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Artificial Intelligence in Learning Transformation: Opportunities and Challenges for Educational Technology

Wanda Ani Nizar Auliya[1*], Bahrul Dwi Kurniawan[2], Maraftul Afdilia[3], Havi Ayuning Tyas[4], Genta Aldi Saputra[5], Kuntoro Adi Juwanda[6]

[1] Department of Educational Technology, Campus 5, Universitas Negeri Surabaya, Surabaya, Indonesia, 63392
[2] Department of Educational Technology, Campus 5, Universitas Negeri Surabaya, Surabaya, Indonesia, 63392
[3] Department of Educational Technology, Campus 5, Universitas Negeri Surabaya, Surabaya, Indonesia, 63392
[4] Department of Educational Technology, Campus 5, Universitas Negeri Surabaya, Surabaya, Indonesia, 63392
[5] Department of Educational Technology, Campus 5, Universitas Negeri Surabaya, Surabaya, Indonesia, 63392
[6] Sekolah Indonesia Kuala Lumpur, Kuala Lumpur, Malaysia

Corresponding author: Wanda Ani Nizar Auliya, Email: 25112104059@mhs.unesa.ac.id

Abstract

The transformation of vocational education in the digital era necessitates the integration of instructional media capable of bridging industry demands with learning processes in schools. This study aims to describe the current use of instructional media in the Visual Communication Design (VCD) program at SMKN 2 Jiwan, identify the challenges encountered in its implementation, and analyze the need for the development of industry-based interactive learning media. The study employed a descriptive qualitative approach with a case study design. Data were collected through observations, interviews, and documentation, and subsequently analyzed using the interactive analysis model, which consists of data reduction, data display, and conclusion drawing. The findings indicate that the instructional media currently utilized are still predominantly conventional, including direct demonstrations and static media, which have not fully supported self-paced learning and project-based learning approaches. In addition, limitations in educational facilities and infrastructure, particularly the shortage of practical equipment, constitute a major challenge in the learning process. Existing media are also unable to comprehensively represent industry workflows, especially during the pre-production, production, and post-production stages. On the other hand, students expressed a strong need for interactive, visually rich learning media that can be accessed through mobile devices. The study concludes that the development of digital interactive learning media integrating industry workflows represents a relevant solution for enhancing the effectiveness of vocational learning. Such media are expected to foster students' learning autonomy, address limitations in practical learning facilities, and improve students' work readiness through the implementation of the Teaching Factory approach.

Keywords: Instructional media, vocational education, visual communication design, Teaching Factory, self-paced learning, interactive multimedia.

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INTRODUCTION

The transformation of vocational education in Indonesia has entered a critical phase following the implementation of the Merdeka Curriculum, which was introduced in response to the demands of the Fourth Industrial Revolution, rapid advancements in digital technology, and the increasingly complex requirements of the labor market. This curriculum shifts the focus of learning from mere content mastery toward the development of competencies, character, and twenty-first-century skills, including critical thinking, creativity, collaboration, and digital literacy. Furthermore, the Merdeka Curriculum provides vocational education institutions with greater autonomy to align learning activities with industry needs and local contexts (Fathimah et al., 2025; Susanti et al., 2024; Hartoyo et al., 2023; Yanti et al., 2024; Andriansah, 2024; Wongkar & Pangkey, 2024).

Within the context of Vocational High Schools (SMKs), these curriculum reforms have directly influenced subject structures, the allocation of practical learning hours, and the adaptation of competency content to better meet stakeholder expectations in the era of globalization (Susanti et al., 2024). One of the vocational programs significantly affected by these changes is Visual Communication Design (VCD), which requires students to master professional design software while understanding creative industry workflows through production-based learning and collaboration with business and industrial partners.

The dynamic nature of the creative industry requires VCD students not only to possess technical skills in operating design software but also to understand professional standards, project management practices, time discipline, and work ethics aligned with industry expectations. Therefore, examining the implementation of the Merdeka Curriculum within the VCD program is essential to evaluate the extent to which curriculum design, instructional strategies such as Teaching Factory, and industry partnerships can bridge the gap between competencies taught in schools and those required in the workplace. Although the Merdeka Curriculum provides a clear policy direction, its implementation continues to face several challenges, particularly regarding the availability of productive learning infrastructure. At SMKN 2 Jiwan, a substantial discrepancy exists between the number of students, which reaches 1,974, and the availability of practical equipment, including cameras and industry-standard computers.

These limitations hinder the effectiveness of the learning process, as students often assume the role of observers during teacher demonstrations rather than actively engaging in hands-on practice. This situation is further exacerbated by the continued reliance on static instructional media, such as presentation slides and conventional lectures. Such media are insufficient to represent the procedural and dynamic characteristics of Visual Communication Design learning and fail to illustrate industry workflows in a comprehensive and visual manner (Afdhal & Sayuti, 2023).

As a consequence, issues related to learning accessibility emerge, whereby students become highly dependent on laboratory-based practice sessions and encounter difficulties accessing learning materials independently outside school hours. This condition reduces opportunities for students to

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strengthen their competencies through self-paced learning. Based on the literature review and field findings, several research gaps remain insufficiently addressed. Previous studies have primarily focused on the development of instructional media such as interactive e-modules and learning videos. However, these media generally fail to represent industry workflows comprehensively in an end-to-end manner, despite the importance of such representations in vocational education, particularly within Visual Communication Design programs.

Moreover, existing instructional media tend to function as one-way information delivery tools and therefore do not fully support experience-based learning. They also have limited capacity to address shortages of practical equipment, are insufficiently learner-centered, and do not provide digital simulations capable of representing complete industrial work processes.

To address these challenges, this study offers a novel approach to instructional media design. Rather than functioning solely as a medium for content delivery, the proposed media are designed to simulate industrial work processes comprehensively. The integration of industry workflows encompasses the entire production cycle, including pre-production, production, and post-production stages, within an interactive digital learning environment.

In addition, this study emphasizes the development of interactive instructional media that support self-paced learning. The media are designed to be flexibly accessible through students' personal devices, thereby overcoming limitations in school-based practical facilities while supporting the implementation of a digitally enhanced Teaching Factory model.

Unlike previous studies that primarily viewed instructional media as visual learning aids (Andriansah, 2024; Yusuf et al., 2024), this research focuses on integrating industry workflows into the structure of interactive multimedia to support the Teaching Factory framework (Wahjusaputri et al., 2020). Consequently, the study is expected to generate recommendations for instructional media design that can address infrastructure limitations while ensuring alignment between students' competencies and industry standards.

This study contributes both theoretically and practically. From a theoretical perspective, it is expected to enrich the body of knowledge in educational technology, particularly regarding the development of industry-based instructional media in vocational education and the integration of Teaching Factory principles into digital learning environments.

From a practical perspective, the study provides benefits for multiple stakeholders. For students, the proposed instructional media are expected to enhance learning autonomy and provide more contextualized and interactive learning experiences. For teachers, the findings may serve as a reference for developing innovative instructional media capable of overcoming limitations in practical learning facilities. For schools, the study may support the implementation of the Merdeka Curriculum, particularly in relation to project-based learning and Teaching Factory initiatives. Therefore, this study aims to:

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1. Describe the current use of instructional media in the Visual Communication Design (VCD) program at SMKN 2 Jiwan.
2. Identify challenges encountered in the implementation of instructional media.
3. Analyze teachers' and students' needs regarding the development of interactive instructional media.
4. Formulate a digital instructional media design concept that supports self-paced learning and the Teaching Factory approach.

The transformation of vocational education in Indonesia through the Merdeka Curriculum seeks to bridge the competency gap between graduates and industry requirements in line with the principles of the Link and Match policy and the Dual System Education model, both of which promote direct integration between schools and industry. However, at SMKN 2 Jiwan, the implementation of these policies continues to face significant challenges. With a student population of 1,974, the school experiences substantial limitations in practical learning infrastructure, particularly within the Visual Communication Design program, where access to professional-grade equipment such as high-performance computers and cameras remains inadequate.

As a result, students frequently assume passive roles during instructional demonstrations, learning activities remain dominated by static media, and opportunities for independent practice outside school hours are severely constrained. These conditions indicate that the implementation of Link and Match principles and the Teaching Factory model has not yet been fully optimized at the institutional level. Therefore, there is a need for innovative instructional media that extend beyond content delivery by providing end-to-end simulations of industrial workflows, thereby supporting experience-based learning and self-paced learning within vocational education.

METHODS

This study employed a descriptive qualitative design with a case study approach. The selection of this design was based on the need to gain an in-depth understanding of instructional practices within the Visual Communication Design (VCD) program in the context of the Merdeka Curriculum and the implementation of the Teaching Factory model. Through this approach, social reality was viewed as a holistic and dynamic phenomenon, where data were constructed from narratives, actions, and documents that were analyzed comprehensively (Creswell, 2014; Moleong, 2019). The descriptive strategy was applied to portray the actual conditions of productive learning practices in the VCD program without manipulating any variables. The study focused on objectively documenting instructional processes, interaction patterns, and learning experiences occurring within productive classroom settings (Sugiyono, 2019). Meanwhile, the case study approach enabled an in-depth examination of a specific phenomenon within a single vocational education institution, providing a contextualized and detailed portrayal of instructional practices (Yin, 2018).

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The study was conducted purposively at SMKN 2 Jiwan, specifically within the Visual Communication Design (VCD) program. The institution was selected because it has implemented the Merdeka Curriculum and integrated the Teaching Factory model into productive learning activities, making it a suitable setting for investigating learning practices oriented toward the needs of the creative industry. Research participants were selected through purposive sampling based on their relevance to the instructional ecosystem. The primary informants consisted of four productive-subject teachers with teaching experience ranging from eight to fifteen years, including two teachers who served as Teaching Factory coordinators. Supporting informants included eight eleventh- and twelfth-grade students selected to represent diverse academic achievement levels and varying degrees of involvement in industrial practice activities. The inclusion of students was intended to provide insights into self-directed learning experiences and perceptions regarding the effectiveness of instructional media in supporting the achievement of technical competencies (Sugiyono, 2019).

Data were collected through methodological triangulation involving observations, semi-structured interviews, and document analysis. This approach was employed to enhance the credibility of findings through cross-verification across multiple data sources and collection techniques (Denzin, 2012; Moleong, 2019). Direct observations were conducted during learning activities in the VCD laboratory to examine instructional methods, classroom interaction patterns, and the utilization of professional design software, particularly Adobe Creative Suite applications, in supporting industry-oriented workflows. A non-participant observation scheme was adopted to maintain the objectivity of field data (Spradley, 2007). Semi-structured interviews were conducted to explore participants' perceptions and lived experiences regarding curriculum implementation, instructional challenges, and the need for interactive learning media. The interview protocol was designed to remain flexible while ensuring alignment with the research objectives (Creswell, 2014). In addition, document analysis was undertaken to validate field data through the examination of curriculum documents, lesson plans, teaching modules, and Teaching Factory implementation records. This process aimed to identify the consistency between documented instructional designs and actual classroom practices (Bowen, 2009).

Data analysis followed the interactive model proposed by Miles, Huberman, and Saldaña (2014), which involves data reduction, data display, and conclusion drawing and verification. The analytical process was conducted iteratively and cyclically throughout the study. Raw data obtained from observations and interviews were first transcribed, organized, and reduced by selecting information relevant to the research objectives. Subsequently, the data were systematically coded using NVivo software. The coding process began with open coding to identify emerging concepts inductively from interview transcripts and observation notes. This stage was followed by axial coding, during which related codes were grouped into broader categories, such as infrastructure constraints, the need for interactive learning media, self-paced learning experiences, and alignment with industry workflows. Finally, selective coding was performed to establish relationships among categories and generate overarching themes that represented the core findings of the study. The analyzed data were then displayed in the form of thematic matrices and descriptive narratives to facilitate the identification of patterns and relationships among themes.

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To ensure the trustworthiness of the findings, data triangulation was conducted across teachers, students, and documentary sources. Furthermore, member checking procedures were implemented by sharing preliminary interpretations with selected participants to verify the accuracy and credibility of the findings. Through these procedures, the study sought to generate valid and reliable conclusions regarding the current conditions, challenges, and developmental needs of interactive instructional media within the Visual Communication Design program at SMKN 2 Jiwan.

RESULTS AND DISCUSSION

Classroom observations conducted across several instructional sessions within the Visual Communication Design (VCD) program at SMKN 2 Jiwan revealed that the instructional media employed by teachers remain largely dominated by conventional hardware-based tools and direct demonstrations. LCD projectors, interactive whiteboards, and live demonstrations using professional software applications such as Adobe Creative Suite serve as the primary means of delivering content related to graphic design, photography, and video production. This finding is consistent with previous studies suggesting that teachers tend to adopt technologies that align with their existing pedagogical beliefs, resulting in limited integration of innovative technologies when instructional practices remain predominantly teacher-centered and directive (Tondeur et al., 2017). In the context of the VCD program at SMKN 2 Jiwan, interviews with productive-subject teacher Khusnul Hidayati confirmed that the learning process remains highly dependent on the teacher as the principal source of information, while self-directed learning resources that would enable students to revisit learning materials outside classroom hours are largely unavailable (Kusnadi et al., 2018).

The findings further indicate a substantial reliance on third-party video content, particularly from YouTube, as a substitute for institutionally developed instructional media. Teachers frequently utilize videos produced by independent content creators to demonstrate graphic design techniques and video production processes. However, these resources are often not aligned with the sequence of competencies outlined in the VCD curriculum and teaching modules. Previous research has emphasized that the effectiveness of educational videos is highly dependent on the extent to which their design aligns with intended learning outcomes, a condition that is often absent when teachers rely on externally produced content that was not specifically designed for a particular curriculum context (Brame, 2016).

Classroom observations also revealed that most learning modules remain print-based or static in nature, while one-way communication continues to dominate instruction, particularly in Grade X before students are introduced to more active project-based learning experiences (Maifa et al., 2024; Tumbelaka et al., 2025). These findings reinforce earlier evidence suggesting that misalignment between instructional resources and the actual curriculum structure represents a significant obstacle to students' competency development (Sudiyono & Alip, 2016).

Field data identified several critical barriers affecting the implementation of instructional media within the VCD program. The most evident challenge concerns the substantial disparity between the availability of technical equipment and the number of students requiring access to such resources.

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Cameras and studio equipment available in the VCD laboratory are insufficient to accommodate all students simultaneously, resulting in rotational practice schedules. As one teacher explained:

"One of our main challenges is the limited number of cameras compared to the number of students. To address this issue, we implement a rotating schedule. We also encourage students to use their personal devices, particularly smartphones, so they can still gain practical experience." (Khusnul Hidayati, 2025)

This imbalance between equipment availability and student enrollment corresponds with previous evaluations of vocational school infrastructure, which found that technical equipment often falls below minimum standards, particularly in schools facing budgetary constraints (Sudiyono & Alip, 2016). Within the international literature, such infrastructure limitations are commonly categorized as first-order barriers, representing one of the most persistent challenges in technology integration within educational settings (Tondeur et al., 2017). Interestingly, the school's reliance on students' personal smartphones as an alternative solution indirectly highlights the potential value of mobile-based learning media as a more sustainable instructional strategy.

A second challenge identified in this study concerns the difficulty of conducting re-teaching activities due to limited instructional time. Teachers reported that students lack structured learning materials that can be accessed independently outside school hours. As expressed by one participant:

"One of our main challenges in the VCD program is the lack of adequate learning materials that students can use as learning guides. When they go home, they have very limited opportunities to review the materials that have been taught in class." (Khusnul Hidayati, 2025)

This statement reflects the absence of self-paced learning resources within the VCD learning environment. Empirical studies conducted in Indonesia have demonstrated that instructional videos and tutorial-based media significantly enhance students' learning autonomy, a potential that remains unrealized when such resources are unavailable (Aghni et al., 2025). Furthermore, one of the primary advantages of well-designed instructional videos lies in their ability to support repeated viewing and independent review, capabilities that cannot be replicated through live classroom demonstrations alone (Brame, 2016).

To strengthen the findings obtained through observations and teacher interviews, the study also explored students' perspectives regarding their instructional media needs. Involving students from Grades X to XII of the VCD program, this process provided valuable insights into how learners perceive existing instructional resources and what they expect from future learning media.

Overall, students reported that teachers consistently utilize instructional media during classroom activities. Many participants indicated that their teachers frequently employ digital tools such as Canva, Quizizz, and Kahoot alongside printed learning modules. Despite this relatively consistent use of media,

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students perceived existing resources as predominantly one-directional and insufficiently supportive of meaningful self-directed learning beyond classroom sessions.

When asked about their preferences, students consistently expressed a strong preference for visually oriented learning media, including images, videos, animations, and interactive applications. They also emphasized the importance of authentic project-based activities that allow them to actively engage in the learning process. Interest in interactive learning applications, project-oriented media, and student-generated creative videos emerged as recurring themes throughout the interviews. Most notably, nearly all participants expressed enthusiasm for becoming active creators of digital content rather than merely passive consumers of existing instructional materials.

These findings align with systematic reviews indicating that mobile learning consistently enhances student engagement and learning outcomes compared with conventional static media (Crompton & Burke, 2018). Within the Indonesian context, smartphone-based learning environments have been shown to significantly increase students' motivation for independent learning due to their portability, flexibility, and accessibility (Nurhidayat et al., 2020). The findings also resonate with the concept of digital natives, which suggests that learners who have grown up in technology-rich environments naturally expect interactivity, rapid access to information, and flexible learning experiences (Prensky, 2001). A clear gap therefore emerges between the types of media students desire—interactive applications, project-based learning resources, and creative digital content—and the predominantly static media currently available in the classroom.

Taken together, the findings suggest that the need for structured, interactive, and independently accessible instructional media has evolved beyond a mere innovation agenda and has become an urgent educational necessity. When teachers encounter difficulties in revisiting instructional content, when practical equipment is insufficient, and when students overwhelmingly express a desire to learn and create through their own devices, instructional media can no longer function solely as supplementary teaching tools. Instead, they must serve as learning companions that support students anytime and anywhere, regardless of classroom schedules or laboratory availability.

More importantly, although direct teacher demonstrations remain the dominant instructional approach within the VCD program, this finding reflects a deeper structural issue rather than a simple pedagogical preference. Interviews revealed that teachers continue to rely on demonstration-based instruction due to three interrelated factors: chronic limitations in hardware infrastructure that prevent simultaneous hands-on practice, insufficient instructional time for re-teaching and content reinforcement, and limited teacher readiness and confidence in designing and facilitating flipped classroom or blended learning environments. Many teachers reported feeling more comfortable with conventional instructional approaches because they were concerned that students would struggle to learn independently in the absence of high-quality self-paced learning resources that are integrated with authentic industry workflows. Consequently, instructional practices remain largely teacher-centered and face considerable challenges in transitioning toward the student-centered learning paradigm

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envisioned by the Merdeka Curriculum and the Teaching Factory model. This situation is particularly significant given that students themselves demonstrated strong enthusiasm for interactive media and autonomous learning opportunities delivered through their personal digital devices.

The findings of this study reveal a significant mismatch between the instructional media currently employed in the Visual Communication Design (VCD) program and the pedagogical principles promoted by the Merdeka Curriculum, particularly those emphasizing Project-Based Learning (PBL) and student autonomy. Instruction remains largely dominated by direct demonstrations and static learning resources, resulting in students assuming relatively passive roles throughout the learning process. This condition suggests that classroom practices have not yet fully transitioned toward the student-centered learning paradigm that constitutes a central foundation of the Merdeka Curriculum.

From the perspective of self-paced learning, the current instructional environment provides limited opportunities for students to learn according to their individual needs, preferences, and learning pace. Self-paced learning fundamentally enables learners to regulate their own learning strategies, schedules, and resources while taking active responsibility for their learning outcomes. As noted by Nugroho and Maulana (2021), learning autonomy reflects students' capacity to manage their learning processes independently and responsibly. However, the lack of accessible instructional media significantly restricts students' ability to revisit learning materials outside classroom hours, particularly given the limited duration of face-to-face instruction. Consequently, opportunities for independent reinforcement of knowledge and skills remain constrained.

The findings further indicate that the implementation of project-based learning, which constitutes a core component of the Teaching Factory model, has not yet been fully optimized. In principle, project-based learning should provide contextual learning experiences that closely simulate authentic workplace situations. Anggraini and Wulandari (2021) argue that Project-Based Learning enhances student engagement by requiring learners to demonstrate creativity and solve real-world problems. Nevertheless, the absence of instructional media capable of visualizing industrial work processes comprehensively limits students' understanding of the sequential nature of professional practice. As a result, existing instructional resources have not adequately supported the fundamental objectives of the Merdeka Curriculum, particularly with respect to learner autonomy and project-based learning. These findings underscore the importance of developing interactive digital learning media that can strengthen the effectiveness of vocational instruction.

Another important finding concerns the inability of existing instructional media to represent industry workflows comprehensively. Within vocational education, particularly in Visual Communication Design programs, understanding industrial workflows is essential for preparing students to meet workplace expectations. Industry workflows generally consist of three interconnected stages: pre-production, production, and post-production. Together, these stages represent a systematic process that extends from planning and conceptualization to execution and final evaluation. Mahendra

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et al. (2024) emphasize that vocational learning environments should be aligned with industry standards to ensure that graduates possess competencies relevant to labor market demands.

Despite this expectation, classroom instruction observed in the present study tended to focus primarily on technical software operation without adequately connecting individual tasks to broader professional workflows. Interview data revealed that students frequently experienced difficulties understanding the continuity and interconnectedness of industrial processes due to the absence of structured learning resources. Furthermore, limitations in practical equipment prevented all students from participating actively in learning activities. These findings indicate that existing instructional media fail to provide a comprehensive representation of industry workflows. Consequently, there is a clear need for instructional media capable of presenting the entire sequence of pre-production, production, and post-production activities in an integrated manner, thereby enabling students to develop a more holistic understanding of professional practices within the creative industry.

The study also demonstrates that the limitations of current instructional media extend beyond issues of availability and access. Equally important are the design limitations of the media themselves, which remain predominantly static and non-interactive. Therefore, a transformation toward technology-enhanced interactive learning environments is necessary. Interactive media, including Android-based applications and interactive e-modules, offer considerable potential for supporting independent learning. According to Maku et al. (2021), interactive multimedia can significantly improve students' motivation and conceptual understanding during the learning process. This suggests that interactive media can serve as an effective mechanism for facilitating self-paced learning within vocational education contexts.

Survey findings further reinforce this conclusion. Approximately 84.2% of students expressed a preference for instructional media that could be accessed through smartphones. Students also demonstrated strong interest in visual learning resources and practice-oriented learning experiences. These preferences indicate a substantial demand for instructional media that are more flexible, accessible, and aligned with the characteristics of contemporary learners. Given the widespread availability of personal mobile devices among students, mobile-based instructional media offer a particularly promising avenue for enhancing learning accessibility and engagement.

Within contexts characterized by limited practical equipment, interactive media can also function as a viable alternative through the incorporation of digital simulations. Such simulations enable students to understand procedures, workflows, and professional practices even when direct access to equipment is restricted. Consequently, interactive media should not be viewed merely as supplementary learning tools but rather as strategic solutions capable of addressing infrastructure limitations while simultaneously improving learning quality.

Overall, the evaluation of instructional media within the Visual Communication Design program indicates that the existing learning resources have not yet met the requirements of effective vocational

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education in the era of the Merdeka Curriculum. From an availability perspective, instructional resources remain insufficient to accommodate practical learning activities for all students. From a design perspective, the media are largely static and fail to support interactivity, learner autonomy, and flexible access. Moreover, they do not adequately represent industry workflows, limiting students' ability to develop a comprehensive understanding of professional work processes.

Both teachers and students expressed a strong need for instructional media that are flexible, interactive, and accessible through mobile devices. These findings reveal a clear gap between current instructional practices and the learning demands of contemporary vocational education. Based on this evaluation, the development of interactive digital learning media emerges as a highly relevant solution for addressing existing challenges. Such media should integrate industry workflow simulations, support self-paced learning, and provide flexible access to learning resources, enabling students to develop professional competencies regardless of limitations in school-based practical facilities.

CONCLUSIONS

Based on the findings and discussion, it can be concluded that the instructional media currently utilized in the Visual Communication Design (VCD) program remain predominantly conventional and have not fully supported effective student-centered learning. Existing instructional practices continue to rely heavily on direct demonstrations and static learning resources, limiting opportunities for self-paced learning and project-based learning. Furthermore, the available media have not been able to comprehensively represent industry workflows, particularly across the pre-production, production, and post-production stages. Consequently, students' understanding of professional work processes remains fragmented, and their readiness to engage in Teaching Factory-based learning environments is not yet optimal. These findings highlight the need for the development of interactive digital instructional media, such as Android-based applications or web-based learning platforms, capable of transforming teacher demonstrations into systematic digital learning resources that can be accessed repeatedly and independently by students. Such media are expected to foster learning autonomy, enhance students' conceptual and procedural understanding, and provide a more comprehensive representation of industry workflows. Nevertheless, this study has several limitations. The research was conducted within a single educational institution, limiting the broader generalizability of the findings. In addition, the study focused exclusively on the needs analysis stage and did not extend to the development, implementation, or evaluation of the proposed instructional media. Therefore, future research is recommended to design and develop interactive digital learning media and empirically examine their effectiveness in improving students' learning outcomes, work readiness, and understanding of industry-based workflows. Furthermore, teachers are encouraged to integrate educational technologies more innovatively to support student-centered learning, while schools should provide both infrastructural and policy support to facilitate the development and sustainable implementation of technology-enhanced instructional media in vocational education settings.

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W.A.N.A.: Writing – Original Draft Preparation, Data Curation
B.D.K.: Writing – Review & Editing
M.A.: Writing – Review & Editing
H.A.T.: Writing – Review & Editing
G.A.S.: Writing Final Draft, Review & Editing
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REFERENCES

Aghni, R. I., Purnama, D. N., & Siswanto, S. (2025). Efektivitas media pembelajaran video tutorial untuk meningkatkan kemandirian belajar mahasiswa pendidikan akuntansi. *Jurnal Pendidikan Akuntansi Indonesia*, *23*(1), 36–43. https://doi.org/10.21831/jpai.v23i01.84022

Amada, N., & Hakim, A. (2022). Analisis penggunaan YouTube sebagai media ajar Pendidikan Anak Usia Dini di era digital. *Jurnal Riset Pendidikan Guru PAUD*, *2*(2). https://doi.org/10.29313/jrpgp.vi.612

Arulantri, N. (2025). Pengaruh media video YouTube terhadap motivasi dan hasil belajar siswa pada mata pelajaran Seni Rupa kelas V di MI Raudlatul Falah Turen. *Ibtidaiyyah: Jurnal Pendidikan Guru Madrasah Ibtidaiyah*, *4*(1). https://doi.org/10.18860/ijpgmi.v4i1.11559

Brame, C. J. (2016). Effective educational videos: Principles and guidelines for maximizing student learning from video content. *CBE—Life Sciences Education*, *15*(4), es6. https://doi.org/10.1187/cbe.16-03-0125

Candra, E., Resnani, R., & Yuliantini, N. (2022). Deskripsi penggunaan media video YouTube pada pembelajaran tematik kelas V Sekolah Dasar Negeri 61 Kabupaten Bengkulu Tengah. *JURIDIKDAS: Jurnal Riset Pendidikan Dasar*, *5*(2). https://doi.org/10.33369/juridikdas.v5i2.22339

Crompton, H., & Burke, D. (2018). The use of mobile learning in higher education: A systematic review. *Computers & Education*, *123*, 53–64. https://doi.org/10.1016/j.compedu.2018.04.007

Iftanurohman, Y. (2021). Penggunaan perangkat lunak SketchUp Pro 2018 dalam pembelajaran drama. *METAMORFOSIS | Jurnal Bahasa, Sastra Indonesia dan Pengajarannya*, *14*(1). https://doi.org/10.55222/metamorfosis.v14i1.542

Kholifah, N., & Santosa, A. (2016). Pengembangan media pembelajaran menggunakan software Articulate pada mata pelajaran Elektronika Dasar kelas X TAV di SMK Negeri 1 Madiun. *Jurnal Elektronika*, *5*.

Kusnadi, H. K., Hidayat, A., & Mariam, P. (2018). Penggunaan media pembelajaran video tutorial dalam upaya meningkatkan kemandirian belajar peserta didik. *Jurnal Pendidikan dan Pembelajaran Ekonomi Akuntansi*, *4*(1), 1–8. https://jurnal.fkip.unla.ac.id/index.php/jp2ea/article/view/307

Lestariningsih, N., Rohmadi, M., Septiana, N., Jumrodah, J., Nirmalasari, R., Astuti, P., & Humam, A. (2022). Pelatihan penyusunan perangkat pembelajaran dan optimalisasi pemanfaatan media pembelajaran e-learning pada masa pandemi Covid-19 di MAN KOTIM. *Sasambo: Jurnal Abdimas (Journal of Community Service)*, *4*(1). https://doi.org/10.36312/sasambo.v4i1.632

Maifa, S., Syafril, Darmansyah, & Yusri, M. A. K. (2024). Pengembangan multimedia pembelajaran berbasis Android pada mata pelajaran konsentrasi keahlian DKV jurusan Desain Komunikasi Visual kelas XI SMK. *Jurnal Pendidikan Tambusai*, *8*(1), 2342–2347.

Muthoharoh, L., & Hendriani, D. (2025). Penggunaan media pembelajaran YouTube untuk meningkatkan kemampuan berpikir kritis siswa pada mata pelajaran sejarah kelas XI SMAN 1 Karangrejo. *SOSIAL: Jurnal Ilmiah Pendidikan IPS*, *3*(3). https://doi.org/10.62383/sosial.v3i3.1059

Neldi, E., Ifnaldi, G., & Gusmaneli, G. (2024). Penggunaan media YouTube dalam pembelajaran PAI di sekolah. *Jurnal Manajemen dan Pendidikan Agama Islam*, *3*(1). https://doi.org/10.61132/jmpai.v3i1.830

Nurhidayat, B., Wedi, A., & Praherdhiono, H. (2020). Pengembangan multimedia mobile learning berbasis smartphone Android. *JINOTEP: Jurnal Inovasi dan Teknologi Pembelajaran*, *6*(2), 103–110. https://doi.org/10.17977/um031v6i22020p103

Pengembangan Lembar Kerja Peserta Didik (LKPD) berbasis discovery learning berbantuan software Modellus pada pokok bahasan gerak parabola. (2022). *ORBITA: Jurnal Kajian, Inovasi dan Aplikasi Pendidikan Fisika*, *8*(2). https://doi.org/10.31764/orbita.v8i2.11432

Prensky, M. (2001). Digital natives, digital immigrants part 1. *On the Horizon*, *9*(5), 1–6. https://doi.org/10.1108/10748120110424816

Purwanto, P. (2019). Penggunaan papan tulis interaktif di kelas (The use of interactive whiteboard in classroom). *Jurnal Teknodik*, *17*(3). https://doi.org/10.32550/teknodik.v17i3.565

Salsabila, S., Salimi, A., Kresnadi, H., & Pranata, R. (2025). Pengaruh media video YouTube terhadap hasil belajar siswa pembelajaran Pendidikan Pancasila Sekolah Dasar Negeri 06 Pontianak Selatan. *AS-SABIQUN*, *7*(1). https://doi.org/10.36088/assabiqun.v7i1.5565

Sari, C., Bistari, B., & Halidjah, S. (2023). Kelayakan video pembelajaran berbasis platform YouTube pada materi bilangan pecahan di kelas IV Sekolah Dasar Negeri 05 Pontianak Kota. *Journal on Education*, *6*(1). https://doi.org/10.31004/joe.v6i1.3465

Septiani, L. (2021). Pengembangan software berhitung dalam pembelajaran matematika pada materi bangun datar dan bangun ruang. *EDUTECH: Jurnal Inovasi Pendidikan Berbantuan Teknologi*, *1*(3). https://doi.org/10.51878/edutech.v1i3.656

Sovia, A., Hakim, L., Partasiwi, N., Siska, S., & Pratama, H. (2024). Pelatihan pembuatan media presentasi berbantuan ClassPoint untuk guru sekolah menengah di SMPN 1 Sukaraja. *Jurnal Pengabdian Pada Masyarakat*, *9*(4). https://doi.org/10.30653/jppm.v9i4.1094

Sudiyono, S., & Alip, M. (2016). Evaluasi sarana dan prasarana bengkel praktik SMK teknik pemesinan di Kota Semarang berdasarkan kebutuhan kurikulum. *Jurnal Pendidikan Vokasi*, *6*(1), 108–117. https://doi.org/10.21831/jpv.v6i1.8117

Sujaya, K. D. A., Herlambang, A. D., & Afirianto, T. (2023). Pengembangan media pembelajaran e-modul interaktif untuk meningkatkan hasil belajar siswa pada mata pelajaran Dasar Program Keahlian Jurusan DKV di SMK Negeri 5 Malang. *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer*, *7*(4), 2001–2009.

Sulastri, S., Jamin, H., & Agustina, M. (2021). Optimalisasi penggunaan proyektor dalam pembelajaran pada mata pelajaran I.P.A. *AL-IHTIRAFIAH: Jurnal Ilmiah Pendidikan Guru Madrasah Ibtidaiyah*, *1*(01). https://doi.org/10.47498/ihtirafiah.v1i01.604

Tondeur, J., van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2017). Understanding the relationship between teachers' pedagogical beliefs and technology use in education: A systematic review of qualitative evidence. *Educational Technology Research and Development*, *65*(3), 555–575. https://doi.org/10.1007/s11423-016-9481-2

Trikawati, T., Yuniar, E., Yulaikah, Y., Soraya, K., Chairulfalah, M., Nurliana, L., & Musfirowati, F. (2025). Efektivitas penggunaan aplikasi YouTube dalam media pembelajaran berbasis ICT (Information and Communication Technology) pada siswa kelas XI SMA Nurul Hasanah Ciheulang. *JISPENDIORA: Jurnal Ilmu Sosial Pendidikan dan Humaniora*, *4*(1). https://doi.org/10.56910/jispendiora.v4i1.2038

Tumbelaka, R. N. D., Mewengkang, A., & Komansilan, T. (2025). Pengembangan multimedia pembelajaran interaktif mata pelajaran Desain Komunikasi Visual kelas XI DKV SMK Negeri 1 Tondano. *Journal of Education Method and Technology*, *3*(1), 31–40.

Wahjusaputri, S., Marlina, E., & Latifah, S. (2020). Developing the teaching factory learning media in a public vocational high school. *Jurnal Pendidikan Vokasi*, *10*(1), 69–79. https://doi.org/10.21831/jpv.v10i1.30222

Wahyuni, R., & Nasution, H. (2024). Penggunaan media papan pintar terhadap hasil belajar matematika peserta didik SD. *ALGORITMA: Journal of Mathematics Education*, *6*(2). https://doi.org/10.15408/ajme.v6i2.42756

Wulandari, F., & Trimurtini, T. (2023). Pengembangan media pembelajaran papan napier dilengkapi LKPD pada bilangan cacah kelas III. *Joyful Learning Journal*, *12*(3). https://doi.org/10.15294/jlj.v12i3.77134

Yudha, J., & Sundari, S. (2021). Manfaat media pembelajaran YouTube terhadap capaian kompetensi mahasiswa. *Journal of Telenursing (JOTING)*, *3*(2). https://doi.org/10.31539/joting.v3i2.2561

Yulistian, Y., Bahrudin, F., & Lestari, R. (2023). Penggunaan media pembelajaran berbasis YouTube dalam meningkatkan minat belajar peserta didik. *Academy of Education Journal*, *14*(2). https://doi.org/10.47200/aoej.v14i2.1654