehensive evaluation of the use of the technology as a potential training tool going forward.

Evaluation Design

Original Design

THRSCA, supported by the CEI/Coady, developed the training process as outlined above. The CEI/Coady created an evaluation framework based on that process. This evaluation was broken into two components: 1) the train-the-trainer process, and 2) the driver training process. The first was completed in November, 2019 and the second was begun through January and February, 2020, but had to be stopped with the Covid lockdown in March, 2020. When the pilot was able to be continued in the fall of 2022, a number of factors required some adjustment in the evaluation process. While the objectives and indicators mostly remained the same, some of the data gathering methods had to be adjusted. This was due to an adjustment in sample size, as fewer companies were able to commit to participating and so the pool of potential participants was also smaller. The evaluation design adjustments required by the Covid interruption meant relying more on the thematic analysis of the qualitative data collected through interviews with the trainers, and participant comments on the post-training survey. The same survey design used pre-Covid was used post-Covid; this provided continuity for evaluating the driver training process, especially when the results were combined with the interview analysis. This mixed methods approach allowed for a comprehensive evaluation, despite the smaller sample size.

Evaluation Results

Train-the-trainer process

The first part of the evaluation concerned the iMVR train-the-trainer process. It consisted of two parts: 1) a document review of the Administrator Training Manual created by iMVR in October 2019, and 2) participating in / observing the two one-day training sessions that took place November 5-6, 2019 in the THRSCA offices in Truro, NS. The session facilitator was a trainer from iMVR.

Final Evaluation Results – Train-the-Trainer Session

Overall, the train-the-trainer session was deemed successful as all participants in both training sessions indicated an understanding of and ability to set up the VRTS, and then deliver training using it. Participants took an active part in all activities and processes and demonstrated comfort in using the technology. The training (manual and hands-on practice) accommodated the variety of learning styles among participants (e.g., more hands on practice than reading or lecture-based delivery) and was adjusted to suit the participants on each day; however, the manual would have been improved with a detailed outline including pictures of how to set the trainer up, as well as step-by-step instructions on how to move through the various programs / functions. Given that the individuals being trained were already professional facilitators, less space (if any) needed to be used for discussion of how to teach, and more on the needed content. Improvements need to be made in order for the manual to be used as a resource post-training. Finally, all participants were able to achieve the iMVR trainer accreditation by the end of the session.

Driver Training Process

Evaluation Results

The evaluation findings in this section are based upon 1) a quantitative analysis of the participant survey responses (surveys were received from all 69 participants covering both pre- and post-Covid training sessions with drivers), and 2) a thematic analysis of the qualitative interviews conducted with trainers/employers post-pilot, as well as the participant comments from the survey that was administered at the end of the individual driver training sessions. The evaluation was measured against the indicators attached to the desired outcomes.

Overall Driver Training Evaluation Results

The results of the evaluation as a whole indicate that while there were some challenges with the physical reactions to the immersive environments as well as technical glitches as might be expected with computer technology, the training using the VRTS was on the whole successful for many participants. While one company chose not to continue using the VRTS post-pilot because of the physical reactions of the participants to immersive environments, the others intend to add it to their toolbox of training methods going forward. One of the latter companies only used the pre-trip circle check program during the pilot period; they indicated that they would like to use the driving programs as well as the technology is improved post-pilot.

This simulated training appears to be especially useful for training younger drivers (those new to the industry) as well as Newcomers who are still working on their language skills. The former (and some of the latter) view the training as another form of gaming and therefore are very engaged in it; the latter, especially those whose English language skills may be lacking, were able to first fully experience driving in a Canadian context while not risking themselves or their vehicles on actual roads, and were able to learn at a speed comfortable to them. The VRTS units also proved themselves to be a viable assessment tool for determining skills gaps and developing training to help fill or top up those gaps. It was also useful for allowing support staff to understand what drivers experience in their jobs, and to adjust their own expectations / communications accordingly.

Recommendations

Train-the-Trainer Process

The following recommendations are based on the results of the train-the-trainer evaluation:

- An adequate spacious environment would be recommended for future sessions to enable full experience for trainers to learn to properly practice and set up the technology.
- Allocating more time for the practical aspect of the training could make the session more interactive and enable participants gain more practice time.
- Future training sessions could reduce participant number to enhance engagement, preferably maximum 3-4 participants per training session.
- The manual can be improved to include more details such as photos to make it more practical and easier for trainers to follow.
- Trainers should be given a more accessible FAQ or troubleshooting script for assessment and VRTS training setup. The availability of tech support at the right times during both setup and VRTS training to assist with this will be very essential.
- While the training manual did have a fairly robust section on the physical challenges that can accompany immersive environments, there was very little on methods that trainers could use to mitigate these effects. Further train-the-trainer sessions should be expanded to include a module on how to teach in an immersive environment.

Driver Training Process

- Based on the post-pilot feedback, there were significant challenges with motion sickness among participants, especially those who were older and not familiar with immersive environments through such things as gaming. The trainers who were gamers or who were very familiar with immersive environments were best able to mitigate this by making changes to the length of time participants wore the headsets, including a number of breaks within the session, and introducing the technology slowly. The less comfortable the trainer was with the technology, the less likely participants were as well. Therefore, individuals who are gamers are the best group to recruit trainers from to ensure participant engagement. There was also some evidence that individuals who had suffered from a concussion were not good candidates for using the VRTS; more research into this needs to be done.

- Initial training sessions should be flexible in design and length to allow participants to get used to the VRTS and the immersive environment. This would mitigate participants withdrawing from the training as a result of adverse physical reactions.
- Additional programs simulating challenging road conditions e.g. icy roads, poor weather, etc. as well as other incidents such as pedestrians, accidents and/or traffic congestion in built-up environments should be developed.
- Non-driver employees benefit from undergoing the training as it allows them to better understand driver requirements. This training could be added to employment onboarding.
- In-company driver champions of the technology could be recruited to mitigate reluctance among drivers to participate in the VRTS training.

Conclusion

Overall, the evaluation findings indicate that despite the challenges imposed by the Covid Pandemic, the pilot was successful in achieving the desired outcomes for the most part. Although some changes in the evaluation framework were needed because of the pivots in the pilot required by Covid in terms of sample size and some data gathering methods, apart from a longitudinal measurement to determine transfer of learning post-pilot the evaluation was comprehensive. Based on the evidence, and feedback from participants, trainers, and employers, the VRTS technology was seen to be a valuable addition to the driver retention, recruitment, and training toolbox. It shows that there is potential for scaling up the use of virtual reality training to enhance driver skills and as a recruitment tool for younger drivers nationally.

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Introduction

This is the final evaluation report for the *Building the Skills of the Trucking Industry for the Future Using Innovative Technology* Future Skills Centre-funded project. The Centre for Employment Innovation (CEI) within the Coady Institute at St. Francis Xavier University partnered with the Trucking Human Resources Sector Council Atlantic (THRSCA) to conduct an evaluation of the training activities[3] as outlined in the original funding proposal, as well as accompanying research concerning the use of virtual reality technology in driver training/retraining. The project was initially to run from July, 2019 – June, 2021; the delays due to Covid had a significant impact on the project design and duration, and it was extended to end on May 31, 2023. This is reflected in the following report.

Background

The trucking industry, both nationally and regionally, is facing a shortage of skilled workers, especially professional drivers; it is estimated that there are 10,000 unfilled jobs within the sector in Atlantic Canada alone (THRSCA). This shortage not only significantly impacts the trucking industry, but the economy as a whole. 90% of all goods moving in and out of Atlantic Canada are transported by commercial trucks. As the Covid pandemic showed, when goods and services are affected by labour shortages, the economy stops moving: our shelves become empty, and growth and prosperity is impacted across communities not just regionally and nationally, but globally.

The trucking industry in Nova Scotia makes up approximately 3.52% of the provincial GDP (THRSCA); this figure does not include data from the sectors that rely on the goods being transported within, and outside of, the province. Approximately 4% of the Nova Scotia workforce is directly involved in the trucking industry (THRSCA); again, this number does not include the workers in sectors who rely on the goods being transported by these trucks.

For all these reasons, it is imperative that the existing labour shortages within the trucking industry be addressed. To do that, recruiting activities need to broaden their focus beyond the traditional labour pool of white males to attract workers from various under-represented groups, such as African Canadians, Indigenous Peoples, other racialized groups, and persons with disabilities, into the sector. While there is an increasing presence of women within the industry, their numbers are still low. The same can be said of Indigenous individuals. While recruiting from immigrant populations can be challenging, due not just to language barriers, but

[3] The Future Skills Centre also conducted an evaluation of the project as a whole, in the context of all the projects in this specific funding stream. While there is some overlap between the two evaluations, this report is focused more on the training process and impact, as opposed to the project itself.

also to different driving requirements, culture, and contexts, there has been more activity in this population over the last few years with increasing waves of immigration into the country.

Equally importantly, there is a need to focus efforts on the retention of the existing workforce. One of the challenges with the latter is that up to 50% of the sector's experienced, older workers demonstrate a lower level of essential skills; this is most evident in the reaction to the increasing use of technology in the transportation sector as a whole. Older drivers are often choosing to retire rather than having to learn or upgrade their computer skills. This is problematic since the average age nationally of professional drivers is 46; in the Atlantic region this increases to at least 53. One company interviewed for the evaluation says the average age of their approximately 1000 professional drivers is even higher than that, and other trucking companies, such as those serving the forestry sector, indicate that their average age is higher still. Thus, older workers choosing to leave the industry rather than use the new technologies is not only exacerbating the existing labour shortage, but the knowledge base and ability to mentor new drivers are impacted as well.

It is critical that a sector which plays such a critical role in the economy works to identify strategic opportunities to strengthen the skills and knowledge of the existing workforce, as well as finds innovative ways to recruit new workers, especially those from underrepresented populations, into the industry.

Context

The THRSCA was funded by the Future Skills Centre (FSC) in 2019 to conduct a pilot project to determine the effectiveness of using an innovative technology – a portable virtual reality training simulator (VRTS) – to provide skills enhancement for experienced professional truck drivers, as well as to train new drivers. While the use of VRTS in other sectors has been ongoing for a number of years (e.g., military operations training, pilot training, medical training, etc.), the gap in the literature around its use in the trucking sector would seem to indicate that to date there has been limited use of the technology in the industry or at least of research into it. Yet these VRTS units have been shown to be effective in allowing learners to gain skills, especially those required to address challenging situations, in a safe, yet realistic, virtual environment before putting them into practice in the real world.

There are some life-sized simulators currently being used in a few Canadian trucker training schools. These large simulators are extremely expensive, in the $100,000 - $200,000 range, and so out of the reach of all but the largest schools or trucking companies for in-house training. The VivePro VRTSs being used in this pilot are smaller, portable and much more affordable (in the $25,000 range); this model is the first of its kind specifically designed for the trucking industry with artificial intelligence (AI) technology. It comes with the ability to track the user's eye movements and as a result to improve/enhance their driving skills by providing detailed psychometric feedback as well as allowing unlimited replays of a specific training session. The THRSCA partnered with iMVR based in Beamsville, Ontario, to provide the VRTS units, design software / programs specific to the trucking industry (starting with modules on Circle Checks,

Backing, and Driving), as well as to deliver the train-the-trainer sessions, and provide on-going technical support and software upgrades as needed based on participant feedback.

Pilot Objectives and Desired Outcomes

The overarching objective of the pilot was to determine the VRTS's effectiveness in enhancing drivers' skills through pre- and post-training road assessments. It also explored emergent and exemplary training methods for using VRTS with diverse populations, especially older workers, in a way that supports varied learning styles. A secondary objective of the project was to see if these smaller units provided effective, affordable training not just for trucking schools, but for the trucking companies themselves to use in-house.

The pilot's desired outcomes were to:

5. improve retention of older drivers and under-represented groups,
6. increase recruitment levels into the industry
7. improve the productivity of drivers today, and
8. prepare the workforce for future technological advancements

Initial Project Design

The initial project[4] was designed with the following components. The design allowed for comprehensive data collection to provide a robust analysis.

- *Participants* – The THRSCA partnered with a number of employers from the sector who were asked to recruit a total of 150 participants from their driver pools. The specific selection criteria for the employers and drivers were developed by the THRSCA and included experienced drivers 55+, new drivers with a minimum of 6 months experience, Newcomers, Indigenous Persons, women, and other diverse populations. This allowed for both intra- and inter-population comparisons in the analysis. Drivers were required to participate in the VRTS training by their employers, but were allowed to withdraw if the physical effects of the immersive environment was problematic to them. The estimated training time was 4 - 6 hours maximum, and was spread out over a number of training sessions, dependent on the participants' availability.

- *Document Review* – The training materials (e.g. the manual developed by iMVR, the software development company) to be used in the VRTS training was assessed to identify potential limitations and gaps of the training to the participants. This was to ensure adaptability and suitability of customized training intended to support participants' various learning styles and skills gaps/areas needing enhancement. The document review was informed by discussions with trainers and iMVR as needed.

- *Essential Skills Training* – The Test of Workplace Essential Skills (TOWES) developed by Bow Valley College was made available to those participants who required it. This test

[4] This section discusses the way the evaluation component of the project was designed for the proposal. In a later section, the impact of the Covid pandemic and ensuing shut-down(s) on the evaluation design will be covered.

measures professional drivers' proficiency levels in three essential skill areas: Reading, Document Use, and Numeracy. This helped ensure drivers met the baseline levels of required skills for training success and driver safety prior to undertaking the training. Those who did not meet the criteria were offered skills enhancement prior to participating in the pilot.

- *Skills Assessment Pre / Post VRTS Training*– Participants took part in the THRSCA's existing recognition of prior learning (RPL)-based skills assessment program (see https://THRSC.com/essential-skills/ for details) prior to undergoing the VRTS training. This program determines the participant's existing skills through a road assessment, industry interview, Test of Workplace Essential Skills (TOWES), and experience validation. Drivers who required upgrading in any of the areas identified from the results of the test would have the opportunity to obtain training prior to the VRTS training. This was required to ensure that all participants in this project have the same baseline set of skills prior to taking the VRTS training. In addition, post-training assessments were to be conducted to measure drivers' skills acquisition and transfer of learning from the training. Drivers' behavioural and physical changes were also to be measured to assess training effects. Post-training evaluation was to be conducted in three phases – after three, six and twelve months for both drivers and employers – through surveys and interviews with drivers as well as employers, in order to evaluate improvement in performance. A wrap up focus group was to be conducted, if possible, to obtain drivers' overall feedback of the training program. The VRTS Trainers were also to be interviewed for their perceptions of the training and how older workers and other cohorts adapt to it.

- *Data Analysis* – Analysis of data was done through thematic analysis using qualitative data analysis software (MAXQDA) (for interviews and focus group results) and Qualtrix for quantitative data derived from the driver / trainer post-session surveys.

Impact of Covid

The pilot project began in July, 2019, with the participant recruitment occurring through that fall. A number of trucking companies had been recruited[5] and were waiting to access the training and the VRTS units. The initial train-the-trainer sessions were held on November 5 and 6, 2019. Throughout this period, driver recruitment was taking place, and 51 were at various stages of the initial skills assessment with the THRSCA between December, 2019 and February, 2020. 12 drivers from Classic Freight in Nova Scotia began the VRTS training during this period.

[5] The following employers agreed to participate in the pilot in the fall of 2019: Classic Freight (NS), Midland Transport (Atlantic), RST Sunbury, Armour Transportation (Ontario / Atlantic), Eassons Transportation Group (Ontario / Atlantic), CHET (Ontario based), Seafood Express (PEI), Riverbend Transport (NL), Eastcan (NL), Atlantic Pacific (NB), Sharpe Transportation (Ontario), Bulk Carriers (PEI), and Clarke Road Transport (Part of the Laidlaw Group, NS).

On March 11, 2020, the World Health Organization declared Covid-19 to be a global pandemic and within the week, the Canadian government had instituted a country-wide lock-down. What this lock-down looked like varied between provinces, but nationally, did not apply to those sectors that were deemed essential services, who were required to continue to work as best they could under the circumstances. The transportation and health care sectors were seen as the most essential of those essential services.

The impact of Covid on this project cannot be overstated. The training sessions and data collection/evaluation activities had just gotten underway as noted above. Other partner companies had just started to explore the VRTS, but had not yet put any employees through training when the lockdown began. Although the training could have gone ahead as planned despite the lock down, through such things as switching to an on-line version of the Essential Skills tools, and incorporating appropriate Covid health protocols such as social distancing and masking when using the VRTS technology, there were no drivers available to take the training, either due to illness or being needed to fill in for others who were sick. Over the next two years many older drivers retired, burnt out from the working conditions or recovering from Covid. The remaining drivers had to step into the resultant gaps; in an industry already facing acute labour shortages, this left little time for training or driver development, and so the in-person training part of the project had to be put on hold. However, THRSCA continued to recruit companies, conduct essentials skills assessments, carry out road assessments, and continue to familiarize the existing trainers with the VRTS, as well as recruit additional trainers. This included learning the ongoing modifications / updates done by iMVR over this period.

Ultimately, it was not possible to continue with the pilot until the fall of 2022. THRSCA was successful in obtaining extensions from the funder, and working with the CEI/Coady, was able to adjust the pilot design to allow for sufficient data to be gathered to still provide a comprehensive evaluation of the use of the technology as a potential training tool going forward.

Evaluation Design

Original Design

THRSCA, supported by the CEI/Coady, developed the training process as outlined above. The CEI/Coady created an evaluation framework based on that process. The project's intended outcomes, and the indicators, as well as the mixed methods approach used to collect the data to determine if the indicators were successfully met, are outlined in the following table:

INTENDED OUTCOMES	INDICATORS	ASSESSMENT METHOD
1. Improve the skills and competencies of drivers	• Employer / trainer assessment results • Driver attitudes to training	• Survey / Interviews (assessors / employers) • Survey / Interviews (participants / assessors)

	• Changes in skills levels based on THRSCA pre-training benchmarking	• Assessor interviews / post-training road test
2. Prepare the workforce for future technological advancements.	• Changes in driver attitudes to the use of technology in the industry in general • Drivers' ability to adapt to training using the VR simulator • Physical reactions to simulator / immersive environments and impact thereof	• Survey / Interviews (participants / assessors / employers) • Survey / Interviews (participants / assessors) • Survey / Interviews (participants / assessors)
3. Improve the retention of the existing workforce and the recruitment of new workers to the sector.	• Demographics of participants (age, Newcomers, previous driving experience) • Number of participants still employed in the industry pre / post VR training • Number of new workers recruited in part due to appeal of use of VR/technology in driver training	• Participant demographic data (survey) • Employer interviews • Employer / Participant interviews

This evaluation was broken into two components: 1) the train-the-trainer process, and 2) the driver training process. The first was completed in November, 2019, (see results below for a more detailed discussion of the evaluation process and results). The second was begun through January and February, 2020, but had to be stopped with the Covid lockdown in March, 2020. It was resumed in October, 2022.

Adjustments Due To Covid

When the pilot was able to be continued in the fall of 2022, a number of factors required some adjustment in the evaluation process. While the objectives and indicators mostly remained the same[6], some of the data gathering methods had to be adjusted. This was due to an adjustment in sample size, as fewer companies were able to commit to participating and so the pool of potential participants was also smaller. In the end, four(4) companies fully participated in the pilot: one (1) in PEI, two (2) in Nova Scotia, and one (1) in Ontario. A total of 69 drivers went through the VRTS training between 2020 and 2023.

[6] One of the objectives was to determine the impact of the VRTS training on older driver retention. In the end, it was difficult to evaluate this as many older drivers left the industry during the pandemic; those that remained were for the most part already comfortable with this type of technology, and thus their retention could not be directly attributed to a greater comfort level with technology as a result of the training.

While the initial design had included 4 – 6 sessions on the VRTS for each participant, and most of the initial 12 participants did complete more than one training session before the Pandemic was declared, many of the post-pandemic participants only went through one session. This had a significant impact on the ability to determine transfer of learning quantitatively: participants were asked to take part in a debrief activity at the end of each individual training session, which was conducted by administering a survey which included both quantitative and qualitative questions. Originally, a comparison of a participant's survey responses from each of the 4 – 6 sessions was intended to provide a longitudinal picture of improvement/learning transfer and/or attitude change. The evaluation design adjustments required by the Covid interruption meant relying more on the thematic analysis of the qualitative data collected through interviews with the trainers, and participant comments on the post-training survey. The same survey design used pre-Covid was used post-Covid; this provided continuity for evaluating the driver training process, especially when the results were combined with the interview analysis. This mixed methods approach allowed for a comprehensive evaluation, despite the smaller sample size.

Finally, the post-training road assessment and follow up interviews over the next year were unable to be included due to time constraints and the adjusted project end date; instead, qualitative data was gathered through longer post-training interviews (30 – 45 minutes) with the trainers / employers. (See appendix C for the Interview Guide.)

Evaluation Results

Train-the-trainer process

The first part of the evaluation concerned the iMVR train-the-trainer process. It consisted of two parts: 1) a document review of the Administrator Training Manual created by iMVR in October 2019, and 2) participating in / observing the two one-day training sessions that took place November 5-6, 2019 in the THRSCA offices in Truro, NS. The session facilitator was a trainer from iMVR.

Data Collection

Data for the train-the-trainer evaluation report was gathered through observation during the training session, a subsequent participant survey, and reflections from participants during a debrief after each training day's session.

Learning Outcomes / Evaluation Indicators

The four learning outcomes as identified by iMVR were used to develop the evaluation indicators:

- Demonstrate proficiency and responsibilities conducting an iMVR Inc.'s Virtual Reality Observation Analysis
- Perform a minimum of four (4) Virtual Reality Analyses using a third person and the instructor as the participant.

- Understand the reasons for, and respond to, iMVR Inc.'s hardware and/or software issues.
- Complete the full verification of issuance of iMVR Inc.'s tag number

The iMVR training manual was assessed through a lens of adult education principles using the following indicators:

- Usability
    - Are the contents relevant and at the right level for the reader?
    - Are different learning styles taken into consideration?
    - Is the information relevant?
    - Are there implicit assumptions e.g., learner familiarity with immersive environments?
    - Are the examples used likely to make sense to users?
    - Is iMVR support information included?
    - Will the manual be useful to the learners as a resource post-session?
    - is the learner given a way to assess their progress?

- Applicability
    - Do contents help users to apply the material?
    - Does the manual explain how to teach the material to others?
    - Are the facts correct?
    - Is the information current?
    - Is the amount of information appropriate? (i.e., not too much, not too little.)
    - Are there practice exercises?

- Accessibility
    - Is the information well-structured and easy to find?
    - Is the text readable?
    - Are illustrations and layout used well?
    - Is the language level right for the user?
    - Are any Universal Design for Learning principles evident?

- Availability
    - Do users have a copy when they need it?
    - Will updates be delivered by iMVR as the software is upgraded?

The principal indicator for the train-the-trainer face-to-face sessions was whether or not participants were able to set up and effectively administer training using the VRTS by the end of the session.

Overview of Training Sessions

A total of seven (7) participants took part in the training – five (5) on Day 1 and two (2) on Day 2; there were three (3) males and four (4) females, all of whom were from the trucking industry, with representation from Nova Scotia, PEI, and Ontario. Each participant was able to complete the four (4) mock[7] tests that were required to demonstrate proficiency in being able to complete the tasks required.

Each day's training session was delivered as follows:

1. Lecture covering:
    - an introduction of the project to participants, highlighting the purpose of the pilot i.e., to help in recruitment and retention of professional drivers in the trucking industry,
    - the learning components involved i.e., RPL assessment, technology training and skills transfer evaluation,
    - an review of the anticipated project outcomes
    - a review of adult learning principles
    - an overview of VRTS as a teaching tool including risks and challenges[8]
2. A demonstration of the software and hardware setup,
3. Practice sessions with the technology
    - setting it up,
    - rotating through first as a participant and then as a facilitator delivering the training.
4. Four (4) mock tests, each one covering different aspects of the training (1) VRTS set up, 2) circle checks, 3) backing, and 4) driving). Each module and related mock test lasted between 45 minutes and one hour with breaks in between. This allowed for participants to get comfortable with using the technology and learn at an appropriate pace.

The adult learning principles as stated in the manual were observed during the training sessions.

Train-the-Trainer Training Delivery Evaluation Results

Through observation, it was determined that the iMVR instructor had the required understanding and skills to deliver the training session, and in addition, had a background in adult education and demonstrated sufficient qualification to teach the participants, using the most effective methods to maintain interest and teaching the trainers. The instructor recognised participants as experts in the trucking field, provided opportunity for people to practice with the technology, allowed participants to practice at their own pace and comfort level and gave the opportunity to share feedback and learnings. Instructions were given in a

[7] These were identified as "mock" tests by iMVR because they were the same tests that the participants would be taking, delivered by the individual trainers following the completion of the train-the-trainer process. iMVR wanted the trainers to have the same experience of the process as the drivers would, which is accepted best practise design for a train-the-trainer learning experience.

[8] The risks mentioned here were largely concerning the potential for physical harm i.e. motion sickness.

way participants understood, based on their subsequent actions. Participants had the opportunity to ask questions throughout the training session and offer feedback as well.

Participant Feedback

Participants were asked to reflect on their training session under the themes of current usefulness, considerations for future training content development, and overall feedback on their experience.

5. **Current Usefulness:** Participants indicated that being able to go through mock tests (technology practice), demos, hands on use of the module pieces, and the practical driving experience were the most useful parts of the training session. They generally had a positive attitude towards the technology as a training tool. On the other hand, two participants expressed that the manual was a bit less detailed than expected and recommended that the manual be updated with photos and step-by-step instructions to make it easy to follow for the audience.

- **Potential Future Training Content:** Participants felt the training sessions could be improved with the addition of the following:
    - Small group discussions on each small group's experiences when doing the hands-on training[9] before joining the large group
    - Training on accident investigation for administrators
    - Increased practice time on the VRTS as new updates and developments unfold, and
    - Additional train-the-trainer sessions for each new program as they are developed.

- **Overall Feedback on the Training Sessions**
    - Participants felt that more time using the technology and less listening to the initial lecture portion of the session would be better. They noted that the longer they had to practice on the VRTS (as opposed to going the lecture portion of the session) the more confident they were that they could successfully set up the VRTS and deliver the training themselves.
    - Participants were both comfortable with, and enjoyed using the VRTS. None felt the motion sickness often associated with immersive environments. Participants further indicated the ability and desire to train with the technology for more than the recommended 20 minutes (as per the training manual).[10]
    - Day 1 had more participants (7) taking the training compared to the second day (2), hence a longer training session time. Some participants from Day 1 indicated the length of the training session was too short for the content and for effective

[9] There was a post-session debrief with the iMVR trainer and participants, but some participants noted that they were less comfortable critiquing the equipment with the developer in the room. They were more forthcoming on the CEI/Coady post-session evaluation surveys.

[10] This is actually not best-practice for training with an immersive environment as indicated in the literature especially for individuals not used to the technology. Shorter periods allow for physical adjustment to the virtual reality environment and can be extended as participants acclimatize to it.

delivery. This indicates the need for a smaller number of participants (3-4 maximum) per session; this was borne out on day two when the training was comfortably completed with two participants.

Final Evaluation Results – Train-the-Trainer Session

Overall, the train-the-trainer session was deemed successful as all participants in both training sessions indicated an understanding of and ability to set up the VRTS, and then deliver training using it. Participants took an active part in all activities and processes and demonstrated comfort in using the technology. The training (manual and hands-on practice) accommodated the variety of learning styles among participants (e.g., more hands on practice than reading or lecture-based delivery) and was adjusted to suit the participants on each day; however, the manual would have been improved with a detailed outline including pictures of how to set the trainer up, as well as step-by-step instructions on how to move through the various programs / functions. Given that the individuals being trained were already professional facilitators, less space (if any) needed to be used for discussion of how to teach, and more on the needed content. Improvements need to be made in order for the manual to be used as a resource post-training. Finally, all participants were able to achieve the iMVR trainer accreditation by the end of the session.

Driver Training Process

Evaluation Results

The evaluation findings in this section are based upon 1) a quantitative analysis of the participant survey responses, and 2) a thematic analysis of the qualitative interviews conducted with trainers/employers post-pilot, as well as the participant comments from the survey that was administered at the end of the individual driver training sessions. The evaluation was measured against the indicators attached to the desired outcomes above. The overall results of the combination of the analysis is found at the end of this section.

Quantitative Results

This section lays out the detailed results of the quantitative analysis of the survey responses by question. Surveys were received from all 69 participants covering both pre- and post-Covid training sessions with drivers.

Section I – Demographics / Participant Background

1. **Participant gender (male, female, other)**

Male	96%
Female	4%
Other	0%

All participants answered this question.

Given that there was no confidentiality on this question and trainers, employers, etc., had access to the surveys, it is reasonable to assume that participants who did not identify as female or male would be reluctant to self identify.

2. How do you identify?

Caucasian	38%
Other	36%
African ancestry	9%
Asian	17%

There was a 28% nonresponse rate to this question. These were excluded from the percentage breakdown.

NOTE: The high non-responses could be explained by participants not wanting to share their geographical background. Given the high number of immigrants we can assume this is the case.

Each response had a line beside it where participants indicated their response.
One respondent identified as 'other' and entered Canadian but selected 'immigrant' in the next question. One person identified 'indigenous' and said they were a newcomer.

3. Are you an immigrant?

Immigrant	72%
Non-immigrant	28%

All the participants responded to this question.

Of the respondents, 72% said they were immigrants, and 28% were not immigrants.

4. Are you an older worker?

Nonresponse	32%
No	64%
Yes	4%

There were a high number (32%) of nonresponses on this question.

This high number could be explained by participants wanting their age to remain confidential possibly thinking that it could lead to age discrimination, be linked to job performance, training performance, and eventually affect their employment. It could also be pride, wanting to fit in with a 'younger' workplace, or being perceived as a senior.[11] These fears could combine with a lack of familiarity of working with technology and lead to increased anxiety during testing.

5. How many years of professional driving experience do you have?

Driving experience	Percentage

[11] Ageism In the Workplace: Statistics To Know | Built In

No experience	7%
6 months - 1 year	34%
1 - 2 years	26%
3 - 5 years	21%
6 - 10 years	4%
15 - 20 years	4%
20+ years	4%

There was 1% nonresponse rate to this question. These were excluded from the percentage breakdown.

Most participants said they had less than 5 of professional driving experience, with 34% stating they had between 6 months and 1 year of experience, 7% with no experience, 26% with 1 - 2 years of experience, and 21% with 3 – 5 years. The more experienced drivers include 4% for each 6 – 10 years, 15 – 20 years, and more than 20 years. As seen below, newcomers formed the largest percentage of inexperienced drivers, with no experience (5%) and 6 months to one year (3%). Note that this is driving experience in Canada and does not include their home country.

Driving experience	**% newcomers**
No experience	5%
6 months - 1 year	39%
1 - 2 years	24%
3 - 5 years	19%
6 - 10 years	6%
15 - 20 years	4%
20+	4%

Section II—Participant Responses to VR Training

1. **In general, what did you think of the VR training?**

Did not enjoy; hard to watch; sick	4%
Good	50%
Helpful, good for training, new experience, user friendly, good visual quality, interesting	38%
Very good	6%
Excellent	2%

There was a 16% nonresponse rate to this question. These were excluded from the percentage breakdown.

Of the responses, there were some that appeared to be answered by the instructor, possibly due to the participant's limited English writing skills.

Comments from participants were sparse but generally positive, with 50% rating it as good, 38% saying why it was good, 6% rating it as very good and 2% as excellent. Comments include references to it being a good training resource for new and older drivers, it helped to improve drivers' skills, was interesting, and that it was a good experience overall. A couple of responses flagged steering, moving their head left and right being an issue and it being hard to watch targets. A small percentage (4%), said they did not enjoy the experience, found it hard to watch, or became ill.

2. **How realistic was VR environment during training?**

Neutral	12%
Fair	11%
Good	56%
Excellent	21%

There was a 6% nonresponse rate to this question. These were excluded from the percentage breakdown.

This was a multiple-choice question with no prompting/space for a comment.

Of the responses, 21% rated the realism of the VR as excellent, 56% rated it good, 12% were neutral, and 11% rated it as fair.

3. **How relevant was the VR environment compared to your everyday driving?**

Poor	3%
Fair	17%
Neutral	18%
Good	52%
Excellent	10%

There was a 6% nonresponse rate to this question. These were excluded from the percentage breakdown.

This was a multiple-choice question with no prompting/space for a comment.

Of the responses, 10% of participants rated the VR environment compared to their everyday driving as excellent, 52% said it was good, 18% as neutral, and 17% rated it fair. Only 3% rated it as poor.

4. **Before you started the VR training, how clear was the purpose of the training made to you?**

Not clear	2%
Little clear	4%
Neutral	12%

Clear	41%
Very clear	41%

There was a 6% nonresponse rate to this question. These were excluded from the percentage breakdown.

This was a multiple-choice question with no prompting/space for a comment.

Of the responses, 41% of participants rated the purpose of training as very clear and 41% said the purpose was clear. Twelve percent were neutral, with 4% rating it as a little clear and 2% as not clear.

5. **How many previous sessions did you take for this project?**

There may have been some misunderstanding by participants about whether they were being asked which training session they were taking at the time vs. how many they previously had. A discrepancy was noted on a couple of surveys where the instructor and participant referred to them as different sessions. Only a few surveys could be identified as 1st, 2nd, etc., as the 'driver ID' field was rarely filled in.

No sessions	31%
One session	56%
Two sessions	6%
Three sessions	4%
Four sessions	1%
Five sessions	1%
Six sessions	1%

There was a 10% nonresponse rate to this question. These were excluded from the percentage breakdown.

There was no category for 'no sessions' on the survey so one was added to capture data. Most of the participants (56%) said they had one previous session, 6% reported two sessions, and 4% had three sessions. One percent each reported four, five, and six sessions.

6. **Do you feel that this technology can be used as a training resource to improve driving skills?**

Yes	88%
No	12%

There was a 3% nonresponse rate to this question. These were excluded from the percentage breakdown.

The options were “yes and no (if no, please explain below)”. Three participants left comments (below). A very high percentage (88%) indicated that it was a good training resource. Twelve percent said it was not.

One participant noted that [the VR] “needed to be improved”. He noted in an earlier question that the “steering and looking left/right bothers my head” and to another question noted that it was “harder to steer and the braking system is different” (2001017). He is a newcomer, not an older worker, with 3-5 years of driving experience. Another in his third training session (newcomer, not older worker, 6 mos. to 1 year experience) said that “it does not feel like a real truck. You cannot feel the weight of the truck behind you” (2001012). The only other participant who commented (not a newcomer or older worker, 2 months driving experience, first VR session) said “it was way too different from the real thing” and “it was way too hard to find your target” and said that they felt sick after the session was done. The assessor noted that they felt sick and stopped, not completing the session (2001007).

7. How comfortable did you feel using the VR technology?

COMFORT LEVEL	RATING
Very uncomfortable	1%
Uncomfortable	9%
Neutral	21%
Comfortable	50%
Very comfortable	19%

There was a 1% nonresponse rate to this question. These were excluded from the percentage breakdown.

Most of the participants said they felt comfortable (50%) with 19% saying they felt very comfortable. Smaller percentages noted they felt very uncomfortable (1%) or uncomfortable (9%), with 21% giving their comfort a neutral response.

8. Did you experience any stress or health issues before, during, or after the VR training?

No	79%
Yes	20%

There was a 1% nonresponse rate to this question. These were excluded from the percentage breakdown.

Only three participants left comments, as did one assessor. The participants noted that they felt nauseated, felt sick, or had a headache. One noted that it hurt his back. An assessor said, “I trained for a day and put drivers through and ended up with a headache for the rest of the day and evening as well as the next day when I woke up with a headache” (2001010).

9. Did you have any other challenges using the technology?

No	88%
Yes	12%

There was a 1% nonresponse rate to this question. These were excluded from the percentage breakdown.

A large majority (88%) said that they had no other challenges using the technology. Two participants left comments. One participant noted "One thing that I find with this technology is that I can't see my hands on the steering wheel and foot pedal". An assessor noted that "The first system did not work".

10. How confident do you feel to be able to apply lessons from the VR training scenarios to real life driving?

Not confident	7%
Little confident	40%
Neutral	12%
Confident	24%
Very confident	17%

There was a 1% nonresponse rate to this question. These were excluded from the percentage breakdown.

This was a multiple-choice question with no prompting/space for a comment.

The majority (40%) of participants said they were a little confident going into the training, followed by 24% who were confident, and 17% who were very confident. Only 7% did not feel confident and 12% were neutral.

11. Is there anything that can be done to make the experience more effective?

No	23%
Better accessories	32%
Better graphics	32%
Better technology	4%
More scenarios	9%

There was a 57% nonresponse rate to this question. These were excluded from the percentage breakdown.

Twenty-three percent responded 'no' to this question. Thirty-two percent cited the need for better accessories. Comments referred to gears, truck seat, a seat belt, the heaviness of the headset, adjustment of the seat, the steering wheel was very small as compared to a real one, and brake and gas pedals were not visible during drive which made it a bit difficult.

Thirty-two percent highlighted the need for improved graphics, that they should be sharpened and more realistic.

Also suggested were more scenarios like cities and towns and more challenging scenarios (poor driving conditions) (9%) and better technology (4%).

Section III—Trainer Questions

Assessors responded to the following questions:

1. **What was the driver's initial attitude towards the training?**

Poor	1%
Hesitant/tentative	15%
Neutral	1%
Good	8%
Positive	30%
Very open	38%
Very enthusiastic	7%

There is a 9% nonresponse rate to this question. These were excluded from the percentage breakdown.

Trainers reported that 83% (combined) had good (8%), positive (30%), very open (38%), and very enthusiastic (7%) attitudes towards the training. Seventeen % (combined), included poor (1%), hesitant/tentative (15%), and neutral (1%) attitudes. In question 5 below, more than half (52%) of the trainer comments cite an open minded/positive attitude as necessary for a successful training experience.

2. **Were there any changes in their attitudes?**

No change	81%
Change in attitude	19%

There was a 9% nonresponse rate to this question. These were excluded from the percentage breakdown.

Changes in participant attitudes were both negative and positive. The majority (81%) of participants experienced no change in attitude. Since a large majority of participants (83% combined) had good to very enthusiastic attitudes, it can be assumed that a high percentage of them remained positive. When there was a change (19%), trainers cited participants getting dizzy, getting nervous, not wanting to repeat the experience, and when the program was not working correctly. As well, several participants who had been hesitant came to appreciate its usefulness and/or enjoy it. "The individual was impressed with the program details and surprised by how many mistakes he made (e.g., speeding, difficulty turning) (1004920). More

than one response referred to how participants grew to like the session after practice, "He enjoyed the session more as his confidence grew" (1000721).

3. How was the driver's experience using the technology for training?

Very enjoyable	13%
Enjoyable	31%
Enjoyed but became dizzy	8%
Good	11%
Not good	8%
Not good—nausea	16%
No response	13%

There was a 13% nonresponse rate to this question. These were excluded from the percentage breakdown.

Of those that did respond, a total of 53% commented that the experience was good (11%), enjoyable (31%), or very enjoyable (13%). Some of the participants enjoyed it but became dizzy (8%), for some it was not good (8%), or not good due to nausea (16%).

4. Were there any challenges faced by the participant during training?

No challenges	53%
Challenges	46%

There was a 10% nonresponse rate to this question. These were excluded from the percentage breakdown.

More than half of the participants (53%) had no challenges during training. Most of the participants who did face challenges experienced either physical effects or technical issues. Approximately half identified nausea and dizziness. Others had issues getting positioned, which in one case was due to the participant's height, or had problems with the technology freezing and having glitches. One participant "Found [that] the structure of the seat constraining given its proximity to the pedals and steering wheel. He was perhaps a little too tall for the apparatus" (2002002). One participant just became nervous (2003013). Another became dizzy, and according to the assessor, worked through it and enjoyed it in the end.

5. What do you think constitutes a successful training experience?

Open minded/positive attitude	52%
Learned something	12%
Enjoyed session/good experience	9%
Program working	9%
Completed training	6%
Easy to teach	6%

Good communication	3%
Not experiencing side effects	3%

There is a 9% nonresponse rate to this question. These were excluded from the percentage breakdown.

Most of the comments (52%) cited open mindedness/positive attitudes as constituting a successful training experience and generally referred to a "Positive attitude going into the session and a willingness to understand the training value of the VR system" (2002004). The rest included when a participant learns something (12%), enjoys the session/has a good experience (9%), when the program works (9%), when training is completed (6%), when the participant is easy to teach (6%), when there is good communication (3%), and when the participant does not experience side effects (3%).

6. What was the overall outcome of the training process?

Enjoyed, wanted to do more	75%
Fair	4%
Dizzy; did not finish	13%
Issues with the technology	4%
No issues	4%

There was a 9% nonresponse rate to this question. These were excluded from the percentage breakdown.

According to trainers, 75% of participants enjoyed the training and wanted to do more. Most of the comments refer to a positive experience, "Good learning. Nice experience. He enjoyed using simulator" (2003008) and "[He] demonstrated an aptitude for using the VR software and equipment and driving in general" (2002001). 4% did fair, 13% experienced dizziness and did not want to continue, another 4% had issues with the technology, and the final 4% had no issues.

7. Any other comments?

Felt sick	64%
Program glitches	18%
Wants to do more	18%

There was a 57% nonresponse rate to this question. These were excluded from the percentage breakdown.

Of the comments that were left, 64% refer to participants feeling unwell from the VR training, and the need for this to be corrected. Several responses refer to program glitches (18%). An equal number were positive responses from assessors: who said they were "Impressed by this user's ability to adapt to the virtual environment. He enjoyed the experience; very engaged

throughout" (1000621). One assessor noted, “I'm observing that the majority of drivers are able to adapt to the technology quickly and perform well. The technology doesn't differentiate between drivers and provides a consistent challenge with measurable evaluation and results” (1001221). Comments referred to how newcomers with limited language skills were able to adapt to the training, “This user's English language skills are developing, and he used 'trial and error' to problem solve. He made his own adjustments where necessary, indicating a level of comfort and confidence with the virtual environment and controls" (1004820). And "This user adapted well to using the technology. He was able to perform the tasks despite his limited English language comprehension" (1003520).

Qualitative Findings

This section details the results of the thematic analysis of the five post-project interviews that were conducted July 5th – 10th, 2023, as well as the qualitative comments from the surveys above. (See Appendix D for the codes that emerged from the data.) The participants represented the four companies that participated in the post-pandemic training[12]; all had been part of the initial project partnership development in 2019. Three participants were employed by their companies as driver development trainers (or this was part of their job description in addition to other responsibilities), one had owned a truck training school contracted by a company to administer the pilot training and had also worked with iMVR as an industry expert during the software development for the VRTS, and one was the Director of Operations and Safety for his company with oversight of the training (one of the trainers mentioned above also worked for this company).

The interview guide was developed to allow for additional detail to deepen the data from the survey responses, as well as to collect data concerning the employers’ opinions of the pilot (see Appendix C for interview guide). This allowed for a 360˚evaluation of participants, assessors and employers. The latter were able to provide data of the project as a whole, not just the specific training experiences. Questions looked at four areas: 1) employers’ desired outcomes from the training, 2) observed participant (drivers) attitudes / physical reactions to the VRTS training, 3) observed learning transfer, and 4) post-pilot employer engagement with the VRTS units.

The data from the thematic analysis informed the evaluation which focused on 1) the VRTS technology itself (hardware and software)[13]; 2) the trainers / training methods; 3) participant’s attitudes to the training; and 4) overall results of the training (i.e. successful transfer of learning, and whether or not it met employers’ expectations for the pilot).

1. **The VRTS Technology (Hardware/Software):**
    - Trainers found that the units were easily moved and once the train-the-trainer session had been completed, over all had no problems setting them up. A

[12] The four companies were: Bulk Carriers (PEI), Laidlaw Carriers Van GP (NS), Classic Freight (NS), and CHET (ON)
[13] This evaluation was not an evaluation of iMVR itself, but of the VRTS units. While the support iMVR provided was included, it was seen through the lens of the support required, not specifically on iMVR’s ability to provide it.

detailed step-by-step set up resource including trouble-shooting solutions was included in the VRTS shipping crates which trainers felt was an excellent refresher of their train-the-trainer session. However, one trainer who was not normally a technology adherent noted that "it is very labour intensive….because once you have it set up, guys coming in, but by the time you set their mirrors and get them going and stuff, it doesn't take long to go through twenty minutes or half an hour." This trainer felt this to be problematic when trying to fit training sessions in around drivers' schedules.

- All trainers reported that iMVR provided excellent tech support, responding to all issues in a timely and helpful manner. The VRTS units were upgraded in an ongoing process over the length of the project based on user feedback (both drivers and participants). As one trainer said, "…every time there's an issue, I call [iMVR Tech Support] right away. He comes right in if he can, which is 9 times out of 10, and he tweaks it. He fixes it. He looks at it. He adjusts it because it is a computer, so as you well know, computers get glitches….we were tweaking the steering wheel to make it tighter to make it more realistic. We did a lot of tweaks to the system, and…he comes right in remotely and does whatever he needs to do to rectify the situation." There were some participants who reacted negatively to wearing the headset: "There were a few drivers, they couldn't even keep the [headset] on their face. They felt too claustrophobic and they started sweating. They weren't sick or anything. They didn't feel funny, they just felt like they were starting to get really overheated and hot. But I also think that that's a combination of the way the headset fits on your head, it's all foam….and I find out the foam accentuates the sweating because it keeps the heat in. I've talked to [iMVR] and I mentioned that to him and he thinks he might have a solution for that."
- Trainers who had started their participant training sessions pre-Pandemic had some technical challenges with the first versions of the software. However, these were improved over the interval between March 2020 and when training resumed in the fall of 2022, and other software enhancements were added such as improved graphics, improved functionality, and additional scenarios. Trainers reporting after the break in training were very happy with the technology overall, as well as with the enhanced software. In a sense, the pre-Pandemic sessions served as a Beta test for the technology, and the results of that positively informed the post-Pandemic training.[14]
- Some trainers had used other life-sized large training simulators prior to the pilot. They compared these with the portable VRTS units used in the pilot very favourably; they noted that the portable units actually were an improvement in some ways over the larger ones due to the truly immersive environment. "…if you turned around to look you actually saw what was behind you and you can't

[14] Post-pilot iMVR is continuing to upgrade and improve the VRTS software and units to develop new programs such as driving under adverse road conditions, or in a variety of contexts (in built-up environments, highway driving, etc.), or adding obstacles such as pedestrians, road accidents, or other challenges into the mix.

do that in the other [large] simulators; you turn around to look, you're going to see an instructor standing behind you. So that one was very good for that. And there was a nice overhead [view]. You could look at it from a bird's eye view, which would be very good for position in the yard if somebody had to maneuver through a yard, so that was a good instructional aspect where you could show somebody where they are, where they need to be, and how they are going to get there."

- Prior to the training, some of the psychometric options such as eye-tracking were of great interest to trainers. They felt that this would allow them to truly be able to assess the gaps in participants' knowledge and/or practice. "I believe there was some validity in [the VRTS] because of the retina tracking. I really like that aspect because I was finding we were having a hard time teach pre-trips to guys and getting them to look at the right thing and I thought the virtual reality would kind of help with that. I also like the driving component because you could track again the eye movement when they looked in the mirror." This data also allowed them to track and measure participant improvement over time. Another trainer noted that "I love the fact that we have metrics coming back. Most truckers don't like that…but [one] trucker we had, those metrics showed he was in the bottom 5% at first. We had to keep him for a whole week…but he adapted to it and he gracefully accepted the information and then was able to reproduce it when he got back on the road. So that's the kind of thing that you can be very grateful for the metrics on the driving behaviours these days, which is another technological innovation that has kind of helped our industry quite a bit."
- The three programs provided by iMVR for the pilot were: pre-trip circle checks, backing, and driving (leaving the yard and moving onto the road(s)). All trainers indicated that these were good options for the initial sessions with drivers, either for new driver training or for enhancing existing skills. As noted above, most hoped that additional programs would be added in the future. All felt that the graphics were very realistic, and liked that participants quickly felt they were actually in the truck or the yard once they put the headset on. Most trainers felt that the pre-trip circle check program was the most useful, in large part because participants could move around the training room as they went through their checks, and so didn't have the motion sickness that can result from the brain perceiving motion, but the body not actually moving.[15]

2. Trainers / Training Methods:

- There is a direct co-relation between the individual trainer's attitudes to technology and their proficiency conducting training using the VRTS. Two of the trainers were hobby gamers and were used to immersive environments; they understood the physical challenges connected to VR, and knew from personal

[15] The challenges of the physical reactions to an immersive environment were the largest barrier to a successful training session. However, these are typical of VR as a whole, and not specific to the VRTS used in the pilot, and so will be discussed below in more detail.

experience what actions needed to be incorporated into their training sessions to mitigate the effects. One trainer who is also an enthusiastic gamer, noted that "I keep a very close eye on the drivers, because I'm standing right beside them and I'm always asking them how do you feel and do you need a break, anything like that. …Some of the drivers, they'd get in, we get them all set up because they're not physically moving yet in the tractor. But then once they start moving, they're like 'oh now!' And they starting to reach for walls. And there's no walls beside them. There's just me standing there, so I grabbed their hand just to give them something tangible that they know I'm right there." Another trainer who also gamed explained that "…we learned over time to use it in spurts and not to go more than five or six minutes with a person that's not used to that technology. Otherwise they start getting disoriented and maybe feel a little queasy." There was also an adaptation to small group instead of individual training sessions to allow for this "short spurt" method. As the participants became familiar with the immersive environment, they could stay in the headset longer. On the other hand, if the trainer wasn't used to immersive environments or had an adverse affect from the headset themselves, they were more prone to excusing participants from the VR training at the first sign of adverse reactions. One trainer who had a particularly bad reaction to the immersive environment indicated that 80% of the participants from his company reacted adversely to the VRTS, and so "the idea behind it is great, but the amount of drivers that get sick I was having a hard time getting guys to do it and then send them out on the road."[16] However, most reported only a small percentage of participants who couldn't continue training on the VRTS at all. Most were able to eventually acclimatize to it, if the trainers allowed them time to adjust as noted above.

- Apart from the impact of their own attitudes to technology, all the trainers found the VRTS unit to be easy and effective to use. As noted above, the immediacy with which iMVR was able to respond to technical issues kept any frustration with the technology at a minimum.
- All but one of the trainers said that they felt that the VRTS as a training tool was a good one to have in their toolbox, especially for the pre-driving circle checks. All but one indicated that they would be interested in continuing to use the VRTS post-pilot and were looking forward to trying out any new programs and upgrades that might be added. One trainer who had challenges with the driving aspects of the training, but who was very impressed with the circle check program, said "[iMVR] told me the one that we had was getting to be kind of on the out-dated end of it last time I talked to him, but he said there were quite a few changes [since then] from the system we've had. So I'm interested to see where it goes." Another trainer, even though he indicated that the company

[16] This same individual had suffered from concussion a few years back, and indicated that his reaction in the headset brought back the same symptoms that his concussion had. It is possible that this type of training is contraindicated for individuals who have suffered a concussion or other types of brain injuries, but more research would need to be done to determine if this is something that needs to be taken into consideration by employers when selecting individuals for training using a VRTS.

would not continue to use the trainer because of the physical effects on the participants, added "For me, as a trainer, I enjoy it and I'm forever grateful for the experience, but I don't relish it enough to have the headaches when I go home." All but one of the trainers interviewed said something similar to this response: "I think it's a great tool in our toolbox and I'm going to continue using it." Another added, "I think the technology is a tool and like any good craftsman, if you know how to use your tools properly, the outcome of your efforts again look that much better." One response broadened out the VRTS to virtual reality training as a whole, although acknowledging that in many ways the technology is still in the early stages of development: "I think the use of simulation in our industry is something that we should all be working towards because it's a very good basic tool for honing, shaping, and preparing people for going on the road…. I think it's less jarring for a brand new novice person who has never been in a truck to break in that way before going out on the road for the very first time. So there are a lot of good reasons to use it, and as the technology improves we're only going to have an easier way for this to be accepted by the [drivers] as they do their training."

- Trainers found that finding champions / opinion leaders from the participants who had gone through the training was an effective method of allaying fears and fostering positive attitudes among those were who were reluctant to try the VRTS. One trainer overheard drivers talking in their driver's room "…telling another driver about 'oh yeah, the simulators, awesome. You should go try it. I tried it the first time and it didn't seem really realistic, but now that I've tried it months and months later, and now it feels the brake pedal feels good, the steering, it feels like you're driving a real tractor [trailer].'" Another trainer noted "You'd have somebody from their group that would speak in favour of it, which would lessen the resistance. So as soon as somebody said 'Oh, that was neat, it was good, I really enjoyed that' then you could feel the temperature of the group going down a little bit so that they're more willing to adapt to trying the technology out… You have somebody that's perhaps maybe a leader of that little group that they say yes, then the rest of the group is more inclined to say yes, not that they all will, but you just get a better inclination for it."

3. **Participants' Attitudes to Training:**
    - Participant feedback on the VRTS training ranged from the extremely enthusiastic to refusing to even try it. The biggest reason for the latter was the negative physical reactions to the immersive environment as has been outlined above. Most participants however were at least willing to give the training a try, although a portion didn't finish it due to physical discomfort.
    - As suggested through the quantitative results, the level of enthusiasm for the VRTS training appears in part to be age-related. Many younger participants were gamers, and so very familiar with immersive environments; they often noted that this training felt like another game to them. "It was younger people, more

adaptable,…that took to it like a duck to water because that was something they're using at home for their entertainment purposes." Another trainer noted, "Some of them are gamers…so they were like, yeah, let's go, put me in there, coach. Now I found that the older drivers who don't play video games, they don't even play poker on their phone or solitaire, they were not so gung ho for it and I have to sometime cajole them into doing things and saying it's not going to be as bad as you think. Don't worry, just give it a shot, if it doesn't work out, at least we can say we tried….You got the middle range people that I'm finding could be a hit or miss, but were, 'well, let's go see. I'll give it a try.'" Other trainers found that there was a certain level of curiosity among everyone in the company: "The younger drivers loved it. They came right in, headset on, let's go. And you know, second nature to them, but the older drivers, they were very curious about it.'

- Participants were able to engage with the training at a pace suited to them as individuals. "This user was a very confident person. He moved very quickly through the simulations. The simulators are very effective in functioning with users who move through at different rates of quickness/speed."

4. **Overall Results of the Training:**
   - Overall, trainers felt that the pilot was a success despite physical and technological challenges. "I think, even with the nausea, it was still a success because it took drivers out of their comfort zone. It got them to look outside the box and understand why we were trying to do something like this."
   - A number of the trainers felt that the VRTS was particularly useful for driver assessment prior to either hiring or to determine future skills enhancement requirements. "I'm observing that the majority of drivers are able to adapt to the technology quickly and perform well. The technology doesn't differentiate between drivers and the proves a consistent challenge with measurable evaluation and results." Another thought it would be useful to have drivers do a yearly refresher with the VRTS as part of their annual performance reviews.
   - An unexpected use of the VRTS unit was in allowing non-driving staff such as dispatchers and administrative workers to experience what drivers do in their day-to-day work. Non-drivers wanted to try the simulator out, initially as a "gaming" experience, but trainers began to see how this deepened relationships between drivers and support staff and so was of benefit to both, as well as the company. "Another thing that kind of happened, was that the all the office staff were curious. So now you can have all their dispatchers and all the maintenance folks and all the administrative folks starting to see what a driver might have to do in the run of a day….I think the general consensus of the office staff was 'wow! Is there ever a lot that a driver has to do before he even leaves the yard. And you know, typical dispatch, what's taking you so long? So it helped in that a lot too. That was a pleasant surprise on the side as well."

- Trainers did note longitudinal results post-training in participants. This was especially true for the pre-trip circle check program. “Our inspections roadside have improved as far as maintenance-related pre-trip items go. So the proofs in the pudding. Now we still have got a ways to go…but our scores have either stayed the same or they’ve gotten a bit better. So in my mind that’s showing what we’re doing is working. It’s getting the awareness out about the pre-trips, showing them a new innovative way to train on pre-trips, and again it never hurts to have that driver in the office to have the one-on-one interaction with them.” Another trainer found that “…they did learn something because I’ve had a few drivers say, ‘Oh! I didn’t realize I was supposed to bang this with my hammer on my pre-trip,’ so I find that yeah, they have taken away information from it and learned from it.”

Overall Evaluation Results

The results of the evaluation as a whole indicate that while there were some challenges with the physical reactions to the immersive environments as well as technical glitches as might be expected with computer technology, the training using the VRTS was on the whole successful for many participants. While one company chose not to continue using the VRTS post-pilot because of the physical reactions of the participants to immersive environments, the others intend to add it to their toolbox of training methods going forward. One of the latter companies only used the pre-trip circle check program during the pilot period; they indicated that they would like to use the driving programs as well as the technology is improved post-pilot.

This simulated training appears to be especially useful for training younger drivers (those new to the industry) as well as Newcomers who are still working on their language skills. The former (and some of the latter) view the training as another form of gaming and therefore are very engaged in it; the latter, especially those whose English language skills may be lacking, were able to first fully experience driving in a Canadian context while not risking themselves or their vehicles on actual roads, and were able to learn at a speed comfortable to them. The VRTS units also proved themselves to be a viable assessment tool for determining skills gaps and developing training to help fill or top up those gaps. It was also useful for allowing support staff to understand what drivers experience in their jobs, and to adjust their own expectations / communications accordingly.

Recommendations

Train-the-trainer Process

The following recommendations are based on the results of the train-the-trainer evaluation:

- The location for setting up the VRTS units appeared to be limited in terms of adequate space. This affected the area for use in terms of allowing for safety, easy mobility and being able to efficiently setup the technology. An adequate spacious environment would be recommended for future sessions to enable full experience for trainers to learn to properly practice and set up the technology.

- Participants liked the hands-on approach of the training better than the oral presentation part. This enabled participants to practice with and demonstrate ability to use the technology which will give them the required experience and support to prepare them for administering training later on. Allocating more time for the practical aspect of the training could make the session more interactive and enable participants gain more practice time.

- A good group size will enable the training session to be well delivered. A smaller size of participants in a training session will reduce the length of training time and improve overall training efficiency and delivery. This seemed to be a major concern for the participants in the Day 1 training session. Future training sessions could reduce participant number to enhance engagement, preferably maximum 3-4 participants per training session.

- The manual can be improved to include more details such as photos to make it more practical and easier for trainers to follow. This will also improve accessibility of the manual for different users. The 'IRS Showcase/ Demo checklist' was developed in addition to the manual (for the Day 2 session) based on feedback from Day 1 session. This will be useful as it provides easy guide on items needed to set up the VR technology to aid in assembling.

- More practice time will be ideal. The session revealed the need for participants to get more practice time to become more familiar with the setup (hardware and software) of the VRTS. This will enable trainers to be able to familiarize themselves with the technology, its use, component and basic troubleshooting. The session also revealed the need for trainers to be flexible in being able to set up technology in different spaces and locations; this is key for a successful training experience. This can be achieved as trainers gain more experience using the technology in terms of setting up in different locations and being able to troubleshoot difficulties.

- The understanding of, and capacity to respond to, any VRTS hardware and/or software issues weren't well determined during both training sessions. Trainers should be given a more accessible FAQ or troubleshooting script for assessment and VRTS training setup. The availability of tech support at the right times during both setup and VRTS training to assist with this will be very essential as well. In terms of demonstrating ability to respond to hardware/software issues during setup and training administering, the trainers weren't provided the opportunity to demonstrate such competency.

- While the training manual did have a fairly robust section on the physical challenges that can accompany immersive environments, there was very little on methods that trainers could use to mitigate these effects. Further train-the-trainer sessions should be expanded to include a module on how to teach in an immersive environment. Given that most trainers are already experienced facilitators, the space in the manual devoted to adult education principles could be better used for this more specialized training.

Driver Training Process

- Based on the post-pilot feedback, there were significant challenges with motion sickness among participants, especially those who were older and not familiar with immersive environments through such things as gaming. The trainers who were gamers or who were very familiar with immersive environments were best able to mitigate this by making changes to the length of time participants wore the headsets, including a number of breaks within the session, and introducing the technology slowly. The less comfortable the trainer was with the technology, the less likely participants were as well. Therefore, individuals who are gamers are the best group to recruit trainers from to ensure participant engagement. There was also some evidence that individuals who had suffered from a concussion were not good candidates for using the VRTS; more research into this needs to be done.

- Initial training sessions should be flexible in design and length to allow participants to get used to the VRTS and the immersive environment. This would mitigate participants withdrawing from the training as a result of adverse physical reactions.

- Additional programs simulating challenging road conditions e.g. icy roads, poor weather, etc. as well as other incidents such as pedestrians, accidents and/or traffic congestion in built-up environments should be developed.

- Non-driver employees benefit from undergoing the training as it allows them to better understand driver requirements. This training could be added to employment onboarding.

- In-company driver champions of the technology could be recruited to mitigate reluctance among drivers to participate in the VRTS training.

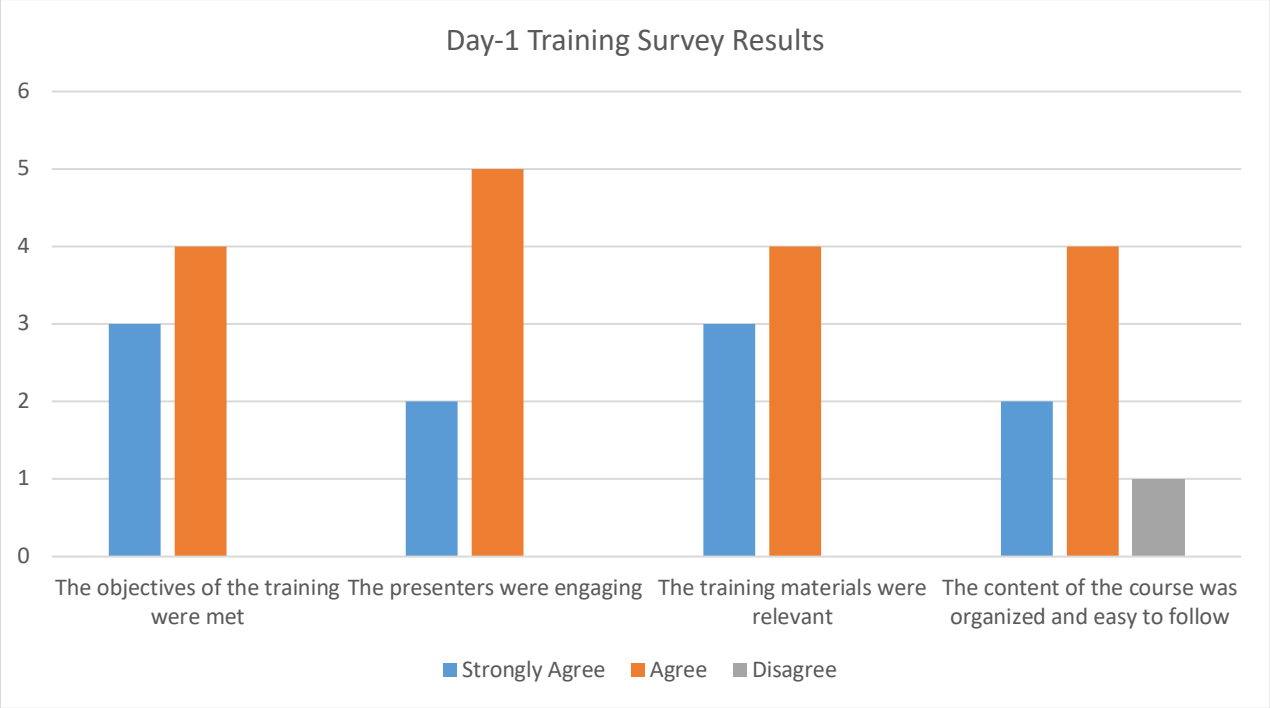
Conclusion

Overall, the evaluation findings indicate that despite the challenges imposed by the Covid Pandemic, the pilot was successful in achieving the desired outcomes for the most part. Although some changes in the evaluation framework were needed because of the pivots in the pilot required by Covid in terms of sample size and some data gathering methods, apart from a longitudinal measurement to determine transfer of learning post-pilot the evaluation was comprehensive. Based on the evidence, and feedback from participants, trainers, and employers, the VRTS technology was seen to be a valuable addition to the driver retention, recruitment, and training toolbox. It shows that there is potential for scaling up the use of virtual reality training to enhance driver skills and as a recruitment tool for younger drivers nationally.

Appendix A – Summary of Results – Train-the-trainer Process

The results from the survey completed by the participants during the training are depicted in Figure 1 (Day 1 results) and Figure 2 (Day 2 results) below.

Figure 1: Day 1 Training Survey Results



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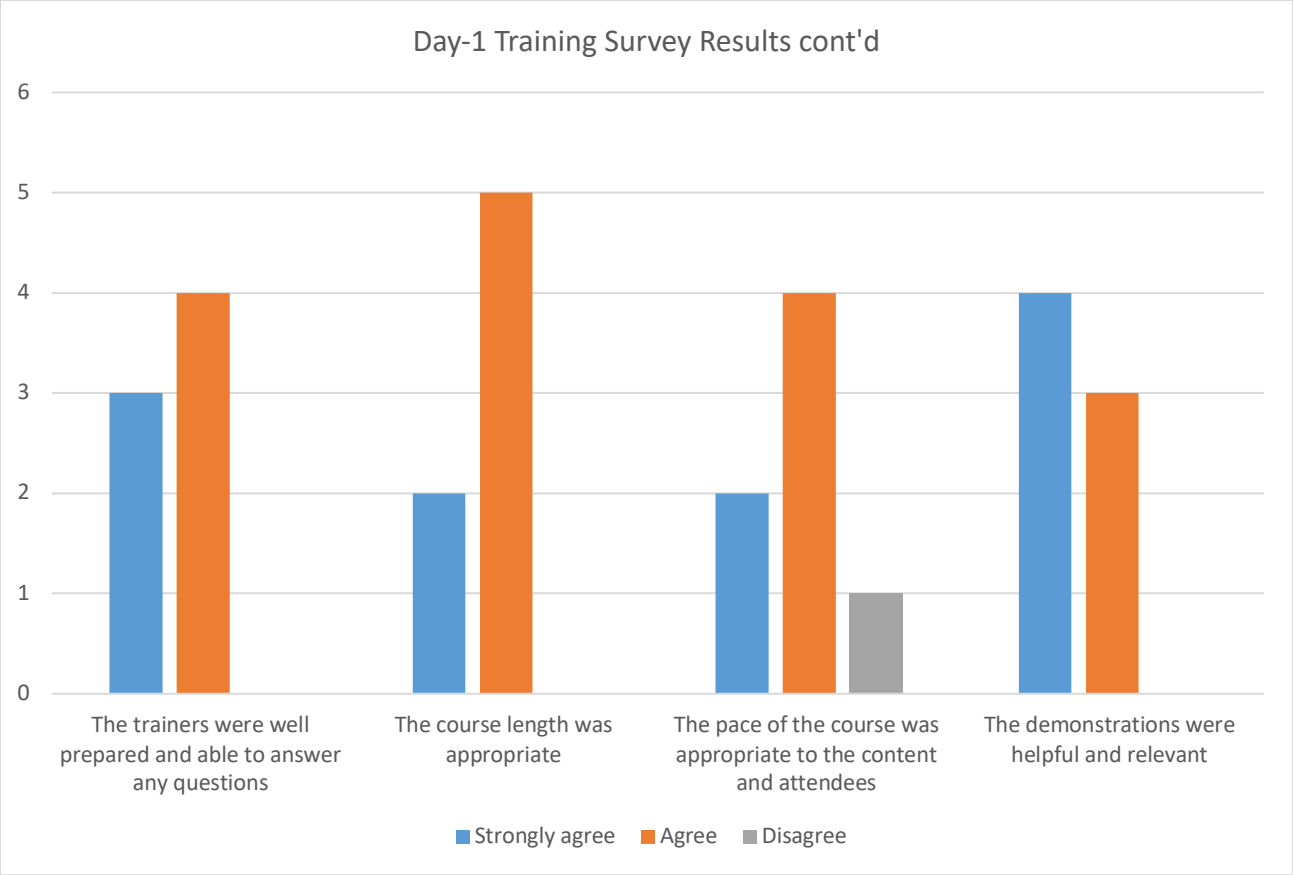
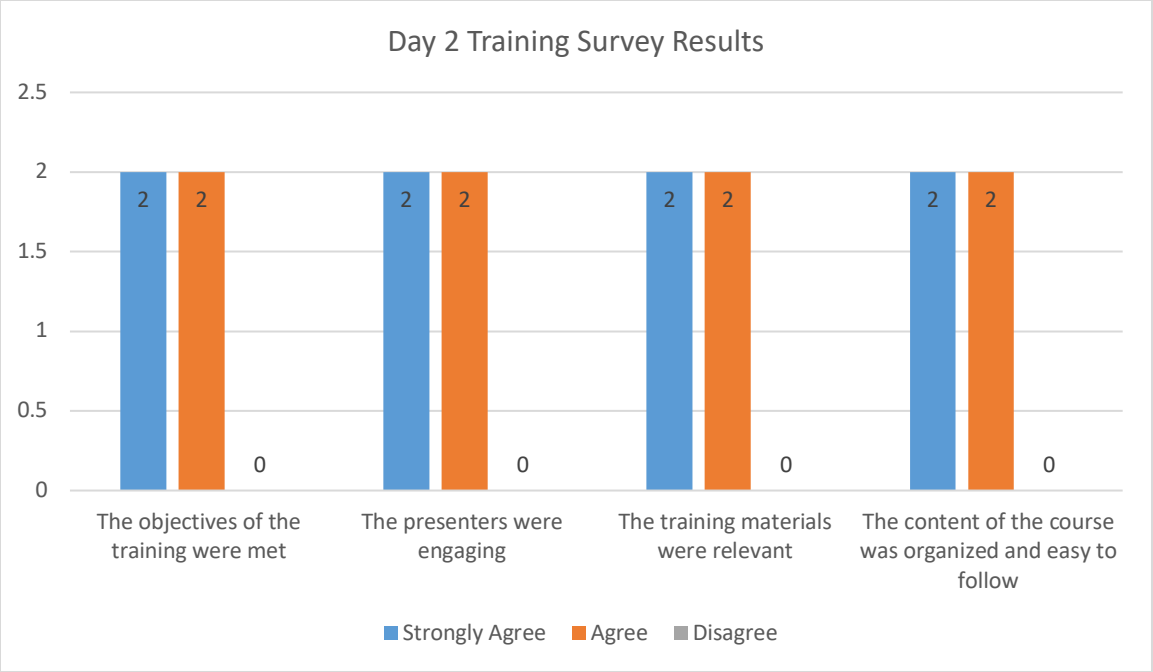
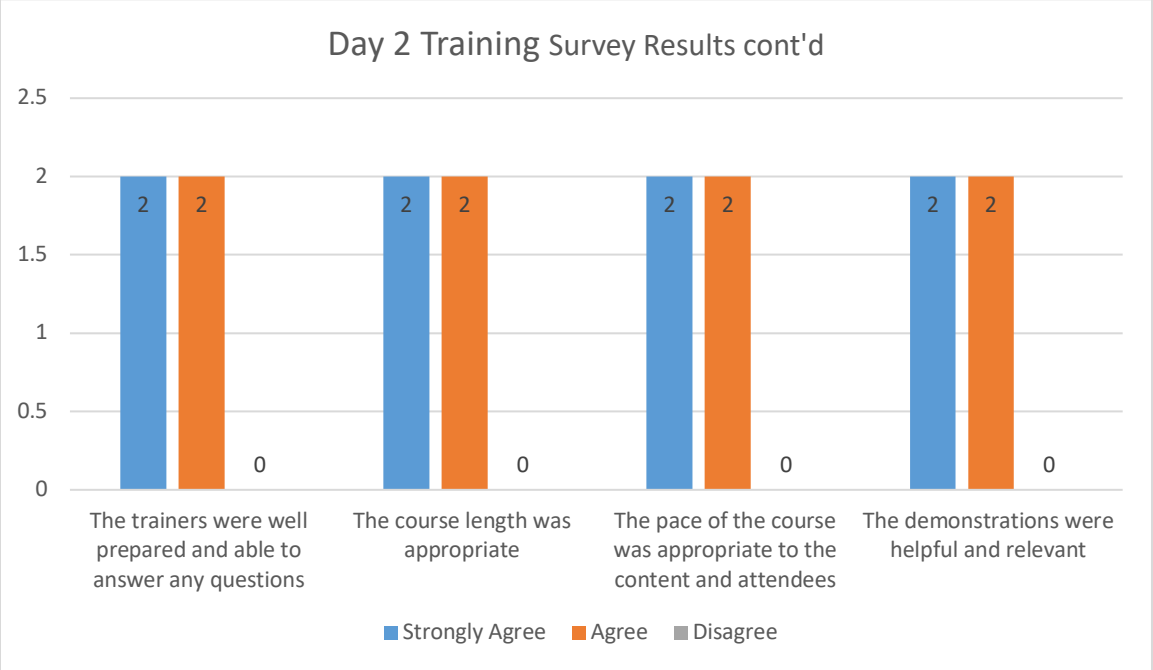


From the Figure 1, all of the participants indicated to “strongly agree” and “agree” to the outcome of the training session in terms of training material (manual) use, course content, materials, engagement of instructors and relevance of demos. In terms of the flow and content as well as the pace of the session, one participant chose “disagree”. This was due to the many participants involved in the first session which prolonged the session, as well as the lesser practice time with the technology. Overall, there is an implication of a positive outcome of the training session – participants agreed to and showed ability to use the technology. One response chose “disagree” regarding content and pace of the course. The reason for this was attributed to the lengthy session during the first day.

Figure 2: Day 2 Training Survey Results



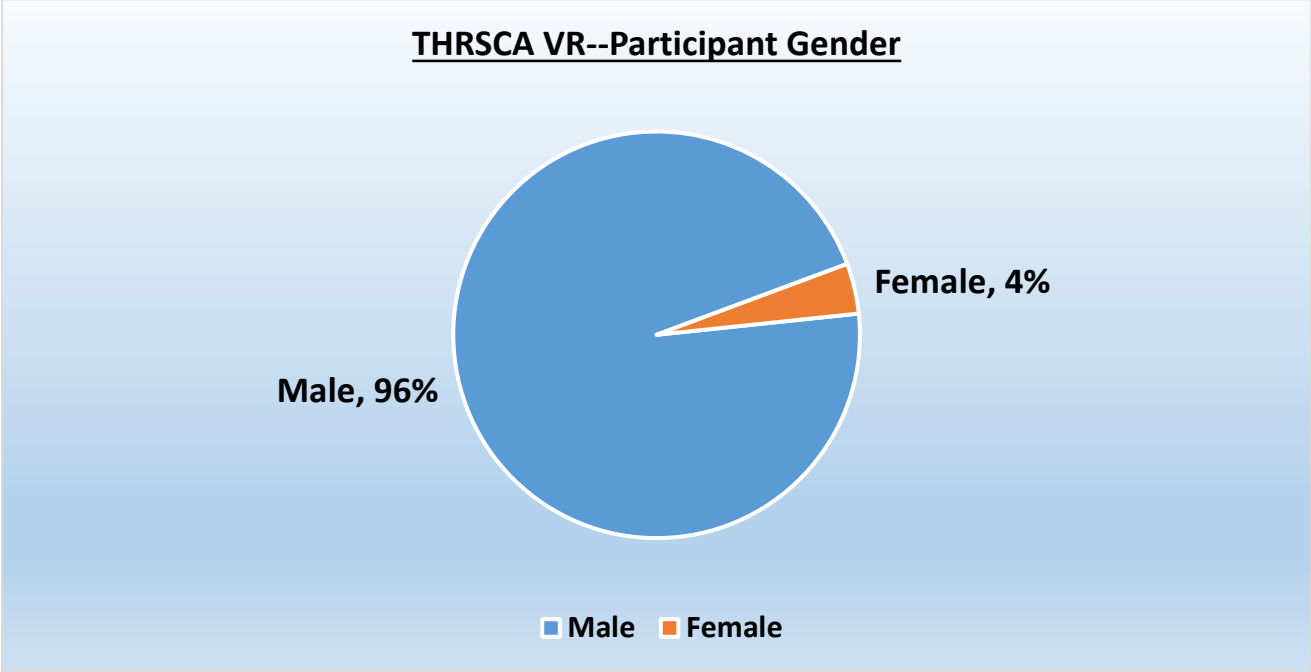


All participants in Day 2 session strongly indicated to ‘strongly agree’ for to the entire training experience of the training session including training material (manual) use, course content, materials, engagement of instructors and relevance of demos. This was because of the more hands on approach, less oral or lecture style in training delivery as well as the smaller number of participants which allowed them to have enough time to practice.

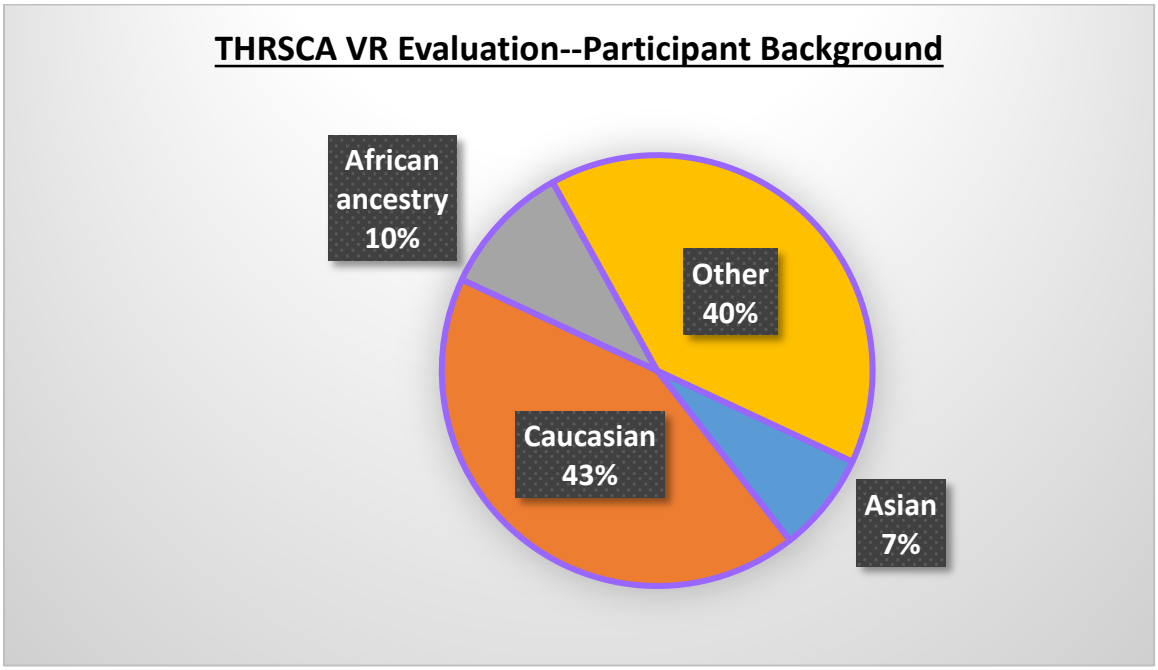
Appendix B—Responses to Interview Questions – Driver Training

A. Participant responses

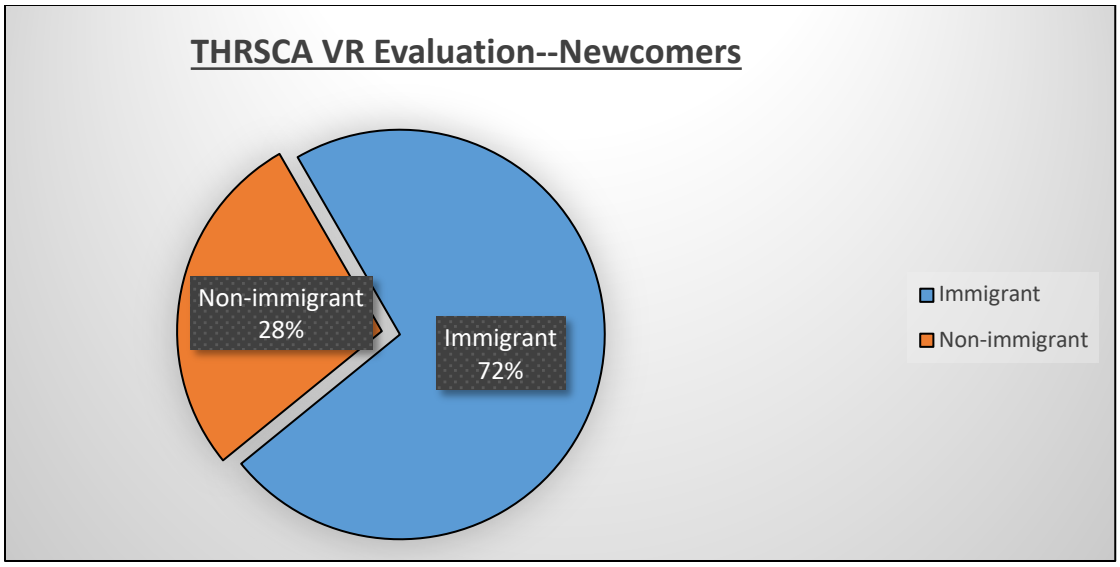
1. Gender



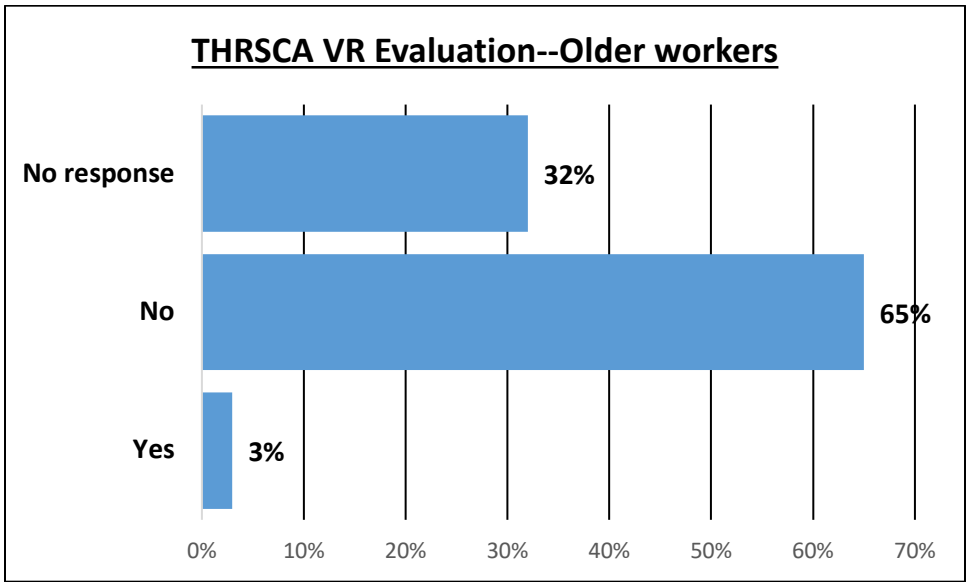
2. How do you identify?



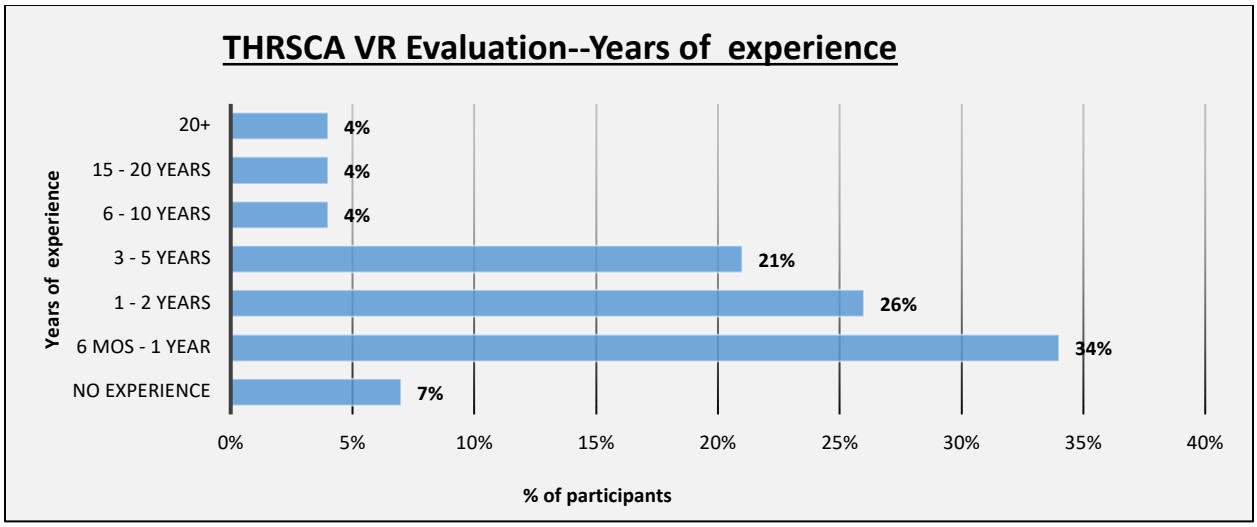
3. Are you an immigrant?



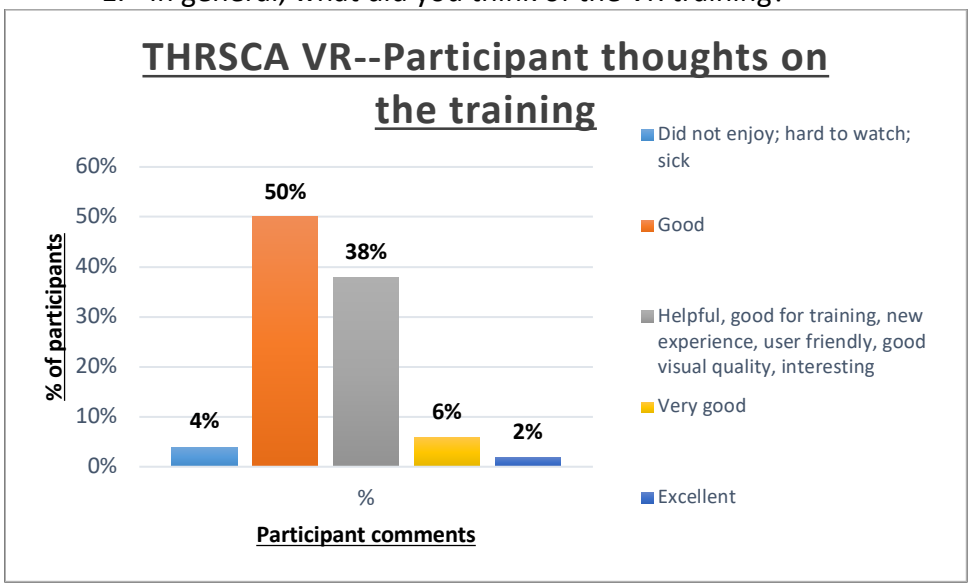
4. Are you an older worker (55+)?



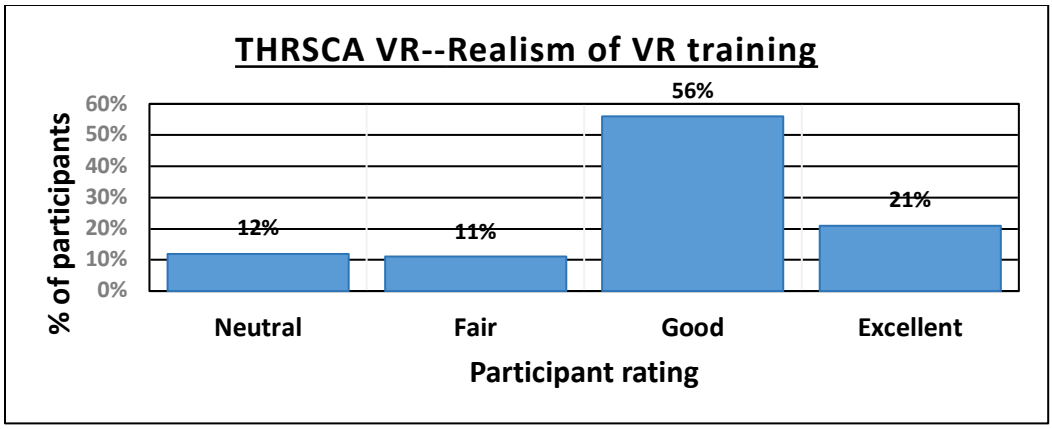
5. Indicate the total number of years of professional Canadian driving experience you have.



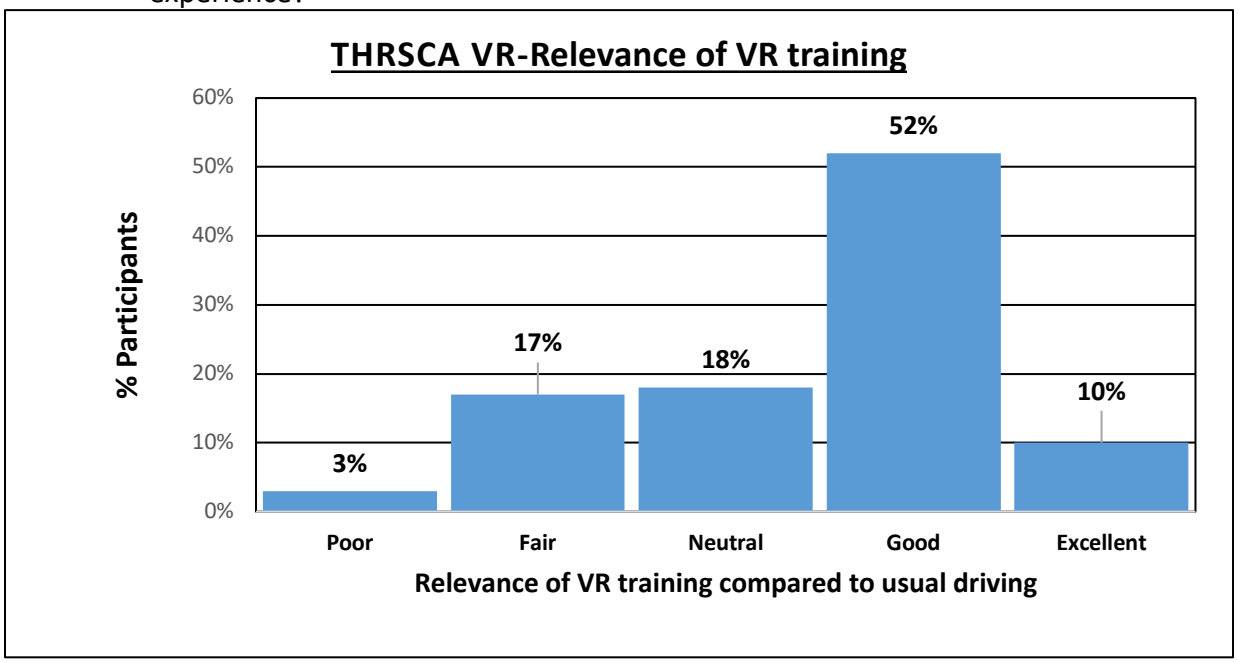
1. In general, what did you think of the VR training?



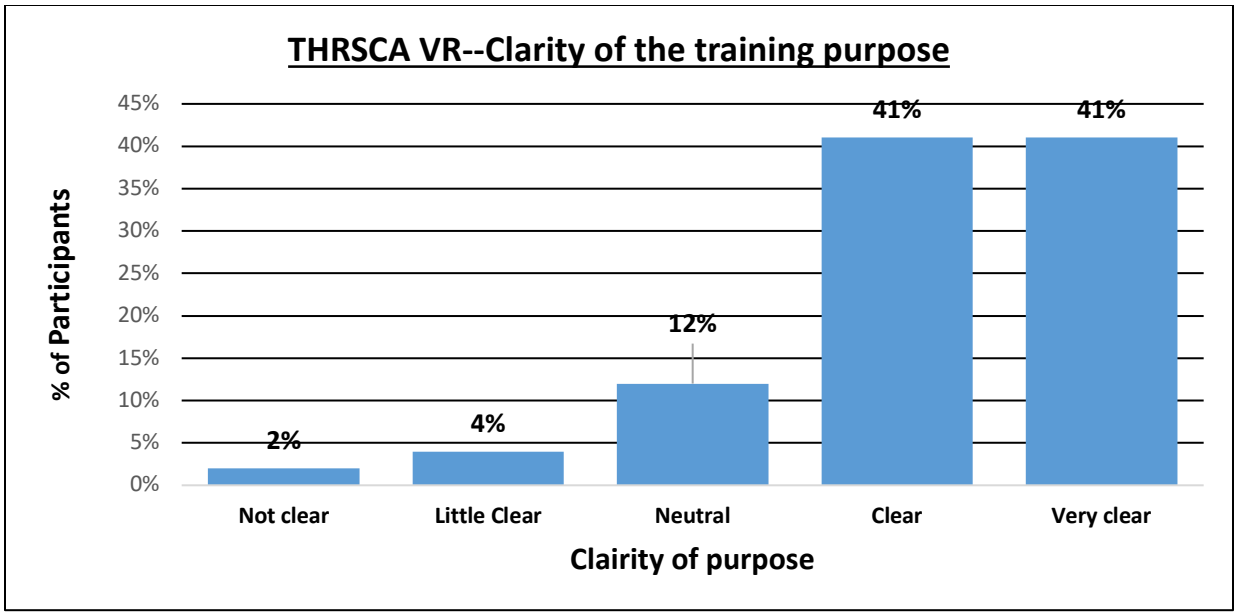
2. How realist was the VR environment during training?



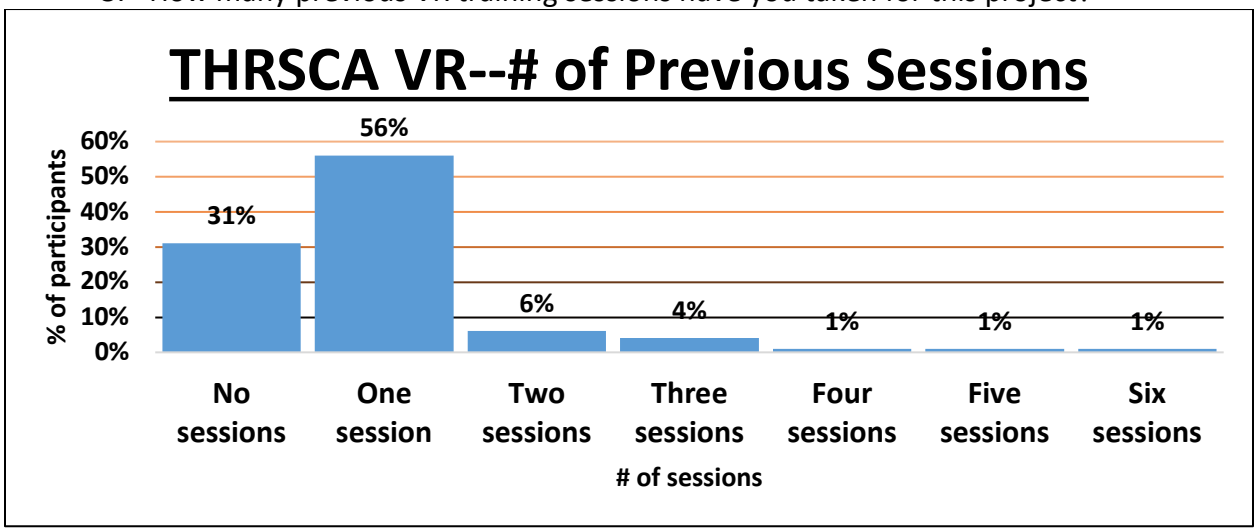
3. How relevant was the VR environment compared to your everyday driving experience?



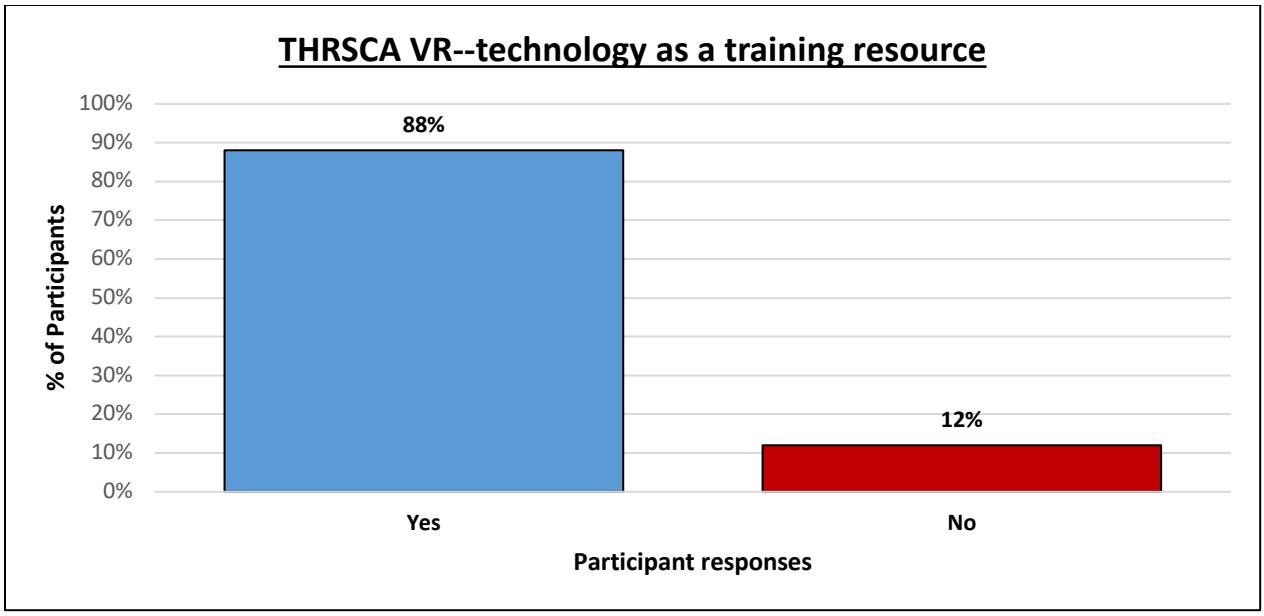
4. Before you started the VR training, how clear was the purpose of the training made to you?



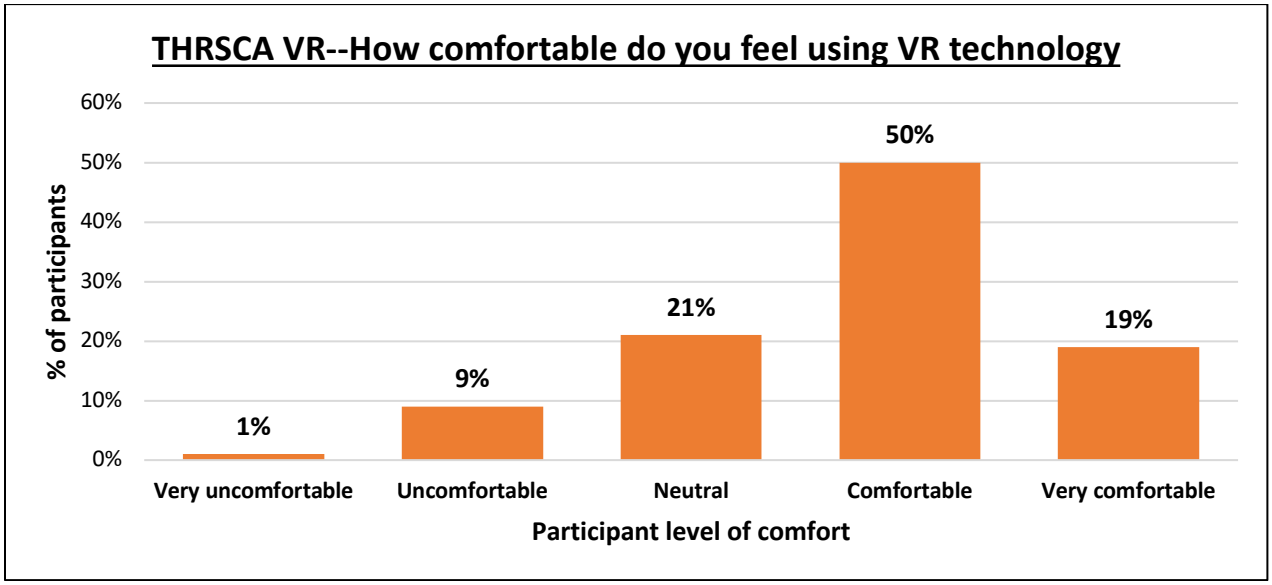
5. How many previous VR training sessions have you taken for this project?



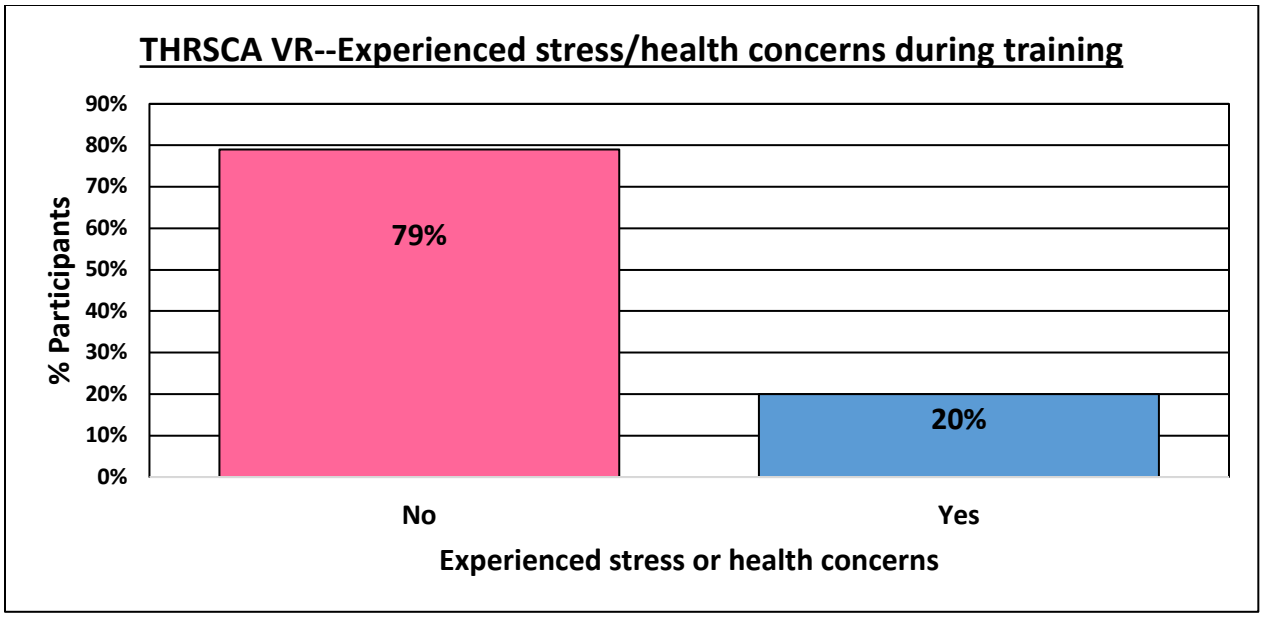
6. Do you feel that this technology can be used as a training resource to improve driving skills?



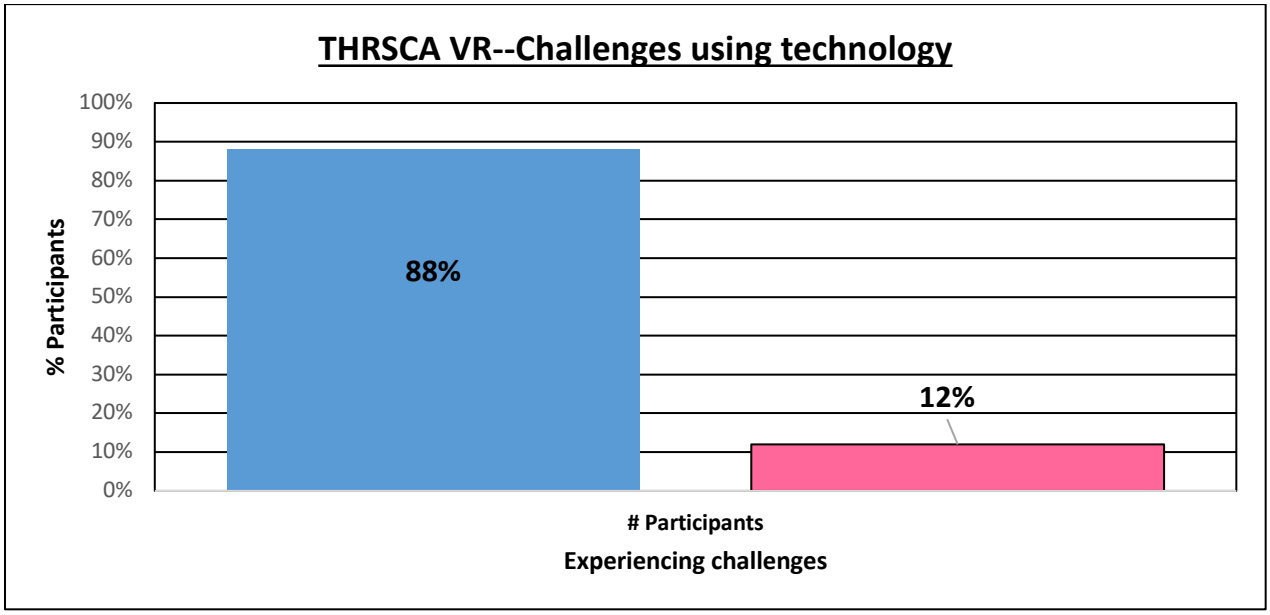
7. How comfortable did you feel using VR technology?



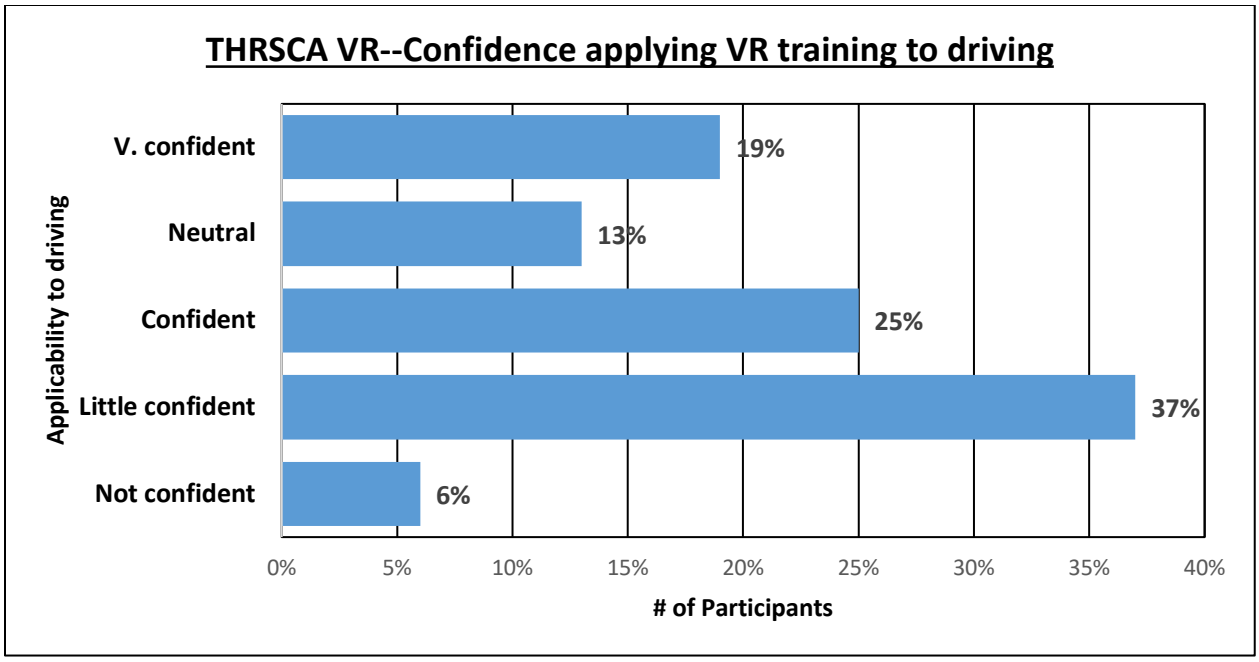
8. Did you experience any stress or health issues before, during, or after the VR training.



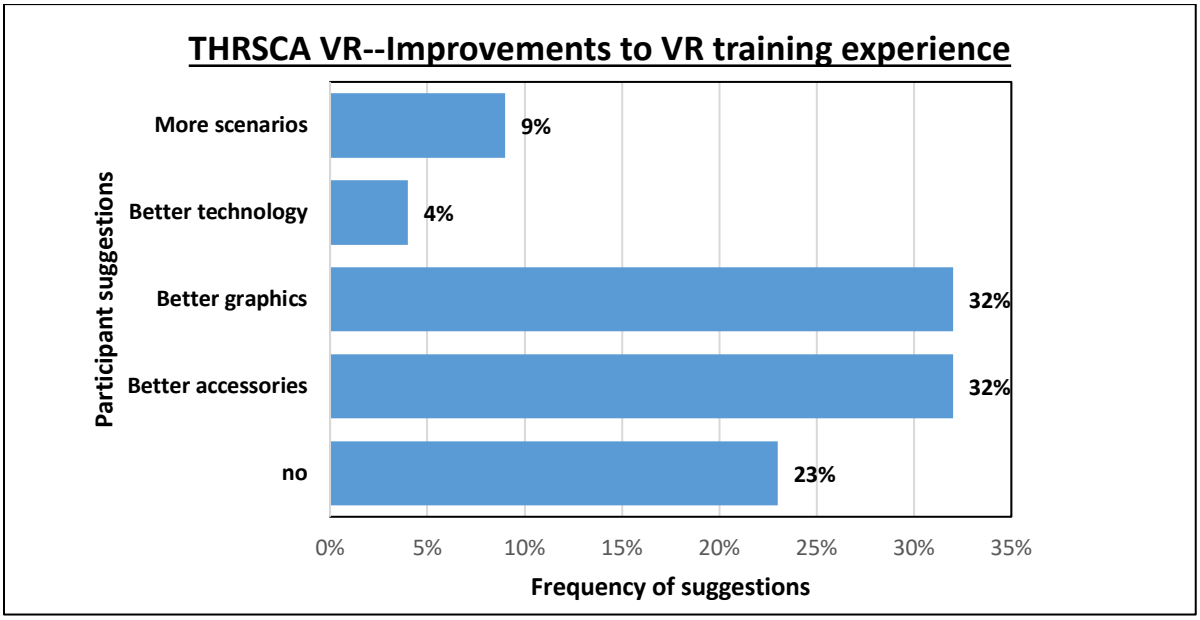
9. Did you have any other challenges during the training?



10. How confident do you feel to be able to apply lessons from the VR training scenarios to real life driving?

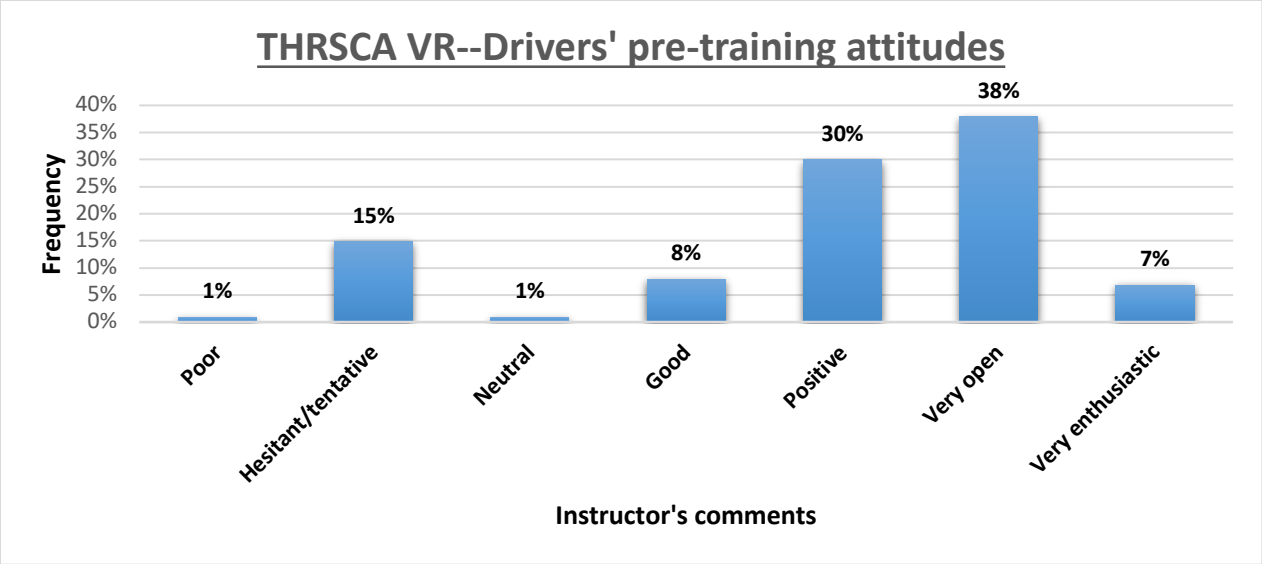


11. Is there anything that can be done to make the VR training experience more effective?

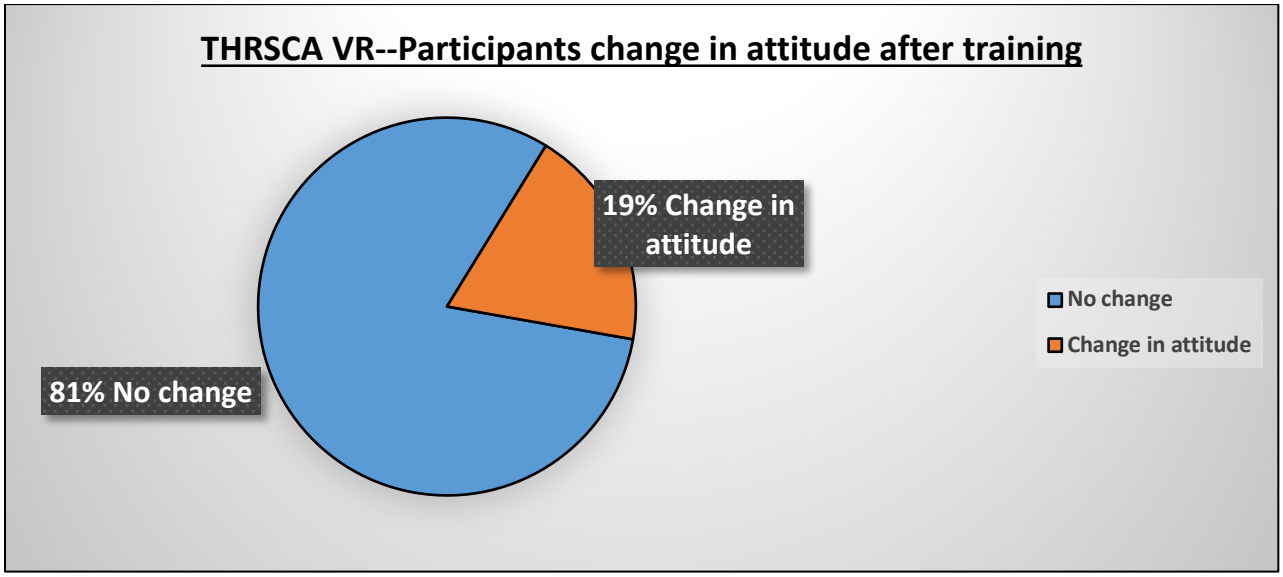


B. Trainer responses

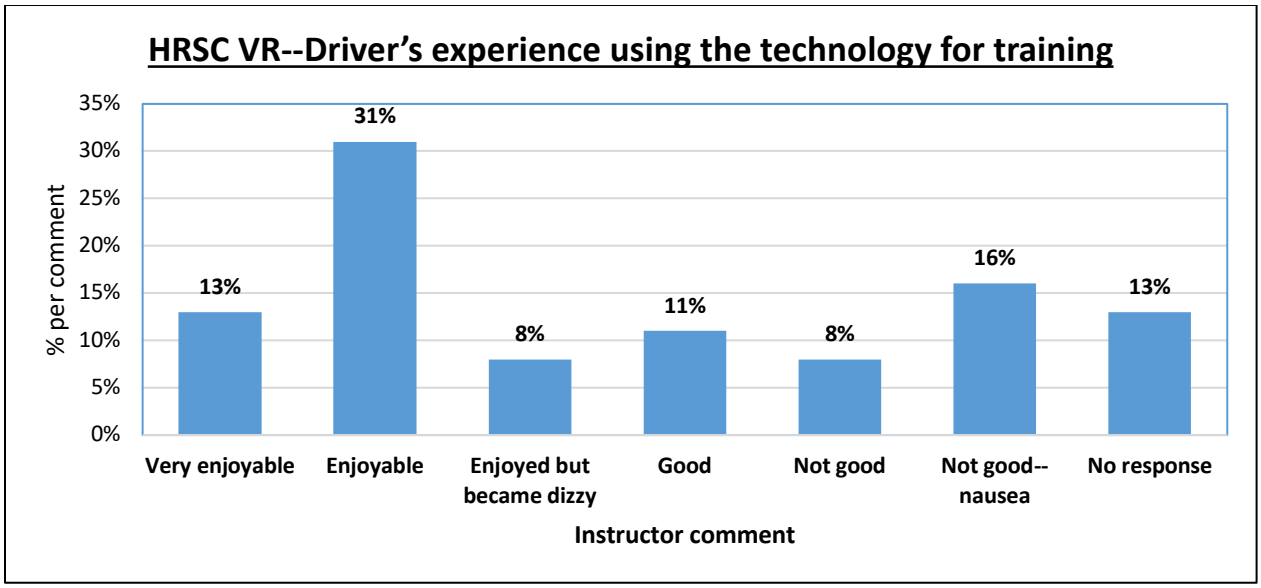
1. What was the driver's initial attitude towards the training?



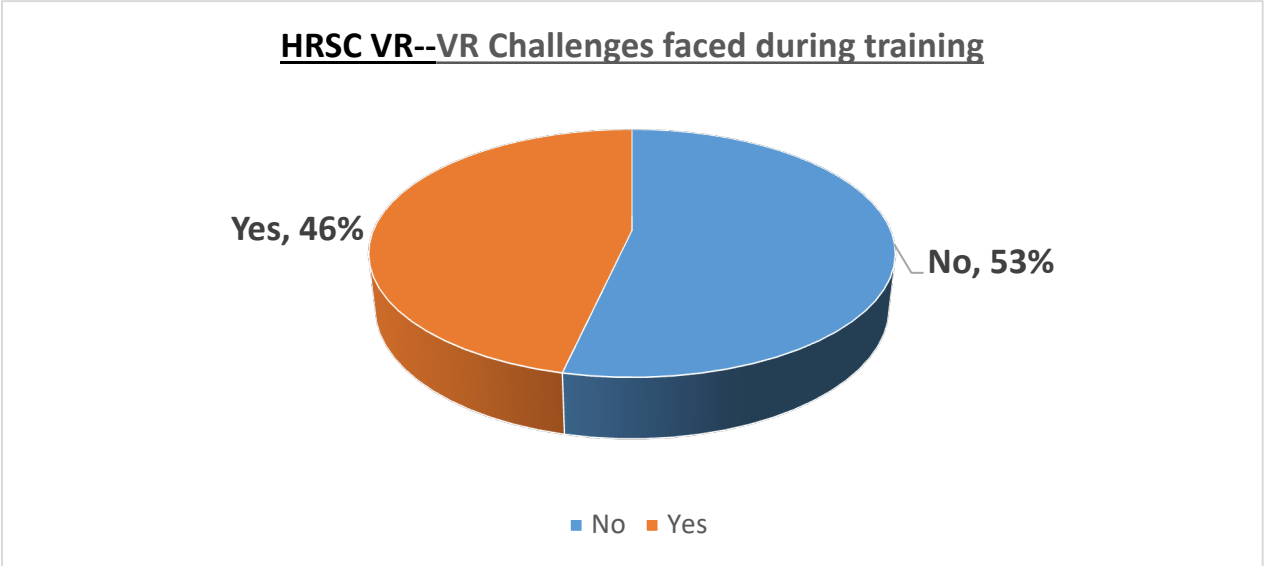
2. Were there any changes in their attitudes?



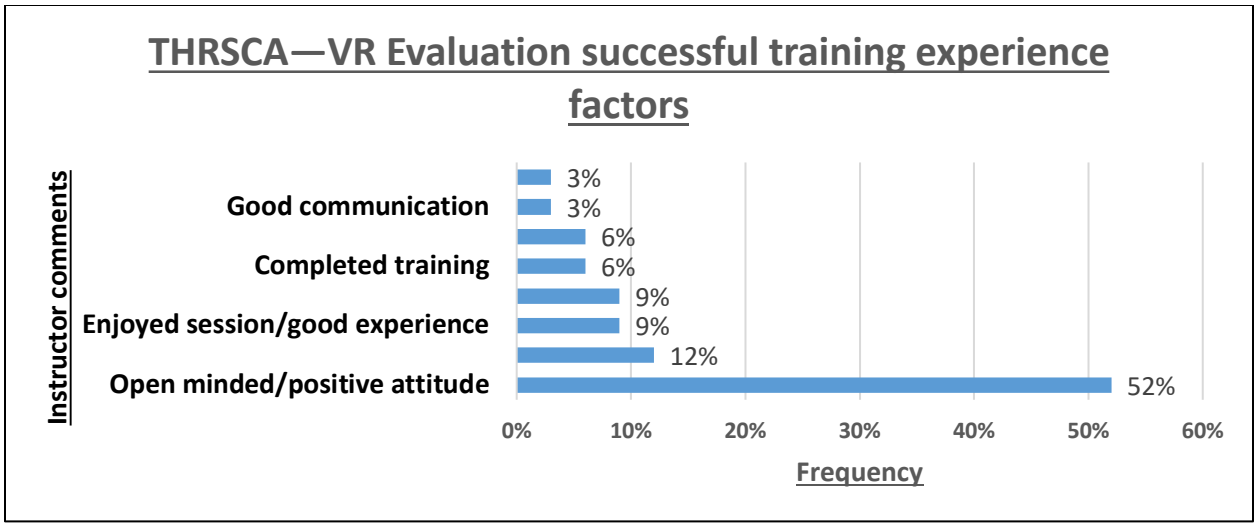
3. How was the driver's experience using the technology for the training?



4. Were there any challenges faced by the participant during the training?



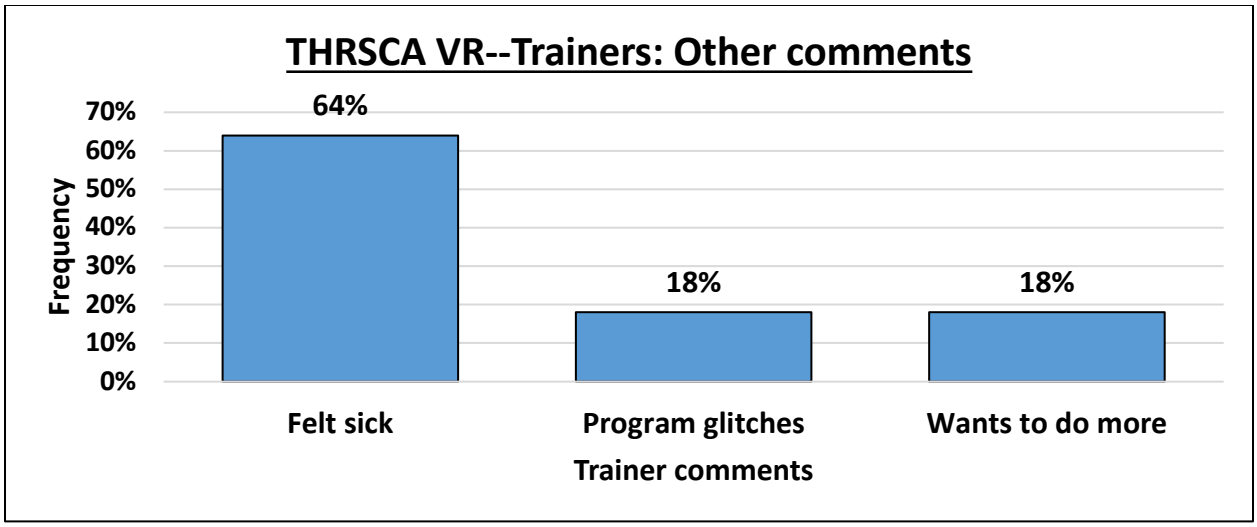
5. What do you think makes a successful training experience?



6. What was the overall outcome of the training process?

- "He was very interested and wanted to do more" (2001002).
- "He enjoyed it" (2001006).
- "He enjoyed it and is willing to try again" (2001008).
- "Was enjoyable and [he] is willing to do it again" (2001013).
- "Very good" (2001014).
- "Very positive and will try again" (2001016).
- "[He] demonstrated an aptitude for using the VR software and equipment and driving in general" (2002001).
- "Completed the session without any issues or side effects" (2002002).
- "He felt that this was an interesting experience at this point in his training" (2002003).
- "Willingly participated in a second session immediately after completing this one" (2002004).
- "Driver did well" (2003003).
- "Road safety" (2003004).
- "It was good" (2003007).
- "Good learning. Nice experience. He enjoyed using simulator" (2003008).
- "Fair " (2003013).
- "Good driver did well" (2004002).
- "He enjoyed it but said a real truck is better" (2001004).
- "He will not repeat it and would rather do one on one training" (2001005).
- "Did not finish as she was feeling ill" (2001007).
- "Short. Felt dizzy and had to sit for 15 minutes before leaving the room" (2003006).
- "First program went wonky then it did an update and driver couldn't drive" (2003002).
- "Driver did well considering the program was a bit wonky" (2003011).

7. Please share any other comments



- "He was okay during the training but became nauseous when he left the room" (2001004)".
- "Very ill after his session" (2001006).
- "She had to sit in the chair before she left" (2001007).
- "Feels like blurry vision" (2001012).
- "He felt pressure in his head and like he just got up" (2001013).
- "Wants to do more" (2001014).
- "There was a glitch in the program. When the driver turned his head, it would switch from day to night" (2003003).
- "He felt dizzy and had to sit for 15 minutes before leaving the training room" (2003006).
- "Program sometimes freezes and goes glitchy" (2003007).
- "He wants to come back for more time on the simulator" (2003008).
- "Need to find a way to keep the people from feeling sick" (2003013).
- "This user was one of only a couple to experience dizziness from the simulation. He was able to recover and carry on" (1004720).
- "Impressed by this user's ability to adapt to the virtual environment. He enjoyed the experience; very engaged throughout" (1000621).
- "This person is new to the industry and is very engaged in her role. She expressed interest in the many ways technology drive trucking forward" (1002420).
- "This user was a very confident person. He moved very quickly through the simulations. The simulators are very effective in functioning with users who move through at different rates of quickness/speed" (1004620).
- "I'm observing that the majority of drivers are able to adapt to the technology quickly and perform well. The technology doesn't differentiate between drivers and the proves a consistent challenge with measurable evaluation and results" (1001221).
- "This user's English language skills are developing, and he used 'trial and error' to problem solve. He made his own adjustments where necessary, indicating a level

of comfort and confidence with the virtual environment and controls“ (1004820).

- “This user started to feel uncomfortable toward the end of their session. After a short break, the user continued and performed well” (1000721).
- "This user adapted well to using the technology. He was able to perform the tasks despite his limited English language comprehension“ (1003520).
- "This driver is a coach and felt the simulation program would be an excellent training tool to supplement the onboarding/coaching of drivers“ (1001521).
- "Updates to some of the visuals have been performed, making the experience better. The nature of the technology will improve/be upgraded (e.g., improvements to the moving picture frames) regularly. This should improve experiences“ (1001321).

Appendix C – Post-Training Interviews – Codes Emerging from the Data

1. Simulator development
    a. iMVR
    b. Real-time tweaking
    c. Impact of glitches on training
    d. Ongoing upgrades
    e. New program wish list
2. Impact of simulator on assessing
3. Impact of simulator on learning transfer
    a. Immersion
    b. Immersion vs real-world training
    c. Retraining
4. Action of simulator
    a. Immersion
    b. Overhead birds-eye view
    c. Use for backing
    d. Precheck vs driving
5. Available programs/simulations
    a. Prechecks
    b. Backing
    c. Driving
6. Driver reactions to the training
7. Drivers' attitudes to training with simulator
    a. Initial
    b. Changes over time
8. Physical reactions to simulator
    a. Adaptations to training process to address physical reactions
    b. Non-simulator-related physical reactions
    c. Vs use of large simulator
9. Relationship to tech
    a. Age
    b. Newcomers
    c. Previous use
    d. Gamers – trainers
    e. Gamers – learners

10. Use of technology in retention of older drivers
    a. Role of opinion leaders
    b. Technology's impact on industry
        i. Use of metrics
11. Train-the-trainer

12. Use post-project
    a. Integration into training processes
    b. Impact of size of company
13. Trainer attitudes to simulator
    a. Initial hopes
        i. Met
        ii. Unmet
14. Definition of successful training
    a. General
    b. With simulator
15. Unexpected consequences
    a. Non-drivers
    b. drivers
16. Employer attitudes to the pilot

Appendix D – Post-Training Interview Guide – Trainers / Employers

1. Why were you interested in participating in this pilot project?
2. What were drivers' initial attitudes or behaviour towards the training?
3. As the training sessions progressed, were there any changes in those attitudes?
4. How was the driver's experience using the technology for training?
5. Where there any challenges faced by the participant during the training?
6. How would you define a successful training experience?
7. What do you feel was the overall outcome of the VR training process? (i.e., did it help in retention, transitioning Newcomers to Canadian roads, etc.)
8. Would you be interested in continuing to use the VR simulator for your driver training?
9. Do you have any other comments?