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Strategies in audiovisual presentations for distance learning

Introduction

Video lectures, video lessons, instructional or educational videos are some examples to refer to audiovisual presentations in educational context. The growth in video use is due to the increased accessibility of digital environments, the ease in dissemination of those materials and increasing demands for distance learning (Bateman, Thiele and Akin, 2021).

Throughout the twentieth century, there have been several cycles of enthusiasm for the educational potential of visual technologies followed by a disappointing lack of implementation in education (Mayer, Fiorella and Stull, 2020, p. 3).

Nowadays, there are a huge variety of instructional videos in informal learning venues, such as YouTube. Mayer, Fiorella and Stull (2020) say that this current phase can be called "Internet video age".

In 2020, the closure of schools and universities due to the global pandemic led teachers to resort to using videos in their remote classes, whether producing or using ready-made videos. Most of them did not have the literacy that is necessary to produce content involving media or technology. Thus, teachers showed difficulty in recording videos or selecting those that might be more suitable in a remote teaching context.

According to Arroio (2017), the educational institutions still developed very punctual experiences regarding the integration of information and communication technologies to enable the development of media and informational competences of the faculty.

And in the current context of the pandemic in 2020, it was a very difficult period in which the faculty faced this challenge of adapting to distance, remote, or emergency education, whatever the situation that is not in person. According to Arroio (2017, p.417):

> "It is clear that there is the need to develop educational programs for teachers, to increase their knowledge and understanding of the media and education relationship, to prepare them in appropriate methodologies in order for the citizens to understand the deeper significance of information, media and being informed, and also to assist people in using information in a more efficient way, preserving the critical and ethical aspects."

Considering it, the objective of this article is to investigate the characteristics of two types of videos: one intentionally designed and produced to be used in distance learning

and one that is a classroom record to be used in distance learning. Two representative science videos were selected from the YouTube channel Canal USP. They were analyzed in terms of duration, framing, camera position and instructor´s conduct.

Literature review and conceptual frameworks

As highlighted by Unesco (2021), the Covid-19 pandemic has exposed pre-existing education inequalities that were never adequately addressed. During school closures, teachers were required to conduct distance and/or online teaching with no time to prepare and often with limited guidance and resources.

That educational crisis has shown us that teachers need continued training on remote teaching, available technologies, and alternative flexible pedagogies for online, blended and offline learning (Unesco, 2021).

The instructional videos are one of the most common teaching materials in online teaching. However, most teachers are unaware of how to record or how to select the most suitable videos to be used in their remote classes.

Video production involves technical but also pedagogical knowledge about this didactic tool. As the use of technologies should be based on pedagogical intentionality, it is important that the tools and technical resources are exploited based on their potential for improving the learning process.

In this sense, two theories could give rise to strategies in audiovisual presentations: the cognitive load theory, initially proposed by Sweller (1994) and the cognitive theory of multimedia learning, proposed by Mayer (2003, 2014).

Cognitive load theory suggests that the working memory is very limited and because of that the learner must be selective about what information to pay attention to. This observation has important implications for creating educational materials (Brame, 2016). The cognitive theory of multimedia learning builds on the cognitive load theory and brings contributions by focusing on the intersection between cognition, instruction, and technology. A multimedia instructional message is a presentation consisting of words and pictures that is designed to foster meaningful learning (Mayer, 2003). For the author, the intelligent design of multimedia instructional messages depends on an understanding of how the human mind works.

The cognitive theory of multimedia learning is based on three principles of cognitive science related to learning: the assumptions of dual channels, limited capacity, and active processing. The assumption of dual channels establishes that the human system processes information in different channels; both in visual terms (written words, illustrations, animations, videos) and in auditory terms (narration and non-verbal sounds). The assumption of limited capacity postulates that there is a limit to the amount of information that the human system can process simultaneously on each channel. The assumption of active processing places that active learning implies the execution of a coordinated set of cognitive processes.

Based on these assumptions, the cognitive theory of multimedia learning has as its starting point the functioning of the mind from a student-centered design that aims to adapt the multimedia to support human cognition (Mayer, 2014).

One of the recommendations of cognitive load theory to multimedia designers is that they should produce educational materials that avoid overloading the working memory, especially when the learning materials are complex, in other words, with high element interactivity (Castro-Alonso et. al, 2021).

According to multimedia learning, knowledge cannot be received passively by students. On the contrary, students need to select, organize, and integrate the relevant verbal and nonverbal information presented so as to construct new knowledge (Ng and Przybylek, 2021). For the authors, a prominent argument for perceiving these fundamental theories is that instructional designers can devise a multimedia material based on how the multimedia instructional principles work and maximize their effectiveness.

The challenge of multimedia instructional design is to prime and guide active cognitive processing in learners so that learners construct meaningful internal representations (Mayer, 2003, p. 130). Mayer (2003) presents three sets of processes for active learning: selecting, organizing, and integrating.

The process of selecting involves converting some of the printed words and some of the illustrations into verbal representations to be processed in the verbal channel. The process of organizing refers to building a coherent mental representation of the verbal material and a coherent mental representation of the visual material. Finally, the process of integrating is to build connections between the verbal and pictorial models and with prior knowledge.

To engage in active learning, some strategies can be used, such as package video with interactive questions, the use of interactive features that give students control, the use of guiding questions or making video a part of a larger homework assignment (Brame, 2016). For the author, watching a video can be a passive experience, much as reading can be, so it is important to help students do the processing and self-evaluation that will lead to the learning.

Once a learning outcome has been constructed, it is stored in long-term memory for future use (Mayer, 2003, p. 130). A solution to avoid split-attention is to physically integrate the textual and pictorial information such that corresponding textual and pictorial information are presented close together (Castro-Alonso et. al, 2021). The authors also explain that highlighting a text to signal the essential information is one of the most popular learner-managed strategies to support learning.

Castillo et. al (2021) claim that educators should evaluate mechanisms of how the video will be produced. For the authors, as compared with recorded lectures, produced videos can deploy the multimedia learning theory supported by Mayer (2014), which may not be a consideration for a standard synchronous videoconferencing lecture. The authors explain that the process of video production could be daunting to some educators, as there are many different styles of videos to consider creating, but the evolution of video technology has made it easier and cheaper to record high-quality videos by implementing minor design decisions (Castillo et. al, 2021). For the authors, the challenge with filming in a classroom or doing a demonstration video, for example, is deciding whether to focus on the board, the demonstration, or the speaker. Understanding the mechanisms of video production consists of three aspects for intentional video design: script, style, and length (Castilho et. al, 2021).

An important guideline for maximizing student attention to educational video is to keep it short (Brame, 2016). Based on the research, the author explains that the maximum median engagement time for a video of any length is 6 minutes. Considering it, making videos longer than 6 to 9 minutes is likely to be a wasted effort. For the author it is necessary to keep videos brief and targeted on learning goals.

Another important observation for teachers when creating or choosing videos is to consider whether they were created for the type of environment in which they will be used. When reusing videos, instructors can package them for a particular class using text outside the video to contextualize the relevance for that particular class and lesson (Brame, 2016, p. 4).

Castro-Alonso et. Al (2021) recommend five strategies of the cognitive load theory and the cognitive theory of multimedia learning to produce multimedia materials: it should (1) contain both text and visualization; (2) present texts and visualizations contiguously or integrated, (3) strive to contain only essential learning information, (4) emphasize essential learning information, or (5) do not show too much transient visual information.

Thus, it is relevant to understand the characteristics of different types of instructional videos as well as their implications, in order to use certain strategies in an appropriate way to maximize the effectiveness of multimedia materials.

Methodology

the present study is based on the qualitative research method as it allows for a better understanding of the process. At the moment, a study to quantify the videos made available on the channel is not of interest. But it is interesting to understand the characteristics and constituent elements of the types of videos that are available in order to contribute to the debate for the improvement of processes that enable a better educational experience for students in educational processes mediated by technologies, especially video.

Canal USP is the official YouTube channel of the University of São Paulo, and it has almost 300k subscribers. In addition to video classes, the channel also broadcasts interviews, special reports, series and videos of scientific research, cultural and academic events. In the channel's playlists, there are a lot of videos about the research carried at the university and video classes that cover different knowledge topics. For example, in the playlist "USP classes", one can find more than thirty undergraduate and graduate disciplines, in practically all areas of knowledge. In the playlist "USP partners", several videos produced by *Canal USP* partners are posted. The channel also publishes the USP Radio Columnists Podcast, where current and relevant issues are addressed by university specialists. *Canal USP* is part of the Science Vlogs Brazil (SVBR) network, a seal that attests to the quality of scientific dissemination on YouTube. Most of the videos are in Portuguese, but there are some lectures given by researchers from abroad in English.

Due to carry out this study two videos were selected from the YouTube channel *Canal USP*: one intentionally designed to be used in distance education and one that is a classroom record to be used in distance education.

The criteria used for the selection of two representative instructional videos were: it needed to be a video about science and with a considerable number of views. One of them should be a classroom record (face-to-face class recorded to be used in distance education) and the other one should be intentionally designed to be used in distance education.

From the results, two videos[1] were selected to be analyzed in terms of duration, framing, camera position and instructor´s conduct.

These categories were chosen considering the principles of multimedia learning (Mayer, 2003; 2014) and the strategies of cognitive load theory and cognitive theory of multimedia learning (Castro-Alonso et al., 2021), which are related to the aesthetic and content quality of instructional materials.

In this sense, each category was analyzed according to the description below.

1. Duration: the educational video needs to be kept short (Bramer, 2016). The length of the video interferes in how it is going to be assimilated by the audience.
2. Framing: refers to how a shot for a specific scene is composed. Framing allows you to emphasize or show thoughts and ideas, for example. It is important that the scene emphasizes only essential learning information to avoid visual distractors which may overload the working memory (Castro-Alonso et al., 2021).
3. Camera position: also known as camera angle, it impacts the way the audience interprets the video. Choosing from static or moving cameras also interferes with how the audience will assimilate the scenes (Castilho et. al, 2021).
4. Instructor´s conduct: empirical findings suggest that the instructor's onscreen presence has different effects depending on the type of knowledge being taught and cultural distance, for example (Ng and Przybylek, 2021).

Considering all these aspects, a comparative table was elaborated using the defined categories for the video analysis (Table 1).

Table 1: comparative table for video analysis

	Duration	Framing	Camera position	Instructor´s conduct
Classroom record				
Intentionally designed video				

Source: the authors

The results that were found and the discussion about them, including some conclusions of this research, are presented in the next sections.

1 https://youtu.be/b1CbeEY5nAk (classroom record), https://youtu.be/nYb4kbYwANE (intentionally designed video)

Results

From the comparative table, the following characteristics could be found (Table 2).

Table 2: results from the comparative table

	Duration	Framing	Camera position	Instructor´s conduct
Classroom record	33´25" (part 3)	bad framing with visual distractors	camera moves several times	no eye contact with the audience
Intentionally designed video	12´10"	good framing without visual distractors	centralized and motionless	eye contact with the audience

Source: the authors

As it can be inferred from the comparative table, the intentionally designed video has a shorter duration than the classroom record (ready-made video). Besides, the intentionally designed video presents all the content in just one video, as the classroom record explains the whole content in three parts (three different videos).

The classroom record video has bad framing, with visual distractors, such as heads of students and the furniture of the classroom (Figure 1). Otherwise, the intentionally designed video has good framing, without visual distractors in the scene. The objects in the background are related to the content of the video (Figure 2).

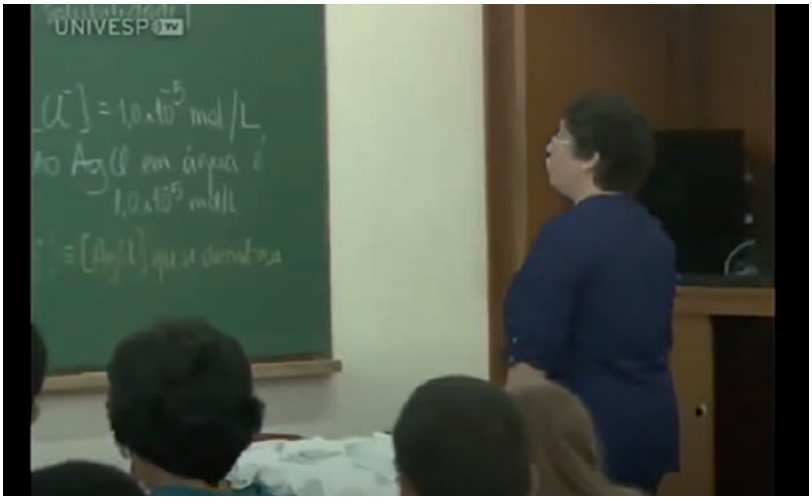

Figure 1: example of bad framing

Source: printed from https://youtu.be/b1CbeEY5nAk

Figure 2: example of good framing

Source: printed from https://youtu.be/nYb4kbYwANE

In the classroom record, the camera moves several times, as the instructor walks through the room (Figure 3). In the intentionally designed video, the camera position changes very few times, and the instructor is always centered on the scene (Figure 4).

We can notice the presence of a script that clearly guides the video production, intentionally planned. For example, regarding camera movements, in the first case the teacher moves from side to side and in front of the green frame, and during the movement the camera lens needs to be adjusted and the focus is changed from the movement. In the second case, for the video, intentionally planned, it is noted that there is no focus adjustment of the moving camera as it was positioned from the previously prepared script. So, there are no distracting elements to the audience´s attention.

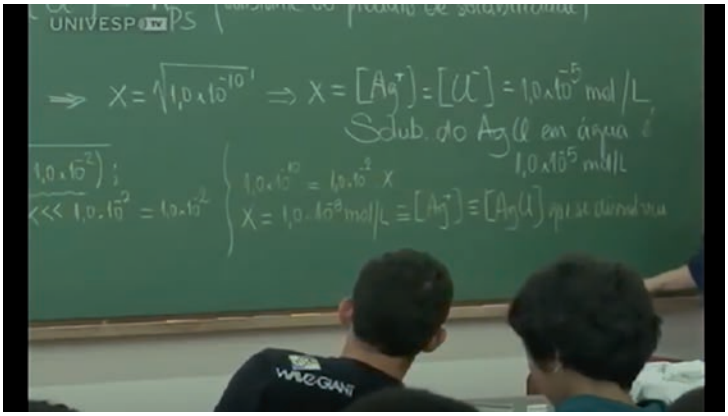

Figure 3: camera moves several times
Source: printed from https://youtu.be/b1CbeEY5nAk

Figure 4: centralized and motionless camera
Source: printed from https://youtu.be/nYb4kbYwANE

In the classroom record, the instructor makes eye contact only with the students in the classroom, so the audience has no eye contact with the instructor (Figure 5). Otherwise, in the intentionally designed video, the instructor makes eye contact with the audience most of the time (Figure 6).

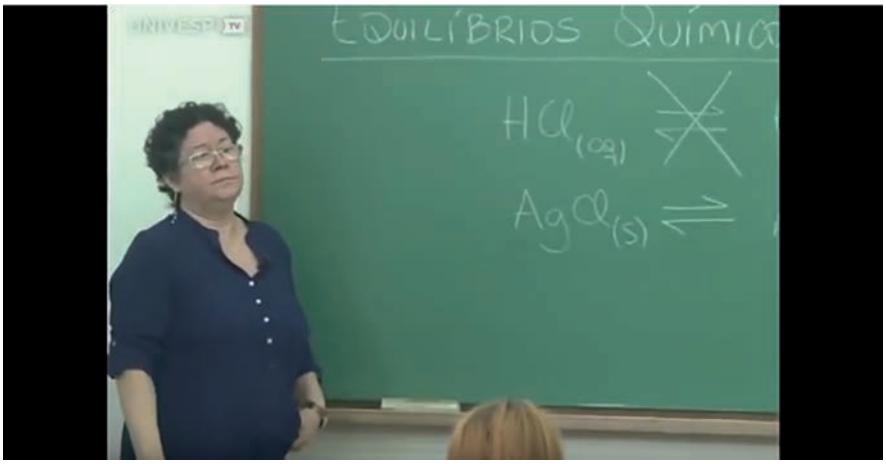

Figure 5: instructor does not make eye contact with the audience

Source: printed from https://youtu.be/b1CbeEY5nAk

Figure 6: instructor makes eye contact with the audience
Source: printed from https://youtu.be/nYb4kbYwANE

When analyzing some particularities about each video, other relevant topics were found. In the classroom record (ready-made video), there were no elements on the screen, such as texts, graphics or visual references. All the text information is available only at the blackboard and sometimes texts do not appear fully complete on the screen (Figure 7).

Otherwise, in the intentionally designed video the instructor´s voice is synchronized with elements on the screen; texts and visualizations are contiguous and integrated (Figure 8). Throughout the explanation, texts and images are placed in sync with the professor's speech, highlighting important points in the content.

Again, it is possible to observe the presence of a script that supports the production choices. In the first case, the camera registers a class that is not organized according to the script, it was certainly the capture of the image and sound during a conventional face-to-face class. But in the second case, it is noted that in the script there were certainly indications of elements that could compose the scene of the recording in order to dialogue with the themes and speeches of the teacher. But in this case, the elements that make up the scene would eventually not distract the audience, as the elements were intentionally planned, they can even increase the audience´s attention, being a positive aspect that enhances the video´s communication. We should not forget that there are issues regarding audience reception, but clearly addressing modes are considered in the production of the script-based video.

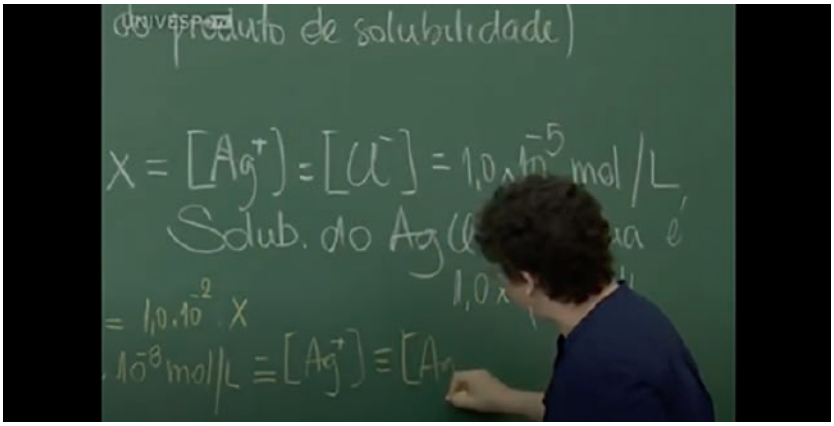

Figure 7: texts elements in the classroom record video
Source: printed from https://youtu.be/b1CbeEY5nAk

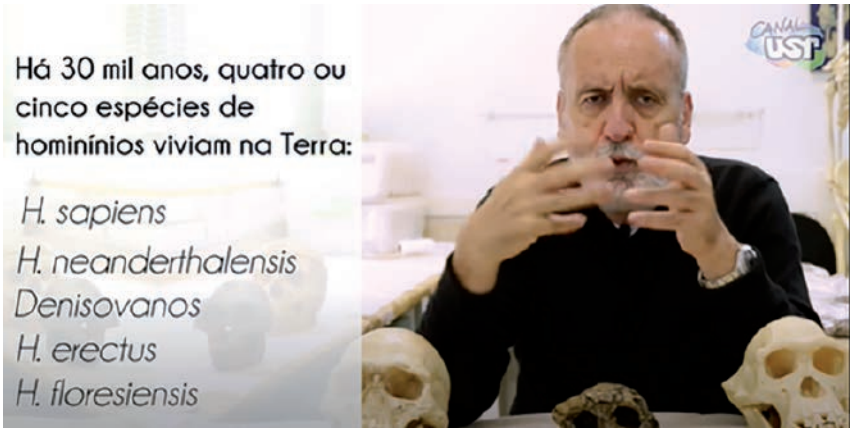

Figure 8: texts elements in the intentionally designed video
Source: printed from https://youtu.be/nYb4kbYwANE

That is, even if it were possible to include audiovisual elements at the time of editing for the video for the first case, they would be mitigating actions and not what originally comprised the proposal. What can impact visual quality with possible impacts on audience reception in a way that impacts the consumption. Note that for the cases under analysis there is a difference regarding the number of accesses to the videos, which can be caused by the quality of communication of the video. But

not necessarily due to the contents because in the first case it is a basic content that could have a wide audience different from the content in the second case that would have a smaller audience, because it is a more specific content. Even so, the difference in reception between the two videos under analysis is very significant.

One last observation is that the classroom record video had 1,600 views and it was published in 2015. The intentionally designed video had 30,000 views and it was published in 2018.

Discussion

as noted by the results, the two videos have very distinct characteristics. It can be observed that the intentionally designed video is more in line with the multimedia principles than the classroom record because it implements minor design decisions (Castillo el al., 2021). Although both videos present quality of the content, the quality of audiovisual aesthetic is noted only in the intentionally designed video: video mechanics, such as camera position, scenery, framing, sound and lighting.

The intentionally designed video is shorter than the classroom record and all content is presented in just one video, whereas the classroom record has its content divided in three different videos. Short videos are better assimilated by the audience than long lectures, so it is important to keep videos brief and targeted on learning goals (Brame, 2016).

Considering the principles of multimedia learning (Mayer, 2003; 2014) and the strategies of cognitive load theory and cognitive theory of multimedia learning (Castro-Alonso et al., 2021), it is possible to identify which other characteristics could maximize the effectiveness and what should be avoided by multimedia materials.

The assumption of dual channel (Mayer, 2003) establishes that information is processed both in visual and in auditory terms, so it is important that multimedia materials contain both text and audio and present it contiguously or integrated (Castro-Alonso et al., 2021). Although each channel has limited capacity, the use of the two channels can facilitate the integration of new information into existing cognitive structures (Brame, 2016).

The intentionally designed video has used that dual channel principle highlighting on the screen some words that were spoken by the instructor. By highlighting the key information, signaling helps direct learner attention, thus targeting particular elements of the video for processing in the working memory (Brame, 2016, p. 2). Otherwise, in the classroom record the texts do not appear fully complete on the screen because it is written only at the blackboard. So, in visual terms the information can be misinterpreted by the audience.

The principle of limited capacity postulates that there is a limit to the amount of information that is processed simultaneously on each channel (Mayer, 2003). In this sense, educational materials should avoid overloading the working memory and contain only essential learning information (Castro-Alonso et al., 2021).

As noted by the results, in the classroom record there were lots of visual distractors in the framing, such as the heads of students and the furniture of the classroom. The camera moves as the instructor walks through the room, which

may annoy or distract whoever is watching the video. It is also observed that the instructor in the classroom record does not make eye contact with the audience, only with the students in the classroom. Although the educator may feel uncomfortable or reserved speaking in front of a camera, using positive body language and facial expressions can help to retain the audience's attention (Castillo et al., 2021).

In the intentionally designed video, the background is set up with references that are related to the theme of the class (evolution of humanity). One key aspect of building a set is to ensure minimal distractions behind the subject that would pull the viewers' attention away from the purpose of the video (Castillo et al., 2021, p. 6). Another observation is that the camera is motionless, and the instructor stays centralized in the scene. The instructor makes eye contact with the audience, has proper posture and careful gestures. For the educator to appear engaging, having "eye contact" with the camera gives the illusion that the educator is speaking directly to the student (Castillo et al., 2021).

The assumption of active processing places that active learning implies the execution of a coordinated set of cognitive processes (Mayer, 2021). To engage in active learning some strategies can be used, such as interactive questions. None of the analyzed videos used elements that contributed to active learning. However, these strategies fit better in an intentionally designed video because its implementation requires planning a script in which these didactic moments are foreseen and previously elaborated.

Finally, when reusing video or selecting ready-made videos for remote classes, teachers may contextualize the use of that material and the relevance that it has for that particular class or lesson (Brame, 2016).

Conclusion

The global pandemic impacted teaching work, leading teachers to produce or select videos for use in their remote classes. This situation highlighted a problem that predates the pandemic: the need to prepare faculty for media literacy, so that teachers are able to produce multimedia content or appropriately select ready-to-use videos in online or remote contexts.

It would be important for media literacy to be present in the curricula of courses aimed at teacher formation. For teachers who have already graduated, it would be necessary to provide training courses.

While intentionally designed video presents the most suitable strategies for use in distance education, classroom recordings are not necessarily bad if there is technical support to allow multimedia principles to be used.

Multimedia principles can enhance the effects of multimedia material, considering cognitive aspects based on the functioning of the mind. It is not possible to say whether these actions guarantee learning. To assess this, specific studies would be needed.

Based on the results of the study carried out, the need for investment by institutions (Universities and Schools) in teacher training to deal with the need to produce content that accompanies the digitization of society is evident. It

is investment in infrastructure so that teachers can develop projects for the production and dissemination of scientific content to society taking into account the dissemination of misinformation. The University has an important role now, as well as investments in training teachers in media literacy that allows them to produce and/or understand the audiovisual production process to better communicate with the public. Furthermore, the results showed that it is necessary to study the reception of the audience so that new improvements can be made in the videos produced that can achieve the objectives in dialogue with this audience.

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Strategies in audiovisual presentations for distance learning

Abstract

The closure of schools and universities due to the global pandemic led teachers to resort to using videos in their remote classes, whether producing or using ready-made videos. In this sense, it is important to know the characteristics of different types of videos as well as

their implications, considering the potentialities when they are selected intentionally for educational purposes. This article aims to investigate the characteristics of two types of videos: one intentionally designed and produced to be used in distance learning and one that is a classroom record to be used in distance learning. Due to this, two representative videos were selected from the YouTube channel Canal USP. Both videos were analyzed in terms of duration, framing, camera position and instructor´s conduct. In the intentionally designed video, the instructor's voice is synchronized with elements on the screen; audience has eye contact; camera is motionless; it has a short duration. Otherwise, in the ready-made video there are no elements on the screen; camera moves many times; audience has no eye contact; there are visual distractions; it has a long duration. The conclusions are that teachers can develop audiovisual presentations based on how the multimedia instructional principles work and maximize their effectiveness.

Keywords: audiovisual presentations; distance learning; instructional videos; educational videos; multimedia learning.

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