Enhancing Student Motivation in Virtual Classrooms: the role of vMix technology

Urip Muhayat Wiji Wahyudi,[1]

[1] Univeritas PGRI Yogyakarta, Bantul, Indonesia.

Abstrak

Motivasi memiliki peran yang sangat penting dalam keberhasilan kegiatan belajar yang dilakukan oleh mahasiswa. Semakin tinggi motivasi belajar individu maka semakin tinggi prestasi belajarnya untuk dicapai. Perkembangan dunia teknologi yang semakin berkembang memacu dunia pendidikan mulai membentuk dirinya untuk menghadapi masa depan. Pendidikan yang berlangsung di dalam kelas kini bergeser ke dunia maya dan dunia nyata dengan blendended learning. Pendidikan memiliki tujuan untuk menumbuhkan semangat siswa dalam belajar sehingga mampu mengembangkan dirinya. Sebagai pengajar, kita harus berinovasi dalam mengembangkan kelas virtual agar mahasiswa antusias mengikuti perkuliahan. Kebanyakan mahasiswa malas untuk kuliah virtual karena kelas terlihat membosankan . Vmix dapat menghasilkan tampilan kelas virtual yang cantik dan menarik layaknya studio televisi. Hasil tampilan ini bisa kita gabungkan ke zoom, gmeet, Microsoft team, dan lainnya. Metode penelitian yang digunakan dalam penelitian ini adalah Research & Development. Penelitian ini mendeskripsikan pengembangan kelas virtual 3D dalam meningkatkan motivasi belajar mahasiswa di kelas virtual.

Abstract

Motivation plays a crucial role in the success of students' learning activities. The higher the level of individual motivation, the greater the potential for achieving learning outcomes. With the rapid advancement of technology, the field of education is adapting to meet future challenges. As educators, it is essential to innovate and create engaging virtual classrooms that captivate students' interest. Many students shoz`w disinterest in attending virtual lectures due to the perceived lack of excitement in these classes. However, there is a technology solution that can address this issue - VMix. VMix offers the capability to create visually appealing and captivating virtual class displays similar to television studios. By integrating VMix with platforms like Zoom and Google Meet, we can enhance the virtual learning experience. This research follows a Research & Development approach and focuses on the development of VMix to enhance student motivation in virtual classrooms.

✉ Corresponding author :
Address: UPY Unit 2, Faculty of Teacher training & Education,
Universitas PGRI Yogyakarta, Yogyakarta, 55182 (zip code)
E-mail: muhayat@upy.ac.id

INTRODUCTION

In this highly advanced digital era, technology has become intricately woven into every aspect of our lives. The rapid development of technology is driving the education sector to adapt and prepare for the future. Sharma et al. (2022) suggests that online classes are a preferred alternative when in-person classes are not feasible, particularly during situations like the pandemic where online classes ensure the safety of students by allowing them to follow necessary protocols. According to Li (2022), traditional classroom education has shifted to the virtual realm due to the COVID-19 pandemic, which restricts students from studying together in physical classrooms.

The goal of education is to cultivate students' enthusiasm for learning and enable their personal growth. As educators, it is imperative that we innovate and create engaging virtual classrooms to foster students' enthusiasm for attending lectures. In our daily lives, we rely on technology for various activities such as transportation, meals, e-money, meetings, schools, entertainment, videos, photography, and more. The digital space offers an abundance of platforms including YouTube, Facebook, Zoom, Google Meet, Instagram, TikTok, and others. Those who fail to master or adapt to technology risk being left behind if they are unwilling to learn and innovate. The public also has the opportunity to contribute by creating videos that entertain others. For those who prefer not to engage in video editing, streaming provides an excellent solution to immediately share the best content.

Research by Agustina (2018) states that social media now also offers realtime broadcasts and livestreaming. All social media applications provide live broadcast facilities such as Zoom, Google Meet, Facebook, Instagram, and YouTube. To perform live streaming of multi-broadcasts that are visually appealing to various destinations, we can use other applications such as vMix. Vmix, which stands for video mixer, is software used to combine video, audio, and virtual displays into a beautiful digital presentation. Typically, vMix is used in computer hardware to deliver HD quality in live video events (Event, 2022). Vmix is gaining popularity in webinars, teaching, and conferences, as it provides an easy and costeffective solution compared to expensive equipment for a virtual studio (Pratama et al., 2020).

When compared to classroom mode, online classes offer extensive flexibility that is essential during the pandemic, as stated by Li (2022). Students have more control over their learning materials, allowing them to choose the appropriate access time, sequence, pace, and amount of information, thereby following a more personalized approach. One of the crucial factors for the development and effective functioning of education in line with the times and environmental conditions is educational innovation. In the midst of the uncertain pandemic situation, knowledge transfer must continue. Education constantly strives to increase students' enthusiasm for learning and their overall development.

Although some schools have started face-to-face classes, universities are still conducting distance learning or online classes. Lectures must continue, with both advantages and disadvantages. One problem faced during lectures in the pandemic era is the low learning motivation among students for online study. According to a survey I conducted in learning media courses, students tend to be disengaged during lectures, often turning off their cameras and not responding when called upon by the lecturer. The survey data from my classroom shows that 60% of students turn off their cameras during lectures, 30% are frequently late, and 30% fail to connect or respond when asked. Students also find online classes monotonous, which leads me to believe that if lectures were presented like a TV station, 100% of students would be interested.

The learning effectiveness of online classes is positively correlated with the supportive attitude of students. The better the learning effect, the higher the likelihood of supporting online learning. Among the preferred learning methods, recorded and live broadcasts with or without interaction are positively correlated with the supportive attitude. Adopting audio and video teaching methods, rather than solely providing learning materials, better predicts students' support for online teaching (J. Li et al., 2021).

In this paper, I aim to present a new virtual class with additional features using vMix. Vmix provides a new experience for instructors, as it is crucial for boosting student motivation during the COVID-19 pandemic. Vmix creates an elegant and visually appealing class atmosphere. Considering the low learning motivation of students during this pandemic, I believe vMix is

Figure 1 Research and development steps

Preliminary studies	Development	Testing
• Literature review • Field survey • Preparation of a draft product • Planning	• Product design • Product validation • Product improvements • Limited trials • Product revisions	• Pre-test • Treatment • Post-test

one of the right solutions to engage students in online learning in an interesting way. Lecturers usually teach using platforms like Google Meet or Zoom without incorporating other mediums. With vMix, the class will feel like an attractive and sophisticated TV studio.

Hence, new innovations are necessary to accommodate educational needs even in challenging conditions, whether by leveraging technological advancements or other means. According to Government Regulation No. 57/2021 on national standard of education (Pemerintah Republik Indonesia, 2021), the learning process in educational institutions should be active, creative, fun, and motivating for students. Previous research has shown that virtual classes (Alam Fajar et al., 2015) and virtual labs can improve student achievement in vocational schools (Astiani, 2019). Therefore, we must innovate to create engaging virtual classrooms for students.

The aim of this research is to develop appropriate learning media during the pandemic based on the vMix live streaming application. By offering an interesting and enjoyable learning experience, we can enhance the quality of learning and maintain students' motivation to learn. Through the development of virtual classes with the vMix application, I believe we can provide something new for students in the teaching and learning process. While lecturers usually rely on ordinary learning media such as Google Meet or Zoom, vMix will help them increase student learning motivation with cool virtual classrooms that are elegant and visually appealing.

METHOD

This study utilizes the Research and Development (R&D) method based on the Borg & Gall model (2007). The development research follows several steps: (1) research and data collection; (2) planning; (3) development of product draft; (4) initial field trials; (5) revision based on trial re-

sults; (6) field trials; (7) revision of operational product; (8) field implementation test; (9) final product refinement; and (10) dissemination and implementation. It is important to note that these steps are not set in stone and can be adjusted according to the researcher's needs, considering constraints such as time, energy, and cost. Due to limitations, this research and development process does not involve steps 9 and 10. The modified research and development process used by the researchers can be illustrated as follows.

In this study, the researcher employed a one-group pretest-post-test design pattern, which involved a single class. The class comprised 35 students. Both a pre-test and post-test were administered to assess the effectiveness of using vMix Virtual Class.

The study was conducted at Universitas PGRI Yogyakarta, involving two classes, A and B. The independent variable was Tsanawiyah English Grammar, while the dependent variable was students' English learning outcomes. Data collection techniques included the use of questionnaires, interviews, and test instruments. The instruments used in the study consisted of expert validation sheets, observation sheets, student response questionnaires, and test questions. The evaluation of the media utilized experimental research with a pretest-posttest control group design to compare the learning outcomes before and after the implementation of vMix in the classroom. The study employed both quantitative and qualitative data, leading to the use of two data analysis techniques: descriptive statistical analysis and inferential statistical analysis.

RESULT AND DISCUSSION

Following the procedure proposed by Borg and Gall (2007), this study utilized ten stages of research and product development. The results of the research and development process are as follows.

Figure 2 Tools in virtual classroom development

Figure 3 TV studio 3d virtual classroom design

Figure 4 Assembling virtual classes using the VMix application

A. Virtual Classroom Development with vMix

The development of the virtual classroom was carried out using the Borg and Gall model, which consists of ten steps.

1. Research and Data Collection

The initial stage of development involved collecting data through various analyses, including market analysis. Field observations revealed that live streaming software, such as YouTube, Instagram, TikTok, and mobile legends, has become increasingly popular among the public. This presented a good opportunity to introduce vMix as an alternative to enhance virtual appearances. vMix can be downloaded for free from its website. User analysis was conducted to assess the potential users of the technology among both teachers and students. This analysis aimed to ensure a smooth transition to virtual classes with the addition of vMix. Teachers, in particular, needed to familiarize themselves with how vMix works. Material analysis was also performed by examining the lesson plan and determining which materials would be included in the virtual class.

2. Planning

The second step involved planning the development of a media platform that could enhance student learning motivation during online lectures. With conventional virtual classes, students often lack enthusiasm for the learning process. To address this issue, the initiative was taken to develop virtual classes using the vMix application. The goal was to create an engaging and attractive online learning environment that would stimulate students' enthusiasm for learning.

3. Product Draft Development

The development of the virtual class commenced with the preparation of materials and equipment, including laptops, webcam cameras, green screens, and lighting.

After all the necessary preparations, the next step is to prepare the software for designing the virtual classroom. In this case, we utilized 3ds Max to design our 3D room. The results of this design process are as follows.

The next step involves combining or integrating virtual classes with the learning media using VMix software. We connect the available webcams to a laptop that has VMix installed. Additionally, we import the 3D studio image that has been prepared into VMix. This studio image plays a crucial role in enhancing the visual appeal of our live streaming teaching sessions. We have the flexibility to adjust the camera angle and distance to achieve optimal results. It is essential to ensure proper lighting for a satisfactory
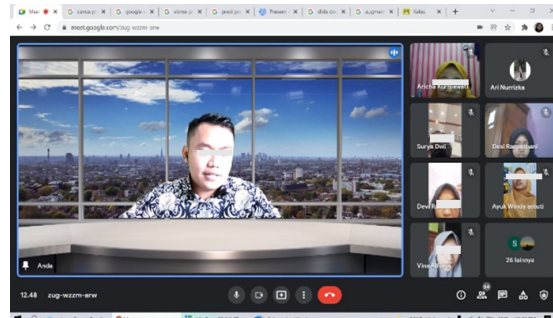
Figure 5 Virtual class display connected to google classroom

Figure 6 Virtual class display connected to google classroom

Table 1 The results of the material expert's assessment

No	Variable	Score Max	Score	Percentage	Information
1.	Aspects of content	100	80	80 %	Very good
2.	Aspects of increasing the level of thinking of students	100	83	83 %	Very good
3	Aspects of visuality	100	82	82%	Very good

Table 2 The results of the media expert's assessment

No	Variable	Score Max	Score	Percentage	Information
1.	Aspects of Maintainable	100	85	85 %	Very good
2.	Aspects of Usability	100	79	79 %	Good
3	Aspects of Compatibility	100	95	95 %	Very good
4.	Aspects of Appearance	100	90	90 %	Very good
5.	Aspects of Audio	100	87	87 %	Very good

outcome. When the green screen is well-illuminated, it provides a clean and professional studio background. Below is a display of the assembled VMix setup as a unified system.

Once the virtual set has been successfully assembled, the next step is to prepare the learning materials or media that will be presented to the students. We can showcase the materials while operating our virtual classroom, simulating the experience of a TV studio. vMix can be seamlessly integrated with various online learning platforms, including Zoom, Google Meet, Microsoft Teams, and others. The convenience offered by the features of vMix makes it an appealing software choice for anyone involved in online learning. For further details, please refer to the accompanying image.

The 3D virtual classroom has been successfully integrated with Google Classroom. As a proficient lecturer, all you need to do is deliver the material eloquently, supported by an appealing virtual display. This combination can serve as a magnet to attract students to engage in your lectures. It is still uncommon for lecturers to utilize vMix in their teaching activities, which makes your class stand out as it offers a visually captivating learning environment compared to others.

At this stage, the development of the virtual class has been finalized. You will observe a noticeable distinction between classes that utilize vMix and those that do not. Student responses will reflect a higher level of engagement and interest in your lectures when vMix software is employed.

4. Product Validation

The fourth step involves validating the media. The completed media is subjected to expert validation, which includes material validation and media expert validation. The material validation is conducted by a lecturer in the Elementary School study program, and the assessment results are presented in Table 1.

The results of the material expert's assessment of the content aspect of the lesson material showed very good results. This is very good, seen from the content of the material loaded, the learning objectives are in accordance with the students. In the aspect of suitability, the level of

Table 3 Limited test student responses

No	Variable	Score Max	Score	Percentage	Information
1.	Aspects of attractiveness	100	80	80 %	Very good
2.	Aspects of Virtual Classroom Design	100	84	84 %	Very good
3	Aspects of Visual Communication	100	52	86,6 %	Very good

Table 4 Student response

No	Variable	Score Max	Score	Percentage	Information
1.	Aspects of Media use	100	85	85%	Very good
2.	Aspects of Attension	100	86	86%	Very good
3	Aspects of Relevance	100	77	77%	Good
4.	Aspects of Satisfaction	100	88	88%	Very good

students' thinking also shows very good results, where the material in this media is suitable for students in learning. Then from the aspect of the visualized image it also shows very good results, this can be seen from the images displayed in media that are interesting for students to study. While the results of media expert validation are as follows.

At the stage of media expert assessment, there are specific criteria for evaluating the media, and the results are as follows. The first criterion is the ease of maintenance and management, which shows excellent results. Learning media with vMix can be easily stored and maintained on a laptop or computer, and it can be readily reused once the settings have been saved. In terms of usability, it performs exceptionally well. This media can be utilized by any lecturer as long as they are willing to learn how to use it. Additionally, in terms of compatibility, vMix can be seamlessly connected to various live streaming platforms, including games, virtual meetings, and virtual studios, making it highly compatible in different media settings. The visual aspects of the media also exhibit excellent results, such as the studio design, virtual studio colors, and the clarity and quality of the displayed images. Finally, the assessment considers the audio quality within the virtual studio, which is also deemed to be very good, ensuring that the material is effectively delivered.

5. Product Revision

The fifth step involves product revision, which incorporates feedback from experts. Following the expert validation stage, several suggestions were provided for enhancing the virtual classes. These include rearranging the materials in vMix, improving the room lighting, considering the limitations of the free version of vMix

(with a duration of only 2 months), and simplifying the 3D design used for the background. Additionally, it is crucial to configure vMix for teaching purposes, and it would be beneficial to prepare a package that allows for direct connection to vMix or Gmeet, thereby saving more time.

6. Limited trial

The sixth step involves conducting a limited trial by implementing the media in a trial class. We selected 10 students who participated in this trial, divided into control and experimental groups. These students provided feedback on the final design of the virtual class. The responses obtained from this trial are presented in the table below.

Student responses during the trial class indicated a high level of interest, demonstrating their excitement and curiosity in learning online using vMix as the media. They expressed that the virtual classes provided an engaging and enjoyable learning experience. In terms of visual communication, students found the media to be highly interactive, resembling a TV studio with captivating visuals and sound.

7. Product Revision

Based on the trial results, some minor improvements were identified for further product revision. These include optimizing the resolution of the live streaming video output and ensuring the readability of text elements during learning sessions. These enhancements aim to maximize the effectiveness of the virtual class for learning purposes.

8. Field Implementation Test

In the eighth stage, the researcher collected student response data after implementing the virtual class with vMix. According to the

student response table, the average assessment in terms of media use received a percentage of 92.5%, falling within the "very good" category. The attention aspect scored 86% in the "very very good" category, while the relevance aspect obtained a score of 77% in the "good" category. The data from the confidence aspect yielded a score of 70% in the "good" category, and based on the satisfaction aspect, a score of 88% was achieved, classifying it as "very good". Based on these findings, it can be concluded that virtual classes with vMix enhance student enthusiasm and motivation during lectures.

Based on the field implementation stage and student responses, it is evident that the use of vMix as a learning media significantly facilitates students in comprehending the subject matter. This achievement aligns with the intended outcomes of generating interest, motivation, creativity, increasing student activity, and creating meaningful learning experiences. Thus, the results are highly favorable in terms of media utilization.

Furthermore, the majority of students in the class demonstrated excellent attention during the learning process, indicating their active participation. Students also expressed that the vMix application was relevant to their learning needs and effectively fostered their motivation to learn. Additionally, students conveyed high levels of satisfaction with the media and acknowledged the lecturer's impactful delivery. Their enthusiasm, happiness, and ability to comprehend the material were evident.

B. Discussion

Research on vMix has been conducted by several researchers worldwide, including the Italian University of Salerno. According to Todino & Sibilio (2019), vMix is a tool that facilitates new teachers in delivering learning to students. It serves as a plug-and-play medium that acts as a real-time or real display laboratory. The project's main objective is to design and implement a mobile video analysis laboratory for recording videos of actual or simulated teaching activities.

Furthermore, Todino & Sibilio (2019) state that the mobile laboratory, utilized at the University of Salerno, primarily supports teacher training courses and aids researchers in reviewing their lessons by comparing them with existing video recordings. This allows for a deeper understanding of classroom dynamics. The

process can be completed in less than 15 minutes and is applicable in various settings.

Virtual classrooms enable the replication of real classroom situations and atmosphere using technology, transforming teaching and learning experiences. This aligns with the research conducted by Martin & Parker (2014), which emphasizes that virtual classrooms facilitate synchronous communication between students and instructors through features such as audio, video, text chat, interactive whiteboards, application sharing, instant polling, emoticons, and breakout rooms. Virtual classrooms allow for effective communication between teachers and students, even when they are not physically present.

Additionally, research conducted by Octavita & Saraswati (2017) reveals that students in virtual classes demonstrate better indicators of learning initiative, the ability to diagnose and evaluate learning processes and outcomes, self-efficacy (self-concept), but exhibit weakness in setting learning targets and objectives compared to students in traditional learning environments. Moreover, Ruohonen et al. (2017) state that virtual classes enhance student learning activities, requiring teachers to be more active and creative in utilizing effective teaching methods. The use of virtual classes can lead to improved student learning outcomes.

Vmix, as a virtual class live streaming tool, offers visually appealing displays that can be further enhanced using the vMix console (Murdaningtyas et al., 2021). The vMix display can achieve exceptional clarity when live streamed and offers ergonomic features. This presents great potential when using vMix for educational purposes. Adi & Iqbal (2016) have also explored other virtual classes, such as the Virtual Laboratory excretory system, which received validation from experts, affirming its classification as "very good" and its readiness for actual learning activities. Testing on grade XI students at SMA Negeri 2 Bondowoso demonstrated that the Virtual Laboratory of the excretory system significantly increased students' learning motivation.

Similar research by Tasbihah & Suprijono (2021) highlights the impact of online learning based on virtual tours of museum media on students' learning motivation. Even in an online setting, students displayed a strong interest in learning about museums and social science. Yusnita et al. (2017) state that the vMix based Web

Streaming system allows campuses to streamline documentation processes, disseminate information, and serve as an educational medium. The system has reduced the burden on the socialization and publication team, as academic activities are readily available on Wicida TV. Additionally, vMix has proven cost effective, efficient, and practical.

The previous research studies mentioned are closely related to the research presented in this article. Our research reveals that using vMix to create visually appealing virtual classroom displays akin to TV studios received high praise from experts, with excellent ratings. Both material experts and media experts concluded that this virtual class solution serves as an alternative means to enhance the visual presentation of teaching lecturers. Lecturers can seamlessly blend their teaching display with material delivery and media in the form of an aesthetically pleasing virtual class, ultimately improving the overall learning experience.

CONCLUSION

Based on the comprehensive research and development conducted on 3D virtual classes using vMix, it can be confidently concluded that the media produced through various stages, following the Borg & Gall (2007) model, has yielded exceptional and validated results by both media and material experts. The process of installing the required software on a laptop or computer is remarkably straightforward, cost effective, and practical to operate, saving valuable time and energy during virtual classes. The integration of hardware devices like webcams, green screens, and appropriate lighting enhances the overall virtual classroom experience. The software itself, utilizing tools such as 3dsmax for designing the 3D studio and vMix for material mixing, camera setup, audio management, and seamless integration with platforms like Zoom, Google Meet, and Microsoft Teams, presents an ideal solution for creating captivating and engaging virtual classrooms.

The positive impact of these 3D virtual classes is reflected in increased student learning motivation. Assessments across various aspects, including media usage, attention, relevance, confidence, and satisfaction, consistently indicate highly favorable outcomes. Students demonstrate active participation, ask questions, provide feedback, express their opinions, and complete assigned tasks with enthusiasm.

The combination of a visually appealing virtual classroom, effective material delivery, and a conducive learning environment contributes to enhanced student engagement and motivation in online lecture activities. In summary, the development of these 3D virtual classes proves to be a worthwhile endeavor, offering significant benefits for both students and educators in the realm of online education.

REFERENCES

Adi, W. C., & Iqbal, M. (2016). Virtual laboratory. *Jurnal Pendidikan Sains, 4*(11), 130–136. https://doi.org/10.5860/choice.36-6309

Agustina, L. (2018). Live Video Streaming sebagai Bentuk Perkembangan Fitur Media Sosial. *Diakom: Jurnal Media dan Komunikasi, 1*(1), 17–23. https://doi.org/10.17933/diakom.v1i1.16

Astiani. (2019). *Pengaruh Penggunaan Laboratorium Virtual terhadap Motivasi Belajar dan Hasil Belajar Fisika Peserta Didik SMA Negeri 16 makassar*. Unpublished thesis. Universitas Negeri Makassar.

Borg, R.W. & Gall, M.D. (2007). *Educational Research: An Introduction.* Pearson Education, Inc.

Event, A. (2022). *Apa itu VMIX dan OBS*. Agievent. https://agievent.com/news/vmix-dan-obs

Fajar, N. A, Purnamawati, & Jaya, H. (2015). Efektivitas Penggunaan Virtual Learning terhadap Motivasi dan Hasil Belajar Siswa di SMK Negeri 2 Makassar. *Jurnal Penelitian Tindakan Kelas, 3*(1), 1–14.

Li, D. (2022). The Shift to Online Classes During the Covid-19 Pandemic: Benefits, Challenges, and Required Improvements from the Students' Perspective. *Electronic Journal of E-Learning, 20*(1), 1–18.

Li, J., Qin, C., & Zhu, Y. (2021). Online teaching in universities during the Covid-19 epidemic: A study of the situation, effectiveness and countermeasures. *Procedia Computer Science, 187*(2019), 566–573.

Martin, F., & Parker, M. (2014). Use of Synchronous Virtual Classrooms: Why, Who, and How? *Journal of Online Learning and Teaching, 10*(2), 192-210.

Murdaningtyas, C. D., Astin, N., & Susanto, D. (2021). Rancang Bangun Audio Video Vmix Console pada Pertunjukan Live Stream Youtube. *JST: Jurnal Sains Terapan, 7*(1), 25-32.

Octavita, R. A. I., & Saraswati, R. (2017). Integrasi Pen-

didikan Berkarakter Dalam Pembelajaran Bahasa Inggris. *Jurnal Terapan Abdimas, 2*, 33-40. https://doi.org/10.25273/jta.v2i0.974

Pemerintah Republik Indonesia. (2021). *Peraturan Pemerintah Republik Indonesia Nomor 57 Tentang Standar Nasional Pendidikan.*

Pratama, A. V., Astin, N., & Murdaningtyas, C. D. (2020). Design and Implementation of VMix Console for Audio in Music Show. *IES 2020 - International Electronics Symposium: The Role of Autonomous and Intelligent Systems for Human Life and Comfort*, 680–683.

Ruohonen, M., Mavengere, N. B., & Manzira, F. M. (2017). Learning in a virtual class: Efforts to improve way of learning and environment. *2017 IST-Africa Week Conference, IST-Africa 2017*, 1–10.

Sharma, D., Sood, A. K., Darius, P. S. H., Gundabattini, E., Darius Gnanaraj, S., & Joseph Jeyapaul, A. (2022). A Study on the Online-Offline and Blended Learning Methods. *Journal of The In-stitution of Engineers (India): Series B, 103*(4), 1373–1382. https://doi.org/10.1007/s40031-022-00766-y

Tasbihah, N. L., & Suprijono, A. (2021). Pengaruh Pembelajaran Daring Berbasis Media Virtual Tour to Museum terhadap Motivasi Siswa Belajar IPS di Kelas VIII SMPN 1 Gresik. *Dialektika Pendidikan IPS, 1*(1), 16–25.

Todino, M. D., & Sibilio, M. (2019). Design and implementation of a new mobile video analysis laboratory at the University of Salerno. *Research on Education and Media, 11*(1), 4–8. https://doi.org/10.2478/rem-2019-0002

Yusnita, A., Daud, J., & Syahroni, M., & Informatika, T. (2017). *Membangun Web Streaming Wicida TV sebagai Media Saluran Informasi dan Edukasi pada STMIK Widya Cipta Dharma.* https://repository.wicida.ac.id/342/1/1243153_Sarjana_TI.pdf