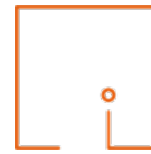A DIGITAL TRAINERS TOOLBOX TO HELP CRANE OPERATORS
UPDATE THIER SKILLS FOR INDUSTRY 4.0 ENVIRONMENTS

Crane 4.0 - IO3 – Blended Testing

Procedural Manual and Best Practices

Table of Contents

1. Introduction

The Crane4.0 blended learning course is designed for aspiring crane operators, people working in the construction industry or crane operators who wish to enhance their knowledge of modern crane technologies. During this course the concept of virtual reality (VR) equipment will also be introduced and explained to the students. One of the tools that will be given to the trainers is a VR app that can be installed in the Occulus VR headset and used to practice the theory covered during the course. The mixture of theory and practice is extremely beneficial as well as making the learning process more interesting. The use of VR equipment for training is increasing and has also proven to be very useful in the healthcare industry where professionals can train before going on the line of work where a mistake can have serious consequences. Similarly, crane operators use heavy machinery daily and a mistake can be hazardous for all the people in the construction site as well as the operator thus good knowledge and practice are essential before operating such vehicles. By making use of the VR app in this course, students will be able to understand the essential operations and hazards involved in setting up and operating a crane before stepping into a real crane.

This procedural manual will highlight how the course should be delivered, based on the Pilot Blended testing that was carried out by the partners of the consortium participating in the "Crane 4.0" project, as well as offering best practices and suggestions to help with the delivery of the course. The course offered is a baseline and should, therefore, be adapted and further developed by the companies or individuals delivering the course to give even more value to those following the course.

By completing this course, the crane operators/students will gain a set of valuable skills that will help them in their line of work or increase their employability.

2. Crane 4.0 IO3 – Blended Training – Course Overview

The blended Training developed for Crane 4.0 is made up of 2 parts: The Face-to-Face Theoretical training which involves 40 hours of training and the Hands-On Training by means of a Virtual Reality Application.

Theoretical Training

As part of IO1 of Crane 4.0, a Course Plan and Didactic Manual for Crane Operators was developed. The Blended testing should follow this plan and manual to deliver the course. In order to aid the delivery, teaching materials were also delivered. These materials should be used as a foundation for the delivery of the course but should be further developed and supported with additional materials, such as additional presentations, videos, guest speakers etc. to give more detail and up-to-date information as required by the company or person delivering the course.

The Course Plan, Didactic Manual and Teaching Materials may be found in following link under *Intellectual Output 1 - Curriculum Handbook* - https://www.erasmuscrane40.com/erasmus-crane-4-0-project/

To help with the delivery of the training of the 40 hours of training a guide timetable was also developed and this is available from the same link above under *Intellectual Output 3 – Pilot Blended Testing*.

Virtual Reality Training

In order to deliver the Virtual Reality aspect of the Training Course, it is necessary to have an Oculus Quest VR headset. A Learning Outcomes Manual for the Virtual Reality Training was developed under IO2 of Crane 4.0. This manual give recommendations and guidelines for the implementation of the VR labs training, how to use the headset, and how to install and use the Crane 4.0 application and further information about the learning outcomes linked to the use of VR for this training.

This manual may be found under *Intellectual Output 2 – VR Application* - https://www.erasmuscrane40.com/erasmus-crane-4-0-project/

The Application developed for Crane 4.0 may be downloaded from the following link: https://sidequestvr.com/app/10869/cranes-40-vr-for-training

As we understand that not everyone might be familiar with how the Oculus Quest VR Headset works, a set of videos explaining the functionality of the headset have been developed by the consortium. These may be found at the following link: https://www.youtube.com/playlist?list=PL5ojYO7CFQVCdb3Z_ytUTdjSpSMMRChZ0

3. Crane 4.0 IO3 – Blended Training – Course Guidelines

The following are recommendations and guidelines of how the course should be delivered.

Course delivery method:

- Face to face: Power point presentations, lectures, videos, group discussions, guest speakers, integration of VR application.

Resources:

- Laptop (for presenter)
- Monitor/projector
- White board and markers/Interactive white board
- Presentation covering course content – **relevant to course module**
- Internet connection for online videos
- Electrical connection (adequate number of power outlets)
- Oculus headsets (ideally more than one per group)
- Timetable, Course plan and Didactic Manual for crane operators

General Guidelines:

Preparation

- The suggested length of the training is 40 hours, plus an additional 4 hours of VR training.

- The recommended number of trainees is **10.** This makes the group small enough to give individual attention when needed but also big enough to have group discussions.

- The trainees may come from different backgrounds such as crane operators, students or people who are interested in pursuing a career in the crane industry.

- All course content and PowerPoint presentations should follow and be based on the Course plan and Didactic Manual for crane operators presented in Intellectual Output 1 of this project, Crane 4.0.

- It is recommended to use a mix of media for the delivery of the course content, (ex. PowerPoint presentations, videos, hands-on activities, guest speakers etc.)

4. Crane 4.0 IO3 – Blended Training – Delivering the Training

During the Training

- The classroom setting should be big enough for the trainees and teachers to move comfortably as well as have adequate area to use the VR headset without causing injury.

- The VR headset to be used for this training is the Oculus Quest, to avoid software compatibility issues

- It is suggested that more than one VR headset is present for the training sessions as it will make training more efficient and engaging.

- Prior to initiating the training, participants should be asked to complete an Incoming Learning Outcomes questionnaire (Found under Intellectual Output 3 – Pilot Blended Testing).

- It is recommended that participants should to be asked to sign attendance sheets covering the 40 hours of training as well as the 4 hours of VR training for tracking purposes (Found under Intellectual Output 3 – Pilot Blended Testing).

- As noted in the recommended timetable, breaks are encouraged so that the participants will remain engaged throughout the whole training.

- The course also includes 4 hours of VR training, which are over and above the recommended 40 hours of training; this can be split throughout the length of the training.

- As many students will not have any experience using VR equipment, it is recommendable to include a session introducing the Oculus Quest headset and how it works. It is recommended to give trainees sessions to try the headsets and experience the VR app first hand, prior to trying out the VR training.

- At the end of the training, participants will be asked to complete an Outgoing Learning Outcomes questionnaire upon completion of the training. Participants should also be asked to fill in the Satisfaction Questionnaire so that we can collect feedback from the participants (Found under Intellectual Output 3 – Pilot Blended Testing).

After the Training

- All partners will be requested to complete a post-training evaluation satisfaction questionnaire so as to understand the effectiveness of the training and collect any necessary feedback to improve any future training provided (Found under Intellectual Output 3 – Pilot Blended Testing).
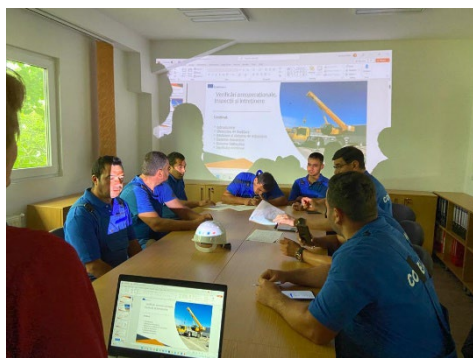
5. Crane 4.0 IO3 – Blended Training – Best Practices

Recommendations:

o It is advisable that the classroom setting is adequate for the students to move and stay in groups

o It is highly recommended to use additional teaching materials and methods, not just those presented in the pre-established teaching materials of this project. These materials should serve as a baseline which should be further developed and elaborated to give more detail and necessary information to students following this course. Using a variety of teaching methods will also help to make the course more interesting. Other materials which could be included are videos, further presentations, interactive discussions and games, group work and brainstorming, having guest speakers and lecturers, site visits etc.

o It is also recommended to allocate a substantial amount of time for familiarisation with the Oculus Headset and controls. This could be supported with hands-on sessions, where each students spends time trying to use the headset, as well as using the videos indicated under the Virtual Reality Training section of this manual. Lack of knowledge of using VR headsets is the greatest difficulty linked to this pedagogical method of delivery.

o Participation from the students is encouraged to aid in keeping them engaged.

o If a small group is present, the group sessions can be done with the whole class.

o It is recommended that VR sessions are not held in one block but rather separate scenarios following particular modules of the Course Plan so as to offer a more realistic and hands-on approach to the different topics being covered.

o Training Materials provided should be revised and adapted by the teacher/trainer. Technical information, terms and practices provided might not be 100% accurate for the industry and therefore it should not be taken for granted that the materials are free from any errors. Graphics, images, tables and other visual materials included should also be checked for accuracy and relevance and the trainer should do their utmost to provide the best quality material possible for the training.

6. Crane 4.0 IO3 – Blended Training – Conclusions

This manual is meant to help trainers deliver the training created as part of Crane 4.0. It should be used together with the Materials created under the project, namely, the Course Plan, the Didactic Manual, the Training Materials, the Learning Outcomes Manual for the VR App, The Questionnaires and the VR Application so as to deliver the best possible training for the students. As the use of VR equipment is quite prominent in this course it is suggested that the trainers who are not familiar with this technology, familiarise themselves with using the VR headset and the learning material provided under IO2 prior to delivering the course so as to ensure a streamlined delivery of the training for the students. By successfully completing this course both the trainers as well as the students will have gained a set of skills that enhances them in a professional way, thus benefitting both.

All material in this course is freely available to use and can be accessed from the project website - https://www.erasmuscrane40.com/