THE INFLUENCE OF DIFFERENT MEDIA INSTRUCTIONS ON SOLVING A PROCEDURAL TASK

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Abstract

This study investigates the influence of different forms of media instructions on the process and outcomes of completing a specific procedural task. The experiment was conducted with four student groups having an education in the area of Information Design. In the experiment four media instructions – text only, text plus drawings, a series of pictures and video with narration – were considered. The findings show that the type of media has an influence on the ability to solve a procedural task and on group interaction and the way groups solve a task. Compared with the other instructions, video instruction triggered a different interaction and behavioural pattern during assembly. Participants considered both video and picture instructions as more usable in terms of facilitating the ability to understand, select and apply possible solutions to a given task. However, the video medium showed little influence on dialogue in the group during assembly. The instructions, such as text plus drawings, pictures and video had a similar influence on task performance times, whereas text instructions took three times longer to implement than other instructions.

Keywords: Human behaviour in design, visual communication, information design, procedural instructions

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1 INTRODUCTION

In everyday life people routinely engage in some kind of procedural tasks, such as assembling furniture, fixing a bike and mechanical assembly. In order to perform procedural tasks successfully, product development companies usually provide some kind of procedural instruction documents (Ganier, 2004), offering a step-by-step procedure to help the user complete a task. It is often assumed users first read through each step of the procedure and gain knowledge before attempting the task. However, studies have shown that procedural documents are seldom used in this linear manner (e.g., Eiriksdottir and Catrambone, 2011; Schriver, 1997).

From an information processing perspective, wide variations of behaviour exist in the performance of individuals following procedural instructions. This could be attributed to the user's ability or to the design of the instructions (Eriksson, 2009). According to cognitive theories, any information presented through external representations is processed and constructed with internal representations. Schnotz and Bannert's (2003) theory of how we process text and pictures includes mental representations as well. Eriksson (2009) stressed the interaction between mental images and external representations; while external representations provide us with ideas that stimulate mental images, the latter influence how we interpret representations. Dual coding theory suggests that humans possess two separate channels to deal with these different representations (Paivio, 1991). It is assumed both channels have a limited capacity for material, and that successful learning occurs only when the learner actively engages in cognitive processing (Mayer, 2003). Wileman (1993) stated that the choice of visual information (e.g., pictures, animations, video or audio recordings, graphic arts, models, etc.) is related to the major objective of communication and the specific information that is suitable for a specific situation. However, since the choice of media influences the content of a message (McLuhan, 2001), it will have an effect on how individuals perceive, interpret and understand the expected behaviour. This in turn will have an impact on performance. Therefore, it is interesting to learn more about how different media work as procedural instructions.

In this context, earlier research efforts have addressed the relationship between some types of media instructions and procedural task performances, learning and knowledge transfer (e.g., Eriksson et al., 2014; Huang and Chiou, 2010; Mayer, 2003; Michas and Berry, 2000). Eriksson et al. (2014) performed an eye-tracking study using three kinds of instruction, a line drawing on a page, a series of seven line drawings on a page, and a live action video. They found that the video, compared with the other mediums, accommodated different kinds of visual strategies. Huang and Chiou (2010) compared five types of visual information (i.e., short film videos, static snapshots pictures from the videos, a combination of video and static pictures, drawings trace out from static pictures, and unplanned static photos), and claimed that the combination of video and static pictures had the lowest error rate but took the longest time to learn. Similarly, Michas and Berry (2000) investigated text, line drawings, text and line drawings, video and video stills for learning a first aid task. The findings showed that video presentations and text and line drawings were superior over the other three conditions in terms of the resulting performance and questions answered about the task.

However, most of the previous studies have focused only on isolated aspects of learning and performance. Research focusing on the comparative influence of various media instructions on the process (e.g., interaction and behavioural patterns) and outcomes of completing a procedural task is limited. In addition, few studies have tested a broad range of media instructions in solving a procedural assembly task. The purpose of this study, therefore, is to investigate the influence of different forms of media instruction, such as text, text plus drawings, series of pictures and video with audio narration, on the process and outcomes of completing a specific procedural assembly task. Consequently, this study addresses the following research questions:

RQ1: How do different forms of media instructions influence the way a specific procedural task is solved?
RQ2: What interaction and behavioural patterns are noticeable when users interact with different media instructions?

The remainder of this paper is organized as follows. Section 2 details the research method, including the design and production of instructional materials, experimental design and information regarding participants. Section 3 introduces the theoretical background relevant to this research, and Section 4 explains the experimental results with a number of attributes of the process and outcomes. Section 5 discusses the findings and conclusions drawn.

2 RESEARCH METHOD

2.1 Design and production of instructional materials

The procedural task considered for this study is building a construction truck using Lego blocks. Four types of procedural approaches were investigated to solve the procedural task: text only, text plus drawings, series of pictures and video with audio narration. Figure 1 shows snapshots of the chosen media instructions. Three information design experts, who have been teaching informative writing (for 14 years), technical illustration (for 21 years), and image production (for 10 years), designed the instructions in English. The visual instructions were made from principles used in engineering drawings.

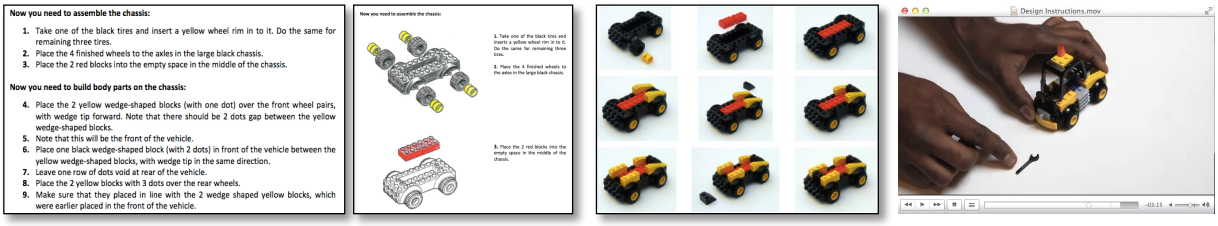

Figure 1. Snapshots of different forms of media instruction used in this study: text only, text plus drawings, series of pictures and video with audio narration

The text-only instructions were prepared by following the logical structure of the procedural task, e.g., beginning with the construction of the truck chassis, then building body parts on the chassis, and later building the parts on both sides of the vehicle, and so on. The text instructions were prepared in a step-by-step manner (N=39) with short and concise sentences. These instructions were used as a basis for designing the other forms of instruction. The instructions with text plus drawings were designed by using the traditional way of teaching procedural tasks. This consisted of drawings showing each step in the procedure accompanied by supporting text explaining the step in more detail. The drawings were designed in such a way that only the specific parts that needed to be assembled in that step were colour coded, as shown in Figure 1. The drawings were illustrated using a central perspective; that is, a view or angle that showed more information about the object. Similarly, the instructions with a series of pictures (N= 50) were produced using the central perspective. Finally, the instructions with a video voice-over were produced using the combination of 'point of view' (POV) and 'show and tell' perspectives. The video (10 minutes 27 seconds long) was produced by following the steps (N=39) used earlier when designing the text-only and text plus drawing instructions. In addition, the video incorporates a cueing technique common in the instructional video genre: it fades to black in between the sequences to indicate that one action is finished and another is about to begin. This is the equivalent of turning the page in sequential assembly instructions. Compared with the drawings, the main difference (apart from the fact that this is a live action video with all of its time and velocity implications) is that the video displays the assembler's hands, thus giving the user ample information about size and distances.

2.2 Participants

The experiment consisted of four groups, each comprising three participants. The participants (N=12) were students from an undergraduate Information Design programme whose first language is English. All participants were randomly distributed across the four groups. We divided the participants into groups because we wanted to explore if and how media influence interaction in a group while its members perform a task. In addition, the research team (N=2) facilitated the whole design session, introducing relevant materials and information to the participants at each stage of the experiment.

From the questionnaire, previous individual experiences in building Lego assemblies were collected, and classified on a scale of 1 to 5 (1 = never, 5 = frequent). Table 1 presents each individual experience, average group experience and the type of instruction assigned to each group.

Table 1. Individual and group Lego experience

	Group1 (Text)			Group2 (Text +drawings)			Group3 (Picture)			Group4 (Video)		
Lego Experience	2	5	5	3	3	5	2	3	3.5	2	4	4
Average	4			3.6			2,8			3.3		

2.3 Experimental design

The experiment was designed in five stages, as shown in Figure 2. The total duration of the experiment was one hour, and English was the language used. The experiment was performed in the university's design studio, which was equipped with two static cameras and one adjustable camera.

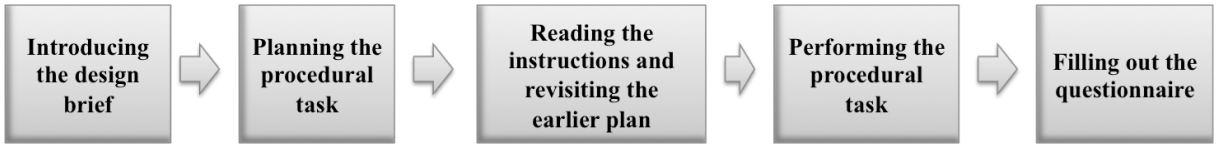

Figure 2. Various stages in the experiment

In the first stage, the design brief was introduced to the group; the brief included information on the procedural task to be solved, the experiment's aim and a short description of the five stages. In the second stage, the group was asked to plan how to perform the procedural task in a short lead time. This was similar to a brainstorming session in which group members are free to discuss and gather a list of ideas to accomplish a task. Participants were allowed to use paper and pens if they wanted to write down or sketch their ideas and plans. In the third stage, one form of media instruction was provided to each group. The group was asked to read the instructions and to revisit the earlier plan if there was any need to change the manner of execution. This was done in order to define the possible influence of an instruction on the earlier plan. In the fourth stage, the group was asked to perform the procedural task with the help of instructions. The final assembly was expected not to have any loose parts. In the final stage, participants were asked to give their individual reflections and comments on the experiment using a questionnaire, which included both open-ended and Likert scale questions (from strongly disagree to strongly agree). Some of the open-ended questions were: In what way was the design of the instruction helpful? Were the overall design instructions confusing and/or unclear? If so, in what ways? How did you interact with the instruction during the assembly and why? The Likert scale statements included: The medium of instruction helped us to easily understand the instructions; helped us to select possible solutions quickly and apply them in the design task; supported our discussions during the experiment, etc. For the analysis, scores were generated for answers to all of the statements on a five-point Likert scale (ranging from -10 points for strongly disagree to +10 for strongly agree).

3 THEORETICAL BACKGROUND

3.1 Visual communication and its effects

Communication means to do together, to share something with others. What does it mean to do something together and to share understanding with others when it comes to visuals? Visuals may work differently depending on context, but some visuals are expected to have a clear message (Barthes, 1967). How well the visual communicates its message is related to how well the representation's design is made, and the context (Tversky, 2011). Text and context are frequently added to visuals in the form of reading instructions (Eriksson, 2009). It was long considered that communication was something that could be unidirectional, meaning that someone conveyed a message that was received as the sender intended (preferred reading, preferred meaning and concept of information). The traditional communication model: Transmitter → communication → receiver is characterized today as a one-way transmission model with a passive recipient (Eriksson and Göthlund, 2012). However, since visuals are essentially arbitrary, visual communication requires a lot from the

user, and his/her ability to interpret the message. Eriksson and Göthlund (2012) emphasise the user's involvement in the communication process.

A unique aspect of images in relation to other forms of representation, such as text and audio, is that they can portray things and show relations (Tversky, 2011). But even though visuals look alike, the meaning of the representation has to be interpreted. In addition, visuals have a mimetic quality, which makes it possible to follow and imitate (Eriksson, 2009). A visual representation is not an imprint; it is in fact a representation of an object or environmental phenomenon (Danto, 1999). This representation represents the designer's interpretation of an object or phenomenon presented visually (Eriksson and Göthlund, 2012). The interpretation is not only a personal act; it is inscribed in a cultural and historical context.

The impact on the user depends on the type of visuals, the manner in which they are used and the media employed (McLuhan, 2001). The impact and possible effect visuals have on users may depend on who the user is and the context in which the visuals are presented. Instructions need to be decoded and interpreted by a user before they are useful; in this sense, it is the user who brings life into the visuals (Belting, 2005). In the manufacturing industry, awareness of the way in which media and the design of visuals convey not only values but also usability is low. Many motifs are used as symbols and pictograms. Therefore, they have come to represent a kind of archetype for a range of phenomena. Often their appearance has nothing to do with the actual objects, but they may affect our mental images and thus our conception of something (Eriksson and Göthlund, 2012).

3.2 Language

Visuals are translations from one symbolic system to another. They portray things and show spatial relations, and thus, when talking about them one must transfer them from a spatially organized symbol system to a linear and sequential one (McCloud, 1999). Despite the transfer of problems that can arise, it is virtually impossible to circumvent the language as one approaches visuals. Visual representations are created largely through language, and even in the language. By looking at a picture and talking about it, we become aware of its content and structure (Eriksson et al., 2011). The way we understand the image depends on how we label the picture's details. This means language can alter the image content, without adding or omitting certain details in a description and analysis (Eriksson and Göthlund, 2012). Generally, words and written texts leave more room for the imagination than visuals, because the visual medium can limit one's ability to think in new directions (Tversky, 2011).

3.3 Multimodality

Multimodality can be understood in two ways: as different senses and as different representations such as text, visuals and audio. When individuals interpret text or visuals, memory and mental images are involved and these indirectly invoke several senses. Even the interpretation of one single picture involves a multimodal act. This study is informed by the view that representations and their meanings materialize in different stratums as a medial object adheres to a *Discourse*, is *Designed, Produced* and eventually *Distributed* (Kress and Van Leuween, 2001). As such stratums in a way are analogue to the phases of a generic design process, this semiotic theory possibly offers a more concrete and useful way to categorize and approach potential meaning and meaning implications in design research.

4 RESULTS

Overall, the results show that there are differences in the process and outcomes of completing a procedural task when using different media instructions. In this study, the following attributes were considered to analyse these differences: the influence of the medium on interaction and behavioural patterns, on the ability to understand the instructions, on selecting and applying possible solutions, in supporting discussions and in time to perform the task. This section discusses each of these attributes and then summarizes the results.

4.1 The influence on interaction and behavioural patterns

The analysis showed that different interaction and behavioural patterns emerged during reading/viewing/watching the instructions, as well as during the solving of the procedural task.

4.1.1 Text-only instructions

This group's earlier plan was to sort the pieces into easy/known parts and small parts and build the assembly in a logical, step-by-step manner. After receiving the text instructions, all participants read through the instructions step-by-step. During the reading, the group viewed the parts 61 times (participant 1=11, participant 2=26, participant 3=24). After reading the instructions, the group decided to follow the instruction steps (N=39) and build the assembly. This group did not define any roles and responsibilities and decided to solve the problem together. During the assembly, while one participant read an instruction step aloud (occasionally two participants read the instructions together out loud), another person searched for the parts. If something was unclear, they went back and read the instructions again. In a few instances they read an instruction step, searched and held the part in the hand, then read the instruction again to confirm their selected choice. They also questioned each other to verify their choices. For instance, when one participant asked "*What do you think*?" "*Is this a tubular holder*?" another participant responded "*This is not a holder, try to look for another piece. These are the pieces left.*"

This means the participants interacted with the text instruction continuously, as they did not have any visual information to consult like the other groups. Therefore, the interaction pattern observed for this group was as follows: Reading the text → imagining the part → searching and picking up a part → building the assembly if it worked → reading again and finding another part if it did not work → confirming with other participants → building the assembly until it worked fine. This was emphasised by one of this group's participants: "*It is hard to build something without a picture of how it is supposed to look. I create my own image in my brain during the task*." This group made five mistakes during the assembly process.

4.1.2 Text plus drawings instructions

This group, compared to other groups, viewed the final assembly picture of the truck, as this picture was displayed in the design brief. Hence, they had an idea of the overall layout and final assembly of the truck before they received instructions in text plus drawings. In total, this group viewed the final assembly picture 10 times (participant 1=5, participant 2=4, participant 3= 1). Therefore, during the initial planning stage, some participants referred to the final assembly picture to help formulate their ideas. Their initial plan was to divide and share the task individually so one person would build the front, another the rear and the remaining person the underneath part.

After receiving the instructions, the participants first read through them, then skimmed through the pages several times. They then divided the whole work into segments, i.e., building the chassis and tyres, building the roof and building the front side and hook. They also assigned different roles and names to one another. For instance, one person was a builder, another identified and organized the parts in sequences and another helped assemble the smaller parts. In contrast to other groups, this group set its own target to accomplish the task in the duration of five minutes. During assembly, they viewed the instructions 117 times (participant 1=39, participant 2=48, participant 3=30), sometimes for a fraction of a second before applying the instructions to the parts. The participants said they looked mostly at the drawings and only read a few words or sentences in a few steps at a time. One participant described the illustrations as "*so clear, as the parts are colour coded and showed the direction"*. This participant did not even read the text because the illustrations "said it all'. The interaction pattern observed in this group was thus as follows: Viewing drawing (reading few words) → looking at and checking the parts → viewing drawing again → checking/confirming the parts → building the assembly → viewing drawing. This group did not make any mistakes during the assembly process.

4.1.3 Series of pictures instructions

This group's earlier plan was to identify what parts were available, sorting by colour, forms and shapes, trying to build the parts by rearranging them several times until they completed the task. After receiving the picture-only instructions, they did not look at all the pictures. Instead, they quickly previewed all pictures and counted how many were available to them. They then decided to change their earlier plan to accomplish the task as quickly as possible. One participant explained: "*We obviously need to change our plan. I mean the instructions are kind of a good foundation to start*

with." The new plan was simply to look at the pictures and building the pieces. The participants assigned themselves different roles and names (1 picture reader, 1 piece finder and 1 constructor). This means one person read picture, another found the piece and gave it to the constructor and the remaining person build the assembly. The picture reader also acted as a second constructor.

Generally, the interaction pattern for this group was different from the other groups: reading the picture by colour or shape → identifying the part → building the part → reading the next picture → identifying and building the part. One participant described the group's interaction as follows: "*We looked at the pictures to make sure what we did was correct as well as to prepare for the next step*." This means the group read and interacted with the instructions all the time during the assembly procedure. During assembly, the participants looked at the instructions 150 times (participant 1=62, participant 2 = 44, participant 3=44). They made three mistakes. In such instances, the picture reader manually pinpointed the instructions' picture sequence to clarify the part's position.

4.1.4 Video with audio narration instructions

This group's earlier plan was to sort the Lego blocks into larger, smaller, unique and unknown categories, and then to start building with easy parts, and continue with a trial-and-error approach. After watching the video instructions, the group stuck to the original plan but sorted the pieces into more specific categories, e.g., front parts, body parts, rear parts, etc. They did not define any roles and responsibilities. Afterwards, all participants assembled the parts together without using instructions. The video group remembered the first few steps in the assembly procedure. One participant emphasized the video's influence, stating that: "*It felt like the instruction talked to me. I just listened and tried to remember.*" This suggests that participants constructed the Lego truck using their working memory. However, they did not manage to remember all the procedure's steps and had to replay the video four times during the assembly process. While watching the video, participants held a specific part, and simultaneously checked the built-in assembly parts to confirm whether they had done it right or not. The three participants watched the video 66 times on these four occasions (participant 1=25, participant 2=15, participant 3=26). During the assembly, they made two errors and were surprised they did not remember the steps. One participant stated, "*It is funny how we do not remember this.*" Another said, "*It is harder than I thought.*" Overall, the interaction pattern for this group was as follows: Assembling the parts based on their working memory → playing and watching the instructions when something was not clear or a step had been forgotten → checking the built-in parts while watching the instructions → building uncertain parts → pausing the video → continuing to build until they could not remember any more steps.

While watching the instructions participants repeatedly checked the matching parts in front of them to sort them. For instance, by following the instructions, the participants worked out what the front and rear parts of the truck were. The participants checked the parts in front of them 55 times (participant 1=18, participant 2 = 9, participant 3=29). They said that they could have been more productive if they had assembled the parts while watching the video for the first time. This means the video medium triggered a different kind of behaviour – the participants expected to watch the video and build the truck at the same time.

4.2 The influence of medium

4.2.1 In understanding the instructions

One way to measure the effectiveness of a specific medium is to assess how easy it is to understand the instructions it presents. The results highlighted significant differences in understanding the instructions according to different mediums, as shown in Figure 3.a. In terms of helping participants understand the instructions the video medium was superior to pictures, text plus drawings and text. The group using video instructions (with a voice-over describing what to do, step by step) found that the medium helped them to easily understand the instructions because it made them feel someone was personally showing them how to do a particular task. The video also enhanced understanding because it allowed the participants to receive visual and audio instruction simultaneously. After video, picture instructions were superior to the other mediums, as shown in Figure 3.a.

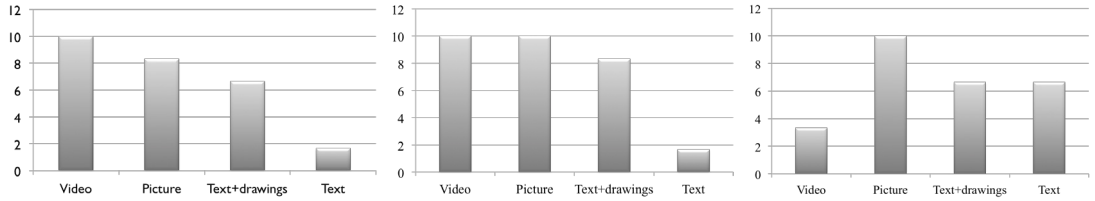

Figure 3. The influence of medium (a) in helping participants understand the instructions, (b) in helping them select and apply possible solutions, and (c) in supporting their discussions

4.2.2 In selecting and applying the possible solutions

Another measure to evaluate the effectiveness of a medium is to assess how easy it is to select and apply possible solutions by following a media instruction. The results show that both video and picture instructions were superior to the other instructions, such as text plus drawings and text, as shown in Figure 3.b. Both video and picture instructions showed a similar effect in helping participants select and apply possible solutions. The video group explained that video with a clear voice instruction helped them to see and understand the whole assembly process, which helped them quickly relate to the parts in front of them and figure out where to place them. As one participant put it: "*You heard what you should do and you could see it at the same time… both audio and visuality help a lot.*" Similarly, the picture group explained that a series of pictures structured in a step-by-step manner made it very clear which pieces should be used, in what order and where to place them. These observations could explain why video and picture instructions were superior to the other instructions.

4.2.3 In supporting discussions

The picture instructions were superior to other instructions in supporting discussions during problem solving, as shown in Figure 3.c. Thereafter, text plus drawings and text-only instructions had a similar effect in supporting discussions. Video instructions had less influence in supporting dialogue between participants. During the discussion in the assembly process, the picture group referred mainly to the colour of the Lego blocks to point out a specific block; for example, "grey hook", "black one", "red one", "big black piece", "little orange one". The text group mostly used the parts descriptions; for example, "2 black and 2 red dots" "3 sticks". The text plus drawings group used part names; for example, "hook", "stripes". The video group mostly used pronouns; for example, "this one", "this part", "we have this", "this should be here". They seldom used part names. This shows that different media instructions had diverse effects on the way participants referred to the parts in front of them.

4.2.4 Time taken to perform the task

All groups successfully solved the procedural task. The different forms of instruction slightly influenced task performance times. Both video and picture instructions had a similar influence on task performance time. The time to complete a task using video instructions was 6 minutes 27 seconds; using picture instructions, it was 6 minutes 14 seconds. The text plus drawings instruction group completed the task in less time – 5 minutes 53 seconds. However, this group, in contrast to the other groups, had the advantage of viewing the final assembly picture of the truck in the design brief. The final assembly picture was later removed from the design brief for the remaining groups. This advantage may have influenced task performance time, but this influence is hard to measure. On the other hand, performance time for the text-only instruction group was 20 minutes 29 seconds. Although the text-only group indicated that the text instructions had a logical structure, easier step-by-step instructions and detailed descriptions of every part with colour and shape, they were not effective in terms of performance compared to the other groups.

Table 2 summarizes some key results in relation to the different media instructions.

Table 2. Summary of key results from the experiment

	Text	Text plus drawings	Pictures	Video
Defined roles and responsibilities	No	Yes	Yes	No
Building the Lego	Build together	2 persons	1 person	Build together
Behavioural pattern during the assembly (with lower details)	Reading→ imaging→ searching/ picking→building →confirming	Viewing/reading→ checking → viewing/reading →checking/confirming → building	Reading→ identifying → building→ reading	Building→ playing/ watching→ checking→ building→ pausing
Viewing instructions during assembly	All the time	117 times	150 times	66 times (Played 4 instances)
No. of errors made during assembly	5	0	3	2
Easy to understand the instructions	Lowest score			Highest score
Easy to select and apply solutions	Lowest score		Highest score	Highest score
Support discussion			Highest score	Lowest score
Performance time	20 min 29 sec	5 min 53 sec	6 min 14 sec	6 min 27 sec

5 DISCUSSION AND CONCLUSIONS

The present study was designed to investigate the influence of various media instructions (i.e., text, text plus drawings, series of pictures, and video with audio narration) on the process and outcomes of completing a procedural assembly task. The findings show that type of media has an influence on the process of completing the same procedural task in different ways. In the planning and execution of the task, the text and video instruction groups were not allocated any specific roles and responsibilities, and built the assembly together with mutual consensus within the group. In contrast, text plus drawings and picture instruction groups defined specific roles and responsibilities where one person acted mainly as a constructor while the others served supportive roles.

In addition, the results show that type of media influences group interaction and the way groups solve tasks in different ways. Compared to the other instructions, the video instruction (which was of a live-action type, not a so-called screen-cast) triggered a different interaction and behavioural pattern during the assembly wherein users, without using instructions, built the assembly based on what they remembered from watching the video earlier. Thus, the video group, in contrast to the other groups, viewed the instructions for less time since they only used it on an on-need basis. This finding is congruent with other research findings, which claim that an instruction in the form of video is more memorable than text-based instruction (Jonassen et al., 1999). Furthermore, the video medium seems to trigger users to attend to it fully. This means the video's realism and velocity readily invite an audience to be swayed by its rhetorical force and realism as it – as a participant described it – 'talks to us'. Moreover, it seems fair to assume that the actual talk in the video, i.e., the narration, calls upon the resources of the auditory working memory and that this makes watching the video an engaging experience. This phenomenon is usually discussed in multimedia learning theory as the 'modality principle', the most well established multimedia design principle (Mayer, 2003).

In addition, both video and picture instructions were considered more usable by participants in terms of facilitating the ability to understand and select and apply possible solutions in the task. The multimodal instructions could be defined as redundant. Since the visuals and text told the same story, they did not work in a complementary fashion. The group's behaviour using the video shows that the video had little influence on their dialogue. This could be attributed to the fact that the voice-over was

dominant and the narrator's voice did not allow a conversation between group members. In contrast to the video, picture instructions supported more interaction in the group.

The different instruction media, particularly video and picture instructions, had a similar influence on task performance time. Video and picture instructions enabled the groups to imitate (Eriksson, 2009) the illustrations in the pictures and video. More generally, the visuals (video, pictures and drawings) did facilitate the task-solving process because they released the working memory from trying to imagine how to assemble the parts (Tversky, 2011). Interestingly the addition of text to the drawings did not seem to play a crucial role in solving the task. This could partly be explained by the well-designed visuals. The group solving the task from text only interacted within the group to a high degree and with the instructions. They had no support from visuals and therefore needed to create a mental image of what was asked for in the different steps. However, these results were only extracted from one pilot study. Further research is needed to validate the results in different experimental setups, especially to enhance our understanding of how visuals work in cross-cultural contexts.

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