

EDULEARN¹⁹

**11TH INTERNATIONAL CONFERENCE
ON EDUCATION AND NEW LEARNING
TECHNOLOGIES**

**PALMA (SPAIN)
1ST - 3RD OF JULY, 2019**



CONFERENCE PROCEEDINGS



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PROCEEDINGS**

Published by
IATED Academy
iated.org

EDULEARN19 Proceedings
11th International Conference on Education and New Learning Technologies
July 1st-3rd, 2019 — Palma, Mallorca, Spain

Edited by
L. Gómez Chova, A. López Martínez, I. Candel Torres
IATED Academy

ISBN: 978-84-09-12031-4
ISSN: 2340-1117
Depósito Legal: V-1702-2019

Book cover designed by
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TEACHING AND LEARNING THROUGH VIDEOLESSONS: THEORIES AND METHODS

M.A. Garito

International Telematic University UNINETTUNO (ITALY)

Abstract

The aim of this work is to analyze psycho-pedagogical theories and methods linked to the modes of communication and knowledge dissemination by means of videolessons, in order to highlight the strengths and the weaknesses bound to the video-communication of the academicians.

At present, very interesting phenomena are manifesting in the world, the use of the most powerful platform in history is rapidly advancing, i.e. the Web, to digitize scientific contents from academic professors, which are not only textual but also videos. In particular, there are many videolessons that are conducted by prestigious professors in many Universities worldwide, both on YouTube and on MOOC platforms.

The videolessons that can be watched on YouTube for free, as well as those uploaded in the MOOCs and delivered by the most prestigious American and European Universities, bear patent methodological lacks, linked to the communication model of the videolessons. These do not have a well-defined format, nor their structure consents to assume that behind the video communication there is a specific didactic model and solid theoretical grounds underpinning the communication model, so the didactics by means of a peculiar language, which is the language of the image with its rules and theories.

Video technologies lead academic teachers to cope with and face a new language for transmitting knowledge that certainly does not belong to their normal teaching method. The teachers have to learn a new mode for explaining, synthesizing, laying out the subjects, linking images and words, taking into account body language, posture and clothing.

The continuous research activities, analyses and testing conducted by the working staff I have been coordinating at the International Telematic University UNINETTUNO, allowed to define and elaborate communication models to be applied in the making of videolessons and multimedia teaching materials linked to them.

In order to conduct the research 1000 students got involved who were given a questionnaire. The questions of the questionnaires had the goal to verify the way the videolessons were used to develop their learning processes.

The outcomes of this research activity, the study and the deepening of the theories related to communication, learning, and memory allowed to identify useful models to explain a lesson to virtual students, languages and styles to be adopted by a video-teacher with the aim to trigger a critical and reflective learning process.

Keywords: e-learning; psycho-pedagogic models; videolectures; learning and teaching methodologies.

1 INTRODUCTION

The aim of this work is to analyze psycho-pedagogical theories and methods linked to the modes of communication and knowledge dissemination by means of videolessons, in order to highlight the strengths and the weaknesses bound to the video-communication of the academicians.

At present, very interesting phenomena are manifesting in the world, the use of the most powerful platform in history is rapidly advancing, i.e. the Web, to digitize scientific contents from academic professors, which are not only textual but also videos. In particular, there are many videolessons that are conducted by prestigious professors in many Universities worldwide, both on YouTube and on MOOC platforms.

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well-defined format, nor their structure consents to assume that behind the video communication there is a specific didactic model and solid theoretical grounds underpinning the communication model, so the didactics by means of a peculiar language, which is the language of the image with its rules and theories.

Video technologies lead academic teachers to cope with and face a new language for transmitting knowledge that certainly does not belong to their normal teaching method. The teachers have to learn a new mode for explaining, synthesizing, laying out the subjects, linking images and words, taking into account body language, posture and clothing.

In designing the videolessons we have taken into account the existing theories on unidirectional communication, as well as on the language of the image, and in particular:

- on written communication (Horowitz and Samuels, 1987)
- on the characteristics of the technological means
- on aspects of reasoning and representation of information (Johnson-Laird, 1983)
- on the role of memory, functioning of the mind, understanding and learning (Bower and Cirillo, 1985; Norman, 1988; Gagné and Briggs, 1974; Ausubel, 1978; Vygotskij, 1978).

As a consequence of this theoretical approach, to realize an effective learning process with videolessons, we have taken into account what are the main stages with which the human mind develops and builds critical knowledge. The teaching process has been decomposed into different phases, each with different construction needs: phase of motivation, understanding, acquisition and retention, phase of memory, generalization, performance, feedback. For learning purposes, four techniques used by video teachers were very important, which we can define as "triggers" of learning

- posing questions
- communication of educational objectives
- presentation of initial overviews
- use of anticipatory organizing concepts.

An important element to strengthen the understanding and memory of the concepts expressed by the teacher can be represented by graphic animations and videos or films that visually represent both the theoretical topics developed and the practical applications of the formulas and concepts transmitted. Every theoretical concept can have its representation visually and three-dimensionally animated. The appropriateness of the representation is closely linked to the task and purpose that is set. A representation system consists of two essential elements:

- the represented world, i.e. what must be represented;
- the representing world, that is a set of symbols and signs, each of which stands for something else (in other words it represents something) (Norman, 1993).

The digitized and indexed videolesson deeply modifies the learning processes. The study strategies, implemented during the use of the digital videolesson, are based on seeing and reviewing parts of the videolessons as many times as desired, based on the student's needs; on pausing to reflect and to realize if they need to consult further sources, to review what has been observed in order to strengthen long-term memory.

These functions are not only techniques related to the use of videolessons, but are also metacognitive strategies that can facilitate the self-assessment of their activities of understanding. The multimedia and hypertext study strategy, possible with video, is effective because it allows to organize the knowledge in memory using different registers (text, sound, images) and therefore to increase the accessibility and depth of understanding, and strengthen the long-term memory.

2 THE VIDEOLESSON IN THE TEACHING-LEARNING PROCESSES

In face-to-face teaching, where teachers and learners are both present and interacting, the kind of communication that takes place is of a two-way kind; instead, in teaching through the videolessons, teachers and learners are not present in the same place and the kind of communication that takes place is of the one-way kind.

This characteristic allows us to liken it to another form of one-way communication: the production of a written text (Horowitz and Samuel, 1987, pages 1-46). Though they do not allow the speaker to make use of a direct exchange with his listener and consequently to correct and adapt the communication to the needs the listener in real time, both have the advantage of being pre-planned, without repetitions, more structured and logical, more objective and concise, of a richer and more suitable vocabulary, more explicit and richer in information. Essentially, the written text allows thinking over its contents thanks to its permanent nature. However, in face-to-face conversation meaning is enhanced by gestures, posture, intonation of the voice, mimic and facial expression that give additional information, little of which can be present in written communication. If a lot of additional information is lost in the written text, it has the advantage that its visual mode results in the externalization and objectification of the content of the communication, which allows the author to make his authority on the subject more evident.

The video teacher, unlike the author of a text, who can use only written language, has also the possibility to make use of some of the advantages of oral language and of the visual language, which in addition to those of written and graphical language gives particular effectiveness to communication.

One of the fundamental advantages of television is the fact that it has the possibility of presenting different models of audio and visual communication simultaneously through the use of oral language, written texts and images, etc. (Greenfield, 1987). The realization of a videolesson is planned in advance, envisaging and imagining the user's reactions, as it happens in formal verbal communication or while writing a text. However, we have to consider that not all that happens during the shooting of videolesson follows the set list; actually, the teacher carves out times for himself for spontaneous contributions and communications to make the lesson smoother exploiting the positive aspects of an informal "chat". Therefore, it is hard to exactly specify the formalization level of the recorded lessons, which can be comprised between a lower level, that is during the teacher's spontaneous interventions, to the highest level, when the lesson consists in well-structured, multimedia (oral explanation, several written texts, software, videos etc...) and hypertextual (reminds to past notions) presentation or when it is explicitly recommended to revise some parts of already realized videolessons in order to trigger a cognitive scaffolding on issues that were already treated with the aim of facilitating the understanding of the subjects that are being explained.

3 THE RESEARCH WORK TO IDENTIFY THE MODELS FOR THE VIDEOLESSONS

The ongoing research activities, analyses and testing conducted by the working team that I coordinated at the International Telematic University UNINETTUNO, allowed to define and design the communication models to be applied in the making of videolessons and multimedia teaching materials linked to them by the teachers. In order to conduct the research, 10000 students got involved and were given a questionnaire whose questions were aimed at checking the way the videolessons were used to develop their learning processes. From these questionnaires and from their further processing, thanks to the above-mentioned research, the techniques and languages useful to facilitate the student's learning processes while watching the videolessons became evident.

The videolessons appear as a guided didactic conversation; the specificity of the communication medium makes the teacher, besides transmitting knowledge on a given subject, guide the student towards a learning-effective method of study, and encourage a critical reading of the exam textbooks. The teacher delivering the videolessons speaks to the student, suggests him to take notes, creates connections with other issues and treated themes, recalls links with texts and more-in-depth study lecture notes, with multimedia materials such as videos, photographs etc... , related to the issues treated in the videolessons, proposes exercises to assessment each issue and encourages self-assessment by asking questions and raising problems.

4 THEORETICAL ASPECTS

The outcomes of the research activity performed by UNINETTUNO, the analysis and more-in-depth study of the theories related to communication, learning and memory established the scientific foundations on which the teaching method for delivering a lesson to a distance student was built and they also allowed to define the languages and styles to be adopted by the video teacher to trigger a critical and thoughtful learning process. Therefore, in designing the different models of videolessons we took into account current theories on one-way communication and more specifically:

- **on written communication:** given that one-way oral communication on video can be based on many principles relating to the production of a written text (Horowitz and Samuels, 1987, pages 1-46);
- **on the characteristics of the technological medium** in order to enrich communication with further languages. The effectiveness in acquiring the ability to use the media depends on both the characteristics of the medium and on the knowledge of its potentials by those who design it and by those who use it. Authors such as D. R. Olson (1976; 1977;1980) and Hildyard and Olson (1982) stress the fact that human intellect cannot be considered as separated from technologies - numerical systems, graphical representations, writing etc. - that man constructed to enlarge his cognitive resources and that have a deep impact on the cognitive processes. Cognitive processes and abilities are not neutral in cultural terms, but their development depends on the weight and on the importance that technologies acquire in a given cultural setting;
- **on the aspects concerning reasoning and the representation of information** (intermediate analogical representations aimed at achieving specific objectives of the system); reference was made to the theory of mental models of Johnson-Laird (1983) who affirms that human beings build mental models that are used in reasoning, including the reasoning patterns that are necessary to understand a text, through mainly unconscious processes;
- **on the role of memory, the functioning of the mind, understanding and learning:** the cognitive and association theories were adopted (Bower and Cirillo 1985), (Norman, 1988), (Gagné, Briggs, 1974), (Ausbel, 1978), (Bloom, 1982), (Vygotskij, 1978), which describe mental activity as the sequence of three different moments: the recognition of the information, the transformation and processing of the information and finally, conserving the information in the long-term memory.

Therefore, in preparing videoleasons, the teacher should adopt strategies that relate to the theories cited and should plan the development of the contents of the videolesson keeping the various phases which constitute the learning process in mind in order to facilitate this process. Teaching was divided into different phases, each of which was aimed at meeting a particular construction need: **motivation phase, comprehension, acquisition and retention, memory phase, recall, performance and feedback.**

- The motivation phase.** In this phase the teacher introduces external stimulus that can attract the students' attention and enhance their motivation. In order to do so, it is possible to adopt specific techniques, such as that of making clear, since the very beginning, which are the course objectives that the students is about to attend and spur him to achieve them. Another effective technique consists in explaining which are the prerequisites to follow a subject and make the student assess whether he has the skills required to add the new knowledge in order to establish significant links with his previous knowledge.
- The comprehension Phase.** In this phase the video teacher tries to stimulate a selective and discriminating attention among the students guiding them to focus attention only on those elements that are necessary to develop new knowledge. The inclusion of questions during the lesson turns out to be useful to focus the student's attention and making him think. Questions, in particular, play a different function depending on their position in the videolesson, as we will see later on.
- Acquisition and Retention Phase.** In his phase, the student codifies the information that he receives to transform and store it in his memory. In order to facilitate this process, the teacher guides the learning process of the student suggesting a method of codification suited to the material being treated in the videoleasons and useful to the students.
- The recall phase.** This phase is related to the retrieval of stored information. In order to facilitate this process, the teacher stimulates the retrieval of information, suggests the students some retrieval strategies to be used, and asks questions on subjects whose answers enhance memory.
- Generalization Phase.** Generalization is obtained when information is transferred to various contexts. In order to carry on this phase the teacher proposes different contexts in which the retrieval of this information is necessary for the solution of a problem. As a matter of fact, he presents examples and similarities with already known facts.

- f) **Performance Phase.** This phase is related to the use of the learning that has taken place or the skill that has been acquired, namely the task that had been stated as the learning objective. In order to do so the video lecturer supplies examples of the task supplying the assessment criteria (that is to say, the means of verifying the correctness of the performance) in such a way that the student, even on his own, will be able to check his own skills in problem-solving assignments;
- g) **Feedback Phase.** For the student, having detailed independent feedback on his performance that will help in verifying whether he succeeded or in comparing his performance to a standard model is a very important way of motivating learning. In fact, feedback acts as a positive reinforcement to further learning if the performance is correct and if the response is incorrect it gives a clear indication of the specific points that the student must deepen. In order to make this phase easier he is asked questions on the treated subjects and the correct answers are displayed in the didactic cyberspace, on the Internet, in a special area

The teachers who deliver a distance videolessons, without interacting, may not implement the feedback phase, but the model of realization of a videolessons envisages that, at the end of each subject being treated, the teacher asks questions to the students (see following chapter); the answer to the question can allow the student to auto-assess his own learning skills on that specific subject.

5 TECHNIQUES FOR LEARNING TRIGGERING

In order to enhance learning four techniques used by the video teachers and that we may define as "triggers" to learning seem very important since they favor, in a particular way, the first three phases described in the preceding paragraph (Hartley and Davis, 1976, pp. 239-265.)

5.1 Presentation of questions or issues

The first technique is the presentation of questions or issues.

Questions make direct reference to theoretical knowledge and to practical abilities related to the object of learning and they can play different functions depending on the type of question and on the place they occupy in the videolesson.

With regard to their place, the functions of introductory questions related to a single subject consists in eliciting information from the student concerning his knowledge of a specific sector.

When questions are placed, instead, not only before treating a new subject, but also at specific times of the presentation of the subject, they favor the processing of information on a linear mode. Their also contribute to strengthen attention.

Questions placed at the end of a subject look back to verify information similar to that already received, and therefore lead to revise information received more carefully. They are also useful to enhance further learning.

Answers often require processing, integrating and recalling previously acquired information and knowledge and facilitate the acquisition of new information and knowledge.

5.2 Communicating teaching objectives

The second technique is the communication of the teaching objectives.

These must be expressed in terms of the specific competence that the student must convincingly demonstrate to have acquired at the end of the learning period.

This channels the student's energy towards a well defined task and gives him the possibility to verify whether he is making progress towards the targeted goals. In this way, the student is equipped with a tool for self-evaluation on a continuous basis that will help him to study more efficiently.

5.3 Presentation of initial overviews

The third technique consists in presenting initial overviews.

These can be summaries and written presentations accompanied by charts, diagrams, pictures that allow the student to focus his attention on the essential elements: concepts, principles, techniques. They must be structured at the same level of abstraction, generalization and comprehensibility as the

teaching material and they become effective thanks to repetition, summarization, a selective underlining of the main concepts and through the familiarization using some examples and key words.

The functions of this technique consist in the presentation of the student's cognitive matrix for the learning process and in the highlighting of the focal points of the teaching material: in short, they supply a general reference picture for further study

5.4 Using organizational propedeutic concepts

The fourth technique consists in the use of organizational prerequisites or propedeutic concepts (Ausbel, 1978, ch. 2).

This technique consists in facilitating the scaffolding of the learning material into the student's cognitive structure thus supplying a conceptual framework by using languages and concepts with which the learner is already familiar even using appropriate pictures and analogies.

The functions of this technique are, as we have just said, to stimulate the student's cognitive matrix by highlighting key concepts to which the teaching material can be linked and by supplying a framework of conceptual references to support of the whole teaching process.

Briefly, we can say that, among the techniques that facilitate learning, the following are of particular importance:

- **questions presented at both the beginning and the end of the lesson;**
- **information concerning teaching goals** which among other things allows for the channelling of energies towards a well defined task and offer the possibility to verify that this aim is being achieved, thus supplying a tool of continuous and clear self-evaluation;
- **presentation of an initial overview** allowing the student to prepare his cognitive matrix for the learning process by underlining the key points of the teaching material and supplying a general framework in which to place further learning must be set;
- **using prerequisite or propedeutic organizational concepts** that allow the student to demonstrate his cognitive matrix by highlighting key concepts to be linked to the material to be learnt and to supply a conceptual framework in support of the whole learning process.

6 THE LANGUAGE OF IMAGE IN THE VIDEOLESSON

The image has communicative power of its own, such a highly manifest didactic potential that nobody can put in question. In a television-based teaching process theoretical issues can be linked and presented to fix or dynamic images by displaying events, objects, experiments, charts, animation of real cases etc. This helps strengthening the viewer's attention. Of course, images have to be included after an accurate assessment of their educational effectiveness. A wonderful animation, not properly presented by the teacher in an appropriate educational context, may impress the student positively, but may not provide him with any further knowledge. The educational objective of the videolessons is that of developing critical knowledge, by a sensible use of images, and this can favor thinking and the construction of mental patterns and models allowing for abstraction and generalization. In the videolessons, the video teacher, beside transferring knowledge on a given subject, leads the students towards a study and learning method, towards a critical reading of the exams texts; therefore, he shows characters that resemble those of the traditional classroom-based teacher: he asks them to take notes, proposes exercises, promotes self-assessment asking questions and raising issues.

If a video-based educational communication wants to play its teaching role, it must be extremely rigorously and logically structured. New communicative models emerge thanks to the explicit finalizing of learning which is realized particularly thanks to the possibility of watching the (digitized and indexed) videolessons many times.

7 USING SLIDES IN THE VIDEOLESSONS

A useful communication tool, that is at the teacher's disposal during videolessons, is represented by the slides created using specific graphics software packages.

One of the main advantages of using slides (that can present simple writings or charts, tables, diagrams etc...) consists in the possibility of enhancing the student's attention.

Taking into account the fact that attention is mainly related to individuals' motivation, we can affirm that the introduction of the visual channel in communication can enhance the possibility of enhancing the viewer's attention. Attention often fails if the presentation becomes boring and in this sense, the use of slide can enhance it since it introduces a "change in style" which represents an element of novelty.

Slides can be defined, according to Norman's wording, as cognitive artefacts, or tools created by man to expand his mnemonic and cognitive possibilities. They are external supports that make us smarter because they strengthen our mental possibilities.

An appropriate use of a graphical presentation helps the students since it acts as an external memory. Nevertheless, it is also possible to make an inappropriate use of the graphical material: often, actually, slides include the presentation and reading of long and complicated texts and key words that are unclear and not concise that are not useful to summarize and pinpoint basic concepts and that is the reason why it becomes difficult to access information and process its further. An important element for enhancing the comprehension and memorization of the concepts expressed by the teacher can be represented by graphical animations, videos or films visually displaying the theoretical issues being developed as well as the practical applications of formulas and concepts being communicated. Every theoretical concept can have a visually and three-dimensionally animated representation. The appropriateness of the representation is strictly linked to the task and to the aim that is set.

A representational system includes two main components:

- *The represented world* that is to say what is represented;
- *The representing world* that is to say the set of symbols and signs, each one of which means something else (in other words, represents something) (Norman, 1995).

A good representation is that catches the essential features of a concept, leaving aside the less significant ones. In this feature is concentrated the power (and at the same time the weakness) of representation: if it actually points out the relevant aspects, representation has the power to substantially enhance reasoning and thinking skills. In order to be correct and effective representations must:

- catch the essential features of the represented concept and leave aside the less significant ones
- meet the characteristics of the users' cultural skills;
- be well-suited to the task.

Therefore, the selection of the correct representation changes the task difficulty level; Piaget too demonstrated very unambiguously that a different representation of information fairly changes the final structuring of knowledge and the solution of the problems.

Man does not act following a strictly symbolic logic, but he prefers a perceptive mode; to a reflective reasoning that requires a top-down processing, he prefers an experiential reasoning caused by a (bottom-up) sensory, more reactive and automatic information.

As a consequence, representations use spatial and perceptive relationships that allow us to efficiently use our sensory systems and to think in an experiential way.

8 NEW LEARNING MODES

The digitized and indexed videolesson profoundly modifies the relationship between students and teacher both as compared with the classroom-based lesson and with the lesson streamed live on the Internet. In a university classroom, the rules of an extremely formal communication are followed and this confers great authority on the speaker. However, the authority of the teacher does not often promote interactivity: shy students rarely find the courage to speak. In addition, a survey shows that the digitized videolesson enhances interactivity since it makes possible to easily watch and listen to again some parts of the lesson, without specifically asking the teacher to pause to repeat something or answer some questions. The teacher keeps his authority, but loses the authority that often prevents the students from speaking and "admit" that they did not understand something. Adding the benefit of linearity and of organization of the written text to the immediacy, subjectivity and personal involvement typical of oral communication, the watching of a digitized videolesson implements original and peculiar learning modes.

The study strategies implemented while attending a digitized videolesson are based on seeing and going back to look again at parts of the lesson as many times as you wish depending on one's needs; on pausing to reflect and to understand whether you need to consult other sources, on looking again at what has already been seen to refresh the long term memory; on seeing other sections of the video that can have interesting connections with other material and other sources. These functions are not merely technical ones depending on the videolessons use modes, but they are meta-cognitive strategies that can facilitate self-evaluation of one's own comprehension level. During the traditional classroom-based lesson, it is actually impossible to interrupt the teacher to reflect or to consult other sources. Usually, the student takes notes and reserves the task of making comparisons to a later time during which to reflect and clarify but he does not always succeed in carrying out what he plans to do and the task of deeper study loses freshness and impetus on account of the time gap. With videolesson, the student, has the possibility of customizing to all his study paths, he can interact using multimedia materials. In fact, in the videolesson two levels of multimodality can be distinguished: a multimodality in the video, consisting in using different forms of media operating in the same environment and aimed at common goals and a multimodality of the video at the level of use of the video by the user, represented by the student's possibility to use and consult other media (besides the video) to study, compare, memorize and evaluate both the information content as well as his own learning.

The multimedia and hypertextual study strategy made possible the video is effective because it allows the organization of knowledge in memory through the use of different registers (text, sound, images) and therefore increases accessibility and the deepening of understanding and enhances long-term memorization.

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