How-To: Instructional Video
Recommendations For The Design of Software Video Trainings for Production Workers

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Presentation Overview

- R&D project „WerkerLab“
  - Motivation
  - Objective

- Literature Review: Recommendations for Video Software Training with Instructional Videos

- Questions and Discussion
Background: Industry 4.0 and the Need for Qualification

- Industrial trends:
  - Industry 4.0
  - Increased complexity of processes
  - New requirements for workers
  - Training measures often too theoretical
  - Mastery of new trends in everyday work
  - Flexible work deployment
  - Knowledge always up-to-date

Realizable and individual training

• In which industrial contexts can videos be used?
• How should videos be designed?
Research Project: WerkerLab

- **Objective:** Development of a modular training concept for SMEs in the production technology environment

- **Our focus:** Instructional Videos
Instructional Videos: Arguments for Use

Independence of place and time

That is the advantage I see: tutorials really can be used at any time. **Early, late, night shift.** We have a huge effort to reach the three shifts within the shortest time. **With the videos I can really, as I said before, show it to the person at any time.** (mechanic, manufacturing company)

Knowledge for recurring tasks

I find it a considerable advantage to capture **recurring tasks** on video. If I haven't done things for two years, then I have to learn how to do it myself. Then I **only have to click on this video and I know how it was or how it is working.** (trainer, manufacturing company)
Methodology

Literature Study

In-Depth Interviews with Experts

Document Analysis
Instructional Videos: Design

- Design limited by:
  - The object (e.g. software product)
  - Contextual factors (domain, production sector, values and conventions, cultural-economic factors)
  - Situation-related factors (e.g. conditions of reception, access to online resources, didactic embedding)
  - Material-technical conditions and implementations
  - Addressees and their social relationships
Methodology: Literature Review

Step 1: Literature Research:
- Keywords: instructional video, video tutorial, video instructions, how-to video, recorded demonstration
- Databases: Scopus, Web of knowledge, Google Scholar
- Only German and English articles published between 2004 and 2019

Step 2: Restriction to:
- Video tutorials as learning material
- Software application
Methodology: Literature Review

Step 3: Topic-related Selection:
- Video tutorials for software in the context of industrial production
- Guidelines for creating videos

Step 4: Categorization:
- (Case) studies on the topic
- Guidelines for creating videos

13 publications
67 publications
9 studies addressing particular aspects
67 publications
4 guidelines
<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Year of publication</th>
</tr>
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<tbody>
<tr>
<td>Eight Guidelines for the Design of Instructional Videos for Software Training</td>
<td>H. van der Meij; J. van der Meij</td>
<td>2013</td>
</tr>
<tr>
<td>Complex Software Training: Harnessing and Optimizing Video Instruction</td>
<td>J. Brar; H. van der Meij</td>
<td>2017</td>
</tr>
<tr>
<td>New Modes of Help: Best Practices for Instructional Video</td>
<td>J. Swarts</td>
<td>2012</td>
</tr>
<tr>
<td>Show Me! Guidelines for Producing Recorded Demonstrations</td>
<td>C. Plaisant; B. Shneiderman</td>
<td>2005</td>
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# Studies

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<tr>
<td>Work in Progress. Using Video Tutorials To Assist Biomedical Engineering Students in Learning Solid Modelling Skills</td>
<td>Amini</td>
<td>2014</td>
</tr>
<tr>
<td>Individualized Learning With Instructional Videos in Engineering Simulation Education</td>
<td>Brenner; Walter</td>
<td>2018</td>
</tr>
<tr>
<td>Teaching People How to Teach Robots. The Effect of Instructional Materials and Dialog Design</td>
<td>Cakmak; Takayama</td>
<td>2014</td>
</tr>
<tr>
<td>Development of Instructional Software for Demonstrating CAD, FEA Integration Best Practices</td>
<td>Chabura et al.</td>
<td>2004</td>
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<td>How video production affects student engagement. An empirical study of MOOC videos</td>
<td>Guo; Kim; Rubin</td>
<td>2014</td>
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<tr>
<td>Multimedia support for education of mechatronics</td>
<td>Haffner</td>
<td>2018</td>
</tr>
<tr>
<td>Too long, Didn’t watch it. Extracting relevant fragments from software development video tutorials</td>
<td>Ponzanelli et al.</td>
<td>2016</td>
</tr>
<tr>
<td>Developing and Testing a Video Tutorial for Software Training</td>
<td>van der Meij</td>
<td>2014</td>
</tr>
<tr>
<td>Advance organizers in videos for software training of chinese students</td>
<td>van der Meij</td>
<td>2019</td>
</tr>
</tbody>
</table>
Results: Category System

Didactic Design

- Relevance of types of knowledge
- The user’s prior knowledge
- Knowledge application
- Self efficacy
- Autonomy of the learning material

Influence of the Object

- Content selection
- Content segmentation
- Content sequencing
Results: Category System

Material-Technical Implementation

- Duration of the video
- Coordination of image and sound
- User control
- Quality of the visual recording
- Screencapture
- Quality of the auditory recording
- Voice over

Linguistic-Visual Design

- User guidance
- Directing attention
- Narration
- Instruction
- Sequencing the instruction content
- Wording
- Auditory parts
- Visual parts
Instructional Videos: Design Recommendations

**Didactic Design**

- Mainly teach procedural knowledge
- Perform activities in the video consciously and safely
- Repeat important information
- Using Advanced Organizers
- Let knowledge apply

**Influence of the object**

- Only content from the working environment of the users
- Only convey current contents
- Dividing complex content into segments
- Align sequencing in the video with the sequence of activity steps
- If not determined by object: Simple-to-complex sequencing

- Addressed in the literature
- Addressed by trainers
- Addressed by workers
### Instructional Videos: Design Recommendations

#### Didactic Design

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# Instructional Videos: Design Recommendations

## Material-Technical Implementation

- Keep videos as short as possible
- Synchronize picture and sound (sound shortly before)
- Name individual segments and make them selectable -> insert pauses, black screens
- Produce videos in at least 720P (vertical resolution)
- Produce in high-resolution audio
- Use a human voice as narrator

- Use zoom effects to increase readability
- Highlight the mouse cursor
- Screencapture: Show interface completely
- Give users the control (in the player with buttons, timeline)
- Make the video overall color pleasant
- Screencapture: Same software version from producer and user

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### Instructional Videos: Design Recommendations

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Yes, it also **depends on the length of the videos**. At some point, the concentration fades. So I personally do not need a video, which is 90 minutes or 60 minutes... So if the videos are then kept short - **15 minutes, I'd say as a value.** (Cutting machine operator)

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| Addressed in the literature | Addressed by trainers | Addressed by workers |
Instructional Videos: Design Recommendations

**Linguistic-Visual Design**

- Reduce speech rate
- Formulate the learning objective at the beginning of the video
- Give a content overview at the beginning of the video and treat this content in the video
- Choose a suitable title
- Use table of contents, index or keywords
- Introduce the mainscreen of the interface, or the object roughly in a "preview-tour" at the beginning

- Direct the user's attention (visual and auditory)
- Use a functional, but personal language
- Sequence in: (1) starting state, (2) solution path, (3) target state
- Explain technical and foreign language expressions during the demonstration
- Avoid abbreviations
- Formulate sentences briefly and actively
- Speak without accent

- Addressed in the literature
- Addressed by trainers
- Addressed by workers
Instructional videos: design recommendations

**Linguistic-visual Design**

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In any case, explain the **task with the goal**. Where do I want to go? (mechanic, manufacturing company)
Limitations

- Recommendations are very subject-related. There may be very specific design requirements for specific software products that are not discussed.

- Limited to English and German literature only.

- The keyword based search has further limited the corpus.

Conclusion

- Instructional videos as learning material have high potential for training software skills in industrial contexts
- Best practice + research based approaches required
- Linguistic-visual aspects rarely addressed compared to material-technical aspects
- Requirements of the experts (workers & trainers) match the recommendations in the guidelines referring to material-technical aspects
- Didactic design, influence of the object, and linguistic-visual aspects are hardly seen by experts
- Feedback from partners: criteria help to produce videos by themselves

Further study is required:
- Central aspects of the design of videos for CAD/CAM training
- Quality-relevant items (e.g., segmentation, sequencing)
- Linguistic design of the functional parts of instructional videos for CAD/CAM training
Literature & Sources

**Literature:**


**Sources:**

- Icons: flaticon.com/authors/freepik
- Photos: shutterstock.com
Many thanks for your attention!

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