EPiC Series in Computing

Volume 105, 2025, Pages 326–335

Proceedings of EUNIS 2024 annual congress in Athens

An educational studio for quality multimedia content - A successful delivery of IT practices

Dimos Charidimou[1], Georgios Roussos[1], Angeliki Agorogianni[1], Anthoula Patsinakidou[1], Stavros Nikolaidis[1] and Evangelos Christopoulos[1]

[1] IT Center - Aristotle University of Thessaloniki (AUTh) Greece

dharidimou@it.auth.gr, grou@it.auth.gr, aagorogi@it.auth.gr, apatsi@it.auth.gr, stavniko@it.auth.gr, christopec@it.auth.gr

Abstract

The Information Technology (IT) Center of Aristotle University of Thessaloniki (AUTh), in the context of the digital transformation of education, developed a studio to produce quality learning multimedia material. With the appropriate creation of multimedia resources, learning can be facilitated whether it is face-to-face, online, or even hybrid education. This paper deals with the construction of an educational studio as well as the creation of a new service to produce added-value multimedia material for the academic community of AUTh. The studio serves a dual purpose:

Creating high-quality, learner-centered audiovisual educational materials ensures students receive engaging and comprehensive content tailored to their learning needs.

Supporting a wide range of university activities. This includes interviews, promotional videos, events, conferences, and more. By capturing and sharing these activities, the studio strengthens the university's outward engagement and visibility.

This transformative project stands as a testament to the IT Center's strategic foresight in adapting to the evolving educational landscape, particularly after the COVID-19 pandemic.

R. Vogl, L. Desnos, J.-F. Desnos, S. Bolis, L. Merakos, G. Ferrell, E. Tsili and M. Roumeliotis (eds.), EUNIS 2024 (EPiC Series in Computing, vol. 105), pp. 326–335

1 Introduction

Driven by the ever-increasing demand for high-quality educational media, Aristotle University developed a centralized audiovisual studio infrastructure/service. This transformative project stands as a testament to the IT Center's strategic foresight in adapting to the evolving educational landscape, particularly after the COVID-19 pandemic. Developed on the twin pillars of centralization and on-premises solutions, this initiative serves not only Aristotle but also offers a blueprint model for other institutions seeking to modularly enhance their AV services and empower their faculty and students in the digital era.

In an effort to further strengthen its live broadcasting, recording, and multimedia production services, the IT center of Aristotle University undertook a major project aiming at its campus's overall audiovisual infrastructure upgrade, which included the installation of audiovisual equipment in over 100 classrooms and the addition of five more full hybrid conference halls. In the same context, the conversion of a room into a professional green screen studio was implemented, constituting an all-in-one tool for producing high-quality videos.

For the most part, the institutional-level educational events that take place inside the campus are covered by the permanently installed equipment, whereas, until recently, portable equipment was also used for recording greetings, interviews, or lectures. In this case, various difficulties were encountered, such as the need to transport the equipment, the introduction of noise into the audio recording, and the need for time-consuming post-production. Now, the production of these videos has been greatly facilitated and upgraded thanks to the new studio service.

2 Why Videos are Important in Education?

In the era of digitalization, which is strongly characterized by an increasing demand for audiovisual material, educational videos have become an essential part of higher education, providing a crucial content-delivery tool (Brame, 2016), (Vaganova et al., 2019). Likewise, in the Aristotle University of Thessaloniki, video recording services are of significant importance, given the fact that almost 90% of the events, especially the large-scale ones, are recorded for educational, archive purposes and Video on Demand (VoD) (Roussos et al., 2023). But why do videos play such a primary role in today's academic world?

According to Yousef et al., (2014) video-based learning is not only connected with improved teaching methods and academic results but also with increased levels of student satisfaction (Carmichael et al., 2018). Thanks to the combination of verbal and non-verbal cues they include, videos resemble face-to-face communication, rendering the learning experience a more direct and intimate process (Griffiths & Graham, 2019a) (Griffiths & Graham, 2019b). Moreover, students tend to prefer videos over traditional text-based notes, which lack the necessary visual stimulation to make the content memorable and comprehensible (Choi & Johnson, 2005), (Schneps et al., 2010), (Kalfa et al., 2021).

Therefore, video-based learning is extensively used, both in synchronous and asynchronous online education. The present paper will further explore the benefits of video learning in the following paragraphs, especially in the case of asynchronous teaching.

2.1 Asynchronous Video Learning

The Aristotle University of Thessaloniki extensively uses videos in its synchronous and asynchronous educational service both for teaching and assessment (Choi & Johnson, 2005). Synchronous education is carried out through a variety of ways, such as live streams, video conferences, webinars, etc.. The teacher and student must interact at a specific, predetermined time. Although this

type of learning can make communication easier and immediate, it is clearly more vulnerable to technical instabilities and does not offer flexibility to users.

On the other hand, asynchronous teaching does not require the same network stability, while it offers teachers the opportunity to record and upload the videos whenever they want according to their personal schedule (Griffiths & Graham, 2019a). In addition, in asynchronous communication, video recordings can be repeated until the appropriate result is achieved, thus ensuring quality educational material and the avoidance of unfortunate events that may occur in live streaming.

Similarly, according to Harrison, this type of flexibility and the lack of need to be physically present is endorsed by the students, who have the ability to review and revise the learning material at their own pace by pausing, rewinding, and reviewing the video multiple times, thus enhancing the learning process (Schneps et al., 2010) & (Weerasinghe et al., 2009). This type of freedom requires them to develop a number of good qualities like self-discipline, persistence, consistency, and time management. Through the asynchronous learning process, students practice metacognition by overcoming mental barriers and facing the given difficulties (Brame, 2016). They also tend to be more active as they all have to participate, unlike live classes, where some students are more imposing than others and may monopolize the discussions.

2.2 Benefits of Teaching with Video (Teachers-Students-Universities)

Referring only to large-scale events, during the last year, the IT Center of AUTh received over 380+ requests for live streaming services of different types of events (in-person, online, and hybrid) in various locations inside the campus. In other words, the ratio was approximately one large-scale event per day. This high demand for the broadcasting of events concerning the university indicates that the academic community has realized the tremendous benefits of using videos for all its members: teachers, students, and the university overall.

The benefits of teaching with video are confirmed by several researches, one of which being the research of Michael E. Griffiths and Charles R. Graham, who studied the learning results of an online asynchronous class at Brigham Young University (Griffiths & Graham, 2019a), (Griffiths & Graham, 2019b), (Vaganova et al., 2019). The findings of their experiment were positive both for teachers and students on an individual level, as well as for the relationship between them. In further detail, although the students and the professor never met in person, they stated that the relationship they developed was closer than in live classes, which surprisingly offered less one-on-one time between them.

The effects of this approach were essential for the instructor’s psychology as well, as he felt that it was a less stressful process that allowed him to work more efficiently due to a better allocation of his time. Moreover, the professor stated that the online class wasn’t as time-consuming as the face-to-face one, even though he was way more active, often answering students emails and immersing himself in new technologies to further development.

A remarkable progress in students grades and a marked change in the nature of their responses were also noted, proving that video-based education can indeed enhance learning and comprehension. This prevalence of video is explained by Mayer (Griffiths & Graham, 2019a) and Schreiber (Carmichael et al., 2018), who supported that videos stimulate both the visual and the auditory channels, thus maximizing the capacity of working memory. According to Lubov, video teaching can also increase the level of student motivation and confidence because it has an impact on their emotional level (Lubov et al., 2019), (Charidimou, 2019).

Finally, the use of audiovisual technologies makes the presentation of educational material and the explanation of complicated concepts interesting, pleasant, and stimulating while keeping the viewer's undivided attention (Kay & Kletskin, 2012), (Rasi & Poikela, 2016). Students enjoy learning from quality material and start understanding today's visual and digital media culture at a greater level (Kalfa et al., 2021).

In addition to producing videos for purely teaching, the academic community can benefit from making audiovisual media by facilitating the integration of its members, informing them about important actions, and helping promote its work and research. For instance, the IT Center of AUTh has produced numerous instructional videos for all the members of the academic community in order to familiarize them with the online and offline infrastructure of the University.

3 Principles and Guidelines for Maximizing Student Learning from Video Content

In the previous paragraphs, we deduced the value of videos in the educational process. However, the multitude of different elements that can be used in cooperation so as to produce audiovisual content (i.e., visual and audio components, graphics, animations, visual and sound effects) raises the following question: What is the perfect video design to maximize student learning?

The answer can be found in the existing literature, which has done extensive research on the matter, proposing a number of different principles and guidelines in order to enhance learning through video. In the present paper, we will present the ones that we believe to be the most important.

To begin with, according to Moussiades et al. (2019), the highest level of efficiency can be achieved if the video is:

- Motivational
- Engaging
- Interactive
- Thoroughly organized and consistent with learning objectives

In order to produce such videos, Mayer suggests that designers should take into consideration the importance of integrating and carefully synchronizing both visual and audio parts (Contiguity Principle) (Schneps et al., 2010), (Charidimou, 2019). Regarding the audio parts, the use of narrations is highly endorsed, as audio is proven to be preferable to text. Additionally, the majority of students support the embedding of sound effects during animations (Moussiades et al., 2019). Thoroughly organized and consistent with learning objectives.

Furthermore, designers should pay attention to the aesthetics of the video by carefully selecting the most suitable images, colors, camera angles, and backgrounds. Thoroughly constructed graphics and animations are proposed to be included in the final product because they increase its quality and, therefore, the efficiency of the learning process (Brame, 2016). The use of captions is also necessary in order to make the content widely available and inclusive.

However, all those components are intended to pique the student's interest without distracting them from the educational content. Thus, videos should not be overloaded with redundant or incoherent information (Redundancy Principle) (Charidimou, 2019).

4 AUTh innovative professional studio

The AUTh, aiming to enhance the institution's extroversion, productivity, and competitiveness, has invested in establishing a dedicated studio space. This studio serves a dual purpose: facilitating the creation of Massive Open Online Courses (MOOCs) and supporting traditional academic courses. This strategic investment aligns with the institution's commitment to innovation in the ever-evolving educational landscape. In particular, ITC, in an effort to further strengthen its live broadcasting, recording, and multimedia production services, saw an opportunity to create high-quality AV

educational content that meets the course requirements for all the curricula of the university's departments. Additionally, this service extends to other units as well, such as the Lifelong Learning Center and the School of Modern Greek Language. The primary goal is to meet the current educational demands, to ensure that students get a comprehensive content and learning experience tailored to their needs, and to enhance the University's outward orientation.

4.1 Studio Equipment

The state-of-the-art equipment available in the studio facilitates the creation of educational material, having as guidelines the aforementioned principles in order to maximize its efficiency. More specifically, a dual-camera video recording system (2 Panasonic NewTek NDI PTZ Cameras) and 4 Sennheizer microphones (2 lapels and two hand-helds) are available in the studio for video and audio recording, respectively. Audio is mixed through the analog Yamaha MG 10 console, while the production of the multimedia material is done through the Tricaster Newtek system, which greatly facilitates the creation of the video.

The above system allows uploading and adding custom graphics, animations, and backgrounds, creating captions, controlling and switching cameras, modifying color correction and color grading of the system, and adding audio effects simultaneously with recording. As a result, post-production time is minimized, as the exported HD file requires little to no editing. It is also worth mentioning that the system exports, not just one but four mixes with different settings for greater flexibility. If needed, any additional processing can be carried out within Adobe Premiere and Davinci Resolve, which are both installed in the production control workspace.

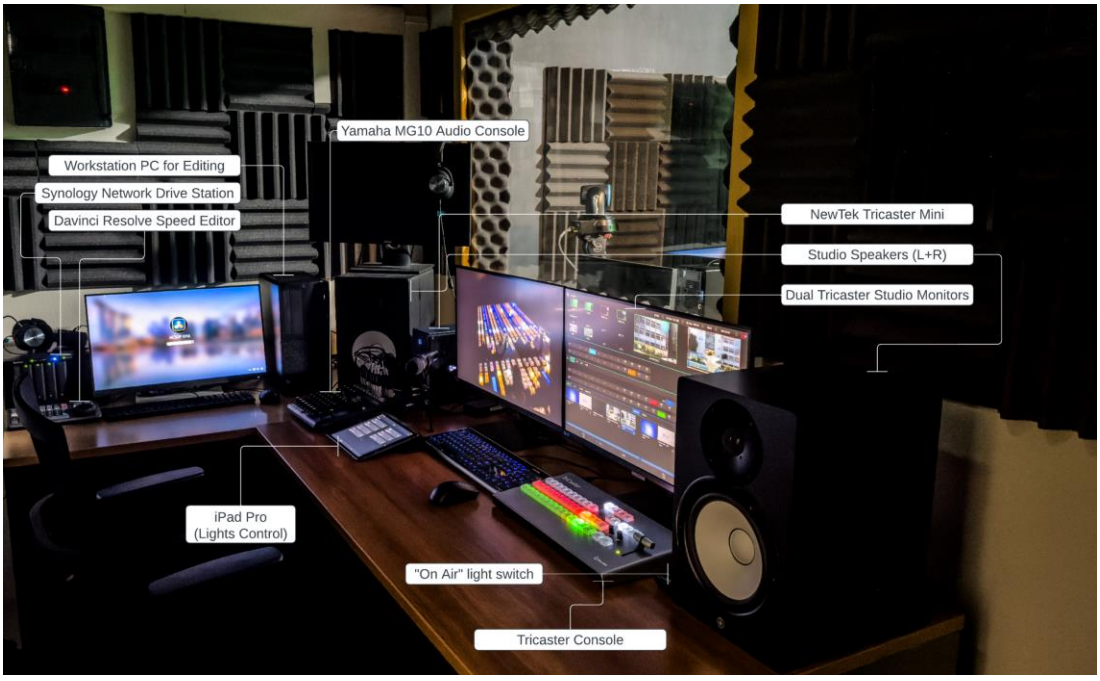

Figure 1: Production control room

The studio also has a Sharp digital interactive board for taking notes or viewing presentations by the professor. The board is connected directly to the Tricaster system via a Newtek Spark IO converter

so that the display can be inserted as a graphical element in the recorded video. It can also be connected to an additional laptop, which is available on-site. Tricaster offers many tools for high-quality, real-time outputs. However, we have also created a pipeline based on Blackmagic Davinci Resolve to handle offline editing for the more demanding cases. The overall process is facilitated thanks to an additional Autocue Teleprompter located under the center camera and a pair of body packs that allow communication between the studio booth and the control room. Depending on the directing idea behind each video, one or two desks can be used, and the appropriate background can be selected thanks to a motorized backdrop-switching system with two options: a white and a green cloth. The green cloth, combined with Tricaster's capability to chroma key, allows the placement of any custom background. Lighting conditions can also be easily modified thanks to the professional 7-light lighting system.

Figure 2: Recording booth

4.2 Best practices in designing a studio

Prime approaches implemented in the AUTh studio configuration include supplying and installing logistical infrastructure for two distinct areas: a production control room and a booth room. According to the appropriate specifications, a soundproof partition separates the two areas, with a double soundproof window and a corresponding heavy-duty soundproof door. Additionally, a new soundproof door was installed at the entrance of the premises.

To optimize acoustic conditions, the studio includes acoustic cladding and panels within the two spaces in order to cover broadband sound absorption, low-frequency management, and broadband sound dispersion around the perimeter.

Effective coordination is ensured by allowing technical personnel in the control room to command the cameras and microphones in the booth room. The setup also allows the technical personnel to interact and communicate with the presenters.

Furthermore, the lighting has been strategically installed to minimize the presence of shadows and is fully controlled in intensity and temperature. The setup also enables the mixing of audio and video streams in real time, facilitating the recording or live streaming of video lectures. A preview screen in the booth room allows for real-time video monitoring.

Last but not least, in order to create an optimal studio environment and to ensure proper technical operation and human comfort, a low-noise fresh air supply and exhaust unit were installed.

5 Typical recording scenarios

The IT Center has developed the Studio Service Page in order to instruct and inform the university teachers and researchers about its facilities, equipment, policies, and regulations. The studio is located in a specially designated area within the ITC facilities and is accessible to the academic community of

AUTh, including both administrative and teaching staff. The studio's IT staff can support and help with the production by providing alternative solutions that can accommodate various video recording scenarios suitable for both live streaming and recording. With various technical means and the right equipment, we can create impressive and quality videos to record various educational scenarios, meeting the users requirements.

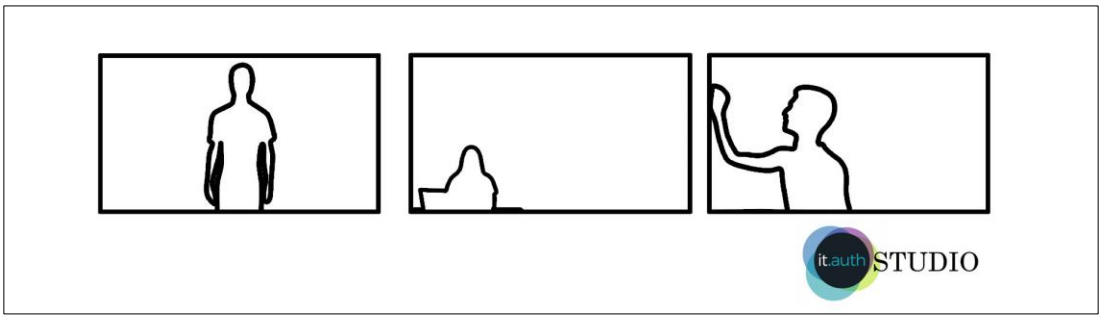

Figure 3: Supported video recording scenarios

Some indicative video recording options for capturing multicamera shots in order to cover different perspectives and angles are listed below:

Speeches and salutations: Recordings of a standing orator from two different angles, in medium or close-up framing, assisted by the teleprompter system.

Figure 4: Center camera in wide shot and side camera in closeup, keyed against pre-recorded backgrounds

Video Lectures: The teacher can utilize the interactive whiteboard and PowerPoint presentations to produce high-quality teaching material. Various carefully pre-planned camera angles allow them great freedom of movement and expression.

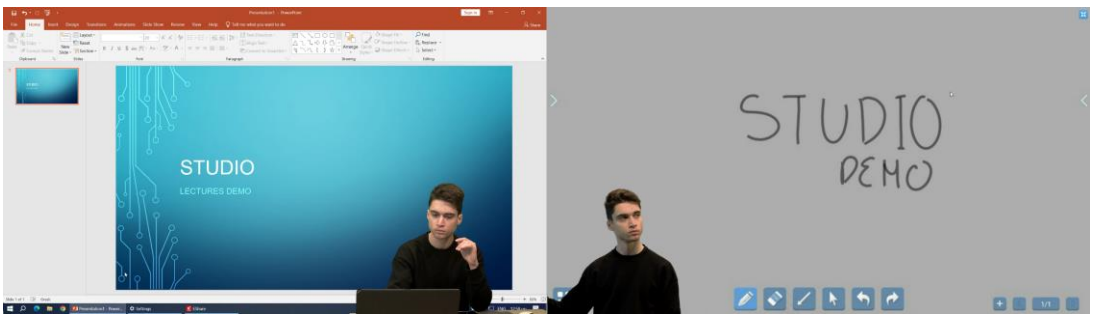

Figure 5: PowerPoint presentation and use of the interactive board

Basically, the video lectures are seamlessly integrated or synchronized with an interactive whiteboard and/or slide. We constantly develop video and multimedia material that will support the students to handle in a more efficient way the various information and representations of knowledge by creating material that will favor the conditions for selecting, organizing, and integrating, according to the cognitive model that Mayer suggests in multimedia learning (Charidimou, 2019).

Podcasts: High-quality microphones and in-ear monitoring systems allow for quick and convenient production of audio-only material. In essence, compelling podcasts can be created by incorporating presentations, slides, or speeches accompanied by real-time computer screen recording learning objectives.

These scenarios can be recorded in two different settings:

- Permanent video recording background.
- Monochrome green screen background for chroma key techniques, allowing the use of a virtual background.

Further, these scenarios can be meticulously filmed in greater detail against a white backdrop or a green screen and later combined with pre-recorded video assets or still images/frames to quickly create a professional and immersive result.

5.1 Special Cases: Handling Studio Requests

A studio production begins when a request is submitted. An internally developed ticketing system facilitates the studio's requests. This system enables the organization and categorization of requests based on the type of recording scenarios. In addition, after the acceptance of the requests, an optional brief meeting between the production team and the person submitting the request is scheduled, where details of the desired output are discussed, bearing in mind the goals and objectives of the recording project. The applicant then provides any footage they want to integrate into the production. A guideline is sent to the applicant, informing them of tips necessary for optimal visual quality, such as avoiding green clothing for improved keying. Then, both parties meet at the studio to rehearse and record. After all recordings are complete, the input is edited together with the provided footage to create the final result.

6 Challenges and Limitations: The dimensions of the Studio

The room allocated for creating the Studio in the context of the competition introduced a major constraint: limited space with a total area of 18.4 and a height of 3.17. The area is very small for a dual-camera fixed system, and the low height poses challenges for configuring a basic setup for omni-point studio lighting and installing a ventilation system.

Indeed, the limited space combined with the abundance of equipment it accommodates (Interactive whiteboard, desks, Autocue Teleprompter, etc.) required a thorough investigation for the proper placement of the two or three cameras so as to ensure a noticeable difference in their shooting angle and cover the requested frame without obstructing the space. The system supports recording a maximum of two people, either sitting or standing (one-quarter headshot). Particularly challenging was investigating the lighting system settings, which lacked sufficient distance for uniform lighting and avoiding the creation of shadows.

Additionally, the subject (professor, student, etc.) has to be static and at a particular position in the room because, otherwise, the green color will be reflected on them due to insufficient distance from both the green screen and the interactive whiteboard, resulting in the degradation of chroma keying. For the same reason, professors cannot be recorded in front of the interactive screen, thus the need for the Spark IO converter and the direct recording of its content through the Tricaster system.

7 Future Plans

The need for the appropriate creation of high-quality learning multimedia material is growing, and the ultimate goal is to establish the video studio as a hub for innovation in creating compelling and meaningful learning content for the AUTh educational community. The videos are significant educational content, as they can facilitate knowledge. Therefore, we want to integrate emerging technologies such as real-time graphics, virtual reality, and augmented reality software for immersive recording experiences. However, the video is a medium that can hardly be produced and cannot be easily modified after creation. For these reasons, we are exploring incorporating automated recording equipment and technology, such as artificial intelligence-powered editing tools and text-to-speech software, to achieve greater productivity, save high-quality human resources, and enhance video and audio quality.

8 Discussion

The need for the appropriate creation of high-quality learning multimedia material is growing. Creating quality videos remains a difficult and undoubtedly costly undertaking, but it is considered a critical factor in ensuring and improving the quality of intangible educational assets. The use of interactive videos that can incorporate various learning activities, such as quizzes, reflection questions, etc., can help students focus on useful content and thus facilitate learning. Moreover, an aesthetic video can convey messages and information concisely in an aesthetic way that can attract the audience's interest. In this way, a small video of a few seconds may, under some conditions, contribute to the promotion and extroversion of the university.

References

Brame, C. J. (2016). Effective educational videos: Principles and guidelines for maximizing student learning from video content. *CBE—Life Sciences Education*, 15(4), es6.

Carmichael, M., Reid, A., & Karpicke, J. D. (2018). Assessing the impact of educational video on student engagement, critical thinking and learning. *A SAGE white paper*.

Charidimou, D. (2019). *Embedding new technologies in the sector of education.* Thessaloniki, Greece: Aristotle University of Thessaloniki Faculty of Science, Department of Informatics. doi:10.26262/heal.auth.ir.306185

Choi, H. J., & Johnson, S. D. (2005). The effect of context-based video instruction on learning and motivation in online courses. *The American Journal of Distance Education*, 19(4), 215-227.

Griffiths, M. E., & Graham, C. R. (2009a). The potential of asynchronous video in online education. *Distance Learning*, 6(2), 13.

Griffiths, M. E., & Graham, C. R. (2009b). Using asynchronous video in online classes: Results from a pilot study. *International Journal of Instructional Technology and Distance Learning*, 6(3), 65-76.

Kalfa, V., Roussos, G., Charidimou, D., & Agorogianni, A. (2021). Coping with the COVID-19 challenges in a comprehensive university: learning tools and procedures adopted by Aristotle University of Thessaloniki. *Proceedings of the European University*, 78, 126.

Kay, R., & Kletskin, I. (2012). Evaluating the use of problem-based video podcasts to teach mathematics in higher education. *Computers & Education*, 59(2), 619-627.

Lubov, P., Irina, P., Yuliana, V., & Nuria, R. (2019). Enhancing reflection activity as a condition for the effective development of students humanitarian culture in the process of learning a foreign language. *Revista Espacios*, 40(09).

Moussiades, L., Kazanidis, I., & Iliopoulou, A. (2019). A framework for the development of educational video: An empirical approach. *Innovations in Education and Teaching International*, 56(2), 217-228.

Rasi, P. M., & Poikela, S. (2016). A review of video triggers and video production in higher education and continuing education PBL settings. *Interdisciplinary Journal of Problem-Based Learning*, 10(1), 7.

Roussos, G., Charidimou, D., Petalotis, A., & Agorogianni, A. (2023). A New Digital Era for European Universities: Implementing Large-scale AV Projects for the Next Generation Digital Hybrid Classrooms-A quick-start guide from 0 to 10: Challenges, Benefits, Pitfalls. pp. 95, 239-248.

Schneps, M. H., Griswold, A., Finkelstein, N., McLeod, M., & Schrag, D. P. (2010). Using video to build learning contexts online. , 328(5982). *Science*, 1119-1120.

Vaganova, O. I., Rudenko, I. V., Markova, S. M., Smirnova, Z. V., & Kutepov, M. M. (2019). The use of educational video materials in educational process of a higher educational institution. *Amazonia Investiga*, 8(22), 216-222.

Weerasinghe, T. A., Ramberg, R., & Hewagamage, K. P. (2009). Designing online learning environments for distance learning. *Instructional Technology*, 21.

Yousef, A. M., Chatti, M. A., & Schroeder, U. (2014). Video-based learning: A critical analysis of the research published in 2003-2013 and future visions. *eLmL 2014, The Sixth International Conference on Mobile, Hybrid, and On-line Learning*, 112-119.