SFIVET

SWISS FEDERAL INSTITUTE FOR VOCATIONAL EDUCATION AND TRAINING

Swiss excellence in vocational education and training

INTEGRATING INTERACTIVE VIDEO IN A LEARNING SCENARIO

GUIDELINES FROM IV4VET PROJECT

The present guidelines are the result of the collaborative efforts and competences of an extensive working group within SFIVET. We would like to thank all of those who, both in formal and informal discussions, contributed to analysis of the topic as well as the operational instructions contained in these pages. We would also like to thank the members of the scientific committee that supervised the project (in alphabetic order: Carmela Aprea, Lorenzo Cantoni, Maria Beatrice Ligorio, Hans van der Meij, Carmen Zahn): their constructive criticism has always ensured the efficient and effective development of IV4VET. We would also like to thank Rachel Dobson for her oustanding work correcting the drafts. However, none of this would have been possible without all of the teachers who took part in the project. While there are too many to list individually, their enthusiasm, time and feedback resulted in so many significant experiments and we cannot thank them enough. Our heartfelt appreciation goes out to each and every one of them.

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INDEX

Introduction

The present document is intended as a tool for education and training professionals working within the Swiss VET sector. It presents the results of the IV4VET project (see infobox) in the form of guidelines and practical suggestions on how to integrate interactive video in education and training activities.

The first section of this document explains the reasons why video can be a useful learning aid. It also describes the features that distinguish normal videos from interactive ones and highlights the added value that interactive video can bring to teaching-learning activities. The second section of the document describes the various stages of integrating interactive video in the learning process. We then discuss various examples of didactic approaches to illustrate the various possibilities.

The main text is complemented by three additional instrumnets:

- Infoboxes blue background: to provide additional information about the project, the research findings obtained during the project, various 'theoretical' elements referred to in this research;
- Practical suggestions green background: to provide practical indications in the form of guiding principles on how to use (interactive) video. In this sense, the whole chapter 2, has a green background;
- Testimonies pale green background: to propose a direct except from interviews to teachers who used interactive video.

IV4VET – Interactive Videos for Vocational Education and Training

Funded by the State Secretariat for Education, Research and Innovation (SERI), the IV4VET project was conducted from 2014-2016 as a follow-up study to the Scuolavisione project (2011-2014). The aim of both projects was to identify the conditions enabling effective use of interactive video in teaching and learning, particularly within the Swiss VET sector. What makes these two projects stand out is the direct involvement of vocational school teachers in the design, development and implementation of various didactic scenarios involving the use of interactive video. Both projects had over 40 vocational school teachers in the Canton of Ticino conducting design-based research activities and both projects enabled the collection of quantitative and qualitative data from the viewpoints of teachers and learners. In this manner, all of these individuals actively contributed to the results being presented here briefly.

1. Interactive video

1.1 To start with: why video?

Our society has become increasingly (audio-)visual; recent years have witnessed the increasing *consumption* and *production* of audiovisual content on the part of users. 'Videos' have become a part of the daily life of the younger generation. They are the main media experience in one's free time (Feierabend and Rathgeb, 2009), accessible on the move via smartphones (James, 2016), and have also emerged as a learning tool: think of the recent, huge success of MOOCs – Massive Open Online Courses (e.g. Giannakos, Jaccheri and Krogstie, 2014).

The use of visualisation - whether it be static or dynamic - in support of the learning process is indeed a topic that has long been of interest to education science, from Comenius to the encyclopaedia, to the 'picture superiority effect' (see Kirkpatrick, 1894) theory developed in the late nineteenth century. Neuroscience tells us that the brain devotes about half of its resources at all times to the processing of visual information (Medina, 2010), which completes a framework that cannot go unnoticed to anyone involved in the education and training field.

Video is a tool widely used in teaching. However, as shown in the study conducted by Hobbs (2006), this tool can still be used improperly in so many different ways, e.g. as a reward to learners for good behavior or as a means of 'killing time'. The author also reminds us that - unlike what often happens in classrooms - one should never show a video without first clarifying what we hope to achieve and why we are watching it.

Before considering the merits of interactive video, it is worth recalling the conditions needed to ensure that video can support learning. While scientific literature (see Renkl and Scheiter, 2015) reminds us that static images are generally better than dynamic ones (because it is more difficult to form a mental representation of a dynamic source), it is also true that animations can bring added value when the knowledge to be gained relates more to processes (see Höffler et al., 2013; Müntzer, Seufert and Brünken, 2009; Höffler and Leutner, 2007).

According to Höffler et al. (2013), the efficacy of animations specifically has to do with

- *the content*: if the content involves an object in motion (e.g. wrapping a bandage around a hand, the movement of electrons in a battery), then animations are more effective than fixed images because they facilitate the creation of a mental model of the movements to be acquired, serving as a prototype;
- *the type of knowledge* to be gained: here, animations are more effective in facilitating acquisition of procedural and motor skills than declarative knowledge; and finally
- *the quantity of information* presented.

The video can therefore be used as a teaching aid (Chambel, Zahn, and Finke, 2006):

- By reconstructing real experiences thanks to the high level of authenticity and realism;
- By allowing learners to observe dynamic processes that would otherwise cannot be observed in real-life (e.g. because they are difficult to reproduce or are dangerous, costly, etc.) or that would be difficult to describe using words;
- By combining different symbolic systems such as graphics, text, narration into coherent multimedia content.

At the same time, when used properly, video allows teachers to:

- Increase learners participation, improving their motivation to learn and helping them to better focus their attention;
- Stimulate discussion;
- Encourage learners to think about what they are learning, e.g. by analysing their own professional practice;
- Set project-based dynamics in motion, involving learners in the process of designing, planning and producing videos.

The authors Schwartz and Hartman (2007) published a paper on the use of video which is still widely used and cited as a reference. In their circular model, they show that there are four main learning outcomes that videos are intended to achieve: Saying, Seeing, Doing and Engaging. For example, using a tutorial is presumably intended to develop ability and facilitate acquisition of procedural skills (Doing), whereas a video documentary or a testimonial is more readily suited for skills associated with 'Saying'.

1.2. What is 'interactive video'?

With these brief but necessary explanations of what is understood by 'video', we can now define the concept of 'interactive video'. There is no single definition used in scientific literature, but rather a multitude of definitions. To clarify the situation somewhat, we recently conducted a review of literature on the topic (Sauli, Cattaneo, and Van der Meij, 2017) to determine the key features of interactive video and how it differs from a simple video. Based on our analysis, we have developed the following definition:

> *An interactive video may be defined as a non-linear video, which offers both conventional video control and navigation functions (e.g. play, pause, stop, rewind/fast forward) and more complex ones (e.g. indices or summaries). Interactive video is enhanced with hyperlinks to additional material (documents, graphics, Webpages, audio files, etc.) using specific 'markers'. Interactive video may also include a certain variety of options enabling interaction, such as taking notes directly in the video interface, in individual and/or collaborative mode; in the latter case, each user can interact and exchange ideas and views with other users by posting shared comments (blog style). Finally, interactive video allows users to receive feedback, through the shared comments feature already mentioned, or automatically from the system (e.g. quiz feature).*

Interactive video or hypervideo? Analysis of the literature revealed that authors who draw a distinction between these two terms – very few, actually – do so on the basis of technical considerations, e.g. distinguishing between the two tools on the basis of their structure (linear vs. non-linear) or interactive features (use or lack of use of interactive points). For some, interactive video and hypervideo possess essentially the same characteristics, but are more pronounced in hypervideo. Therefore, from a purely pedagogical-didactic standpoint, the two terms can be used interchangeably.

From this definition, we can then conclude the following, commenting on Figure 1:

- Interactive video shares the same basic features found in a simple video. Here, we are referring in particular to the *dynamism* and some of the control features, referred to as *micro-level activities* (Merkt, Weigand, Heier, and Schwan, 2011; see Linear Structure in the scheme). These features allow users to pause the video, rewind, or fast forward, essentially letting users view the video at their own pace. This first set of characteristics is also associated with an object that has a *linear*

structure, like a video, which one watches from start to finish.

- There is a second group of features that allow users to navigate the video through a *non-linear structure*, choosing their own path within the video. In addition to the aforementioned control features, we also find *macro-level activities*, which allow users, for example, to divide the video into chapters and create summaries. In addition to facilitating direct access to content that is relevant to each user, these features provide a structured overview of content and break information down into smaller units, thus facilitating learning.

  A second important element is the presence of hyperlinks or interactive points, i.e. 'markers' that users can click on to gain access to additional materials (documents, graphics, links, audio, etc.). These features support learning as they help the user to draw correlations between different sources of information (e.g. linking 'practical' aspects shown in the video with underlying 'theory' or hearing different 'viewpoints' on the same subject). Interactive points also allow users to delve more deeply into video content and, if delimited both spatially and temporally, to also focus their attention.

  This second group of features are distinct basic features that are typically found in interactive video.
- Although the above-mentioned features were described in all of the studies on interactive video that we reviewed, there is an additional group of optional features that may or may not be present in an interactive video. We refer to these as 'exchange options'. From an academic standpoint, 'exchange options' refer to activities that stimulate individual or collective thought and analysis.

  This includes individual or collaborative video annotation, which allows users to add notes directly in the video interface and exchange comments with one another in relation to the same video. Finally, some interactive videos offer the possibility of inserting quizzes, which allow users to assess their own learning progress.

  Quizzes and collaborative annotation enable users to receive feedback, whether automatically from the system, as in the first case, or from other users (e.g. peer groups, tutors, mentors, etc.), as in the second case.

Once we have a clear overview of all of the different features that make a video interactive, we can now classify these features according to three different approaches to interactivity. Applying the classification already used in this technological field (see Beauchamp and Kennewell, 2008, 2010), we can therefore say that a video is interactive if there is:

- A *partner with whom to interact*. This would be the case of various control features (both micro- and macro-level) that allow users to moderate access to information according to their own abilities and needs;
- A *resource on which to interact*. This would be the case of hyperlinks and interactive points that provide access to in-depth resources and enable cross-referencing of different sources of information;
- A *medium through which to interact*. This would be the case of exchange options that allow users to interact with each other and to activate processes of analysis and reflection (incl. individual ones).

It is worth noting at this stage that these three ways of perceiving interactivity also open up three important educational opportunities that can be activated either in isolation or in a complementary fashion, depending on the teaching and learning objectives to be pursued or achieved.
A few examples would include the following: the teacher may develop a scenario where learners are asked to use the various control features and interactive points for self-study; alternatively, the teachers could design a scenario where learners are asked to analyse video (either individually or collaboratively), using the video annotation feature in particular. A third option might involve a combination of both approaches.

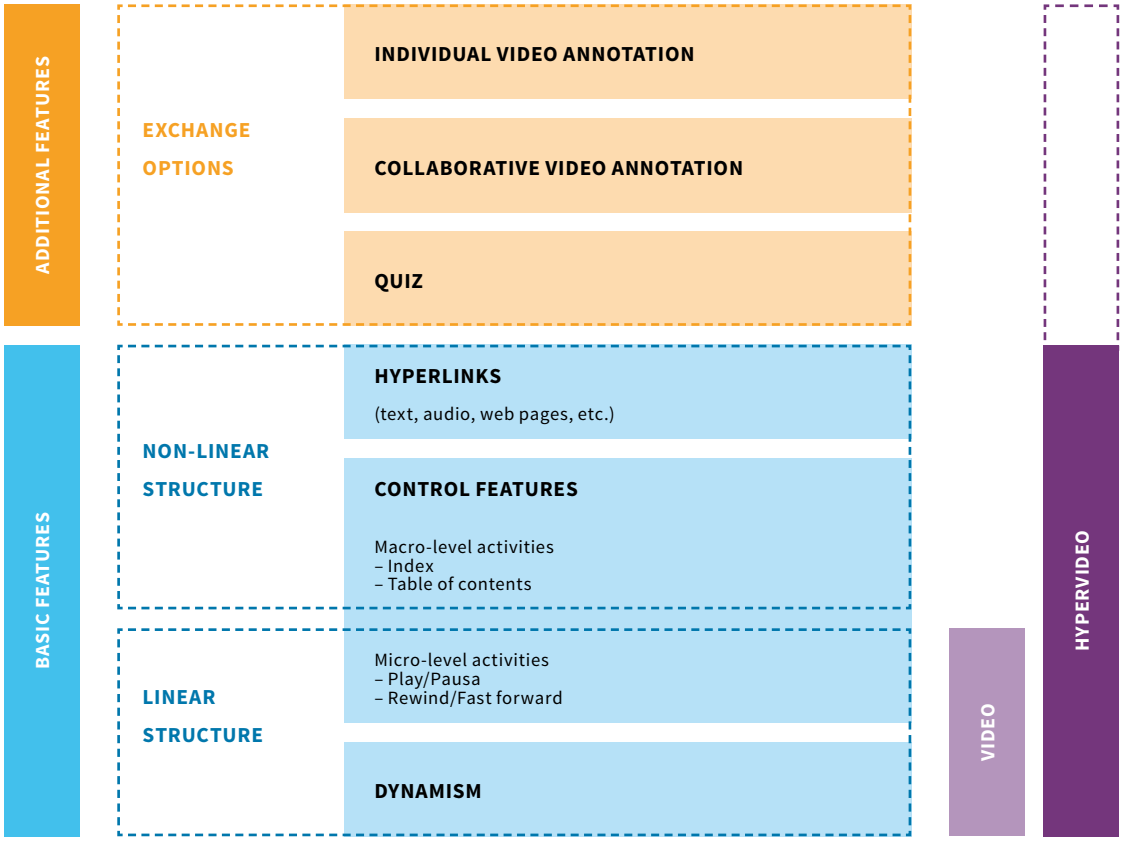


Figure 1. Features found in interactive video (see Sauli, Cattaneo, and Van der Meij, 2017).

1.3. What added advantages does interactive video offer? Added value perceived by teachers.

In the previous chapter, we showed the various features that are typically found in an interactive video. However, do these features really bring added value to teaching-learning processes? In this chapter, we intend to answer this question by considering what existing literature has to say on the use of interactive video for didactic purposes as well as – and more importantly – by asking a group of vocational school teachers who were involved in testing didactic applications of interactive video in the IV4VET project (see infobox in the introduction to this document).

There are currently over 1000 vocational school teachers from all three linguistic regions of Switzerland who are registered on the iVideo.education website, which is the platform through which interactive videos can be created and viewed. So far, over 500 interactive videos have been produced, some of which have not been made accessible to all users for reasons of ethics, privacy, or copyright. However, if we consider that each video produced for general education purposes involved 17 teachers and 27 classes of learners, then we can assume that thousands of learners have used these interactive videos.

We have compiled these results in Table 1 below. The table draws an initial distinction between pure video and interactive video (left-hand side of table). It then shows different types of added value, respectevely for teaching/learning processes (first column) and for learners (second column). Finally, it shows the specific tool that makes the added value possible (third column).

HYPERVIDEO	Focussing of attention More in-depth exploration of content	Regulation of cognitive load	Interactive points Hyperlinks
	Self-regulated learning Autonomy	Regulation of learning pace Self-assessment Reflection/analysis	Tool bar Index Quiz Video annotation
	Differentiation of didactic strategy Flexibility	Motivation, interest	Interactive video… + didactic strategy
VIDEO	Representation (seeing/showing)	Seeing/seeing again	Tool bar Multiple representations

Table 1. Added value of video and interactive video as perceived by teachers.

First of all, as already explained in the introduction, *video* allows us to:

- **represent abstract concepts that would otherwise be inaccessible, unusual or not directly applicable** in reality. It also offers the possibility of showing different representations of the same content. Learners can re-watch the video or added content as often as they like using the tool bar or view different representations of content (graphics, icons, etc.)

TESTIMONY

*'You become more aware of everything that has been explained to you and **you see it**. And you say to yourself 'now I understand what a blast furnace is and what molten steel looks like'. Because, prior to that point, you had only imagined it or seen a few photographs. However, in reality, you had never really seen it at all. […] **It helps to see it**, and once you have understood what it is, you will probably remember it and then know the difference between steel and cast iron. I've noticed that if I don't show the video, many learners simply can't tell the difference.'*

SUGGESTION

Always make sure that the visual information contained in your video, i.e. what is seen, brings added value. Otherwise, one might wonder what purpose a video serves…

In addition to this, *interactive video* offers the following possibilities:

- **focusing of attention and more in-depth exploration of video content** using interactive points. These points allow learner attention to be directed to a specific sequence or detail in the video and provide additional information about the content of the video. In this manner, learners can regulate the flow of information and avoid cognitive overload

TESTIMONY

*'I added other interactive points to highlight details. In some cases, these would be photos of sewing results and in others **important details or snapshots to focus attention on the cause of the anomaly**.'*

SUGGESTION

Use the *red dot* to *focus attention on the detail* that you wish to highlight.

TESTIMONY

'Interactive content allows learners to take a closer look at lesson content covered in class.'
'A combination of different media: written text, images, audio, links, movement: [interactive video] offers young people all of this, making learning more effective.'

SUGGESTION

Always choose with care (and moderation) the additional material that you wish to link to the interactive points. What is their purpose? What function do they serve?
You can also structure the additional material according to levels of detail, providing personalised access to users who wish to explore content to greater or lesser extents.

- **self-regulated learning**, with the possibility of assimilating information at one's own pace and to examine content at greater length in a more 'personalised' fashion

TESTIMONY

*'Taking their own time and following their own motivation, learners embark on the chosen didactic path, **devoting personal time and energy to each added piece of information, regardless of the pace that the class has taken. This, in itself, is a major development**.*
*In class, I often encounter situations in which the slowest learners 'bring down' the fastest ones or where the best learners set the pace at which the lesson is taught. In this case, however, we see a **democratisation of learning**.'*

SUGGESTION

An effective didactic strategy involving the use of video would be to provide individual learners with direct control over the video so that they can watch it on their own. Depending on the context, this basic strategy can also be applied to a flipped classroom (see infobox) approach as opposed to a distance learning or blended learning approach.

Flipped classroom is a pedagogical-didactic model that reverses the activity cycle and the teaching/learning roles typically found in a conventional classroom setting. To put things simply, if we consider the notions of 'lesson' and 'study/individual exercise' as two key moments in the learning process, the flipped classroom is characterised by work prepared at home before attending 'class'. In this situation, learners study assigned multimedia content before attending class. The various videos, interactive videos, audio tracks, etc. are prepared for them by the teacher. Later on in the classroom, emphasis is placed primarily on problem-solving, in-depth exploration of content, exercises, discussions as well as questions/answers and interaction with the teacher and fellow classmates on the studied material. The proponents of this model see the advantages in terms of more productive and efficient use of classroom time and the ability to reach all learners in equal measure.

- **help learners to become self-sufficient**, also through the self-assessment feature

TESTIMONY

***'It encourages learners to become more self-sufficient**. Users sit in front of the PC with headphones and this situation of **facing a computer screen to 'talk' with themselves** is rather unusual for them: they find themselves isolated in a way from their classmates and the classroom dynamics. At the same time, they have to use their own resources to carry out the various assignments. Of course, they are always able to ask the teacher for help. However, based on what I have seen so far, learners only ask the teacher for help for purely technical matters. Learners find that **having to manage their time and resources on their own provides them with a refreshing challenge that they are unaccustomed to**.'*

SUGGESTION

Use the quiz feature to allow learners to assess their own progress. Create quizzes to the portions of the video that need to be well understood in order to continue on to the more challenging material in the rest of the video.

- **stimulate processes of reflection** and analysis of professional practice, e.g. using the video annotation feature

TESTIMONY

*'It allows people performing an action to **examine and assess** their posture, the technique used, to identify difficulties and analyse the results obtained […]. They can also **observe** aspects associated with body, verbal and paraverbal language'*

SUGGESTION

One of the strong points of using video as a didactic tool is the effectiveness of reflecting on the video itself. Whenever possible, ask learners to use the individual video annotation feature to analyse and discuss what they have seen. The collaborative annotation session will also provide you with interesting didactic variants.

- **differentiating the didactic strategy and making it flexible**, expressing it in various forms with a direct impact on learner motivation and interest

TESTIMONY

'Using this technological innovation also means enriching classroom didactics, adding this new approach to teaching and learning to conventional lectures, guided and free discussions and group work.'
*'When I showed the video, all of the youngsters paid attention and seemed interested in the video. Then the video stopped and a series of true/false questions were displayed on the screen. **90% of the class had paid attention** and gave the right answers. In other words, **the video had a much greater impact** then the lessons I normally give on the whiteboard.'*

SUGGESTION

The next section describes a specific tool that allows teachers to design many different didactic variants that include different strategies.

1.4. Professional knowledge and general education

Although the figures that we have provided apply in general, our experiments also allowed us to gather specific indications for cases in which interactive video is used to develop professional knowledge or general education.

For the development of **professional knowledge**, interactive video is particularly useful to:

- show specifically how to carry out a given procedure;
- move beyond the level of abstraction achieved from words alone;
- show various viewpoints or different representations of the same object or procedure;
- represent complex concepts.

Here are a few testimonials:

*'[…] In a manual profession such as ours, **you learn by observing**. Having a video as a visual teaching aid is a great help, **particularly when showing work processes that are rarely carried out if at all**. […] In addition, you can also superimpose interactive points directly in the video. These interactive points can be used to initiate discussions, examine more important work processes in greater detail, etc.'*

In scientific literature, there is an abundance of research papers devoted to the use of video to facilitate **observational learning**. Other terms may be used (e.g. observational modelling, vicarious learning, social learning, behaviour modelling, mimicry, matched-dependent behaviour) but the concept is fundamentally the same: a process of acquiring knowledge, abilities and attitudes by watching examples of a given task as it is being performed.
The corresponding didactic strategy (often identified as **demonstration-based training**) is to use video to show how a given task is performed (partially or completely, a single task or a series of tasks, properly executed or containing mistakes, etc.) and to provide learners with accompanying information or instructions. For more details, see the interesting research paper written by Rosen et al. (2010).

'There can be major gaps in the healthcare field in particular. I can give you a good example: with general anatomy, you study a book with beautiful drawings showing exactly where things are on the human body. However, topographical anatomy is a whole different ball game. And then there is surgical anatomy. When you perform surgery, you don't have those little drawings to guide you. I therefore intend to produce a series of short video clips showing a real surgical procedure exactly as you would see it on the operating table. Immediately after each video clip, learners will see slides with a fixed image to enable comparison of reality and the drawing.'

'Another potential use is to show professional realities. Here the intention is not to talk about who is in charge and who the clients are. Instead, the idea is to show something like - let me see - different types of stoves, explaining the differences between an electric stove, a gas stove or an induction cooktop. I could then show learners how to prepare food for larger numbers of people at one time. Maybe one of my learners works in a restaurant and has an induction cooktop, but I have another learner who works with a roaster and yet another who works with a combi-steamer. And these are all kitchen appliances that have been shown in the book. There is a photo and maybe even one in colour but the video shows how the appliance is used. This is the other major advantage.'

Instructions on how to use demonstrations. In relation to the previously mentioned approach 'demonstration-based training' (DBT), Grossman and her colleagues (Grossman, Salas, Pavlas, and Rosen, 2013) have proposed a list of practical guidelines for those wishing to use video to facilitate observational learning. These guidelines are presented below. We have kept the same structure used by the authors in relation to the instructional features described:

Facilitating attentional processes

1. Incorporate activities that teach learners how to learn from the demonstration before the demonstration begins;
2. Initiate discussion before a demonstration takes place;
3. Provide organizers and summaries that are explicit and complete either before or during the demonstration.
   With iVideo.education, this can be achieved using didactic information (before), rather than using chapters and audio (during).
4. Incorporate attentional cueing through verbal or written indicators of key information.
   With iVideo.education, this can be achieved using audio, and especially when combined with the use of interactive points, mostly red dots.
5. Provide instructional narratives (presentation, story, description, report) that describe the reasoning behind demonstrated behaviours.
   This guideline is important because we are asked to describe not just what is being observed but rather the reasons prompting the behaviour, which are not readily apparent.
   In iVideo.education, this feature is also included by adding interactive points. The important thing to remember is that interactive points should be used in this manner sparingly to avoid cognitive overload.

Facilitating retentional processes

6. Discourage unguided note taking while facilitating guided note taking.
   One reason is that writing tends to distract learners, particularly when it is not possible to control the pace of the video. This is why the video stops when notes are displayed in iVideo.education; another reason is that guided note taking should be encouraged instead. Interactive points should be added to video for this purpose (e.g to prompt learners to take notes or to provide them with pre-determined layout/formats).
7. Initiate a group discussion following the demonstration period to further emphasize learning objectives and to provide feedback on in-training performance.
8. Incorporate perspective-taking activities into DBT through activities such as playing the roles of others, verbalizing how another might feel, or describing a task from an actor's perspective.
9. Provide rule codes, descriptions of specific rules to be followed, for demonstrated scenarios that have clear-cut solutions or appropriate actions.
10. Following the demonstration period, incorporate activities that require learners to generate their own rule codes in relation to the demonstrated behaviours.
11. Prompt learners to engage in imagery exercises after the demonstration has taken place, to ensure that they do so with an accurate mental model of demonstrated behaviours.

Facilitating reproduction processes

12. During DBT, prompt learners to engage in mental or physical imitation of the target behaviors.
13. Ensure that learners have opportunities to practice newly acquired knowledge, skills and abilities following the demonstration period.
14. Allow learners to generate their own practice scenarios on the basis of the demonstrated material.

Facilitating motivational processes

15. Incorporate passive motivation inducement activities (e.g. explanation of training utility) into DBT through brief lectures, activities, or discussions.
16. Induce motivation in learners through activities that emphasize the value of target knowledge, skills and abilities, highlight learners' deficits, or enable learners to perform an active role in the determination of learning objectives.
17. Incorporate goal-setting activities after the demonstration has taken place.

For ***general education*** purposes (LCS - language, communication, society), interactive video is particularly useful when the aim is to:

- Introduce a new topic;
- Include real stories in the class;
- Illustrate a historical event or historical figure;
- Place a given topic within a given context;
- Encourage learners to tackle more complex subject matter.

Here again, we provide a few testimonials from the teachers involved:

'Pre-packaged videos are never didactic, they assume that the viewers already possess a certain level of knowledge and skills; they are based on absolute assumptions, and out-of-context. They also are made on the premise that viewers are familiar with certain political, environmental, ecological, etc. aspects. And our role is precisely to situate content within a given context, to somehow adapt and work with this video, adding anything that can facilitate learning.'

'Some topics can be very boring, like filling out a tax return or ballot paper. And since learners may find a more novel approach like this to be more appealing, I would tend to choose subject matter that normally is not assimilated very well in regular classes because it is so mind-numbing'.

'I gave learners some free time to browse the Internet after they had finished their work [with interactive videos]. I found it very productive that they spontaneously took that opportunity to look for more information about the Heysel tragedy, which was covered in one of the two readings included in the video. In other words, the video prompted learners to deepen their understanding of a sports event that they were unfamiliar with. I interpreted this as a significant step by the youngsters in the pre-vocational course towards greater self-study. I suspect that it would be much more difficult if not impossible to achieve the same effect with a traditional lecture.'

2. Integrating interactive video in a didactic scenario

In order to effectively integrate an interactive video in a teaching-learning process, it is important to bear in mind the instructions provided earlier. Based on our review of the literature and the experiences of vocational school teachers, we have come up with a model (shown in Table 2) to facilitate the planning of didactic scenarios designed to tap the potential of interactive video. There are several directions that one can take using this model, depending on the intended learning objectives or the type of didactic strategy that the teacher wishes to adopt; some of these are presented for illustration purposes in the next chapter.

It may be a good idea to develop a complete pedagogical scenario to gather all of this information regarding didactic planning into a coherent whole. A model has been provided on the iVideo.education website. This model shows all of the variables listed here, the various phases of interactive video production, timeframes, actions taken by the actors involved, the materials required and the expected final product. The model is intended to be used as a didactic planning tool enabling you and your colleagues to re-use videos produced by others.

The model is based on two interconnected dimensions: planning of the interactive video and the involvement of the various persons in the planning process. Therefore, the model presents the various phases in the production of an interactive video, from preparation and selection of the raw video (1), creation of the interactive video (2) and finally its use for didactic purposes (3); at the same time, the model considers the roles played by the various actors in each of these three phases, each of which could be handled by the teacher or by the students working either on their own or as a group. In this chapter, we shall go over each of these three phases in detail and provide a few operational instructions.

		TEACHER	STUDENT individually	STUDENT in groups
PREPARATION	Raw video	A	B	C
PRODUCTION	Interactive video	D	E	F
USE	Interactive video	G	H	I

Table 2. Model to guide the planning of didactic scenarios that make use of interactive video.

2.1. Preparatory phase: identification and preparation of raw video

Selecting raw video and general considerations

In order to create an interactive video, you first need to have a video to start out with. The teacher can either use an existing video, e.g. taken from broadcasting archives, or can create his/her own video from scratch.

- If the idea is to use an **already existing video**, it is important to devote a certain amount of time to video selection. The search engines of broadcasting archives, specialised websites or video aggregation sites (e.g. YouTube, Vimeo, etc.) can make this task easier. However, it is important to make sure that you find out whether or not the videos in question are subject to copyright (see also 'Legal Guide from iVideo.education');
- However, if the idea is to **produce a video from scratch**, then there are two possibilities:
  1. Create a storyboard to reproduce a specific situation: in this case, the video represents a reconstruction or a simulation of reality.
     Planning the storyboard is extremely important in order to take into account all of the elements that one wishes to show (see infosheet about iVideo.education).
  2. Film a real situation to maintain authenticity and naturalness.

Depending on the type of didactic strategy that one wishes to adopt – and therefore taking into account the characteristics of learners and the given context – the teacher may decide whether to choose an existing video, to produce one from scratch or even to ask the learners to do this, either working on their own or as a group. In all cases, it is important to assign specific tasks to learners and provide them with adequate guidelines.

Editing raw video

Regardless of the option chosen in the previous section, you will need to make some changes to the video to make it interactive. Here, we are not referring to the technical characteristics of the video (format, quality or coding parameters) but rather to how the video relates specifically to the content that you wish to teach. The changes to be made in the video editing phase may vary according to the learning objectives and other requirements. In some cases, only minor changes are needed (e.g. cutting out a scene) but in others you may have to make more significant changes such as splicing and combining various video sequences or creating complete video footage.

SUGGESTION

Pay attention to the duration of the video! The amount of time needed to carry out an activity using the interactive video is much greater than the simple duration of the interactive video itself. This is because the video will include additional material and other activities to be carried out. We suggest that you **limit the duration of the video**: in our experience, we found that an average duration of 3 to 5 minutes worked well; in the literature, we found recommendations that video duration **not exceed 6 minutes** (Guo, Kim, and Rubin, 2014) in order to avoid overloading the cognitive resources of learners.

SUGGESTION

*Also carefully plan the **audio tracks** in your video*. Here, the aim is to use audio in line with the intended purpose of the interactive video, choosing the most inclusive scenario. If the teacher intends to show the video exclusively to the entire class as a group, then there is no need to include audio in the video, since the interaction between the teacher and learners will suffice. However, if the video is to be made available to learners at a later stage, or if the option of having learners watch the video on their own has not been ruled out, then perhaps you should consider immediately adding audio to your video. Devote a suitable amount of time to planning and creating of audio tracks: this task is anything but easy. Selecting the information to be included or excluded will already be a challenge!

2.2. Production phase: making the video interactive

Subdividing video into chapters

It is a good idea to subdivide video content into different parts (chapters), to facilitate comprehension of narration and give learners the time needed to gain a clear overview (Merkt et al., 2011).
In the creation of chapters, we suggest the following:

- ***Choose meaningful titles***, that are immediately understandable, that allow learners to quickly get an idea of the topics that will be covered in the chapter;
- ***Maintain semantic coherence***, creating titles that are evocative and semantically coherent, that allow users to situate themselves within the video and understand its internal structure;
- ***Insert an adequate, but not excessive, number of chapters***, to facilitate navigation and avoid information overload.

Inserting interactive points and other types of interaction

We have already seen how interaction in an 'interactive video' allows learners to:

- Explore video content at greater depth, thanks to multiple representations and the formation of linkages and correlations between the various concepts;
- Be able to process information at their own personal rhythm;
- Add notes to develop their own thoughts on – or analysis of – the video.

These three elements are often associated with the presence of interactive points. Interactive points appear over images in the video; clicking on the point will interrupt the video and provide the user with access to additional information about the subject (e.g. brief text, documents, webpages, graphics, audio, and possibly other videos).
The following steps need to be considered when creating an interactive point:

- Its ***function*** with respect to the content of the video and the learning objectives to be reached: interactive points can be inserted, for instance, to provide targeted indications, introduce a topic, define various concepts, provide bibliographic resources, share testimonials, display schematic diagrams, give instructions, assign tasks, formulate questions and so on;
- Its ***nature***: as we have seen, an active point can provide additional information, but can also be used to assign a task or start a quiz to assess one's own learning progress. A different active point should be used for each of these three macro-functions (see infobox below);
- Its ***spatial and temporal position***. Its spatial position can be used to focus learner attention on a detail in the frame that is particularly relevant to the content covered; it is important to set the position in a way that does not prevent learners from seeing the information that the teacher wishes to highlight (e.g. positioning the active point on the detail to be shown). Not all interactive points need to be spatially positioned, e.g. because they refer to an entire video sequence. In such case, emphasis is placed more on audio rather than visual content.
  The temporal position (duration) determines how long the interactive point will remain visible and clickable on the screen. Also in this case, it is important to pay attention to the relationship between the content of the active point and the frame being viewed, in order to avoid having the active point remain visible over content that it does not refer to (and corresponding audio track);

The iVideo.education editor allows users to add three types of interactive points plus a 'quiz' point. Apart from the latter, these interactive points serve the same purpose of enabling more in-depth study and/or a focusing of learner attention on a particular aspect.
The **red dot** makes reference to a specific detail in the video. For this reason, it is the only interactive point to offer a special feature apart from the temporal one: in other words, the red dot can be positioned directly on the object in the frame that the teacher wishes to point out.

The **blue triangle**, which indicates more detailed information, is used to mark an entire video sequence, as well as the **green leaf**, which is intended to assign tasks; both have a fixed position in the interface.
Although the various functions are 'predefined', it is possible to use interactive points in different ways: it is not uncommon, for instance, for red dots to be used to assign tasks, or to ask a question, merely because they can be positioned directly over the object in question.
Quiz points give learners the opportunity to assess themselves and check their answers on an ongoing basis (*in itinere*) or at the end of the video (*ex-post*). For each question, it is possible to insert up to five possible answers (true/false). When quizzes are provided *in itinere*, the aim is to ensure that learners have assimilated previous content that is needed in order to understand subsequent content. Inserting quizzes at various points in the video (*in itinere*) also allows the teacher to reactivate and maintain learner attention at high levels while the video is playing. Inserting a quiz at the end of the video (*ex-post*) is intended to encourage learners to re-visualise the video and refresh their memories on what they have just learnt.

- ***Additional material***. In order to avoid cognitive overload, it is important to carefully select the material to be linked to each active point, asking yourself whether there is a need to provide an alternative representation of the content shown in the video (e.g., through a diagram or technical sheet). This can be a useful means of strengthening the link between theory and practice, of showing various fields of application (transfer), or simply to provide an additional piece of information to delve more deeply into the subject matter;
- ***Creating opportunities for reflection***. We have seen how an interactive video, including video annotation tools, can be considered a means of stimulating analysis and reflection. Interactive points can also be used to facilitate and stimulate these activities. Whether the aim is to have learners work individually or collaboratively, it is important to make sure to include adequate prompts or questions in the active point to guide the activity. These can be inserted directly inside the interactive points (e.g. brief text) or gathered in an infosheet attached to the video (often, this infosheet is placed in the first active point at the start of the video).

Generally speaking, when adding interactive points, we make the following suggestions:
- ***Limit the quantity of interactive points***. The presence of too many visual stimuli, in addition to the visual and audio stimuli already present in the video, runs the risk of creating cognitive overload and subsequent disorientation (es. Arguel and Jamet, 2009; Chambel et al., 2004; Zahn et al., 2002);
- ***Exercise restraint when inserting additional material***. By 'restraint', we mean insert only the amount of additional material strictly needed to achieve learning objectives. With the exception of possible structuring of additional material according to different and progressive levels of understanding, we suggest that you not provide more information that what is needed to achieve the objectives for the given activity;

Video annotation allows users to add notes directly in the video interface, either by inserting captions to mark a specific detail in the video or adding the notes in a separate window, which could appear to the side or beneath the video. Some video annotation tools (see Rich and Hanafin, 2009; Rich and Tripp, 2011; Bonaiuti, 2012) allow users to interact with one another, sharing their comments and replying to comments posted by others. This feature is particularly useful to exchange various viewpoints (Zahn, Pea, Hesse, and Rosen, 2010) or to receive feedback (from fellow classmates, supervisors, teachers, etc.; see Colasante, 2011; Hulsman and van der Vloodt, 2015).

- ***Facilitate reflection and analysis***, e.g. by assigning tasks to be performed individually or in groups, including the use of video annotation to facilitate processes such as reorganising, elaborating, analysing and reflecting on information (e.g. Tripp and Rich, 2012; Colasante, 2011);
- ***Carefully choose the right moment to insert a new active point, giving preference to moments in which learners are not required to pay close attention to other video or audio material***. This is because visual and audio stimuli are mutually exclusive when they are used, which means that information in the video may be lost as a result (see Tua, 2007);
- ***Insert interactive points that make reference to specific elements that are immediately obvious to users*** (names of people, precise visual objects, places, etc.). It is important to make the relationship between the active point and external information as clear as possible;
- ***Set enough time and space between one active point and another*** if you want to add more interactive points to the same frame sequence so that the learner is able to clearly distinguish between each active point (see Debevc et al., 2008).

Below we provide a few operative suggestions on the type of content that may be associated with interactive points:

- ***Text and documents***. In order to preserve the spatial contiguity principle, which holds that people learn better when corresponding words and pictures are presented near rather than far from each other on the screen (see Mayer, 2005), insert brief text (short and sweet) directly in the space provided beneath the video. If the volume of text needs to be long and includes images, then it is better to link it to the active point as an external attachment;

The **principles of multimedia learning**, which are based on the cognitive theory of multimedia learning proposed by Richard Mayer (1996, 2005, 2009), are well-known and widely used. They were formulated in successive stages, evolving from an initial version based on six principles to the current one based on twelve. The twelve principles listed below were taken from the most recent publications by the author in question (Mayer, 2011). *People learn better…*

… from words and pictures than from words alone (Multimedia Principle);
… when extraneous words, pictures and sounds are excluded rather than included (Coherence Principle);
… when corresponding words and pictures are presented near rather than far from each other on the page or screen (Spatial Contiguity Principle);
… when corresponding words and pictures are presented simultaneously rather than successively (Temporal Contiguity Principle);
… from graphics and narrations than from animation and on-screen text (Modality Principle);
… from graphics and narration than from graphics, narration and on-screen text (Redundancy Principle);
… when cues and titles (e.g. arrows, frames, outlines,…) that highlight the organization of the essential material are added (Signalling Principle);
... when explanations are given in advance on what is expected from learners (Expectation principle);
… from a multimedia lesson is presented in user-paced segments rather than as a continuous unit (Segmenting Principle);
… from a multimedia lesson when they know the names and characteristics of the main concepts i/le (Pre-training Principle);
… from multimedia lessons when words are in conversational style rather than formal style (Personalization Principle);
… when new material is linked to material that learners are already familiar with (Concretisation principle);
… when material is presented within the context of a situation that learners are already familiar with (Anchoring principle).

- ***Hyperlinks***. Hyperlinks should be used sparingly. Whenever possible, insert a hyperlink that takes the user directly to a specific webpage, rather than the homepage of the website itself. Also, in order to prevent dispersal of attention, provide learners with instructions on how to use the links to perform the various tasks assigned to them;
- ***Graphics***. Select graphics that match the type of content and established learning objective. Graphics may serve different purposes (see infobox on the various functions of graphics according to Clark and Lyons, 2004). In general, avoid using graphics for purely decorative purposes.

As far as the **function of graphics** is concerned, the main frame of reference is the work of Ruth Colvin Clark and Chopeta Lyons, in which the two authors identify the main functions that graphics can have. They draw a distinction between communication and psychological functions (Clark and Lyons, 2004). Each of these functions is intended to serve a specific instructional goal. Below we provide their 'classification', which helps us to decide whether a given graphic is relevant each time we are tempted to include it in didactic materials.

Graphics serve different communication functions, which are listed below:

- Decorative: when graphics are used to inspire instructional display by adding artistic appeal and/or humour
- Representational: when graphics are used to represent an object or situation in realistic fashion
- Organisational: when graphics are used to demonstrate qualitative relationships between two or more variables
- Relational: when graphics are used to present quantitative relationships between two or more variables
- Trasformational: when graphics are used to demonstrate variation of objects over time and space
- Interpretative: when graphics are used to illustrate a theory or process

Graphics also serve different psychological functions, which are listed below:

- Support attention: when graphics are used to draw attention to important elements in an instructional display
- Activate or build prior knowledge: when graphics are used to engage existing mental models to support acquisition of new information
- Minimize cognitive load: when graphics are used to minimize extraneous mental work imposed on working memory during learning
- Build mental models: when graphics are used to help learners to construct new memories in long-term memory
- Support transfer of learning: when graphics are used to illustrate key features of the work
- Support motivation: when graphics are used to make material interesting and at the same time not hinder learning

2.3. Usage phase: interactive video becomes didactic material

The final stage of our model relates specifically to the didactic strategy upon which the entire scenario is developed. According to the categorisation proposed by Smith and Ragan (1999), didactic strategies can be classified along a *continuum* ranging from more teacher-centred ones, where teachers provide the most support (supplantive) to more student-centred ones (generative). In the first case, teachers maintain a rather high level of control over the lesson and the class. It is therefore a more directive style. In the second case, learners play a more active role in the production of knowledge and the teacher plays a less active role, exerting a more limited level of control and scaffolding. In the first case, it is normal for the teacher to use interactive video as a teaching aid for their lessons. In the second case, it is possible to create a project-oriented didactic scenario, where the end result is less important than direct learner involvement in the design, planning and creation of learning materials. Similarly, the level and type of interactivity that we saw earlier will vary accordingly, and can be assigned differently to the various actors involved.

During experiments with teachers we noticed that, as is often the case when one approaches a new teaching tool, teachers tended to start out with more teacher-centred didactic strategies and then gradually moved towards more generative, and often highly creative, ones as soon as they felt more confortable with the tool.

Each of the two extremes offers advantages and disadvantages. For example, supplantive strategies may be useful to focus learner attention on the most relevant aspects of the lesson and thus allow the teacher to achieve learning objectives more effectively. However, these classes can be perceived as boring, not very motivating and, in the long term, prevent learners from becoming self-sufficient in their learning. In contrast, generative strategies are considered best for more in-depth learning. However, they require greater investment of time and may overload learners who have only just started on their path to learning. It is up to the teacher to decide where his/her didactic scenario should be situated on this continuum on the basis of three considerations: 1. the profile of learners (cognitive skills, motivation, attitudes), 2. the type of activity and 3. the context of action.

SUGGESTION

Designing an interactive video and including it in an educational setting should not be considered as separate processes from one another. Instead, they should be considered as intrinsically linked, since many of the choices concerning the design of interactive video depend directly on how the video is to be used in the classroom.

3. Examples of didactic scenarios used in the context of vocational education and training

In this final section of our paper, we provide various infosheets describing various didactic scenarios used in recent years (see also Cattaneo, Nguyen and Aprea, 2016, 2014; Cattaneo, Nguyen, Sauli and Aprea, 2015). Although our selection of didactic scenarios is as broad as possible, interactive video can be used in so many different ways that we simply are unable to list all of them. A great deal of room is left to teacher creativity. Our choice of didactic scenarios was therefore guided by three main criteria: 1. we wanted to present experiences that combined both professional knowledge and general education, illustrating both procedural and declarative content; 2. we looked for examples of didactic scenarios that cover differentiated didactic approaches and strategies (ranging from the most supplantive to the most generative); 3. we considered the various types of video such as the categories proposed by Schwartz and Hartman (2007; see infobox), and chose examples of video that focus on the aspects of 'observing' (e.g. infosheets 1, 2, 4 and 5), 'doing' (e.g. infosheets 1 and 4), 'motivating' (e.g. infosheets 2 and 5) or 'saying' (e.g. infosheet 3).

In experiments conducted during the IV4VET project, various ways of using interactive videos in class were tested, including classroom learning, individual learning and learning by design (see infosheets below for specific examples). The results show that while all of these types of usage are effective in learning, each offers specific advantages.
Both in terms of **group study** and **individual study**, learners report higher levels of satisfaction and perceived efficacy in lessons using interactive video.
Learners who used interactive video with the **learning by design** approach, however, reported higher levels of motivation because of their direct involvement in the creation of learning materials.
Moreover, both teachers and learners felt that the various types of usage of interactive videos in the classroom did not fundamentally alter the role of **teachers and learners** with respect to a conventional lesson, where teachers play a central role and learners play a more marginal one. However both teachers and learners felt comfortable.
In lessons where videos are viewed by learners **on their own**, roles change considerably with respect to the previous scenario: the learner plays a central role because he/she has direct control over the video and is able to set his/her own pace of learning. For their part, teachers play a more supporting role. This gives the learner more freedom of action, but also requires more effort and creates greater uncertainty (since the learner is unable to compare his/her knowledge and understanding with others). This approach allows teachers to observe their learners at work.
Finally, the **learning by design** approach is similar to the individual learning approach in terms of the allocation of roles, but with the difference that learners are given the opportunity to interact with their classmates. However, in this case, the assignment requires a certain amount of effort and the activation of social skills (cooperation, negotiation, argumentation, etc.), which are not always given.

MODALITY

Shown to entire class

A D G

TITLE

Filling of solar heating system

CONTENT

The video shows the entire process of filling a solar heating system, followed by installation and putting into operation.

TYPE OF CONTENT

Procedural

VIDEO SOURCE

Video created by teacher

TARGET GROUP

Learners enrolled in training programme for the Federal VET Diploma in Heating Installation

LEARNING OBJECTIVE

Learn how to properly fill a solar heating system; learn how to perform the calculations necessary for this operation (pressure, combining of liquids, mixtures).

DURATION

3 Teaching Units (TU)

PROGRESSION

The teacher realised that some processes had never been seen or done by the learners in one of his full-time classes; he therefore took the opportunity of using an interactive video to show learners the process of filling a solar heating system. He was unable to find a company that was willing to film this procedure, so he decided to make the video himself, taking into account certain aspects that should be considered when performing the various tasks.
The teacher then inserted interactive points in the interactive video to highlight crucial moments in the process. These interactive points were used to ask questions and provide learners with the resources needed to answer these questions (photos, data sheets, etc.).
The teacher starts the lesson by showing the video to the entire class. The teacher then asks learners what they saw and what they thought about how the tasks were performed. After brief discussion, the teacher once again shows the interactive video to the entire class, this time focusing on the interactive points, reading the questions out loud and showing the additional content. Learners are then asked to write down their answers to the questions on a sheet of paper. Finally, each learner is asked to come up to the whiteboard and explain to the class how they solved the equations presented in the interactive video.

ADDED VALUE

This type of usage allows the teacher to vary the level of interaction of the lesson and to maintain interest by alternating between showing the video to the entire class and having learners work on their own first and sharing with their classmates afterwards. Interactive points enable the teacher to draw attention to crucial details of the process and apply the principle of multiple representations using additional materials that are particularly suited for putting theory into practice in a working context. Calling learners to the whiteboard to explain the reasoning used to answer questions also helps them to practice oral expression.

TO BEAR IN MIND

- Because learners are unable to control the interactive video directly, it is important that they be able to watch the entire video in the first showing, without dwelling on interactive points, so that they can gain an overview of the material.
- In a scenario of this kind, the teacher also acts as a moderator: he/she must see to it that all of the learners take part in the process of exchanging and sharing information, including the less outgoing members of the class.

MODALITY

Shown to entire class B D G

TITLE

Cooking vegetables in the oven

CONTENT

The video shows how a recipe is followed in two different work settings: a restaurant of a certain category and a company cafeteria. In particular, it shows how different types of vegetables are cooked in the oven: how to cut vegetables, which tools to use, how to prepare them, and how to serve them.

TYPE OF CONTENT

Procedural

VIDEO SOURCE

Video filmed at the workplace by learners using an action camera

TARGET GROUP

Cooks

LEARNING OBJECTIVE

Learn the technique used to cook vegetables in the oven in different work settings.

DURATION

2TU

PROGRESSION

The learners are asked to use an action camera to shoot video footage at the workplace to illustrate the techniques used to cook vegetables in the oven. The teacher then uses the collected material to select, splice and combine footage into a single video, which is then made interactive.

In particular, the teacher inserts interactive points that focus attention on important preparatory steps and highlight certain content that can be examined at greater length. The interactive video is then shown to the entire class; learners are called to the whiteboard to explain the procedure that they followed. Other learners are brought into the discussion and are asked to reflect on how the same tasks are performed at their workplace.

ADDED VALUE

Using a video produced by learners reinforces their own personal experience and makes the learning process even more authentic and engaging. Learners also find it more motivating and interesting to watch themselves or their classmates at work and to describe and explain their own practice to the entire class.

Interactive points are used to focus attention. For this reason, in line with the overall teaching strategy used here, even red dots are used to ask learners questions directly about the highlighted details.

In addition, when used in this participatory manner in the classroom, interactive video allows linkages to be established between the various learning locations. This

facilitates the transfer from theory to practice, by bringing the experiences from the workplace into the classroom. The teacher's aim is also to show how the same cooking method may differ depending on the work setting, not so much in terms of technique as in the manner in which this technique is applied (utensils and related specific terminology, division of labour, general conditions, etc.)

TO BEAR IN MIND

- This approach requires the teacher to devote a certain amount of time to preparing (viewing, selecting and combining video footage) the raw video provided by learners. Therefore, it is important to set aside enough time for preparation of materials and lesson planning.
- It is also important to obtain authorisation from employers before learners start filming at the workplace.

MODALITY

Individual

A D H

TITLE

Semmelweis

CONTENT

The video shows the most significant scenes of a fictional account of physician Ignác Fülöp Semmelweis who, in the nineteenth century, was the first to discover the link between autopsies preformed by doctors in hospitals and transmission of serious puerperal infections to women in labour. Prior to discovery by Semmelweis of this link, this infection caused postpartum deaths of one in every ten women.

TYPE OF CONTENT

Declarative

VIDEO SOURCE

Existing video; footages edited by the teacher

TARGET GROUP

Assistants working at a medical practice (subject 'History and Politics')

LEARNING OBJECTIVE

Familiarise learners with the figure of Dr. Semmelweis and his medical discoveries within a broader context of the 2nd Industrial Revolution.

DURATION

2TU

PROGRESSION

The teacher shows the entire class how to use interactive video and explains the activity: at the end of each chapter of the video, material for further study is provided together with instructions (e.g. answer technical or linguistic questions, or submit comments and personal thoughts) to be followed using the video annotation tool.
At the end of the lesson, the teacher asks learners to save their comments and personal thoughts in a PDF file, generated using iVideo.education's export feature. They are asked to rename the PDF file and e-mail it to him so that he can provide them with feedback in the next lesson.

ADDED VALUE

In this manner, learners are directly involved. Compared to what is expected of them with a normal video, learners here are asked to play a more proactive role to reinforce their understanding and interact with the learning material to a greater extent. They also have to do other things like looking for additional information materials, submitting comments and reading replies or sharing their personal thoughts. The pace of study can be personalised. This approach allows the teacher to diversify lessons, also making them more 'fun' and engaging.
In addition to sharpening their IT skills, learners are

encouraged to become more self-sufficient. They are asked to identify and select the most relevant information and process it in the form of personal notes.
A more 'collaborative variant' of this scenario is to have learners work 'in pairs' instead of working on their own. This requires them to discuss and work together to complete the work by the established deadline, which in turn also helps them to develop interpersonal and communication skills.

TO BEAR IN MIND

- It is important to give learners the instructions and explanations needed to work on their own with the interactive video tool and learn at their own pace.
- Equally important, instructions embedded in the interactive video must be formulated clearly and unambiguously. Moreover, attached materials must be relevant. Finally, learners need to be given enough time think and formulate their notes.

MODALITY

Learning by Design

C F

TITLE

Sewing anomalies

CONTENT

The video shows the main sewing anomalies that may occur when using a linear sewing machine. For each anomaly, the video provides clues indicating what the problem is and the possible cause. Finally, the video explains how to resolve the anomaly.

TYPE OF CONTENT

Procedural

VIDEO SOURCE

Video created by teacher

TARGET GROUP

Clothing designers

LEARNING OBJECTIVE

Learn how to analyse sewing anomalies for sewing machine (how to recognise sewing problems, identify the causes and find solutions).

DURATION

4TU

PROGRESSION

Before the lesson, the teacher had already given a lesson to show the entire class how to use the interactive video. After explaining the activity, the teacher shows the entire class how to use the iVideo.education editor. He then assigns learners to heterogeneous groups (i.e. comprised of both quick and slow learners) of 4-5 learners each. Each group is provided with a PC with the editor application pre-installed, the raw video, a pre-selection of relevant materials both in electronic and hardcopy form, paper, scissors, tape and glue. Learners are asked to make interactive video using the material provided and, if necessary, to work together to design the video on paper first.

Working in groups, learners are asked to carefully watch the raw video footage and decide where and how to divide it into chapters as well as what titles to give each chapter. They then select and/or prepare materials to be included. Once these decisions have been taken, learners will use the editor to produce the interactive video.

The teacher will then view and analyse the videos produced. He/she will also show the interactive video to colleagues and in subsequent lessons provide learners with feedback on material produced.

ADDED VALUE

This scenario is based on the learning by design approach (for examples, see Zahn et al., 2002; Zahn, Pea, Hesse, and Rosen, 2010; Zahn, Krauskopf, Hesse, and Pea, 2010), which holds that people learn best when they actively

participate in the collaborative development of knowledge. In this manner, learners develop their interpersonal skills (by discussing and working with fellow group members) as well as their argumentative skills (by defending their ideas and looking for solutions to achieve a common goal). Emphasis is placed not so much on the end result (i.e. the interactive video) as on the process leading to the end result.

TO BEAR IN MIND

- This approach takes more time to implement because learners need to be given enough time to discuss, design and create an interactive video.
- The younger the target group, the greater the need to provide more detailed and structured instructions.

MODALITY

Analysis of professional practices

B D E

TITLE

Cholecystectomy

CONTENT

The video shows how to prepare the operating room and how to perform a cholecystectomy.

TYPE OF CONTENT

Procedural

VIDEO SOURCE

Videos filmed by learners in a real working situation

TARGET GROUP

Operating room techniques

LEARNING OBJECTIVE

Analyse one's own professional practices (technical gestures and attitudes) using video.

DURATION

Variable

PROGRESSION

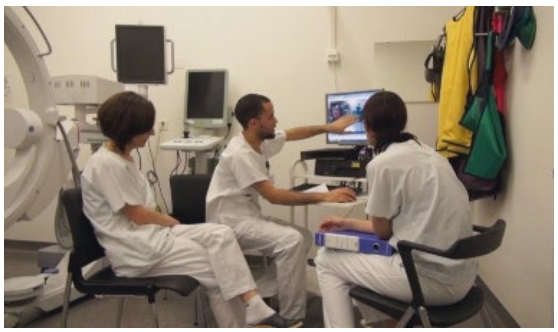
Learners are asked to film themselves at work, in this case when preparing the operating room and performing a cholecystectomy. Surgical interventions are always followed by debriefing sessions with tutors to provide feedback on professional practice. These debriefing sessions are usually carried out without any video material. The video recording of the surgical intervention is securely uploaded to the website of iVideo.education and made available to the tutor and the learner in an online session. The people involved watch the video and analyse the practice of the learner. They provide feedback in the form of comments made directly in the video. In the next phase, the learner considers the feedback and reflects on his/her own practice, also adding comments to the video. The 'annotated' video will then serve as the basis for the debriefing session.
Gradually, the learner will be asked to carry out his/her own analysis before receiving feedback from the tutor.

ADDED VALUE

The use of video to analyse professional practice brings added value because it allows one to observe – from an external point of view – an activity that is often performed in an automatic way. The video also offers the opportunity to see and review the steps and note items that may go unnoticed when experiencing the situation directly. In this manner, feedback is much more specific, objectified, concrete, and situated; characteristics that enhance the effectiveness of feedback.

TO BEAR IN MIND

- The length of the video can have a major impact on feasibility: it is not always possible to spend hours analysing one's activities



- Analysis of one's own professional practice requires certain conditions, particularly external support: for this reason self-analysis may be proposed only after an initial phase in which feedback is provided by an experienced tutor or by one's own peers.

MODALITY

Complex

B F G H

TITLE

Adenotonsillectomy

CONTENT

The video shows various steps that need to be followed in order to perform an adenotonsillectomy.

TYPE OF CONTENT

Procedural

VIDEO SOURCE

Videos filmed by learners in a simulated situation

TARGET GROUP

Operating room techniques

LEARNING OBJECTIVE

Present the various steps that need to be followed in order to perform an adenotonsillectomy.

DURATION

The activity consisted of several lessons broken down into phases and spread out over more than three weeks

PROGRESSION

Initially, learners are given a lecture on the procedure to be performed, focusing on technical terms and using static images. Learners are also given a document containing 'guidelines' on how to carry out the procedure. After ascertaining personal interests, learners are assigned to four groups of four. Each group is asked to handle a specific part of the procedure in question (1. Patient positioning, 2. Transtympanic paracentesis, 3. Instruments for the ear, 4. antisepsis and drainage). The teacher asks learners to identify possible questions on the topic assigned to them, particularly with regard to the professional procedures involved. Where possible, learners endeavour to find the answers on their own (e.g. over the Internet or in scientific papers provided to them by the teacher) and through comparison and discussion with fellow classmates. Unresolved questions are used by the teacher for subsequent discussion in the classroom.

Afterwards, learners are asked to create a storyboard to illustrate the different steps that would have to be followed in order to produce a video (the learners themselves take on the role of actors). In this phase, the teacher allows the learners to freely discuss the choices to be made. Since learners will frequently look to the teacher for help, he/she will always remain available as a resource and will intervene with suggestions or comments as needed.

The true simulation phase in the operating room will begin one week later, as soon as the video design phase is complete. The procedure is staged and filmed. All learners who are not actively involved in the simulation

are asked to carefully observe and take notes, making sure that the various steps have been properly carried out and checking to see if any mistakes have been made. These notes can be used to add information to the interactive video.

A few days later, the teacher shows the four videos produced to the entire class. The teacher has already completed the initial work of splicing and combining film sequences to shorten the video and eliminate non-relevant parts. Comments are added to the videos, highlighting mistakes and drawing attention to key aspects. Learners are actively involved in the process, making their own observations and asking questions, on the basis of their experiences or notes taken. When viewing the videos, learners are asked to think about content that could be added (i.e. content to be included in interactive points) and to write their ideas down on paper. This discussion continues even at a distance: the teacher publishes the raw video on the website, taking advantage of the 'online comments' mode. He/she then decides how long the online session will last and notifies learners of the final deadline, inviting them to actively participate in the discussion. The result of the online session will serve as the starting point for the final phase, which will be conducted in the classroom.

A week later, the teacher once again shows the videos to the entire class, asking learners in each group to make suggestions on where to insert interactive points and what aspects should be removed. The learners assigned to each group are free to make suggestions and ask questions of their classmates in the other groups. Gradually, following the indications, the teacher finalises the four interactive videos and adds information as needed. Once completed, the interactive videos will be used as study material for future lessons.

ADDED VALUE

Learners are directly involved in the production of the material and help to deepen their understanding of the topic, from the design phase and concrete implementation to subsequent analysis; this puts them in a position to identify first-hand the key moments that they themselves consider important and therefore worth

exploring. They are also able to link these moments with the suggestions discussed in the classroom. This approach helps learners to develop their own ability to select information and materials and to reflect upon what they are doing.

TO BEAR IN MIND

- This is a complex scenario that must be planned and carried out over a suitable period of time.
- Given the considerable involvement of learners in design, planning and analysis, we suggest that this experience be done with more advanced learners (i.e. not with new learners or newly formed classes).

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