The path to creating subject-specific teaching videos for vocational teacher training

C. Czichy1*, M. Niethammer2, S. Odenbach1

1 Chair of Magnetofluid Dynamics, Measurement and Automation Technology, Institute of Mechatronic Mechanical Engineering, Faculty of Mechanical Engineering, TU Dresden
2 Chair of Construction Technology, Wood Technology, Color Technology and Interior Design/Vocational Didactics, Institute of Vocational Education and Vocational Didactics, Faculty of Education, TU Dresden

Abstract

The measurement and automation technology module is used as an example to show how a content-adapted, flexible, practice-relevant, practicable and modern teaching and learning format was developed for student teachers at vocational schools. In this context, a guideline is provided to enable the knowledge gained, the necessary work steps and the challenges of such a redesign of a module to be transferred to other modules. On the one hand, the methodology is kept general so that a transfer can take place regardless of the module or field of study, while at the same time explicit assistance, tips and examples are provided.

Anhand des Moduls Mess- und Automatisierungstechnik wird beispielhaft gezeigt, wie für Lehramtsstudierende der Berufsschulen ein inhaltlich angepasstes, flexibles, praxisrelevantes, umsetzbares und modernes Lehr-Lernformat entwickelt wurde. In diesem Zusammenhang wird ein Leitfaden gegeben, um die gewonnenen Erkenntnisse, die notwendigen Arbeitsschritte und die Herausforderungen einer solchen Umgestaltung eines Modules auf weitere Module übertragen zu können. Die Methodik ist einerseits allgemein gehalten, so dass ein Transfer unabhängig vom Modul bzw. der Studienrichtung erfolgen kann, während gleichzeitig explizite Hilfestellungen, Hinweise und Beispiele gegeben werden.

*Corresponding author: charis.czichy@tu-dresden This article was originally submitted in German.
Why all this?

The design of courses is a constant topic in educational institutions. The demand for practice-oriented teaching tailored to the target group is set against the regulations for creating modules and the (time) limited capacities of teachers.

A small group of people such as the group of prospective vocational school teachers poses a major challenge for every teaching staff. No separate modules are offered for this group, but they are assigned modules from various fields of study that have a certain overlap with the future teaching area. However, these courses do not contain all the relevant topics and/or do not cover the required material. In addition, the combination of modules from different fields of study means that individual courses overlap. However, face-to-face teaching does not offer any flexibility and limits students' ability to attend all of the planned modules within a semester. This leads to students taking significantly longer than planned to complete their studies or even dropping out [1]. In view of the shortage of teachers at vocational schools throughout Germany [2-4], there is an urgent need for action.

To counter this, educational institutions need to develop alternatives. A combination of teaching videos with blended learning formats such as the flipped classroom can meet the demand for subject-specific content for small groups and also give students the opportunity to flexibly design their learning plan in combination with an application-oriented and practice-based examination.

Initial situation

Creating an educational video can be a great way to convey learning content in an innovative way. However, the production of such a video is also a major challenge. Starting with the content preparation and implementation, framework conditions such as the technical equipment are also important elements that need to be carefully planned at the beginning to ensure smooth and efficient video production. We would like to provide a guide from the curriculum analysis to the finished video. The various steps are shown in Fig. 1.

Fig. 1: Work steps for creating teaching videos for a (university) module for vocational school teachers.

1. The curriculum analysis

The first step is to determine what specific content should be included in the videos. The requirements analysis is a suitable method, as it is flexible in its creation and can therefore be adapted precisely to the content to be requested.

Fig. 2: Two examples of the results from the curriculum analysis.

First, the topic blocks that correspond to the module are selected from the respective curricula. This can be done by simply marking them (Fig. 2 left) or by writing out the relevant points (Fig. 2 right). The topics are then weighted according to frequency and scope.
2. Outline

As soon as the topics are known, the structure of the video series is created. The outline can be based on the existing structure of the module. Depending on how the topics are linked in the respective curricula, it may also make sense to combine or rearrange them. The duration of a single video is flexible and does not have to be 90 minutes, as the respective topic should be explored instead.

3. Storyboards

Once the rough content concept is in place, the technical preparation as well as the design of the framework story and the reference to practice are now carried out for each topic. The video is classically divided into an introduction, main section and conclusion. The content should be presented briefly and concisely. It was implemented in the form of storyboards, which for example document the set design, content, time and notes as shown in Fig. 3.

![Example of a storyboard.](image)

Technical contents:

With regard to the technical content, it is important to cover the overlaps between the training occupations and the module content. In this case, this means reconciling various vocational training courses such as machining technology, automotive mechatronics, industrial mechanics and system mechanics for sanitary, heating and air conditioning technology with the measuring and automation technology module. The learners' wishes with regard to required software or tools such as Excel should also be considered. It is important to define the needs of the learners and to decide how deeply the topic should and must be covered. A distinction should be made between what is absolutely necessary and what is merely background knowledge.

Frame story:

First of all, it is important to develop a clear framework that facilitates the introduction to the topic and opens up a problem. Open questions can arouse the learners' interest and motivate them to actively participate. In the final part, the introductory topic should be taken up and a reference to the internship or other relevant topics should be established. If necessary, this reference can already be made during the main part. For example, a thermometer can be shown at the beginning of the video regarding temperature measurement.

Practical relevance:

Another important aspect of the video is the practical relevance. For example, the measuring principles of measuring devices used can...
be explained here. Examples from various training occupations can also help to illustrate the learning content and strengthen the practical relevance. The elaboration of the teaching material is accompanied by presentations, for example, which contain in-depth technical information and illustrations and can form the basis for the slides used in the video.

Overall, it is important to find a balance between theory and practice, to offer a transfer from theory to practice and vice versa and to make the learning content appealing.

With a clear concept and a structured approach, teachers can create successful educational videos and convey their learning content in an innovative and effective way.

4. Overview of the work steps

In order to organize the shooting days as efficiently as possible, an overview of the individual work steps and scenes is helpful. In this overview, the scenes can be scheduled, responsibilities assigned and further steps for preparation and agreements planned, as shown in Fig. 4, for example.

5. Checklist

A checklist should be drawn up for the respective day of filming for preparation and execution, which, for example, queries the technical equipment, clothing, transition sets and subject objects. An example of such a checklist is shown in Fig. 5.

6. Script

There are various aspects to consider when creating a script for an instructional video. Firstly, depending on the speaker's preference, it is important to create a coherent text or key points in the video with a clear logic and a common thread. Time can play an important role here, as the creation of such a script can take a lot of time.

Another important aspect is the slide design, which should also be carefully planned. The integration of other media or objects can also increase the students' interest in the learning content and the benefits for everyday working life and should therefore be taken into consideration.

Various methods can be used to create a text-based script as shown in Fig. 6 on the left. One option is to use a dictation machine and special software that facilitates the extraction of the text. Proofreading the script is also important to ensure high quality. Alternatively, the script can also be created by taking notes.

In general, it is important to make sure that the transitions between the sentences or bullet points and the various scenes fit well and are clear (see Fig. 6 on the right).

A teleprompter can be helpful when recording the video, as the speaker has the script in front of them. However, only conditional formatting is possible here, which should be considered when creating the script.
Any presentation must also be coordinated with the script so that an image track can be recorded at the same time as the slides. A presentation is also a way of supporting the person speaking. It is important that the same format is used as for the camera settings, e.g. 16:9.

### 7. Test run technology

To ensure that everything runs smoothly during the shoot, the equipment should be set up and checked in advance. This includes charging the batteries, checking the memory cards and a test run on location. In the course of this, the image and sound quality can be checked.
and the microphones used should be tested. With the camera settings, make sure that the same format is always used, e.g. 16:9.

Once a suitable set-up has been found, it should be documented, e.g. with photos, so that it can be restored quickly for further filming.

Fig. 7 gives an impression of such a turning set.

Fig. 7: Test run of the technology.

8. Filming

The actual filming can only start after a test run. Beforehand, however, all employees should be informed about when and where the filming will take place in order to hopefully have a quiet background. In addition to the equipment, other items such as a clapperboard or warning signs can also be helpful, as can a clothing check. The checklist created for support can be used for documentation purposes.

Various camera settings are used during the shoot. In addition to a front camera, other cameras for side, close-up and detail shots are helpful to avoid duplicate filming. However, it is important to ensure that a uniform format is used and that the respective film ends do not appear on the shots from the main camera if possible.

When using presentations or other elements on a screen, it is necessary to record the screen as a separate image track. This ensures the appropriate image quality and simple synchronization with the image or audio track of the person giving the presentation. Suitable software is OBS, for example.

9. Cut

Once all the image and sound data has been collected and saved, the individual scenes can be merged. Different camera angles, close-ups and long-distance shots, scene transitions and synchronization of the soundtrack play a decisive role here. Various software programs such as Matrix (Fig. 8) offer support here.

Fig. 8: Matrix.

10. Implementation

Once the videos have been created, they must be made available to students via a platform. In principle, an evaluation or test run with subsequent feedback from the relevant target group is necessary before general publication for teaching purposes. If only videos are made available, a learning process is only achieved to a limited extent, especially with regard to a deeper understanding. For this reason, a combination with a blended learning format such as the flipped classroom and practicals makes sense. Here, students must first watch the videos and work through the material in order to then present it in their own words in the form of a presentation and, for example, back it up with their own examples. Different topics can be covered using a rotation principle. In addition, future teachers practise applying didactic concepts and preparing teaching content in a clear way. As this is an examination, corresponding assessment sheets (Fig. 9) must be created.
Summary

A combination of instructional videos with tailored content and blended learning formats such as the flipped classroom can be used to meet the needs of teacher trainees for vocational schools.

This first requires a curriculum analysis to determine which content is relevant and which learning objectives are to be achieved. The structure must then be defined in order to create a clear common thread.

To make the video appealing, it is important to develop a framework and include practical references and examples from various training occupations. The technical content should be designed in such a way that it covers the overlaps between the training occupations and the study module to be adapted.

It is also important to define and schedule the work steps for the individual videos in advance. A checklist for the day of filming and a script can help to structure the process. A technical test run should be carried out before filming to check the positioning of the cameras, the sound and the image quality.

Once filming is complete, the video is edited and published. The video is then evaluated in order to identify possible improvements for future videos.

Finally, it is advisable to implement the video in a suitable blended learning format to create a flexible and effective learning environment.

With this one-time effort to create sustainable and reusable videos, there is only a small amount of effort for the teachers for subsequent semesters with regard to the respective blended learning structures. For the students, however, there is enormous added value.

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Literature

[1] internal request, TUD, April 2023