Multimedia Technologies in Modern Educational Practices: Audiovisual Context

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Summary
In modern educational practices, the issue of dependence on the experience of using multimedia by students and the adoption of technologies in education, the perception of their benefits and effectiveness in blended learning is little covered. **The purpose** of the academic paper lies in assessing the audiovisual context of multimedia technologies, its acceptance by students in practice on the example of using video lectures in blended learning. **The methodology** is based on an online survey of 120 students of Ukrainian universities who have assessed the experience level in using video lectures, as well as the constructs as follows: Technology Characteristics, Fit, Perceived Usefulness, Perceived Ease of Use, Attitude, Intention to Use, Actual Use. **The results** show that the majority of students use video lectures to a certain extent in their training (20,8% have used technology to a certain extent, 49,2% have often used technology in training, 20% are regular users of technology). It has been revealed that most students agree with the relevance of video lectures, the accuracy of lectures, the brevity of lectures, the clarity of lectures, as well as the high quality of lecture videos. It has been estimated that 42,5% believe that lecture videos are an effective tool towards supporting students in hybrid learning. 26,7% of students consider video lectures to be appropriate technologies for online / hybrid courses. In general, 37,5% of respondents find video lectures useful; however, 35,0% do not agree with this statement. 83,3% of students have rated the high level of ease of access to video. In total, 95% of students find lecture videos easy to use. In general, positive attitude of students to video lectures has been revealed.

Key words:
Multimedia technologies, audiovisual context, blended learning, hybrid learning, acceptance of technology in education.

1. Introduction

Dynamic changes in the Internet and information technologies have contributed to the integration of multimedia technologies in education, which is manifested in traditional forms of training using digital tools, online learning and e-learning or distance learning, as well as blended learning (Dang, Zhang, Ravindran, & Osmonbekov, 2016). Blended learning includes any combination of methods, including the most common face-to-face instruction with asynchronous or synchronous learning style by applying technologies (Zhang, 2021). Blended learning is synonymous with hybrid learning using multimedia technologies (Dang et al., 2016).

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Multimedia technologies are being used as a strategic tool to bridge the gap in providing unrestricted access to quality education and improving productivity of pupils and students. Multimedia technologies solve the problem of access to quality education and inequalities in education.

Recently, multimedia technologies, including video and live broadcasts, have been increasingly used for online and blended learning at universities and colleges. Many studies have found better learning outcomes using multimedia instructions compared to training where only one media resource, such as text, is used (Adi, 2021; Amirov, 2020; Pang, 2021; Zhang, 2021). However, such effectiveness of multimedia learning does not seem to be universal. For instance, in psychology classes, some scientists have revealed better learning outcomes using multimedia compared to traditional text-based learning (Erwin & Rieppi, 1999; Smith & Woody, 2000). Other studies have found that incorporating multimedia into training process has not improved learning outcomes (Amirov, 2020; Pang, 2021). Previous scientific investigations have been focused on the benefits, advantages, or effectiveness of multimedia technologies for learning, while little empirical evaluation has been done on perception as a factor in efficiency.

The purpose of the academic paper lies in assessing the audiovisual context of multimedia technologies, its acceptance by students in practice on the example of using video lectures in blended learning.

2. Literature Review

Multimedia learning is the process of training through multimedia learning messages, which are communications built not only on words, but on images, animations, stories and videos, designed to facilitate studying learning materials and memorize it (Mayer, 2002). Multimedia is increasingly used in online and blended learning due to a number of benefits. According to the multimedia principle of learning (Mayer, 2009), people perceive and assimilate information better from words, graphics, images than from words and text, in which graphics mean static illustrations, such as drawings, graphics, maps or photographs and dynamic graphics, such as animation or video (Bartlettt &

Strough, 2003; Zhang et al., 2006). Based on the cognitive psychological literature, Mayer (2005) has theoretically developed three assumptions underlying the cognitive theory of multimedia learning, namely: "dual-channel, limited capacity, and active processing". The assumption about the duality of such training lies in the fact that people process separate channels of information for visually presented materials, which are closely related to the theory of double coding (Clark & Mayer, 2016). The assumption about the limited potential of multimedia lies in the fact that people are limited in the amount of information that can be processed in each channel at the same time, which should be taken into account when designing multimedia learning technologies. The assumption of active processing lies in the fact that people engage in active learning by assimilating relevant inputs, organizing selected information into coherent mental representations, and integrating mental representations with other knowledge. Based on these three assumptions, Mayer (2005) has proposed a cognitive theory of multimedia learning, which defines the human mind as two-channel, characterized by limited ability, active information processing system in learning. This theory differs from previous multimedia theories of training, where learning is single-channel, unlimited in capacity, which is characterized by passive processing. The theory of multimedia training lies in the fact that the understanding and assimilation of educational materials occurs in active learning, where students are actively involved in the educational process through relevant technologies. Active learning promotes cognitive processing of materials, intelligent integration of information into existing knowledge systems.

The use of multimedia technologies for learning is an incentive, encouraging students to be actively involved in the educational process, providing cognitive processing of information through words and graphics (Clark & Mayer, 2016). Such involvement through active learning is a major advantage of using multimedia technologies for training. For instance, Shin, Biocca & Choo (2013) have investigated the process of engaging students in the virtual learning environment, which is one of the innovative forms of multimedia learning using virtual reality technology. The scholars have found a significant impact of this form on learning materials and satisfaction of students (Shin, 2015; 2017a; 2017b; Shin, Biocca, & Choo, 2013).

The main challenge in multimedia education lies in determining the way multimedia technology and educational theory are combined (Zhang et al., 2021). The following case studies of multimedia tools are studied in the scientific literature, namely: the level of their efficiency and success; limiting factors in the implementation, in particular the perception by teachers and students; implementation mechanisms; areas of application; assessment methodologies; technological components; age groups targeted by multimedia tools (Abdulrahaman et al., 2020).

Table 1: Research questions for teachers about multimedia environment

Research questions for teachers	***Mean***	***S.D***
Q1. The multimedia environment improves experimental education	4.3	0.67
Q2. I could easily manage the class using the multimedia environment	4.4	0.52
Q3. The multimedia environment is easy to use	4	0.82
Q4. Learning to use these multimedia applications is not a problem.	4.2	1.03
Q5. Operation with these multimedia applications is clear and understandable	4.3	1.06
Q6. Using such a multimedia environment makes learning more interesting	4.3	0.82
Q7. Using such a multimedia environment in the experiment classroom is a good idea.	4.4	0.7
Q8. I would like to use the authoring tool to create AR experiments	4.5	0.71
Q9. I would like to use the multimedia environment in the future if I had the	4.3	0.82

Source: Zhang et al. (2021).

Some studies have discussed the acceptance of a multimedia system in training. Lee and Ryu (2013) have considered the determinants of students' behavioural intent to use a multimedia learning system by applying a technology acceptance model; the authors have identified the consequences of multimedia self-protection and perceptions of the plentifulness of a multimedia presentation at the behavioural level. However, they focus on identifying exogenous factors on the behavioural intention to accept a multimedia system rather than a perceiving mechanism in actual behaviour. In the course of the present research, we attempt to understand the actual behaviour and mechanism of acceptance while implementing multimedia technologies in training.

The scholars are also exploring theories and models in order to measure the acceptance and performance level of information systems (IS). Examples of studies include a success model focusing on system usage and user satisfaction based on system quality, and a task technology based on user evaluation using the correspondence between task characteristics and technologies. From among others, the most widely used model predicting technology adoption in training is the technology acceptance model, focusing on an individual's acceptance of a technology based on his / her perception of usefulness and ease of use. In the present research, we have applied an integrated model of such theories and models in order to understand the acceptance of multimedia technologies

for training. The Technology Acceptance Model (Davis, Bagozzi, & Warshaw, 1989) is considered as perceiving the theory of reasonable actions, which states that behaviour is determined by the intention to perform actions and tasks, and intention is assumed by attitude to behaviour (Ajzen, 1991).

According to the viewpoint of Davis (1989), the user's attitude towards information technology influences the following two perceptions, namely: usefulness, defined as "the degree to which a person believes that the use of a particular system will increase its efficiency", as well as ease of use in terms of "the extent to which a person believes that the use of a particular system requires minimal effort" (p. 320). The user's attitude is proportional to the behavioural intention to use or accept the technology, which in turn influences the actual user's behaviour. Therefore, the technology acceptance model focuses on the acceptance of the user's technology based on his perception of the usefulness and ease of use of the technology. This model of perception is widely used and tested in empirical studies of technology acceptance.

3. Methodology

In the course of the research, a survey of students was conducted participating in online and blended classes with multimedia technologies available in course management systems. The multimedia technology used during training and interviews includes recorded videos, videos and support for YouTube training videos. Web questionnaires were sent to 120 students studying at business courses of three south-eastern universities of Ukraine; in particular, students took courses in management information systems and business statistics. The survey was conducted in September - October 2021.

The survey tool (questionnaire) was adapted from previous studies (Park & Raven, 2015). The questionnaire has included features (constructs) of learning technologies, assessing their quality. In particular, the constructs have included the user's previous experience in multimedia technologies, reflecting the form of users' perception of the suitability of technologies in the training process. These constructs were as follows: Technology Characteristics, Fit, Perceived Usefulness, Perceived Ease of Use, Attitude, Intention to Use, Actual Use (Table 2). Each construct was assessed by the respondent on a scale of 1-5, where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree. Previous experience was also rated on a scale of 1-5, where 1 is low and 5 is high.

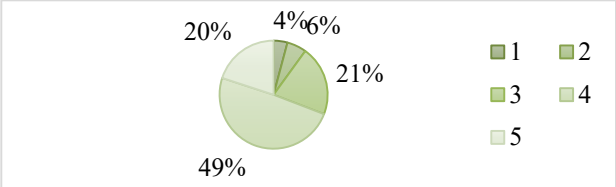
Table 2: Constructs and measures

Constructs	***Measures***
Individual Characteristic	Please rate your experience of using lecture videos before taking this class.
Technology Characteristics	The content of the lecture videos is relevant.
Fit	I believe that the lecture videos support student learning well in online/hybrid
Perceived Usefulness	I believe the use of lecture videos would improve my performance in the course.
Perceived Ease of Use	It was easy to access the lecture videos.
Attitude	I think it would be good to use the lecture videos rather than using only reading materials (e.g., lecture slides and textbook) for the coursework.
Intention to Use	I am very likely to use the lecture videos for learning.
Actual Use	I use the lecture videos for learning.

Source: Park et al., (2018)

4. Results

According to the results of students' assessments of perceiving multimedia technologies, it was revealed that 4,2% practically did not use technologies in training, 58% rarely used them, 20,8% used technologies to a certain extent, 49,2% often used technologies in training, 20 % - were regular users of technologies (Figure 1).



Source: the author's research.

Fig. 1 Distribution of students' answers to questions about previous experience of using multimedia technologies in training, %

The assessment of the technological features of multimedia by students (Table 3) indicates that the majority of students agree with the relevance of video lectures (83,3% of students have given a grade 4-5), the accuracy of lectures (75,8% of students have given a grade 4-5), brevity of lectures (64,3% of students have given a grade 4-5), understandability of lectures (68,3% of students have given a grade 4-5), high quality of lecture videos (65,0% of students have given a grade 4-5).

Table 3: Technological features of multimedia for training, %

Technological features	*1*	*2*	*3*	*4*	*5*
The content of the lecture videos is	0,0	3,3	13,3	56,7	26,7
The content of the lecture videos is	0,0	4,2	20,0	61,7	14,2
The content of the lecture videos is	1,7	5,8	28,3	51,7	12,5
The content of the lecture videos is	2,5	5,0	24,2	53,3	15,0
Overall, the lecture videos are of good	2,5	5,8	26,7	56,7	8,3

Source: the author's research.

From among the respondents, 42,5% believe that lecture videos are an effective tool to support students in hybrid learning, while 23,3% are neutral concerning using video, 34,2% do not agree with this statement (Table 4). Only 26,7% of students consider video lectures to be appropriate technologies for online / hybrid courses, 26,7% are neutral regarding this statement, and 46,7% of students disagree. 49,2% of respondents consider that video lectures meet the requirements of content delivery in online and hybrid courses, while 22,5% disagree with this statement, 28,3% are neutral in terms of compliance with delivery requirements.

Table 4: Approaches used in multimedia learning

Fit	*1*	*2*	*3*	*4*	*5*
I believe that the lecture videos support student	12,5	21,7	23,3	36,7	5,8
I believe that the lecture videos are an	22,5	24,2	26,7	17,5	9,2
I believe that the lecture videos match the	7,5	15,0	28,3	32,5	16,7

Source: the author's research.

From among the respondents, 40,8% believe that the use of lecture videos will improve their productivity during the courses, 29,2% disagree with this statement, 30% are neutral to the statement specified (Table 5). 40,0% of students consider the use of lecture videos as a tool to enhance their own effectiveness, 29,2% disagree with the effectiveness of video in training, 30,8% are neutral to the statement specified. 32,5% of respondents consider the use of lecture videos as a tool to facilitate work on a course project, 40,8% disagree with this statement, 26,7% are neutral to the statement specified. In general, 37,5% of respondents consider video lectures useful, 35,0% do not agree with this statement, 27,5% are neutral about the usefulness of technology.

Table 5: Perceived Usefulness and Perceived Ease of Using Technologies, %

	1	*2*	*3*	*4*	*5*
Perceived Usefulness					
I believe the use of lecture videos would	9,2	20,0	30,0	30,8	10,0
I believe the use of lecture videos would	10,8	18,3	30,8	25,8	14,2
I believe the use of lecture videos would	12,5	28,3	26,7	22,5	10,0
Overall, I found the lecture videos useful for	11,7	23,3	27,5	21,7	15,8
Perceived Ease of Use					
It was easy to access the lecture videos.	3,3	4,2	9,2	20,0	63,3
It was easy for me to play and watch the	1,7	3,3	4,2	9,2	81,7
It was easy to learn how to watch the lecture	1,7	1,7	2,5	5,8	88,3
My interaction (e.g., play/pause, fast-	1,7	1,7	1,7	3,3	91,7
Overall, I found the lecture videos easy to	1,7	1,7	1,7	4,2	90,8

Source: the author's research.

The estimated level of perceiving the ease of using video lectures in online learning is also different. 83,3% rated the ease of access to video as high. 90,8% indicated that the video was easy to watch. 94,2% noted the ease of studying the mechanism of reviewing lectures. 95,0% noted the high level of interaction, clarity and comprehensibility of video lectures. Overall, 95% of students find lecture videos easy to use.

In general, the attitude of students to video lectures is positive. 84,2% of students find it positive to use lecture videos in class rather than just reading material (such as lecture slides and a textbook) for term paper writing. 78,3% consider it necessary to use video lectures, 81,7% prefer to use not only reading materials but also video (Table 6).

Table 6: Attitude, Intention to Use, Actual Use, %

	1	*2*	*3*	*4*	*5*
Attitude					
I think it would be good to use the lecture videos	1,7	2,5	11,7	26,7	57,5
In my opinion, it would be desirable to use the	2,5	4,2	15,0	20,0	58,3
It would be better for me to use the lecture	2,5	3,3	12,5	21,7	60,0
Intention to Use					
I am very likely to use the lecture videos for	4,2	6,7	15,8	30,0	43,3
I am very likely to use the lecture videos to do	3,3	7,5	21,7	35,0	32,5

To the extent possible, I would use the lecture	2,5	3,3	12,5	21,7	60,0
Actual Use					
I use the lecture videos for learning.	0,8	3,3	7,5	15,0	73,3
I have watched the lecture videos.	1,7	3,3	9,2	12,5	73,3

Source: the author's research.

Assessment of students' intention to use video lectures is also positive on the whole. 73,3% are most likely to use lecture videos for learning. 67,5% of respondents are likely to use video to complete tasks. 81,7% of students will, if possible, use lecture videos for various learning tasks. In fact, 88,3% of students use videos in their studies. 85,8% of students watch lecture videos.

5. Discussion

The present research empirically examines the acceptance of multimedia technologies for online and blended learning, and the findings contribute to the formation of new knowledge in the theory of multimedia learning. Despite the benefits of multimedia technologies for training, previous scientific studies have revealed conflicting results of their effectiveness. Some scholars have found that technologies provide more effective learning (Smith & Woody, 2000), but others argue that their use is not always efficient (Johnson & Christensen, 2011; Zhang et al., 2006). The conclusions drawn in the present research explain such conflicting results. For instance, Zhang et al. (2006) has revealed that certain multimedia technology was not effective forasmuch as students could not adapt to this technology and perceive it in learning due to lack of interest and subjectively assessed low usefulness in the training process. This means that we can talk about the effectiveness or benefits of multimedia technology for learning only if pupils and students accept and adapt to this particular technology.

Along with this, the findings of the present research show that technological features and individual characteristics are the main exogenous factors influencing the acceptance of multimedia technologies for learning. By comprehending and modifying these factors, we can facilitate the acceptance of multimedia technologies in the training process, which in turn will make it possible to discuss and study their effectiveness and benefits. Therefore, these findings are significant in developing an integrated model of technology acceptance.

The results of testing the integrated TAM model and "theories of task technology fit" are also discussed in the scientific literature (Yen et al., 2010). The present research has empirically confirmed the relationship between the main elements of the TAM model and these theories. A strong link between technology fit and the benefits of technology for students was revealed in the research, which was not reflected in previous studies (Yen et al., 2010).

Lee and Ryu (2013) have empirically tested the TAM model in the multimedia acceptance learning system. The study focuses on exogenous facts and includes only perceived usefulness and behavioural intentions, not actual behaviour. Compared to the study of Lee and Ryu (2013), the present academic paper has revealed that technological features, personality traits, and task technology fit are more favourable factors in the acceptance of multimedia technologies for learning compared to other exogenous factors identified in previous studies on multimedia acceptance.

6. Conclusion

The present research has revealed that the majority of students to a certain extent use video lectures in training (20,8% use technology to a certain extent, 49,2% often use technology in training, 20% are regular technology users). It has been established that most students agree with the relevance of video lectures, the accuracy of lectures, the brevity of lectures, the clarity of lectures, the high quality of lecture videos. It has been estimated that 42,5% believe that lecture videos are an effective tool towards supporting students in hybrid learning. 26,7% of students consider video lectures to be appropriate technologies for online / hybrid courses. In general, 37,5% of respondents find video lectures useful; however, 35,0% do not agree with this statement. 83,3% of students have rated the high level of ease of access to video. Overall, 95% of students find lecture videos easy to use. On the whole, a positive attitude of students to video lectures has been revealed.

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