



USING AUGMENTED AND VIRTUAL REALITY IN TVET

Virtual and Augmented Reality (VAR) Learning - Transforming Training in Lift Repair and Maintenance

Submitted by VOCATIONAL TRAINING COUNCIL HONG KONG

BIBB International Roadshow DIGITAL MEDIA IN TVET



Abstract

Hong Kong has witnessed manpower shortage in various industry sectors, especially in traditional “dirty, dangerous and demanding jobs”. The VR Training Simulator for lift repair and maintenance makes use of immersive technologies to make learning fun and interesting, and to promote a new approach to training through technology in vocational and professional education (VPET) in Hong Kong.

The application raises trainee’s and employee’s safety awareness and improve their ability in responding to emergency and accidents in the lift maintenance sector. The VR Training Simulator is recognized as an official Continuing Professional Development (CPD) training unit for registered workers in the lift maintenance industries.



Basic Information

- **Purpose of immersive technology use in TVET:**
 - Dealing with unfamiliar situations
 - Safety/accident prevention training
 - Acquisition of professional competencies
- **Sector / subject area:** Lift maintenance
- **Type of training:** Formal training in the context of initial and continuing vocational and professional education
- **Start date:** 2018 (to date)
- **Partners:**
 - Electrical and Mechanical Services Department (EMSD)
 - Lift & Escalator Contractors Association (LECA)

Educational Concept

Learning contents & outcomes

This VR Training Simulator currently features 9 scenarios that replicate the working environment of general lift maintenance works and simulate lift incidents that are difficult to replicate in real life.

The VR scenarios help to achieve the following **learning goals**:

- Raising trainees' safety awareness
- Improving trainees' ability in responding to emergency and accidents in the lift maintenance sector.

The VR-based training is recognized as an official Continuing Professional Development (CPD) training unit for Registered Workers of Lift Maintenance Industries by the Electrical and Mechanical Services Department (EMSD).

Educational setting

The VR Training Simulator is mainly used during class-based learning and follows an **experiential learning** approach. Teaching and learning is organized as follows:

- Two **instructors** are designated to teach and guide a group of 15 trainees, while a **technician** prepares the VR equipment and provides technical support.
- The **target group** for training are trainees as well as experienced employees in the lift maintenance sector.
- At the beginning, the instructors explain the importance of safety procedures in lift maintenance and refer to exemplary cases of lift accidents.
- Trainees form **small groups** and take turns in using the VR Training Simulator to perform specific tasks related to lift safety and maintenance procedures.
- Those trainees that do not use the VR simulator **observe the performance of their peers** and mark good / bad practices. Instructors provide additional information to enhance the in-depth understanding of the respective incident.
- Practical training is followed by **discussion and reflection** of specific lift accident cases. Each group prepares a presentation on how to avoid and handle possible accidents and reflects on their experiences using VR.

Technical Setup

Hardware

VTC uses a few sets of VR devices, each including

- 1 head-mounted display,
- 2 controllers
- 1 desktop computer
- In addition, external motion tracking sensors have been installed on the ceiling of the VR lab.



Motion tracking & interaction

- The VR Training Simulator allows trainees to walk freely within the defined virtual training area, using **360° tracking** of hand and head movements
- Users can also navigate by using the **teleportation function** of the VR Training Simulator to move around in the VR environment with minimal effort.
- Trainees use the controllers to **interact with 3-D objects** inside the virtual environment. They can use the controllers to pick up and move objects, e.g. barriers, keys and tools.



Benefits of Use in TVET

VR is an affordable solution to provide practical training for difficult and dangerous situations

Traditional training comes with substantial costs and space requirements to model a realistic training environment in the physical world. VR-based learning also allows to simulate incidents that are difficult to be replicated in real life by providing a safe training environment.

A realistic 3D environment helps to achieve the intended learning outcomes

VR-based learning complements traditional teaching methods as it allows trainees to gain hands-on-experience and develop a better understanding of work and safety procedures. The Lift & Maintenance Industry, together with VTC have made extensive use of the VR Training Simulator for training, which received very positive feedback from employees and trainees.

VR supports career education

The VR Training Simulator also facilitates the introduction of the lift and escalator industry and may help to attract more young people to the industry.

Lessons Learned

Collaboration with industry is key

VTC entered into a collaboration with EMSD, the industrial accreditation authority of the Hong Kong Government, and the industry association LECA and formed a tripartite working group to ensure that the VR Training Simulator meets the requirements of the industry,

Project management is a prerequisite

For the development phase, the “waterfall model” commonly used in software development was applied to monitor project progress and ensure timely completion of each development phase. Continuous coordination and communication between developers, industry experts and VTC teaching staff was necessary to develop a common understanding about the requirements of VR-based training.

Guidance for trainers and learners is essential

Train-the-trainer workshops were organized for VTC instructors and trainers to use the VR application, as they have to provide close supervision and guidance to learners for using the application for hands-on training.



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The Bridging Innovation and Learning in TVET (BILT) project provides TVET stakeholders with a platform for exchange and supports them to address current challenges in TVET systems, which arise due to technological, social, environmental, and workplace changes. Within BILT, the overarching theme is New Qualifications and Competencies in TVET, which is supported by four focus themes in the context of TVET:

- Digitalization
- Greening
- Entrepreneurship
- Migration

Through regular knowledge exchange, thematic project activities, and expert working groups BILT leverages the existing mechanism of the UNEVOC Network to offer opportunities for collaboration and peer learning in

Europe, Africa, and Asia and the Pacific. The project complements national developments to explore and support innovative, market-oriented and attractive modes of learning and cooperation in TVET.

The results of ongoing activities are accessible on BILT's web page.

The BILT project is carried out in collaboration with UNEVOC Network members, coordinated by UNESCO-UNEVOC with support of the German Federal Institute for Vocational Education and Training (BIBB), and sponsored by the German Federal Ministry of Education and Research (BMBF).

For more information, please visit www.unevoc.unesco.org/bilt

or contact us at unevoc.bilt@unesco.org

BIBB International Roadshow Digital Media in TVET

Initiated by the Federal Institute for Vocational Education and Training in Germany (BIBB), the Roadshow aims to show the potential of digital applications and technologies for teaching and learning in Technical Vocational Education and Training to make learning more flexible and enhance the quality and attractiveness of TVET.

The format builds on the German Roadshow 'Digital Media in TVET', which has been successfully implemented and conducted by the Federal Ministry of Education and Research in Germany (BMBF) in cooperation with BIBB since 2016.

More information:

<https://www.bibb.de/en/147504.php>



About VTC Hong Kong

The Vocational Training Council (VTC), established in 1982, stands at the forefront of vocational and professional education and training (VPET) in Hong Kong.

As a statutory body, the VTC ensures the skills of the Hong Kong workforce remain relevant and future ready through a full range of pre-employment and in-service programs. Its mandate to provide VPET is vital in meeting industry needs, and in fulfilling the aspirations of some 200,000 students across 13 member institutions every year.

The VTC provides flexible study pathways from diploma to degree levels, equipping students with professional knowledge and skills in a wide spectrum of professions. Our "think and do" approach cultivates the passions for learning while imparting the necessary skills and know-how for success.

Contact & Further References

Contact

- Ir. Timothy LEE Kin Sang
Principal Lecturer Youth College
VTC Hong Kong
timkslee@vtc.edu.hk

Further References

- Demo video: [Lift Repair and Maintenance](#)
- Website VTC Hong Kong: www.vtc.edu.hk

