Mediated Information and Flipped Classroom - Information Retention Level Assessment

Armando Silva, Paula Quadros-Flores

School of Education of P.PORTO, Portugal

Abstract— The Flipped Classroom methodology uses audiovisual products in general and video in particular as a means to make content available to students. In this study, we intend to verify and evaluate if there are significant differences in the retention of information mediated by the audiovisual products according to the type of resource that carries it. For this purpose we created eleven prototypes using the "Articulate Storyline ©" program. In these prototypes the information was presented exclusively in the following typologies of resources: i) Video; ii) Video, Audio and Text; iii) Video and Text, iv) Video and Audio; v) Image, Audio and Text; vi) Image and Text; vii) Image and Audio; viii) Image; ix) Audio and Text; x) Text; xi) Audio. In this study, the data revealed that the average levels of information retention mediated by the various typologies of resources were higher than 60%, either immediately after receiving the information or after eight days; and that the highest retention occurred when information is mediated through video, audio and text simultaneously with 92.31% and the lowest retention when information is only available through the 64.62% image.

Keywords— Evaluation of the Information Retention Level, Mediated Information and Retention Effectiveness, Multimedia Resources, Audiovisual, Flipped Classroom.

I. INTRODUCTION

Online distance education contexts should be based on the premise that teaching must be student-centred, promote autonomous, self-regulated and collaborative learning and encompass both the scope of formal education and the scope of informal education.

The main platforms that offer online distance education courses use audiovisual products in general and video in particular for the presentation and distribution of their content. In online teaching contexts, teacher-student communication takes place through multiple means of communication, in which the video assumes a role of excellence that teachers use to make content available.

In the Flipped Classroom methodologies, the video is used to present the contents to the students, which will be treated later in the classroom. The Flipped Classroom methodology follows a model of teaching and learning in reverse: students attend home-based classes (mostly embedded video-based video support) and use classroom time to interact with peers and teachers [11].

However, video as a learning support tool is (still) poorly exploited and often misused [12], [7] and [6]. The language of video has a synthetic nature, articulates moving and static images, sounds, speeches and texts, creating a juxtaposition of codes and significations, predominantly audiovisual [13], [10]. Video captures the attention for its moving images, for its audio and is often self-explanatory, which enhances the seizure and

retention of information and consequently learning. The research of several authors raises questions related to the levels of retention of the mediated information according to the different resources in which it is transmitted. The British Audio Visual Society [1] and the Industrial Audiovisual Association [8], converge in their conclusions stating that we remember about: 10% of what we read; 20% of what we hear; 30% of what we see; 50% of what we hear and read simultaneously; 80% of what we say and 90% of what we speak and do simultaneously [1] and [8]. The study developed by Socony-Vacuum Oil CO. Studies [15], shows the relationship between the data retained in the first three hours, with the data retained after three hours after receiving the information, Table 1.

Table. 1: Comparison of data retention before and after three hours

Teaching method	Data Retained	
	Up to 3 hours	After 3 hours
We hear	70%	10%
We see	72%	20%
We Hear and See Simultaneously	85%	65%

Glasser (2001), in his Theory of Choice, states that we remember things in terms of the interaction we have with

them. He says that we learn 10% of what we read, 20% of what we hear (such as podcasts, audiobooks, ...); 30% of what we see; 50% of what we see and hear (ex: videotapes, films, documentaries ...); 70% of what we discussed with others (e.g., talking, debating, asking, ...); 80% of what we do (e.g. writing, translating, proofreading, ...) and 90% of what we teach others (e.g. explain, summarize, elaborate, ...). For Glasser, to read, to hear, to see, to see and hear are considered passive forms of study, and what we discuss, do, and teach are active ways of learning [5]. Dale, in his study in 1969, says that after two weeks, the human brain recalls 10% of what you read; 20% of what you heard; 30% of what you saw; 50% of what you saw and heard; 70% of what you said in a conversation or debate, 90% of what you said and did, than you experienced during your practice. As for the type of involvement/engagement, Dale groups these experiences into two types: one that he calls passive involvement, in cases where information is received verbally and visually (reading, listening, seeing, hearing, and seeing); and another, which he calls active involvement, in cases where the subject participates (saying, saying and doing) [2], [9].

The majority of the educational videos that are used to make content available are grouped into two different types: videos with shots of the teachers verbally displaying/presenting contents and videos with relevant image plans of the subjects to be dealt with by the teacher's voice off explaining the contents.

In the videos with shots of the teachers verbally presenting/displaying content, the teachers present a verbal text in an expositive way. As a result, in this type of videos the student/viewer quickly ignores/abandons visual information (because it does not change, always the same image of the teacher - does not increase significant information) and focuses exclusively on audio information. In these situations the retention of the information is restricted almost exclusively to the auditory canal, and the visual channel is neglected. The interest and strength of the information is in the verbal/audio and often the student/spectator stops paying attention to the visual channel and concentrates exclusively on the audio channel - in the listening. Examples of this typology are the "Classroom Session", "Talking Head", "Webcam Recording", "Videoconference" [7] and [12].

In the videos with shots of relevant images of the subjects to be explored, with the teacher's voice off explaining the contents, the information retention happens simultaneously through the visual and auditory channel and the student/spectator gets "stuck" to the screen and

concentrates on what they are seeing and listen. In these situations, the retention of information is enhanced by simultaneously activating the visual and auditory channels, which constitute the two main means of audiovisual communication - the eyes and ears. Examples of this typology are the videos "Demonstration", "Slide presentation with voice over", "Khan style digital capture ", "Udacity style digital capture", "Screen capture", "Animation" [7] and [12]. Regarding the online evaluation process and considering that, as Figueiredo affirms, any learning context must contain in itself the essential tools for the evaluation of its own success [4]. Video documents must provide questionnaires embedded at the end of each video in an integrated way, to allow students to self-evaluate their progress and also their success in the learning form that is proposed [12].

II.   THE STUDY

This was the theoretical framework that based the design of our empirical study, whose main objective is to verify and evaluate if there are differences in the retention of the information at the moment immediately after its reception, and after eight days, depending on the information presented in resource video, still image, sound or text separately or in sets formed by combining paired groups or groups of three of these different features.

So we created eleven prototypes using the program "Articulate Storyline ©" in which the information was directed to what we see (video); we see (fixed image) and we hear; we read; we see (video) and listen simultaneously; we see (video) and read simultaneously; we see (video), listen and read simultaneously; we see (Fixed Image) and read simultaneously; we see (fixed image), listen and read simultaneously; we hear and read simultaneously.

III.   INSTRUMENT OF STUDY

Eleven types of audiovisual resources were used with a digital quiz incorporated at the end of each one, which allowed obtaining quantitative data depending on the use of different combinations of the typology of the resource/media used. These features gave rise to eleven different types of arrangements that are explained below.

Table. 2: Type of Resource R1 – Video

Table. 3: Resource Type R2 - Image

Table. 4: Resource Type R3 - Audio

Table. 5: Type of resource R 4 - Text

IV.   SAMPLE

Our sample is made up of 143 students of higher education, of the courses of the teacher training of the Superior School of Education of P.Porto.

In each typology, 13 students of both genders were used in both test 1 and test 2 (eight days later - 8DL).

V.   METHODOLOGY

The eleven features differentiated according to their typologies constitute Test 1 that was applied to all 143 subjects of our sample.

Eight days later, the completion of Test 1, it was applied to the same subjects Test 2, consisting only in part of the questions contained in each of Test 1 resources (audiovisual information of R1, R2, R3 and R4 was hidden).

VI.   DATA COLLECTION AND TREATMENT

Data was collected through the incorporated quiz at the end of each type of audiovisual resource. For data processing, we grouped the eleven types of audiovisual resources into three different sets. Set 1 - videos that present the information in a single resource. Set 2 - videos that present information with two features simultaneously. Set 3 - videos presenting information with three counts simultaneously, Table 6.

Table. 6: Data grouping

	Type of Resource	Percentages Averages		$\overline{X}$	$\overline{\overline{X}}$
		Test 1	Test 2	$\overline{X}$	$\overline{\overline{X}}$
Set 1	R1.4 - video only	82,31%	75,38%	77,12%	72,69%
	R2.4 - image only	64,62%	74,62%		
	R3.2 - audio only	80,00%	69,23%		
	R4.1 - text only	81,54%	71,54%		
Set 2	R1.3 - video and audio	86,92%	76,15%	81,08%	70,46%
	R2.3 - image and audio	77,69%	67,69%		
	R3.1 - text and audio	69,23%	66,15%		
	R1.2 - video and text	86,92%	73,85%		
	R2.2 - image and text	84,62%	68,46%		
Set 3	R1.1 - video, audio and text	92,31%	76,92%	90,38%	77,69%
	R2.1 - image, audio and text	88,46%	78,46%		

The data of Table 6 shows that the highest average of information retention occurs in set 3, reaching 90.38% in test 1 and 77.69% in test 2. Following the set 2, with 81.08% in test 1 and test 2 at 70.46%. And with the lowest average (but above 72%), the set 1 with 77.12% in test 1 and test 2 at 72.69%.
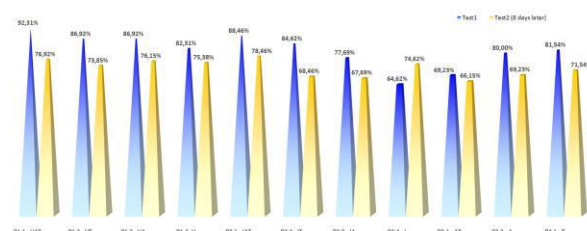

Fig. 1: Mean percentages - Test 1 and Test 2

Fig. 1 shows that data from test 1 and test 2 follows the same evolution pattern as the typology used, with the exception of the image resource (R2.4-I), that undergoes a significant increase in test 2 (eight days later) in relation to the value of test 1.

VII. CONCLUSION

Overall, our study allowed us to verify that the levels of the averages reached in the retention of the information provided/made available by the different typologies of resources were high - higher than 70% - and that the averages increase with the increase in the number of resources at the same time as the information is served. When we use three resources simultaneously - video, audio and text or image, audio and text - we achieve the highest averages of information retention. We also verified that the lowest information retention average occurs when only one resource is used - only video, only image, only audio or text only. And that, when we use two resources simultaneously - video and audio, image and audio, text and audio, video and text or image and text -, the averages are between the previous two.

The study data also revealed that: i) the average of the retention of the information is higher when it is transmitted/made available through video, audio and text simultaneously; ii) when we offer/disseminate information through a single resource, the one that reaches the highest average is the video; iii) the lowest mean of retention of information occurs when it is made available to the information only in the image resource; iv) after eight days, the averages maintained the same relations between the different typologies of resources compared to those of test 1; v) after eight days, the averages of test 2 were all lower than those of test 1, with the exception of the image resource, which increased.

The results of the study, when compared with the results of Socony - Vacuum Oil CO.Studies [15], [5] and [2] , allow us to conclude that the best resources to extend the acquired or constructed knowledge are those involving video, audio, and text, perhaps because they respond to the various modes of learning (auditory, visual, and kinesthetic). However, the best results come when it is "saying", "doing" and "debate/argue", so this study supports the Flipped Classroom approach that previously provides video, audio, text and other multimodal formats for students to have access to content before class, to retain the necessary information for a critical and reflective participation in the classroom reaching a higher degree of complexity of knowledge and a higher motivation in the act of learning..

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