



Training Systems Australia  
First in Vocational Training Equipment

# WeldTrainer Welding Simulator



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# Contents:

About Training Systems Australia

WeldTrainer Welding Simulator

Simulation Advantages

- Savings

- Productivity

- Safety

WeldTrainer Welding Simulator

Welding Simulator Hardware Features

- Work Table

- Welding Coupons

- Interchangeable Torches & TIG Filler Rod

- Vibration Engines / Haptic Error Notification

- Infra Red System

- Sensors System

- Audiovisual System

- Main Unit

- Instructor Position

Welding Simulator Software Features

- Welding Procedures

- Exercises Development

- Pieces & Welding Positions

- Welding Parameters Control

- Analysis & Results Report

- Replay System

- Right & Left-Handed Users Support

- Theory Test Mode & Questions Editor

- Custom Pieces Integration

- Instructor Position Functionality

# About Training Systems Australia

We supply world leading technical equipment and courseware that improves student engagement and provides teaching efficiencies to deliver better learning outcomes.

The equipment and technology that we provide is didactic: specially designed for use in training and education to improve student comprehension and retention.

Our products bring subject matter to life, allowing students to learn through valuable hands-on experience and for their learning to be transferred directly to the workplace.

However, our service extends beyond just being an equipment supplier. Over the past decades, we have built successful partnerships with leading TAFEs, Polytechnics, RTOs and Schools. We have done this by understanding their exact requirements and applying our experience to effectively formulate, integrate and implement the most appropriate training equipment and learning resources and assisting in areas such as planning, lab design, budgeting and equipment selection.

**Suppliers of world leading technology, equipment, learning resources & courseware**



## Implementation & Ongoing Support



**Backed by specialist technical staff and comprehensive training and support**

Our team includes; product specialists, technical support staff, management and administration personnel and our client account managers.

Our team can work with you to develop a solution that specifically meets your requirements and then provide implementation, training and ongoing technical support.

In addition to an extensive range of quality products and courseware, Training Systems Australia provide full installation and commissioning of equipment including training for educators as well as providing ongoing support.

## Better Learning Outcomes

Training Systems Australia is committed to helping TAFE's, Universities, RTO's and Schools of all sizes to deliver better learning outcomes.

We do this by supplying world leading educational equipment, learning resources & courseware that:

- **Improve Student Engagement & Retention**
- **Provide for Blended Learning**
- **Create Teaching & Operational Efficiencies**
- **Are Industry Relevant & Upgradable**

Our experience, our range of products and our investment in implementation and ongoing support will make a big difference to students, educators and your whole organisation.

# Why Simulation?

Training is undoubtedly one of the most effective practices to improve skills development, reduce occupational risks and ultimately increase productivity. From a risk prevention perspective this training should be comprehensive, aimed not only at bringing a change in attitude towards preventive measures, but to achieve the desired behavioural change to perform a specific job and do it safely.

At all times, one must consider the possibility of accidents in the operation and handling of each machine's respective processes and activities. With this being said, a well-trained operator can avoid accidents that in some cases can become deadly.

To give a more quantitative explanation of the role accidents play in the workplace, statistics show that:

- Of all accidents recorded, 87.5% were caused by human factor
- From this 87.5%, 36% of these accidents were caused by the operator of a piece machinery, with an even further breakdown of:
  - 12% Perceptive failure
  - 13% Judgmental failure
  - 8% Failure to react properly
  - 3% Comprehension failure
- The remaining 12.5% were accidents caused by the failure of equipment.

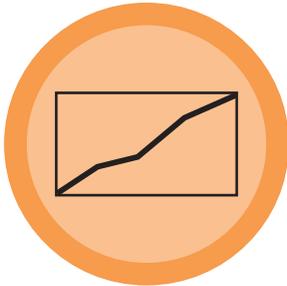
Almost all of these accidents are preventable through proper rigorous training procedures, which is ably facilitated by the use of simulators and the simulation of respective work environments.



# Simulation Advantages

## Savings

- No waste of fuel or other consumables
- No wear and tear caused by repetitive equipment use
- Train multiple operators at once
- Reduction of incidents and accidents
- Reduction of damage to property
- Reduction of insurance costs
- Considerable savings in the maintenance of equipment
- Reduction in the need to maintain physical equipment



## Productivity

- Physical machinery is available for production
- Greater use of machinery in production
- Increased lifespan of machinery for productive purposes
- Improves the aptitudes of the operators to significantly increase the productivity of machinery

## Safety

- Once the learner has received the proper instructions, they receive hands-on training in a safe environment that allows for various scenarios
- Experimentation using a range of exercises and different tasks in a safe environment
- Reduces the anxiety of the operator in a controlled environment
- Learning the safety procedures during operation, which eliminates bad habits
- Training is possible no matter the time of day or weather conditions
- Practice is possible in all conditions of fatigue



# WeldTrainer Welding Simulator

WeldTrainer is a welding simulator designed both for the training of new welders and for improving the skills of those already experienced.

Based on virtual reality and created using precision and realism as fundamental pillars, WeldTrainer allows users to immerse themselves in a virtual welding room. The spatial detection of the welding mask and welding tools recreate a virtual scenario in which the user can weld in an interactive realistic manner.

WeldTrainer is the ideal solution for understanding, developing and improving welding techniques as well as gaining muscle memory in order to act in an efficient way in a wide range of different types of welding including SMAW, GMAW, GTAW, FCAW-G and FCAW-S.

**Any welding piece can be introduced into the virtual environment regardless of its shape and the system allows users to perform welding on it.**



# Welding Simulator Hardware Features

## Work Table

Each WeldTrainer includes a carefully designed work table which provides an optimal space for interacting with the system.

The work table permits having all the elements of the system in their designated places, protected and ready to use.

The work table is easily height adjustable which means the height of the working area is accessible to any user, regardless of the user's height or if they are sitting or standing.

It includes a custom-made reclining tray which, along with the other couplings present in the system, allows the robust positioning of all the welding parts in all the welding positions.

It also includes a custom-made side table for the placement of all the welding coupons.



## Welding Coupons

Each WeldTrainer unit includes 14 welding coupons that exactly represent the pieces within the work area that appear in the simulation.

All the pieces integrate custom-made couplings that allow their placement on the work table in a robust, precise, fast and simple way in all welding positions.

The included coupons are:

- Square plate for flat welding (x 1).
- Tee joint (x 2).
- Lap joint (x 2).
- Butt joint of flat plates (x 1).
- Butt joint of plates with borders preparation (x 2).
- Pipe to plate joint (2 different pipe diameters) (x 2).
- Pipe to pipe joint (2 different pipe diameters) (x 4).

# Welding Simulator Hardware Features

## Interchangeable Torches & TIG Filler Rod

The welding torches for the different types of welding included in the simulator (SMAW, GMAW, GTAW, FCAW-G and FCAW-5) are interchangeable, with a USB 3.0 connection system integrated in the base of the welding hose.

This means the torch exchange is carried out in a few seconds and the torches that are not in use can be placed and protected on the work table thanks to their custom fittings.

Within each torch is an integrated micro joystick that allows, through its different directions of pulsation, interaction with the system intuitively without the need to ever remove the welding mask.

Furthermore, the system includes a custom piece that allows the user to handle the TIG filler rod in the simulation.



## Vibration Engines / Haptic Error Notification

WeldTrainer integrates vibration engines controlled by the electronics of the equipment that reports errors to the user through a haptic system based on different patterns of vibration in real time during the execution of the welds.

**By means of this hardware functionality, the system is capable of correcting user errors instantaneously.**



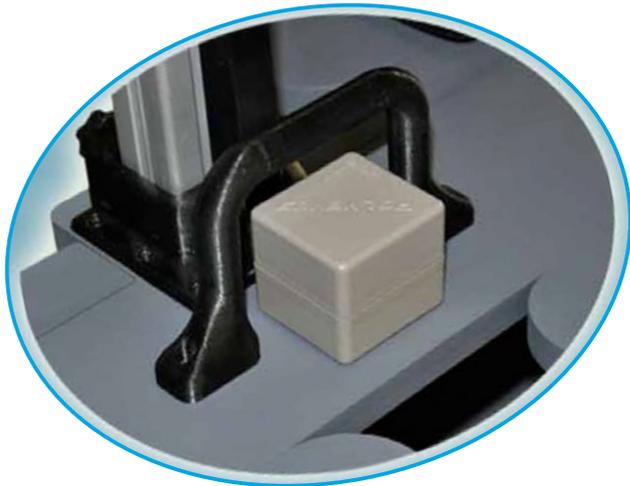
## Infra Red System

WeldTrainer integrates an infrared system which allows users to position the welding mask in the space and thus to determine the view in the simulations by its position and orientation.

The welding mask integrates infrared light which allows the system to position and orient the virtual camera in the simulation in relation to the user.



# Welding Simulator Hardware Features



## Sensors System

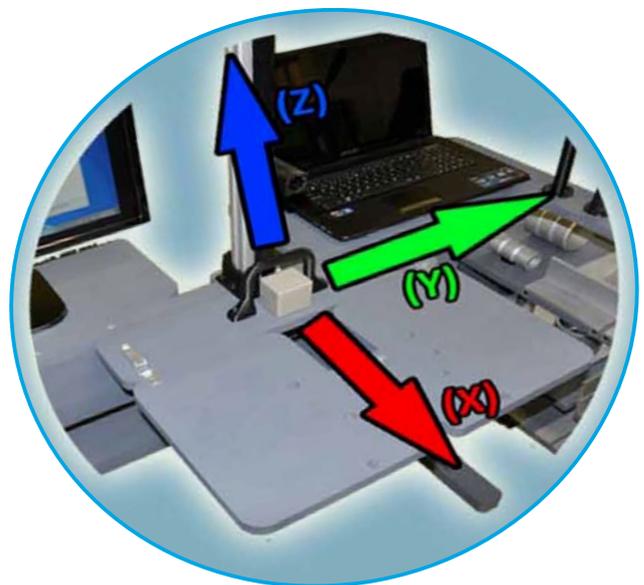
WeldTrainer is built and designed based on magnetic technology which allows the system to control with millimetre precision the position and orientation of the sensors placed inside the welding tools. This means the system provides an accurate simulation of precision welding.

**Unlike other systems based on augmented reality (where two-dimensional work is done from the image capture made by a camera with low precision, high latency, forced need for line of sight between camera and objects, large restrictions and no origin of coordinates), the motion tracking system of WeldTrainer allows a total three-dimensional control of the welding tools providing at all times exact spatial data with origin of coordinates, without any possible interruption in the flow and with non-existent latency.**

As a consequence of this tracking precision the relationship between the welding tools and the actual welding parts in the work area is always accurate and never requires any calibration.

This system also allows all simulation in the WeldTrainer to be 100% determined by the actions of the user without predetermined or approximate behaviours or results, without any limitation, restriction or dependence on external factors that can frequently interrupt the accuracy and real usefulness of the simulation.

The accuracy of the system ensures that the development and improvement of muscle memory, essential to correctly perform welding work, is transferrable to welding in the real world.



# Welding Simulator Hardware Features

## Audiovisual System

WeldTrainer integrates within the welding mask a highly realistic image which can be adjusted in brightness by the user.

Optionally the stereoscopic 3D image can be depth adjusted thereby providing real depth visualisation.

The mask includes a system of over ear cushioned loudspeakers, with volume control and noise-isolation which delivers crystal clear sound integrity with perfect pitch highs and a thundering base.



## Main Unit

The WeldTrainer main unit contains all necessary computer hardware and includes Ethernet network port, Wi-Fi adapter, external USB connections, ventilation system, speaker system and a handle for transportation.

## Instructor Position

Each WeldTrainer includes a portable computer that works as instructor position.

The connection of the portable computer to the Weldtrainer is performed by Ethernet, and permits several units of Weldtrainer to connect to the same instructor position.



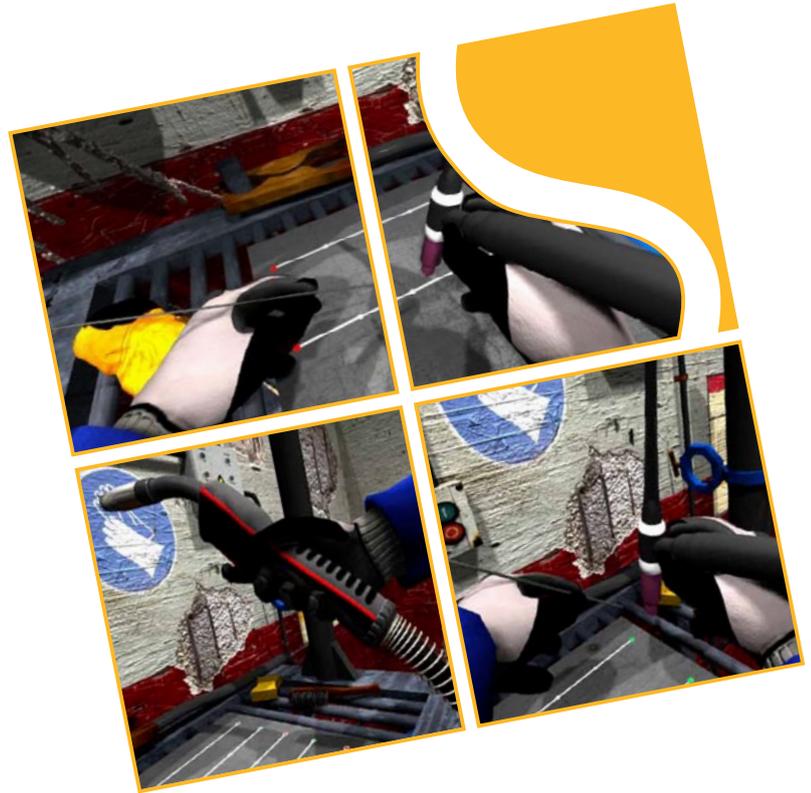
# Welding Simulator Software Features

## Welding Procedures

The system simulates welding with SMAW, GMAW & GTAW, FCAW-G and FCAW-S. In the case of SMAW, the user can modify the intensity, polarity and orientation of the electrode with respect to the electrode holder.

In the case of GMAW and FCAW welding, the user can modify the voltage, the welding wire output speed, the gas flow rate, the wire diameter and the mode of operation (2T /4T).

In the case of TIG welding, the user can modify the intensity, the diameter of the non-consumable electrode, the diameter of the welding rod, the polarity and the gas flow rate.



## Exercises Development

Each exercise presents the user with a series of weld beads to be made in which the start point and completion point are indicated. According to the selected exercise, the order of realisation of the welding beads can be free or pre-set in a particular order. In some exercises it will be necessary to apply several passes by making cords on top of each other until filling the joint.

In the case of GMAW welding, the user can select, in the middle of the execution, the realisation of any pending welding bead with push technique or drag technique.

A maximum time for the completion of each exercise is set as part of the task."

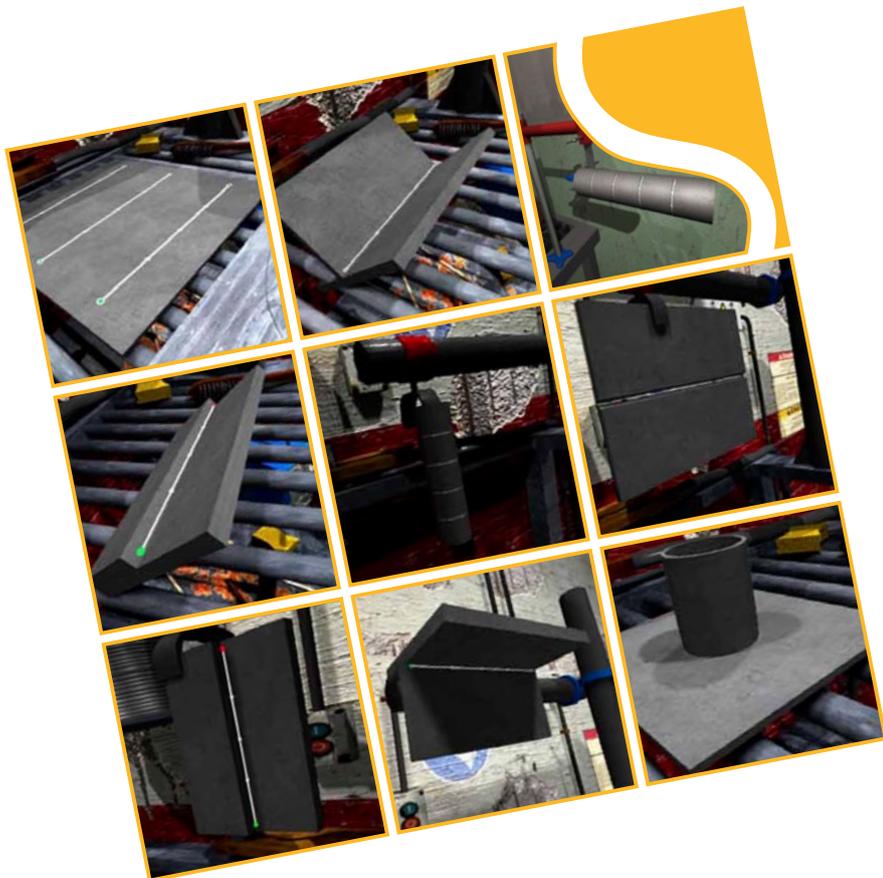


# Welding Simulator Software Features

## Pieces & Welding Positions

WeldTrainer includes the following pieces for all welding procedures:

- Exercises featuring a square plate to perform flat welding in straight lines with different directions and also curved lines with different radii.
- Exercises featuring tee joint in all positions (1F, 2F, 3F, 4F).
- Exercises featuring lap joint in all positions (1F, 2F, 3F, 4F).
- Exercise featuring butt joint without border preparation.
- Exercises featuring butt joint with border preparation in all positions (1G, 2G, 3G, 4G).
- Exercise featuring pipe to pipe in all positions (2G, 5G, 6G) with two different pipe diameters to select.
- Exercises featuring pipe to plate in all positions (1F, 2F, 4F, 5F) with two different pipe diameters to select.

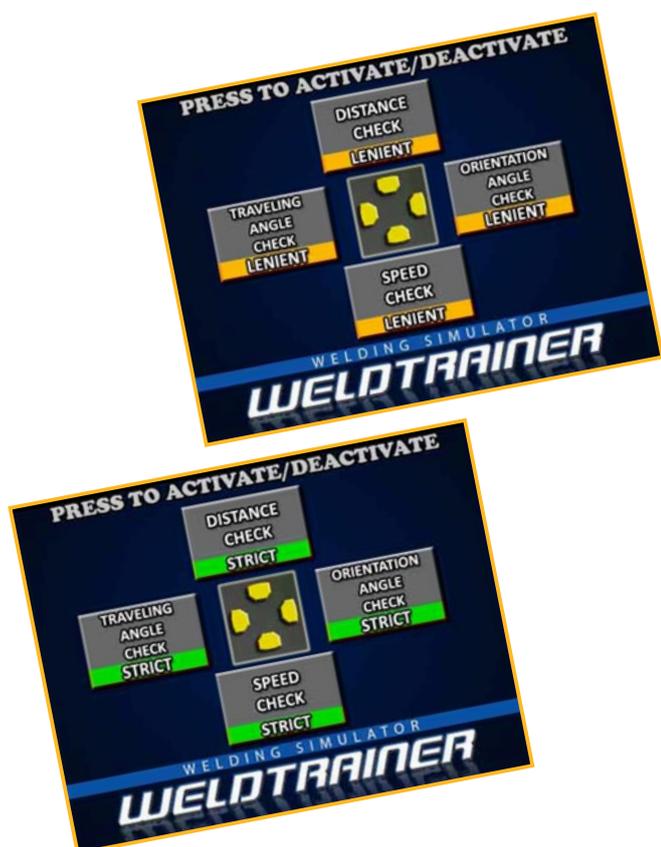


## Welding Parameters Control

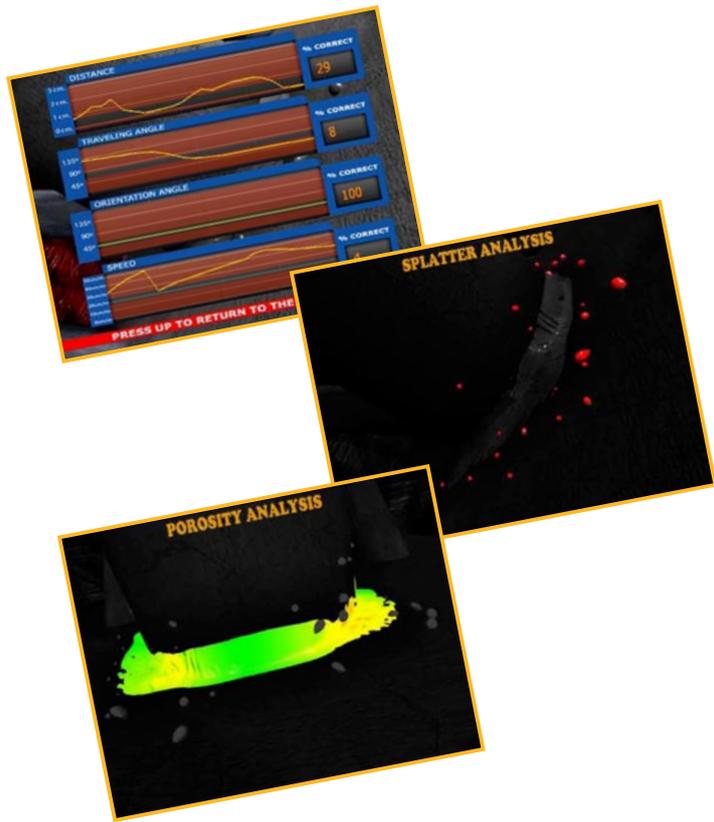
For each exercise you can activate or deactivate the error control of the relevant welding parameters such as welding distance, working angle, angle of inclination and welding speed.

The activation of the control of each of the parameters can be selected in strict or tolerant mode, so that the error margins determined by the system are more or less strict depending on the selection of the user.

When a parameter is activated, the system displays the exact numerical measurement of its value at each moment during the execution of the pass, as well as correction indications. It sends the user different vibration patterns that report errors in real time during the execution.



# Welding Simulator Software Features



## Analysis & Results Report

When the user finishes every welding pass, the system shows a telemetric report with the numerical data of each parameter during the execution.

The virtual scene visualising mode can be changed at any time in order to see it in special modes which show the analysis of porosity, penetration and splatter. In these special modes, the welding cords are shown in different colour scales that determine the area of the cord where the result is correct and the ones in which the result is not correct.

For every welding pass, the system stores screen shots of the telemetric report as well as screen shots of the result of the welding cord from different angles.

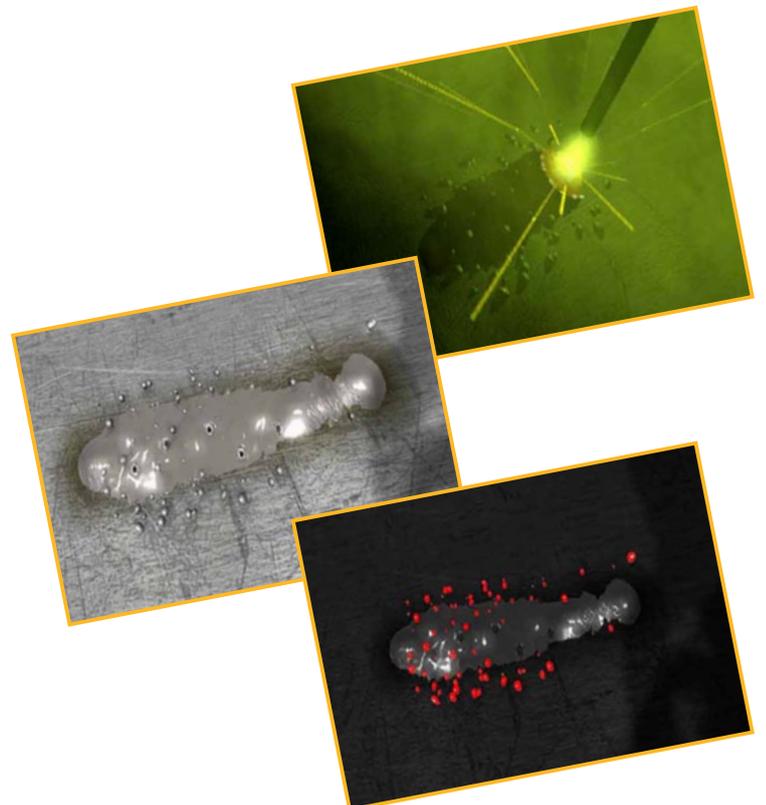
These screen shots are sent to the instructor position so that they can be viewed at any time.

## Replay System

For every exercise, the system saves an interactive repetition of the execution and therefore allows the user to view it.

As it is not a video but rather an interactive replay the user finds themselves in the very same virtual scene as in the exercise and is able to move around the scene with the same freedom as in the execution itself. It is also possible to pause and rewind the replay forward or backward to the desired point.

In this way the system offers the user the possibility to review the same virtual scene and fix the mistakes made, something which is impossible to replicate in the real world.



# Welding Simulator Software Features

## Right & Left-Handed Users Support

Before launching any exercise, the system lets the user choose if he is right handed or left handed in order to adapt the direction of the welding beads accordingly.



## Theory Test Mode & Questions Editor

The system includes a mode where the user can have theory tests based on a series of multiple choice questions.

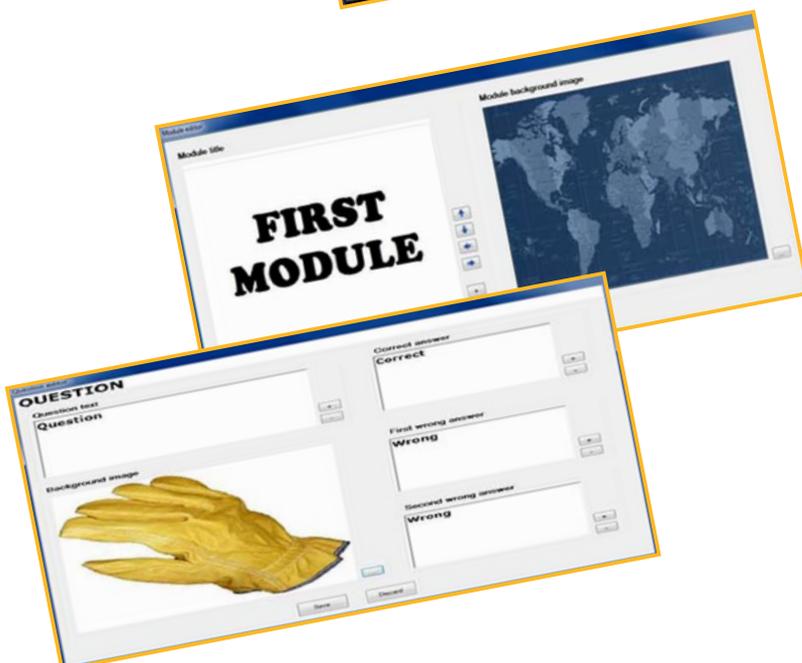
The content of the questionnaires is organised into several modules with a dozen questions per module. The system allows you to add as many new modules and new questions as you like by using a built-in editor integrated in the instructor position.

The results of every questionnaire are sent to the instructor position in order to view them in web format at any time.

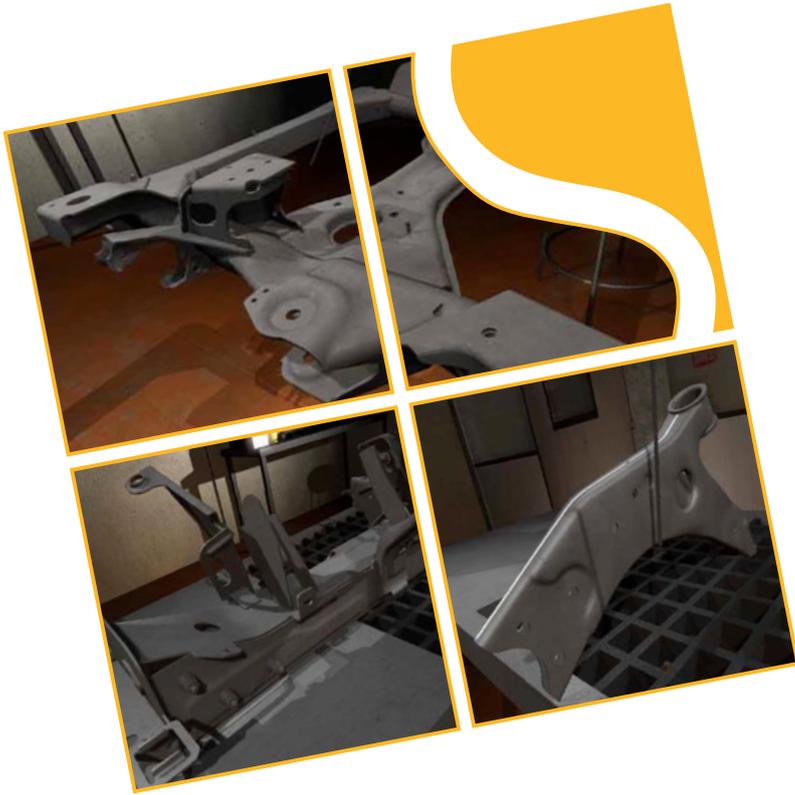
The system allows the user to create content tailored to the theoretical questionnaires, with no limit on the number of new modules and questions.

Using a simple editor integrated into the instructor position, the creation of the new content is managed and exported to the simulator, thereby adding it to the existing content.

The editor allows you to manage as many databases of new modules and questions as you like allowing you to export all together or separately.



# Welding Simulator Software Features



## Custom Pieces Integration

**WeldTrainer integrates a unique functionality that allows trainers to import into the virtual scene any piece of any size or shape and weld on to it. This feature makes it possible to add custom exercises for very specialised alternative uses of the simulator.**

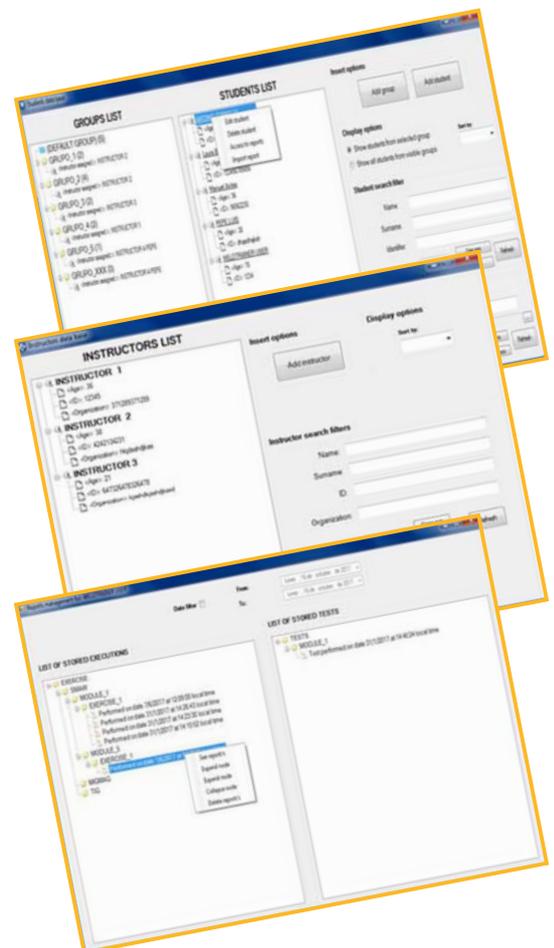
**This functionality is extremely valuable for industry where unique parts are required to be welded. The systems therefore allows welders to practice ahead of welding on the real item.**

**THIS IS AN EXTREMELY VALUABLE FUNCTION OF THE SYSTEM.**

## Instructor Position Functionality

The software for the instructor position includes the following functions:

- Manage the connection and status display of each connected WeldTrainer unit, with no limit on the number of machines that can be connected to a single instructor position.
- Manage a database of students which can be assigned to connected WeldTrainer positions.
- Manage the creation of groups for the grouping of students.
- Manage a database of instructors which can be assigned to groups.
- Receive, organise and manage the performance reports and results of each student's exercise, including the telemetric report of each pass and all the results captured in the simulator.
- Receive, organise and manage the result reports of the theory test questionnaires.
- Be able to view any report in html format from the web browser.
- Allow access to all reports of any student at any time even with the simulators turned off.
- Provide access to the editor of theoretical questions.





## First in Vocational Training Equipment

Training Systems Australia is committed to helping TAFE's, Polytechnics, RTO's, Schools and Universities of all sizes to deliver better learning outcomes.

We supply world leading equipment, teaching resources and courseware that:

- Improve Student Engagement, Retention and Confidence
- Allow for Experimentation, Investigation and Research
- Provide for Blended Learning
- Create Teaching and Operational Efficiencies
- Are Industry Relevant and Upgradable

Our experience, our range of products and our investment in implementation and ongoing support will make a big difference to students, teachers and your whole organisation.

We are happy to assist with planning, budgeting, lab design and product specification – even prior to funding. Call us to discuss your current requirements or future vision.

Supplying exceptional equipment, resources and courseware for:

- Automotive Technologies
- Robotics, Automation and Advanced Manufacturing
- Electro Technologies and Electrical Installation
- Machines & Drives and Power Electronics
- Refrigeration and Air-conditioning
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- Instrumentation and Process Control
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