# TEASER

# Teacher as Avatar

## Teaching and learning scenario

## Three-point calibration on the LC2030 – with avatars



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# Contents




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# I. Master Data and Context

- **Scenario Title and Abstract:** The scenario is titled **"Three-Point Calibration on the LC2030 – with Avatars".** In this learning unit, the trainees carry out a practical **level calibration** on the LC2030 chemical test facility. The aim is to reconcile the real physical display of the system with the digital visualization on the PC by applying the method of **three-point calibration** . Learners use AI-powered avatars as digital tutors who provide instructions asynchronously and guide them through the process of recording readings and analyzing data.
- **Occupational field and target group:** This scenario is located in the field of **chemistry, process engineering and process automation** .
    - **Target group:** The scenario is primarily aimed at **trainees (VET apprentices) from the 2nd year of apprenticeship**.
    - **Occupational profiles:** Prospective chemical technicians **and** chemical laboratory assistants **who need to acquire skills in plant control and measurement data evaluation as part of their training (e.g. in the elective qualification in digitalisation)** are particularly addressed.
- **Learning objectives:** The competencies to be acquired are broken down as follows:
    - **Knowledge:** Participants understand the **basic principle of three-point calibration** and the mathematical logic behind the creation of a trend line/equation for calibrating technical displays. They know the structure of the LC2030 system as well as the functions of the level indicator and signal processing. They are also aware of the specific syntax requirements in control scripts (e.g. the use of periods instead of commas in decimal numbers).
    - **Skills:** The learners are able to systematically record measured values on the system and on the PC and to prepare them in **Excel diagrams** (XY diagram). You will master the **customization of the visualization** by entering correct calibration equations into the control script. In addition, they can operate the avatar via QR code as an interactive aid directly at the system.
    - **Competencies:** The trainees develop the competence for **independent problem analysis** by identifying and correcting deviations between reality and digital display (e.g. incorrect displays of "-4"). They can critically reflect on their results, systematically track down causes of incorrect calibrations (such as reversed axes in the diagram) and independently prepare the system for subsequent regular operation.



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# II. Educational Design

- **The "Educational Question":** The central pedagogical challenge is that the **calibration of technical displays** is a highly precise, but often repetitive process that requires a high degree of individual attention in training. Instructors often spend a lot of time explaining standard procedures such as measurement or the mathematical logic of trend lines over and over again, which ties up resources for more complex problem analysis. The specific "Educational Question" is: **"How can specialized expertise in measurement value preparation and script entry on a complex system (LC2030) be taught in such a task-related and asynchronous way that trainees can independently master the process of three-point calibration and correct errors in digital visualization independently?"**.

- **Didactic setting:** The scenario is embedded in the theoretical framework of the **SAMR model** and the European competence framework **DigComp 2.2**. In the sense of the SAMR model, the level of **"modification" is** reached because the learning task is functionally changed by the integration of AI avatars in such a way that asynchronous troubleshooting instructions (e.g. correction of an incorrect display of "-4") are possible directly at the point of action. Station-based learning is used as a teaching method : Learners work directly on the LC2030 physical system and use mobile devices to retrieve task-specific avatar instructions via QR code. This approach combines **practical measurement data recording** with **digital data analysis in Excel** and **reflection on target/actual deviations**.

- **Role of the trainer/teacher:** The teacher undergoes a role change from primary knowledge imparter to **moderator, coach and pedagogical advisor**. While the avatar explains the standardized steps of three-point calibration and the mathematical logic of equation calculation, the instructor takes on the following specialized tasks:

    - **Demonstrator for real procedures:** It introduces the physical handling of the system, as avatars can complement the practical demonstration in the real world, but not completely replace it.

    - **Pedagogical advisor in case of complex errors:** He supports the learners if the calibration fails despite avatar instructions (e.g. in the case of reversed axes in the diagram or syntax errors in the control script).

    - **Quality assurance:** He carries out plausibility checks of the scripts created and provides individual technical feedback on the accuracy of the calibration.

    - **Reflection facilitator:** He moderates the final discussion on the importance of precision in the process engineering industry.



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# III. Technological implementation

- **AI and avatar solution:** In this scenario, **linear 2D AI-generated avatars** are primarily used, as this type enables particularly simple and practical handling in everyday laboratory and workshop life. The avatar acts as a **digital tutor and specialist companion** during the learning process, guiding the trainees asynchronously through the complex steps of **level calibration**. A central function of the avatar is its role as a **demonstrator for process accuracy**: It visually explains how the real physical display of the LC2030 system is reconciled with the digital visualization on the PC, sets specific decision points and asks comprehension questions about the mathematical logic of calibration. Although the project also supports the use of **3D environments and AR/XR glasses** (e.g. HoloLens 2) for the spatial perception of avatars, the solution here deliberately remains low-threshold in order to focus on precise measurement recording.

- **Technical tools:** The technological infrastructure for three-point calibration combines physical industrial hardware with a specialized AI software chain:

    - **Hardware: The** LC2030 **chemical test facility** serves as a real training object. Laptops/**PCs** and mobile devices such as **tablets or smartphones** are used for control and evaluation .

    - **Trigger:** Physical **QR codes** are attached directly to the system and serve as a starting point to access the task-specific avatar videos on the go.

    - **AI software: ChatGPT** (GPT-4) is used for didactic script optimization and for the creation of comprehension questions. Visual animation is done via **HeyGen** or **Synthesia**, while high-quality voice acting **is generated** via Eleven Labs.

    - **Analysis tools: Microsoft Excel** is an indispensable tool for trainees to prepare the recorded measured values in an XY diagram and to calculate the necessary calibration equation (trend line).

- **Software-hopping approach:** The creation of the learning content is carried out via a technical chain established in the TEASER project **(software hopping),** which enables teachers to produce professional media without programming knowledge:

1. **Content Capture:** The instructor begins by recording a short video or transcript of the real-world calibration steps on the LC2030.

2. **Text optimization:** This raw script is linguistically refined by **ChatGPT**, translated into a structured manual and prepared didactically.

3. **Media synthesis:** The optimized text is voiced in **Eleven Labs** and then imported into **HeyGen** to lip-sync the avatar.

4. **Interactive addition:** The finished avatar video will be supplemented with an **AI-generated quiz** (also created via ChatGPT) and made available via YouTube. This process ensures that the instructions for three-point calibration are consistent, modularly expandable and motivating for learners at all times.



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# IV. Detailed Lesson Plan

This lesson plan takes learners through the process of level calibration at a chemical experimental facility, linking theory and practice through AI-powered avatars.

## 1. Introduction and orientation

- **Duration:** 20–30 minutes.
- **Content:** The learners receive an introduction to the **basic principle of three-point calibration** as well as an overview of the physical system LC2030 and its digital visualization on the PC. A central problem that is addressed here is the discrepancy between the real display and the digital value (e.g. an incorrect display of "-4" in the software).
- **Activities:**
    - **Apprentices:** Scan the **QR code** on the system, follow the **avatar video**, make notes on the methodological procedure and ask comprehension questions about signal processing.
    - **Lecturers:** Demonstrate the basic handling of the system, explain the importance of correct measured values for process reliability and clarify technical questions about the control instructions.
- **Media:** Visualized attachment LC2030, **AI avatar video**, instruction script.

## 2. Execution of the task

- **Duration:** 60–90 minutes.
- **Contents:** Practical implementation of the calibration for the left tank of the system by **systematic measurement data recording** and subsequent adaptation of the control script.
- **Activities:**
    - **Apprentices:** Pump water into the container and record the real value on the system scale and the displayed value on the PC at three defined points (e.g. 5 cm, 20 cm, 30 cm). You transfer this data to an **Excel document**, create an **XY diagram** to calculate the **trend line (equation)** and enter this equation into the control statement script. In doing so, they pay meticulous attention to the syntax (use of **periods instead of commas** in decimal numbers).
    - **Lecturers:** Support the recording of measured values, provide assistance in the creation of Excel diagrams and monitor the correct entry of calibration parameters into the software.
- **Media:** LC2030, PC with **Excel** and visualization software (Winners), digital avatar as assistance.



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## 3. Evaluation / Review

- **Duration:** 30–45 minutes.
- **Contents:** Analysis of the remaining deviations between the system and visualization as well as **formative result assurance** by means of a knowledge test.
- **Activities:**
  - **Learners:** Interpret the values from the Excel diagram after calibration, make necessary fine adjustments to the visualization and document the final result in a protocol. They complete a **knowledge quiz** to confirm their understanding of the mathematical logic of the trend line.
  - **Lecturers:** moderate the analysis of the results, advise on anomalies (e.g. reversed axes in the diagram) and give feedback on the precision of the calibration carried out.
- **Media:** Excel charts, visualized LC2030, **interactive knowledge quiz.**

## 4. Completion of the session

- **Duration:** 20–30 minutes.
- **Contents:** Reflection on the challenges of the calibration process and transfer to industrial laboratory practice.
- **Activities:**
  - **Learners:** operate the now precisely calibrated system independently, carry out a final test filling and reflect together on sources of error (such as syntax errors in the script).
  - **Teachers:** Summarise the most important findings, present the relevance for modernised training regulations (e.g. elective qualification digitalisation) and provide advice for further practice.
- **Media:** Calibrated system LC2030, instruction script, reflection sheets.



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# V. Resources and collateral

## 1. Videos

The scenario is based on AI-supported video instruction. The transcripts were created using teacher recordings and **didactically optimized** by ChatGPT.

- **Level calibration on the LC2030**
  - *Problem analysis:* The avatar points to an obvious error in the existing visualization at the beginning – the fill level is indicated as **"minus four",** which is physically impossible.
  - *Measurement acquisition:* The video guides you through the process of recording three reference points. It is documented how the values on the physical system scale (e.g. 30 cm) are compared with the raw values on the PC (e.g. 27.5).
  - *Mathematical Implementation:* The text explains step-by-step how to create an **XY chart in Excel** to calculate the trend line.
  - *Syntax rule:* A critical part of the video is the script input instruction: It is explicitly pointed out that the control script must use **periods instead of commas for** decimal numbers (e.g. "1.605" instead of "1.605").

## 2. Interactive Components

To ensure measurement accuracy and understanding of mathematical relationships, the scenario includes the following interactive elements:

- **Knowledge quiz on three-point calibration:** A specific questionnaire examines the core aspects of calibration.
  - *Sample questions:* "What is the goal of three-point calibration?" (matching metrics to create a trend line) or "Which character should not be used in the statement script?" (comma).
  - *Feedback loops:* If the answer is incorrect, there is immediate pedagogical feedback that explains the difference between mere visualization and physical calibration.
- **360-degree learning environment (H5P/Hedra):** Learners can use an immersive virtual environment to interactively retrieve information about the LC2030's individual sensors and components before starting the real-world calibration.
- **Excel evaluation tool:** A prepared Excel template allows the calibration equation to be quickly generated from the recorded measurement points.



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## 3. Media Portfolio

The media portfolio establishes the visual and technical connection between the digital instructions and the real hardware.

- **AI Avatar Suite:** Linear 2D videos animated with **HeyGen** and voiced by **Eleven Labs** with a high-quality, natural AI voice. The avatar acts as a digital tutor who gives instructions directly at the point of action.
- **QR code triggers:** Physical QR codes are attached directly to the LC2030 measuring points. By scanning with a tablet or smartphone, trainees gain immediate access to the appropriate video tutorials for recording measured values.
- **Visualization guide:** A portfolio of screenshots shows the correct entry of the calculated equations into the visualization software **Winners**.
- **YouTube archive:** All instructional videos can be accessed via the central **TEASER YouTube account** and can also be used for repetition purposes outside the lab.



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