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IO 5: Digital learning sequences

Final outcome

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Partnership

VHS-Bildungswerk GmbH, Thuringia (Germany) (Coordinator)

Solski center Skofja Loka, Skofja Loka (Slovenia)

Eurocultura, Vicenza (Italy)

Society for the Promotion of Educational Research and Qualification mbH Berlin (Germany)

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Content

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1. Importance of digital learning sequences

Vocational education and training is a key factor in shaping the green and digital transitions in a sovereign Europe (COM (2020) 102 final, Brussels 10.03.2020)). The acquisition of technical, human and social skills to cope with the demands associated with change should be realized on the basis of vocational pedagogical concepts that impart job-oriented vocational competencies. Digital learning sequences also play an important role in modern teaching-learning settings for imparting professional competence. The creation of digital learning sequences is of great importance in contemporary educational processes for several reasons:

- **Individualization and adaptation**: Digital learning sequences enable educational institutions and teachers to better adapt the learning process to the individual needs and abilities of learners. By adjusting the content, difficulty, and pace, learners can learn more effectively and efficiently.
- **Flexibility and accessibility**: Digital learning sequences offer the possibility of learning independent of time and place. This means that learners can use the materials and resources when it fits best into their schedule. This is particularly important for lifelong learning and the compatibility of education with other commitments.
- **Multimedia and interactive elements**: Digital learning sequences can include multimedia elements such as videos, interactive simulations and quizzes that deepen understanding and encourage learner engagement. This helps to make the learning process more effective.
- **Updatable**: In a rapidly changing world, digital learning sequences can be easily updated and adapted to reflect the latest state of knowledge and developments. This is especially important in areas such as technology, science, and healthcare.
- **Measurability and feedback**: Digital learning platforms enable the collection of data on the learning progress of the participants. Teachers and educational institutions can access this data to track progress, identify difficulties, and offer targeted support.
- **Collaboration and social learning**: Digital learning sequences can also integrate social elements such as online discussion forums, group projects, and virtual classrooms to foster collaboration and exchange between learners.
- **Efficiency and cost savings**: Digitizing educational materials can help reduce the cost of printing and physical resources. This is especially relevant in educational institutions with limited budgets.
- **Preparing for the digital world**: The ability to create and use digital learning sequences is an important skill for the learners themselves. It prepares them for an increasingly digitalized world of work, in which digital skills are becoming increasingly important.

Overall, digital learning sequences help to make educational processes more effective, efficient and flexible, which in turn can improve the quality of education overall. Therefore, the ability to create and use digital learning sequences is an important skill forteachers, educational institutions and

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learners alike. This is also where VACIDE comes in. In Intellectual Output 5, the activities in the project were focused on the creation of digital learning sequences. The results are described below.

2. Digital learning sequences in the VACIDE project

VACIDE developslearning projects to promote workplace-oriented vocational learning in the context of the requirements of Economy 4.0 for metal, electrical and commercial-administrative professions. The workplace-oriented learning projects promote process orientation through cross-professional and cross-activity learning. This approach is supported by the digital learning sequences developed in VACIDE to explain working environments and to accompany learning in the processing of the customer order "training robots" at different levels:

- With digital learning sequences in the form of videos, audio files, presentations and information in various open and closed formats, users of the workplace-oriented learning projects receive additional information and explanations that support them in working on the learning tasks. The digital learning sequences are integrated into the workplace-oriented learning projects (see IO 1 – 4), but can also be used separately in other contexts, e.g. In career orientation, can be used.
- These occupational field-related learning sequences illustrate the specific activities as well as learning and working environmentsfor the project partners or project partners. Users who learn and work in other environments. This promotes an understanding of the processes in other contexts of action. The users of the learning sequences involved in the customer order are thus given the opportunity to better classify their own learning, their own work actions in the context of the upstream and downstream as well as supporting processes.
- By mapping work steps, learning situations and environments, it is possible to reflect on the learning process flexibly in terms of time and place in relation to the customer order.
- The possibility of documenting the personal work and learning progress or that of the learning group with their own digital devices promotes the media competence of thetrainees. They will receive appropriate instructions and suggestions from the trainers.
- Themedia-pedagogical competence of trainers and teachers is fostered through teaching/learning activities and the involvement of this target group in the development and testing phases of digital sequences and workplace-oriented learning projects.

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3. Results

The product IO 5 "Digital Learning Sequences" is aimed at trainees and trainers/teachers in the metal, electrical and commercialadministrative professions. Within the IO 5, two different products were created:

1. Tutorial for creating digital learning sequences
2. Digital learning sequences

Below are the products in more detail.

3.1 Tutorial for creating digital learning sequences

When creating digital learning sequences for successful learning processes, various aspects must be taken into account. As part of the VACIDE project, the project partner GEBIFO developed a tutorial with 25 tips for creating digital learning sequences. The tutorial provides information on the following questions:

- Why should I use tutorial videos?
- What types of videos are there?
- What are live-action films suitable for?
- What should I look for in a live-action film?
- What are animation videos good for?
- What should I look for in an animation video?
- What are screencasts good for?
- What should I look for in a screencast?
- How can I create a screencast?
- What is a slidecast?
- What are the benefits of videos for learning?
- What are the limitations and disadvantages of videos for learning?
- How can I get learners out of the Netflix consumer mindset?
- How long should an educational video be?
- For which learning objectives are learning videos suitable?
- How can I proceed to create a video?
- What is the structure of an educational video?
- Do I need a script?
- What equipment do I need to create a video?
- How professional does a learning video need to be?

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- Do I need to cut slips of the tongue out of the video?
- Music in video – yes or no?
- Do I have to be in the video myself?
- You, her or you? How should I address the learners?
- Should the video be shot vertically or horizontally?

The aim of the tutorial is to impart basic knowledge for the creation of digital learning sequences by means of the questions.

The product can be found in the appendix to the document.

3.2 Digital learning sequences

The digital learning sequenceswere developed by the project partners SC Skofja Loka for the professional field of electrical engineering, by EUROCULTURA for the commercial-administrative work and by the VHS-Bildungswerk Gotha forthe occupational field of metal.

3.2.1 Quality criteria

In the run-up to the creation of the digital learning sequences, the VACIDE project team agreed on various quality criteria. The following list of criteria was taken into account and at the same time represented a checklist in the development process of the digital sequences:

Usability

- There is an introductory and a summary structural element.
- Digital learningsequences are clear and unambiguous in the explanation of the learning tasks and the presentation of the working and learning environment.
- Digitallearning sequences are understandable and of high quality (good sound and image quality, medium resolution so that the files are not too large to download).
- Digital learningsequences ensure the transparency of teaching/learning processes.
- Digitallearning sequences have an approximate duration of 5 minutes.
- Digitallearning sequences are location-independent.
- Digitallearning sequences offer the possibility of being recalled repeatedly.
- Explanations of the digital learning sequences are self-contained.
- Additional information and explanations of the digital learning sequences support users in their learning tasks (e.g. tables and bulleted lists in the text).

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Screenplay

- When designing the digital learning sequences, the length and sequence of the digital learning sequences are taken into account.
- The conception of the digital learning sequences describes the events/actions to be shown.
- During the conception of the digital learning sequences, the people depicted are described.
- When designing the digital learning sequences, the environment in which the event takes place is described.
- When designing the digital learning sequences, parts of the text can be inserted into the videos for structuring.

Learning according to specific needs, independent of time and place

- The digital learning sequences relate to current requirements in connection with Economy 4.0.
- The digital learning sequences enable the learning process to be reflected flexibly in terms of time and place in relation to the customer order by mapping work steps, learning situations and environments.
- The digital learning sequences are linked to the acquisition of professional competence.

Relevance to the living environment for the participants

- The digital learning sequences build on the prior knowledge of the participants.
- The digital learning sequences promote the media competence of the trainees through the possibility of documenting their own work and learning progress or that of the learning group with their own digital device.
- The digital learning sequences increase the motivation to learn.
- The digital learning sequences promote self-learning skills.

Process understanding

- The digital learning sequences illustrate the activitiesand the working environment.
- The digital learning sequences offer the opportunity to transfer these approaches to other fields of activity and learning, including other professions.
- The digital learning sequences promote the understanding of processes in other contexts.
- The digital learning sequences offer the opportunity to better classify one's own learning and work activities in the context of upstream, downstreamand supporting processes.

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- The digital learning sequences promote process orientation by referring to cross-professional and cross-activity learning.
- The digital learning sequences describe the teaching/learning situations in connection with the field of work and activity.
- The digital learning sequences establish the reference to the learning objectives for the "production of a training robot".

3.2.2 Procedure

Using the instructional design, the professional field-related digital learning sequences were developed, tested and evaluated in the context of intellectual outputs 2 – 4 by the responsible partners, abstaining from the following steps:

- Preparation of the storyboard
  - Selection and description of teaching/learning situations related to the occupational fieldand activity
  - Conception of the media implementation with specifications of the media format as well as content and technical preparation
  - Shooting schedule, manuscript, document selection
- Editorial of the forum board with teachers/trainers to check the technical and pedagogicalrelevance and to involve the users in the development process
- Preparation of the sequences
  - video shooting and/or audio recording,
  - Cut
  - Compilation of documents
- Wrapping Up
  - Sound, Image, Editing
  - Explanationof texts/documents/graphics
- Reviewingeditorial work with the trainers on qualityassurance under aspects of clarity and unambiguity of the sequences for the explanation of the learning tasks and the illustration of the working and learning environment
- Testing of the learning sequences with trainees/apprentices
- Follow-up of the learning sequences on the basis of the tests in order to achieve the suggestions of the users toincreasethe relevance and user-friendliness

The provision in open file formats and the documented description of the development and testing process make it possible to adapt to other application contexts.

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3.2.3 Digital Learning Sequences Germany

Below are the links to the digital learning sequences that have been developed by the project partner VHS-Bildungswerk.

Introduction:
https://www.vacide.eu/introduction-thor-something-more-than-a-work-project/

Process:
https://www.vacide.eu/video-recording-of-a-process-procedure/

SD card:
https://www.vacide.eu/sd-karte/

3.2.4 Digital Learning Sequences Slovenia

Beloware links to the digital learning sequences developed by the project partner Solski Center Skofja Loka .

https://www.vacide.eu/de/design-and-manufacturing-of-the-training-robot/

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3.2.5 Digital Learning Sequences Italy

Below are the links to the digital learning sequences developed by the project partner EUROCULTURA.

Effective social media posts:
https://www.vacide.eu/creating-an-effective-social-media-post/

Marketing:
https://www.vacide.eu/marketing/

Social Media Marketing:
https://www.vacide.eu/social-media-marketing/

Complaint:
https://www.vacide.eu/complaint-management/

Sales Communication:
https://www.vacide.eu/sales-communication/

E-Commerce Management:
https://www.vacide.eu/gestione-e-commerce/

Storage:
https://www.vacide.eu/warehouse-management/

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4. Appendix

Below is an example of a screenplay from IO 4 .
In addition, the appendix contains the tutorial with 25 tips for creating digital learning sequences (see section 3.1)

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Example of a screenplay for the digital learning sequences in IO 4

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1. Introduction to the project

Form of presentation: declarant

Person: a declarant

Environment: quiet, uniform background (friendly)

Presentation/ animation in the video: possibly important key points in the explanations in the video 'pop up'

Text:

Hello and welcome to the project "Thor - more than a project work!". The aim of this project is to acquire basic knowledge of robotics with the help of a guiding text and to generate in-depth knowledge on the subject of robotics, the Thor robotic arm, its components and assembly. During the project, you will take on the role of a mechatronics technician trainee at ALU KG, where your class will work on the Thor robotic arm project.

But why does the topic of robotics play a role in your context? In today's digitalized world, the labor market is also changing. As a result, more and more robots are taking over tasks to support employees in the company. Therefore, it is of great necessity to take a closer look at this topic and to be well prepared for the coming world of work. But for the time being, it remains to be clarified what exactly a guiding text is and what is meant by the topic of robotics.

The Leittext method is an action-oriented method that guides the trainees to work on various tasks as independently as possible and is intended to contribute to a positive learning process. For this purpose, guiding questions are used, which are intended to guide independent action. Your trainer will serve as a consultant who will be available to answer important questions and provide assistance.

Robotics deals with the design, layout, control, production and operation of robots. In this topic, different approaches of mechanical engineering, electrical engineering and computer science are combined, with a main focus on artificial intelligence. The fields of application of robotics are in business, science, society, transport and the military. For example, robots are used in agriculture, as space robots, combat robots or as therapy robots. In addition, so-called industrial robots are used in industry, which are freely programmable in their motion sequences and can be equipped with tools, grippers or other production equipment and thus perform various tasks. The areas of application are mostly concentrated on assembly work such as welding or joining and the handling of workpieces.

With this short introductory information, you are well prepared for the following sub-areas and now have the opportunity to fully immerse yourself in the world of the Thor robot arm. Have fun!

2. Process chain additive manufacturing processes

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Form of presentation: " Snippets Video"

Person: an explanatory person (not to be seen)

Environment: Presentation of the individual steps by means of the respective snippets on a white/monochrome light background

Presentation/animation in the video: Snippets are placed in the video area at the appropriate time and pushed according to the process

Text:

If a generative manufacturing process is used, the product to be manufactured goes through different phases of a process chain. Which points are passed through becomes clear in this video.

The first processing phase is called "computer-internal processing". In this case, an internal computer 3D CAD file is created that represents the component. In this file, the part is modeled as a solid model. In doing so, it is important to pay attention to the design guidelines of additive manufacturing and especially to the guidelines of the chosen process.

The next phase is the preparation of the construction process. This converts the solid model into an STL file. The STL format is a standard data transfer format for additive manufacturing. In this format, the object surface is represented with the help of triangles and so the 3D model is saved with the help of the triangles and displayed as a grid. The more complex a model is, the more triangles are made for the exact shape description. It is important to note that triangulation errors can occur, especially during rounding. The triangles created describe the geometry but not the texture, color or material of the component.

In the step of component orientation, the adjustment of the support structure and the slicing process, the component is prepared for the printing process. The component orientation influences the accuracy of the component, the surface condition as well as the mechanical and technological properties. Necessary support structure is used for overhanging structures, undercuts or cavities so that the component can be printed in high quality and complete. The final slicing process involves decomposing the STL file into layers according to the layer height, creating 2D layer information. This information is used to generate the corresponding paths, which are then converted into G-code commands. Other setting parameters are, for example, the degree of filling, the amount of energy introduced (e.g. temperature or exposure time) or the travel speed. Subsequently, the construction time is calculated.

Subsequently, the machine is prepared for the printing process. This is understood to mean the filling and control of consumables (e.g. building materials such as filament) or the cleaning of e.g. the optics or the print bed.

Subsequently, the phase of the construction process occurs. In this process, the component is physically manufactured, which means the layer-by-layer structure of the component. When printing is finished, the physical model can be removed.

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After the phase of the construction process, the phase of post-processing occurs. In this process, the component is reworked, i.e. it is cleaned, freed from the support structure and, if necessary, cured again. Now the component is finished and can be used.

3. Make SD card bootable

Form of presentation: Screen recording during process execution, with explanations

Person: a person on the PC (not visible)

Environment: Screen recording, headset for sound recording

Text:

What does it actually mean to make an SD card bootable and why is it important for our process for Thor?

With the help of this process, the operating system is loaded onto the SD card, which enables it to run applications. The SD card serves as the operating system for the Raspberry in conjunction with the Thor control boards, which are used by these components. In addition, the SD card can be used as a hard drive for Thor.

How exactly the SD card is made bootable for the Windows system, I will now explain:

First, the SD card is connected to the computer. With the right mouse button you have to click on the Windows sign at the bottom left and then on Run.

*Then, in the command box, type **cmd** and press Enter. Now you have to* type ***diskpart*** *and press Enter as well. In the newly opened window, you need to* type ***list disk***. *Then, find your SD card in the list and select it. Now you have* to ***select disk*** and *enter the name of the SD card according to the list and confirm again with Enter.*

The next input steps are as follows: Clean, then ***Create Partition Primary***, then ***Active***, then ***Format Fs= NTFS Quick***, *then* ***Assign,*** *and finally* ***Exit.***

Then mount the ISO file by right-clicking on the image and selecting Mount. Now enter the command ***G: CD BOOT.*** *G is the drive letter of the ISO. Now all you have to do is enter the* ***EXE/NT 60 F*** command*. F is the drive letter of the SD card.*

Finally, all the files of the ISO need to be copied to the memory card. Now the SD memory card is in the bootable state.

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Tutorial with 25 tips for creating digital learning sequences

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