

Virtual Avatar (VTuber) Design in Creative Education: A Study of the Roles of Aesthetics, Interactivity and Engagement

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Article Info

Article history:

Received April 20, 2026

Revised May 5, 2026

Accepted May 21, 2026

Keywords:

VTuber, Virtual Avatar,
Creative Education, Aesthetics,
Engagement

ABSTRACT

Advances in digital technology have spurred various innovations in the field of education, one of which is the use of virtual avatars, or Virtual YouTubers (Vtubers), as a creative educational medium. Vtubers serve not only as visual representations of educators but also as a means of interaction capable of enhancing audience engagement in the learning process. This study aims to analyze the role of virtual avatar (Vtuber) design in creative education by examining aspects of aesthetics, interactivity, and audience engagement. This study uses a qualitative method, using a review of the literature already published. Data were collected through an analysis of various journals and scientific publications related to character design, digital learning media, and user interaction within virtual content. The results indicate that the aesthetic design of virtual avatars significantly influences the audience's initial interest, while interactivity plays a major role in enhancing engagement and sustaining attention during learning. The study's conclusion affirms that attractive, interactive, and communicative virtual avatar designs can serve as an effective strategy for improving the quality of creative education in the digital age.

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INTRODUCTION

The development of digital technology in the era of globalization has brought fundamental changes to various sectors of human life, including the education sector (Syerlita & Siagian, n.d.). Advances in information and communication technology have not only influenced the way humans communicate but have also transformed learning patterns, teaching methods, and the roles of educators and learners (Subagio & Limbong, 2023). Once distinguished mostly by in-person teaching, education is now shifting toward online learning that stresses flexibility, availability, and the application of cutting-edge technologies.

Digital transformation in education is becoming increasingly relevant in light of the demands of 21st-century learning. Students are expected to possess critical thinking, creative, collaborative, and communicative skills (Pandapotan et al., 2025). To solve problems, teachers have to create teaching techniques that stress not only the transfer of knowledge but also the development of meaningful learning experience. Digital learning media have become a key tool in supporting the achievement of these goals.

However, the implementation of digital learning is not without its challenges. One of the main challenges frequently encountered is the low level of attention and engagement among students in online learning (Zain et al., 2021). One-way instruction delivered through conventional media tends to cause boredom, reduce learning motivation, and hinder interaction between educators and students. This situation calls for innovations in learning media that can accommodate students' needs while creating an engaging and interactive learning environment (Yanti et al., 2022). The use of digital-based interactive media has proven effective in bridging accessibility gaps and significantly enhancing the effectiveness of knowledge transfer (Listiyoningsih et al., 2022).

In this context, the use of digital character-based media or virtual avatars has begun to gain attention in the field of education. Virtual avatars are digital representations that can be used as a medium for conveying messages, facilitating learning, or enabling interaction in digital environments. One rapidly growing form of virtual avatar is the Virtual YouTuber (Vtuber) (Mamat et al., 2022). This technology enables educators to integrate dynamic and personalized visual elements into instructional modules, thereby fostering emotional connections and facilitating more engaging communication within virtual classrooms (Pranata et al., 2022). The use of these fictional character-based mascots can transform instructional communication patterns into something more casual and engaging, allowing students to participate in the learning process without feeling constrained by spatial or temporal limitations (Ronggowarsito et al., 2022).

A Vtuber is a digital character controlled by a human through animation technology, motion capture, and real-time rendering systems. These characters are capable of displaying facial expressions, body movements, and vocal intonations that resemble those of humans, thereby creating a sense of social presence in the digital space (Huang et al., 2025). Initially, Vtubers were widely used in the digital entertainment industry, such as on streaming platforms and for creative content. However, in recent years, Vtubers have begun to be adapted in educational contexts as an innovative learning medium (Miranda et al., 2024). The adoption of this technology allows educators to visualize abstract concepts through dynamic character representations, which can significantly improve information retention and minimize students' boredom with monotonous material (Arifudin et al., 2021).

The use of VTubers in creative education offers a new alternative for delivering educational content. Through virtual characters, educators can present material in a more engaging, communicative, and age-appropriate manner for the digital generation (Isma et al., 2022). The presence of virtual avatars also allows educators to establish a consistent visual identity, making it easier for the audience to recognize and interact with the presenter (Zhang & Wu, 2024).

From a pedagogical perspective, the use of Vtubers aligns with multimedia learning theory, which states that learning is more effective when information is presented through a combination of visual, verbal, and audio elements (Ronggowarsito et al., 2022). Virtual avatars, as interactive visual media, can help students understand complex material more easily, while also improving their retention of the information presented (Maskati et al., 2021).

In addition, the Vtuber-based learning approach aligns with constructivist theory, which emphasizes the active role of learners in the learning process. The two-way interaction facilitated by virtual avatars allows learners to actively engage in discussions, ask questions, and provide feedback. Thus, learning is not merely passive but also encourages learners' cognitive and emotional engagement (Sulaiman, 2021).

Aesthetics is one of the key elements in virtual avatar design. Aesthetics encompasses the selection of colors, character shapes, visual styles, and facial expressions displayed by the avatar (Zhang & Wu, 2024). An appealing aesthetic design can create a positive first impression, build the avatar's image, and increase the audience's interest in the learning media. Previous research indicates that visually appealing designs have a significant impact on students' attention and learning motivation (Fridayanti et al., 2022).

In addition to aesthetics, interactivity is a key factor in the use of Vtubers as an educational medium. Interactivity enables two-way communication between educators and audiences, whether through verbal responses, avatar gestures, or other interactive features (Ronggowarsito et al., 2022). A high level of interactivity can increase the audience's sense of engagement, create a more

personalized learning experience, and strengthen the relationship between educators and learners (Utama, 2022).

Audience engagement is a key indicator in assessing the success of digital learning. Engagement is not only related to the duration of the audience's attention but also encompasses emotional, cognitive, and behavioral involvement in the learning process (Anthonysamy et al., 2021). Vtuber-based learning media is considered to have great potential in increasing audience engagement because it is capable of providing a learning experience that is enjoyable, interactive, and relevant to the digital world of students (Ronggowarsito et al., 2022).

Although Vtubers hold significant potential, their use in education also faces a number of challenges. These challenges include limitations in technological infrastructure, the need for adequate hardware and software, and educators' readiness to utilize virtual avatar-based learning tools. Additionally, avatar designs that do not align with the characteristics of the audience can also impact the effectiveness of learning (Han et al., 2022).

Therefore, an in-depth academic study is needed to comprehensively understand the role of virtual avatar design in the context of creative education. Such a study should not only focus on the technical aspects of Vtuber use but also on the pedagogical, aesthetic, and psychological aspects that influence audience engagement (Zhang & Wu, 2024).

Based on the above discussion, this study focuses on analyzing the role of virtual avatar (VTuber) design in creative education by examining aspects of aesthetics, interactivity, and audience engagement. Through a literature review approach, this study aims to provide theoretical contributions to the development of educational science as well as practical contributions to educators in designing innovative, effective, and sustainable digital learning media.

IMPLEMENTATION METHOD

This study employs a literature review method with a descriptive-analytical approach. This method was chosen because the objective of the study is to examine, analyze, and synthesize various published scientific findings related to virtual avatar (VTuber) design in the context of creative education. Through a literature review, the researcher can obtain a comprehensive overview of the development of concepts, theories, and previous research findings without conducting direct field data collection.

The literature review was conducted by reviewing relevant scientific sources, including national and international journal articles, conference proceedings, and academic books related to the research topic. Priority was given to literature from reputable, indexed publications released within the past 5–10 years to ensure the information's currency and relevance.

Data collection was conducted through searches of scientific databases such as Google Scholar, the Directory of Open Access Journals (DOAJ), and national journal portals. The collected literature was then screened using inclusion and exclusion criteria. The inclusion criteria include: (1) literature discussing the use of virtual avatars or digital characters in an educational context, (2) literature addressing aspects of aesthetics, interactivity, or audience engagement, and (3) literature with a clear research methodology. Meanwhile, exclusion criteria include literature that is not relevant to the educational context or that discusses virtual avatars solely from an entertainment perspective.

The next step is data analysis, which involves critically reviewing each selected study and then grouping the findings based on the main themes of the research: avatar design aesthetics, interactivity, and audience engagement. The analysis is conducted narratively by comparing the results of previous studies to identify patterns, similarities, differences, and trends in the findings.

The results of the analysis were then synthesized to develop a conceptual understanding of the role of virtual avatar design in supporting creative education. This synthesis served as the basis for drawing conclusions and formulating the theoretical and practical implications of the study. Thus, this research method is expected to provide a systematic, objective, and in-depth overview of the topic under study.

RESULTS AND DISCUSSION

Based on the literature review, a number of articles relevant to the research topic were identified. These articles were then analyzed based on the aspects of aesthetics, interactivity, and audience engagement in the use of virtual avatars (VTubers).

In general, the findings indicate that most studies emphasize the importance of visual design in capturing the audience's attention, as well as the role of interactivity in enhancing user engagement. A summary of the results of previous research is presented in the following table.

Table 1 Analysis of Previous Research Literature

Researcher Name + Year	Journal/Book Title	Publication Title	Key Findings	Similarities with This Study	Limitations of Previous Research
Sobri, S., Hilaliyah, T., & Zahra, A. (2023)	Mendidik: Journal of Education and Teaching Studies	Development of Vtuber Animation Videos in Indonesian Language Learning for Eighth-Grade Female Students in the 2022/2023 Academic Year	The Vtuber learning medium was deemed highly suitable for use and received a very positive response from students	VTubers are effective because they feature visually appealing designs (aesthetics), are interactive, and can boost student engagement and interest in learning.	This study has not yet discussed in detail the role of each aspect of aesthetics and interactivity on engagement and learning outcomes
Amarulloh, N. F., Degeng, I. N. S., & Fajarianto, O. (2024)	Journal of Educational Technology Studies and Applied Research	Analysis of the Potential of Vtuber Characters as a Medium in Training Programs	Vtubers are engaging, innovative, and effective for delivering learning materials	Anime aesthetics, interactive technology, and the use of VR/AR enhance engagement and reduce boredom	This study has not yet addressed the in-depth design and emotional aspects of VTubers in learning
Rayhan, I. M., & Yulia, I. (2025)	National Seminar on Social Sciences and Political Science Law	VTuber Communication Strategies in Building Emotional Connection with Digital Audiences	VTubers are capable of building emotional closeness	Visual aesthetics, direct interaction, and emotional connection enhance engagement in learning	This research is still limited and has not focused on the use of VTubers as an educational medium
Rezky, M. R. (2025)	Imagination: Journal of Art	Development of Virtual YouTuber (VTuber)-Based Learning Media for Illustration Material Among Students at State Junior High School 8 Bogor	Vtubers are engaging and communicative in the digital age	Vtubers increase student interest and engagement through visual and interactive approaches	This study has not yet thoroughly discussed the roles of aesthetics, interactivity, and engagement in creative education
Alfita, A. N. (2025)	Academia Open	Semiotic Identity Construction of VTuber Storytelling in YouTube Shorts: The Semiotic Construction of Identity in VTuber Storytelling on YouTube Shorts	Vtubers can convey moral and cultural values	Visual and audio aesthetics, as well as storytelling, enhance audience interaction and engagement	This study is limited to a single Vtuber and a single type of content, so it does not yet cover a wide range of variations
Sulistiyowati, C., & Asriati, N. (2024)	Citra Bakti Scientific Journal of Education	The Use of Technology to Improve Learning Effectiveness and Engagement in the Digital Age	Digital media makes learning more effective, engaging, and fosters critical thinking	Attractive and interactive visuals improve students' understanding, motivation, and engagement	This study has not yet addressed the role of VTuber avatars, character aesthetics, and direct interaction in learning
Mohammad, W., & Maulidiyah, N. R. (2023)	Jurnal Pendidikan Non Formal	Analysis of the SAMR model and psychological approach on Duolingo livestreams by Hololive VTubers in learning Japanese	Duolingo livestreams by Hololive VTubers demonstrate a new, more interactive and immersive way of	VTubers share commonalities in character aesthetics, high interactivity, and the ability to enhance engagement and learning	This study has not yet thoroughly examined the role of avatar aesthetic design and its design process on educational

Researcher Name + Year	Journal/Book Title	Publication Title	Key Findings	Similarities with This Study	Limitations of Previous Research
			learning languages.	motivation	effectiveness.
Prasetyo, S. R. A., & Prameswari, N. S. (2025)	Abdi Dosen: Journal of Community Service	Designing Virtual Character as Educational Content Support for Anantaka Foundation	Anime-style virtual characters are effective for delivering educational content on social media	Anime aesthetics and character expressions enhance audience engagement	This study has not yet utilized full interactivity and has not measured engagement in a meaningful way
Setiawan, C. O., Pranayama, A., & Basuki, R. M. N. (2026)	Pilar Nusa Mandiri Journal	Designing a Vtuber Character Based on Indonesian Folklore to Enhance Youth Interest in Local Culture	Vtubers are effective as an educational medium for introducing traditional culture to Gen Z	Character design (aesthetics), real-time interaction (interactivity), and high participation (engagement) of the support the delivery of education	This study has not yet optimized character personas, such as voice and dialect usage

DISCUSSION

1. Similarities with Previous Research

Based on the results of the literature review conducted, consistent patterns of similarity were found across various studies regarding the use of Virtual YouTubers (VTubers) in the context of digital media, particularly in education and communication. First, nearly all studies confirm that visual aesthetics are a key factor in capturing the audience's attention. Attractive character designs, particularly those with an anime style or expressive visuals, have proven effective in enhancing initial appeal and sustaining user interest over time. This indicates that aesthetics are not merely visual elements but integral components of an effective visual communication strategy.

Second, interactivity is a key element that distinguishes Vtubers from conventional learning media. Many studies highlight that Vtubers' ability to facilitate two-way interaction whether through live streaming or responding to the audience creates a more immersive and participatory learning experience.

Third, all studies whether implicit or explicit indicate that the combination of aesthetics and interactivity contributes to increased engagement. This engagement takes the form not only of attention but also of emotional involvement, learning motivation, and a sense of connection between users and the content being presented.

Thus, it can be concluded that there is a scientific consensus that aesthetics, interactivity, and engagement are the three main pillars of the effective use of Vtubers, both in the context of entertainment and education.

2. Limitations of Previous Research and Strengths of This Study

Limitations of Previous Research

1. Lack of integrative discussion between variables
2. Lack of in-depth design approaches
3. Dominance of non-educational focus
4. Limitations regarding the context and research subjects
5. Lack of exploration of real-time interactivity

Strengths of This Study

1. An integrative approach to three main variables
2. Focus on the perspective of visual communication design
3. Emphasis on creative education
4. A broad and multidisciplinary literature synthesis

3. Implications of the Review Findings

Theoretical Implications

This study reinforces the concept that in interactive digital media, communication effectiveness depends not only on content but also on user experience design, which involves visual, interactive, and emotional aspects. This opens opportunities for the development of new conceptual models in visual communication design based on virtual avatars.

Practical Implications

1. For designers and content creators
Vtuber design must strike a balance between aesthetics, character personality, and interactive capabilities to boost engagement.
2. For educators
VTubers can serve as an adaptive learning medium tailored to the characteristics of the digital generation, particularly in boosting student motivation and participation.
3. For technology developers
System development is needed to support more natural real-time interactivity, such as motion capture and voice synthesis.

CONCLUSION

Based on a literature review of various studies on virtual avatar (VTuber) design in the context of creative education, it can be concluded that VTubers hold significant potential as an innovative learning medium in the digital age.

First, the aesthetic aspect has proven to be a fundamental factor in capturing the audience's attention. A visually appealing, expressive character design that aligns with the target audience's preferences can enhance initial appeal and strengthen visual identity within the educational communication process.

Second, interactivity is the primary advantage of Vtubers over conventional learning media. The ability to facilitate two-way communication whether in real-time or through digital responses enables the creation of a more participatory and immersive learning experience.

Third, the combination of aesthetics and interactivity consistently contributes to increased engagement. The engagement formed encompasses not only attention but also emotional involvement, learning motivation, and a sense of connection between the user and the presented material.

Furthermore, this study indicates that most previous studies have addressed these aspects separately and have not yet integrated them into a comprehensive design framework. Therefore, this study contributes by emphasizing the importance of an integrative approach between aesthetics, interactivity, and engagement in the design of Vtubers as a creative educational medium. Thus, it can be concluded that the success of Vtubers in education is determined not only by the technology used but also by the quality of visual communication design and strategically designed interactive experiences.

REFERENCES

- [1] Aliyah Nanda Alfita. (2025). Semiotic Identity Construction of VTuber Storytelling in YouTube Shorts: Konstruksi Identitas Semiotik dari Penceritaan VTuber di YouTube Shorts. *Academia Open*, 10(2), 2–5. <https://doi.org/10.21070/acopen.10.2025.13045>
- [2] Amarulloh, N. F., Degeng, I. N. S., & Fajarianto, O. (2024). Analisis Potensi Karakter Vtuber Sebagai Media Dalam Program Pelatihan. *Journal of Educational Technology Studies and Applied Research*, 1(1), 26–32. <https://doi.org/10.70125/jetsar.v1i1y2024a8>
- [3] Anthonysamy, L., Ah Choo, K., & Soon Hin, H. (2021). Investigating Self-Regulated Learning Strategies for Digital Learning Relevancy. *Malaysian Journal of Learning and Instruction*, 18(1), 29–64.
- [4] Arifudin, D., Musyafa, A. M., & Halwa, A. (2021). Gamifikasi sebagai simulasi kuliah online untuk meningkatkan motivasi belajar di era pandemi. *CogITo Smart Journal*, 7(2), 360–372.
- [5] Ferreira, J. C. V., Regis, R. D. D., Gonçalves, P., Diniz, G. R., & Tavares, V. P. D. S. C. (2022). VTuber concept review: The new frontier of virtual entertainment. *ACM International Conference Proceeding Series*, April, 83–96. <https://doi.org/10.1145/3604479.3604523>
- [6] Fridayanti, Y., Irhasyurna, Y., & Putri, R. F. (2022). Pengembangan media pembelajaran audio-visual pada materi hidrosfer untuk mengukur hasil belajar peserta didik SMP/MTS. *Jupeis: Jurnal Pendidikan Dan Ilmu Sosial*, 1(3), 49–63.
- [7] Han, E., Nowak, K. L., & Bailenson, J. N. (2022). Prerequisites for learning in networked immersive virtual reality. *Technology, Mind, and Behavior*, 3(4), 566.
- [8] Huang, H., Li, J., Xie, T., Li, Z., Weng, C., Yang, Y., Luo, Y., Liu, L., Tang, J., Shao, Z., & Wang, Z. (2025). Hi-Reco: High-Fidelity Real-Time Conversational Digital Humans. <http://arxiv.org/abs/2511.12662>
- [9] Isma, C. N., Rahmi, R., & Jamin, H. (2022). Urgensi digitalisasi pendidikan sekolah. *AT-TA'DIB: Jurnal Ilmiah Prodi Pendidikan Agama Islam*, 129–141.
- [10] Lestari. (2024). PEMANFAATAN TEKNOLOGI UNTUK MENINGKATKAN EFEKTIVITAS PEMBELAJARAN DAN KETERLIBATAN BELAJAR DI ERA DIGITAL. *Jurnal Ilmiah Pendidikan Citra Bakti*, 6(1), 75–86.
- [11] Listiyoningsih, S., Hidayati, D., & Winarti, Y. (2022). Strategi Guru Menghadapi Transformasi Digital. *Jurnal Ilmiah Profesi Pendidikan*, 7(2b), 655–662. <https://doi.org/10.29303/jipp.v7i2b.389>
- [12] Mamat, R., Rashid, R. A., Pae, R., & Ahmad, N. (2022). VTubers and anime culture: A case study of Japanese learners in two public universities in Malaysia. *International Journal of Health Sciences*, II, 11958–11974.
- [13] Maskati, E., Alkeraiem, F., Khalil, N., Baik, R., Aljuhani, R., & Alsobhi, A. (2021). Using virtual reality (VR) in teaching students with dyslexia. *International Journal of Emerging Technologies in Learning (IJET)*, 16(9), 291–305.
- [14] Miranda, C., Costa, M., Pereira, M., Almeida, S., Branco, F., & Au-Yong-Oliveira, M. (2024). VTubers, Their Global Expansion and Impact on Modern Society. In A. Rocha, H. Adeli, G. Dzemyda, F. Moreira, & V. Colla (Eds.), *Information Systems and Technologies* (pp. 223–231). Springer Nature Switzerland.
- [15] Mohammad, W., & Maulidiyah, N. R. (2023). Analysis of the SAMR Model and Psychological Approach on Duolingo Livestreams by Hololive VTubers in Learning Japanese. *Jurnal Pendidikan Non Formal*, 1(1), 9. <https://doi.org/10.47134/jpn.v1i1.71>
- [16] Mulan, C., & Putri, E. (2025). JURNAL DESAIN KOMUNIKASI KREATIF VIRTUAL YOUTUBER SEBAGAI MEDIA BRANDING DAN. 04(01), 56–77.
- [17] Pandapotan, D., Latifah, P., Chyan, A. M., Nurdin, R., Ridwan, Y., Nugroho, A., Felisha, L., Mutriwana, R., Truelovin, H. P., Wahyuni, S., Maya, C., Sari, I., Fazriansyah, F., Maulana, M. N., Mario, F., Tjiptabudi, H., Kusumo, B., Djasim, A. K., Paenrongi, I., ... Priantara, N. D. (2025). Literasi Digital Teori, Praktik, dan Tantangan PT. MIFANDI MANDIRI DIGITAL.
- [18] Pranata, K., Dewi, H. L., & Zulherman, Z. (2022). Efektivitas video animasi berbasis animaker terhadap perilaku hidup bersih dan sehat siswa sekolah dasar. *Jurnal Tunas Bangsa*, 9(1), 11–17.
- [19] Rayhan, I. M., & Yulia, I. (2025). Strategi Komunikasi VTuber dalam Membangun Kedekatan Emosional dengan Audiens Digital. *Seminar Nasional Hukum Ilmu Sosial Dan Ilmu Politik*, 2(1), 235–244.
- [20] Rezky, Muhammad Rivanio, I. (2025). Pengembangan Media Pembelajaran Berbasis Virtual Youtuber (Vtuber) Materi Gambar Ilustrasi pada Siswa SMP Negeri 8 Bogor. *Jurnal Imajinasi*, XIX(2), 105–118.
- [21] Ronggowarsito, B. I., Ramdhan, Z., & Afif, R. T. (2022). Desain Karakter Virtual Youtuber sebagai Maskot Pembelajaran Menggambar. *ANDHARUPA: Jurnal Desain Komunikasi Visual & Multimedia*, 8(03), 353–367.
- [22] Setiawan, C. O., Pranayama, A., Milka, R., Basuki, N., & Design, V. C. (2026). DESIGNING A VTUBER CHARACTER BASED ON INDONESIAN FOLKLORE TO ENHANCE YOUTH INTEREST IN LOCAL CULTURE. 22(1). <https://doi.org/10.33480/pilar.v22i1.6921>
- [23] Sheehan Rizky Akbar Prasetyo, N. S. P. (2025). DESIGNING VIRTUAL CHARACTERS AS EDUCATIONAL

- CONTENT SUPPORT FOR ANANTAKA FOUNDATION. *ABDI DOSEN*, 9(4), 1712–1720. <https://pkm.uika-bogor.ac.id/index.php/ABDIDOS/issue/archive>
- [24] Sobri, Hilaliyah, T., & Zahra, A. (2023). Pengembangan Video Animasi Vtuber pada Pembelajaran Bahasa Indonesia Siswa SMP Kelas VIII Tahun Pelajaran 2022/2023. *MENDIDIK: Jurnal Kajian Pendidikan Dan Pengajaran*, 9(1), 139–148. <https://doi.org/10.30653/003.202391.43>
- [25] Studi, P., Komunikasi, D., Desain, J., & Rupa, F. S. (2024). PERANCANGAN MOTION COMIC EDUKASI UNTUK.
- [26] Subagio, I. K. A., & Limbong, A. M. N. (2023). DAMPAK TEKNOLOGI INFORMASI DAN KOMUNIKASI TERHADAP AKTIVITAS PENDIDIKAN. *Journal of Learning and Technology*, 2(1), 43–52. <https://doi.org/10.33830/jlt.v2i1.5844>
- [27] Sulaiman, K. M. (2021). Realitas virtual dan penelitian pendidikan dasar: Tren saat ini dan arah masa depan. *CENDEKIA: JURNAL ILMU SOSIAL, BAHASA DAN PENDIDIKAN* Учредители: Politeknik Pratama Purwokerto, 1(4), 60–85.
- [28] Syerlita, R., & Siagian, I. (n.d.). Dampak Perkembangan Revolusi Industri 4.0 Terhadap Pendidikan Di Era Globalisasi Saat Ini. *Journal on Education*, 07(01).
- [29] Utama, R. (2022). Enhancing students' engagement using interactive applications in online lectures. *Jurnal Pendidikan Kedokteran Indonesia: The Indonesian Journal of Medical Education*.
- [30] Widodo, B. P., & Jacky, M. (2025). Fenomena Virtual Youtuber: Representasi Identitas dan Perilaku Dalam Masyarakat Virtual Dalam Perspektif Sosiologi Virtual (Studi Kasus: Virtual Youtuber Kobo Kanaeru). *Paradigma*, 14(2), 31–40. <https://ejournal.unesa.ac.id/index.php/paradigma/article/view/70840>
- [31] Yanti, R. D., Thaha, H., & Mirnawati. (2022). PENGEMBANGAN MEDIA PEMBELAJARAN BERBASIS ANIMASI PADA PESERTA DIDIK SD. *MUBTADI: Jurnal Pendidikan Ibtidaiyah*, 4(1), 81–95. <https://doi.org/10.19105/mubtadi.v4i1.6357>
- [32] Zain, N. H., Sayekti, I. C., & Eryani, R. (2021). Problematika Pembelajaran Daring pada Peserta Didik di Sekolah Dasar. *Jurnal Basicedu*, 5(4), 1840–1846. <https://doi.org/10.31004/basicedu.v5i4.1051>
- [33] Zhang, R., & Wu, Q. (2024). Impact of using virtual avatars in educational videos on user experience. *Scientific Reports*, 14(1), 6592.