

Transformation of Education Technology 5.0 through 360-Based Digital Modules for Tourism Vocational Schools in Bandung City

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ABSTRACT

The concept of Digital Education 5.0 in tourism education emphasizes the integration of scientific and technological innovations to create an effective, interactive, and future-oriented learning environment. This study aims to examine the role of Digital Education 5.0 transformation through the incorporation of science and technology innovations, particularly in Tourism Vocational Schools. A qualitative approach was employed using literature review, interviews, and observation methods. Data were collected from relevant academic sources, interview results, and field observations to develop a comprehensive understanding of Digital Education 5.0 and its application in tourism vocational education. The participants in this study consisted of 100 students from Tourism Vocational Schools. Data analysis was conducted using descriptive and verification techniques to systematically interpret the findings. The results indicate that the implementation of Digital Education 5.0 provides significant opportunities to improve teaching and learning processes. The integration of advanced technologies such as artificial intelligence, virtual reality, and the Internet of Things supports the development of a technology-based learning ecosystem that enhances students' motivation, engagement, and participation. Furthermore, innovative pedagogical approaches, including flipped classroom, blended learning, and personalized learning, enable educators to deliver learning materials in more flexible and engaging ways while fostering effective collaboration between teachers and students. However, the transition toward Digital Education 5.0 also presents challenges related to technological readiness and the need for continuous capacity building for both teachers and students.

Keywords: Transformation, Educational Technology, Tourism Vocational Schools



INTRODUCTION

Innovation in learning media has incorporated the utilization of Information and Communication Technology (ICT) to support online learning activities, including platforms such as Ruang Guru, Zenius, Edmodo, Zoom Meeting, and Google Classroom (Yuanta, 2020). These platforms are widely employed by teachers and lecturers to facilitate the teaching and learning process in online environments. Through the use of such media, it is expected that the delivery of instructional material can be optimized, comparable to conventional face-to-face learning in classroom settings (Dopades & Adi, 2022). Initially, the implementation of online learning received positive responses from students. However, over time, several challenges have emerged, as reflected in complaints from both students and educators. One prominent issue is the sense of boredom resulting from the monotonous use of instructional media, which subsequently affects the level of student engagement in online learning activities (Hermawan et al., 2021). Therefore, educators are required to design and implement online learning environments that are not only effective but also engaging and enjoyable in order to mitigate student boredom. One potential approach to addressing this issue is the integration of game-based learning media.

The teaching methods of Technology-Enhanced Learning (TEL) and Technology-Enhanced Teaching (TET) are closely related to the integration of technology in education (Köhler, 2019). TEL and TET encompass approaches involving the design, implementation, and evaluation of technology applications aimed at improving the quality of education and instruction. The use of applications, software, and e-learning technologies plays a significant role in supporting educational processes. Educators are expected to integrate digital competencies with conventional teaching practices. Therefore, they need to continuously enhance their knowledge and creativity in utilizing technology in the teaching process in order to achieve the intended learning objectives (Köhler, 2019).

Furthermore, some game developers have explored psychological and motivational aspects of human behavior. This innovation presents an opportunity to engage students in new ways and encourages educators to be more creative in designing their instructional processes. Games can provide three positive aspects—cognitive, emotional, and social—which contribute to increasing learners' motivation. As a result, the development of games has led to innovative ideas for utilizing games as engaging learning media. Instructional materials can be packaged in the form of games, a concept commonly referred to as game-based learning or gamification. Through gamification, it is expected that learning can be transformed to better align with the demands of 21st-century education.

One of the steps that can be taken to achieve 21st Century education is by applying "Design Thinking" to learning innovation. Initially design thinking applied by designers in creating products with a human-oriented approach. However in its development design thinking used in field other like world in education. By Specific, class This will interact process design thinking in planning media learning based Virtual Reality. Technology from virtual reality What is implemented is 360 degree video. 360 degree videos are created using 360 camera to record in a total 360 degree viewing angle. 360 degree videos This emerged as a new way to view immersive videos due to device availability sophisticated handheld, namely smartphones (Hermawan et al., 2021). 360 degree video is a technology used to provide a school environment atmosphere more modern (Meylana Eka Putra et al., 2021). We can see the 360 degree video at Youtube with various kinds of content.

Even though it uses game mechanics, it implements gamification not always made into a game, but how the learning process will be more pleasant, build engagement with without realized by participant educate (H. Jusuf , 2017). In a scientific study by Ifenthaler, Eseryel and Ge regarding methodology learning, give emphasis so that There is matter Which become differentiator between draft games And play, Which It means games the must focused For needs education, whereas play made feature For give impression entertain to player in matter This participant educate (D. Ifenthaler, 2017). There is 4 feature main on A games, that is rule, objective, voluntary participation and feedback system related to aspects of learning (S. Rustan , 2013).

By Because That College Tall as institution Which own position strategic in the field of education, it is necessary to develop digital-based learning Interactive, so that team compiler submit proposal For Development And organizing digital learning in the "Courtesy" course. Expected through organizing digital learning in this hiding system course can provide experience Study for all over student with quality Which standardized. Further objectives of development And maintenance learning digital eye studying system This hiding is to provide a standardized learning experience for students. Especially in practice-based learning. Through interactive digital modules, either in the form of 2- dimensional video, up to 360 virtual reality-based, it is hoped that it will be able to provide interactive and simulative knowledge and skills learning. It is in the effort create human capable tourism apply process learning Century 21. Specifically, the target users of this digital learning are study program students Education Tourist Which take eye studying Management System Serve. However beside That, Module System Serve This Also can utilized by student study program tourism Which learn skill Food and beverages departments, like student in the catering industry management study program, and resort management study program and leisure. Matter This as embodiment from program MBKM in environment campus UPI. Furthermore, Tourism Vocational Studies in Malaysia supports development and improvement towards a better direction through collaboration with various points of view. This is also an effort to target global tourists.

Tourism education represents an important innovation within the transformation of technical and vocational education. As a sector that continues to experience development and reorientation, tourism education is expected to contribute to the preparation of human capital that is not only highly skilled but also possesses strong employability in accordance with industry demands (Saad et al., 2015). Vocational education institutions play a crucial role in preparing graduates with practical competencies required by the workforce, particularly in service-oriented sectors such as tourism. In Indonesia, vocational schools (Sekolah Menengah Kejuruan/SMK) provide opportunities for students with diverse academic backgrounds who demonstrate an interest in career-oriented and practical learning. These institutions are designed to equip students with both theoretical knowledge and hands-on experience relevant to specific industries. In the context of tourism, vocational schools offer specialized programs that focus on areas such as hospitality, travel services, and culinary arts. Bandung, as one of the major tourism destinations in Indonesia, has shown significant development in tourism vocational education.

The city is well known for its cultural attractions, culinary diversity, and creative industries, making it an ideal environment for tourism-based learning. Vocational schools in Bandung that specialize in tourism actively integrate industry-based training, internships, and practical learning approaches to ensure that students acquire relevant competencies. Furthermore, collaboration



between schools and local tourism industries enhances students' readiness to enter the workforce. Therefore, tourism vocational education in Bandung plays a strategic role in supporting regional economic development while simultaneously addressing the demand for skilled labor in the tourism sector. By focusing on local potential and industry needs, these institutions contribute to the development of competent and competitive human resources in the tourism industry.

METHODS

This study employs a mixed-methods approach, combining qualitative and quantitative research designs (Creswell, 2018). The qualitative component utilizes a literature review, interviews, and observations to gain a comprehensive understanding of the concept of Digital Education 5.0 and the integration of science and technology innovations in the educational context, particularly for tourism vocational school students. Data obtained from these sources are analyzed using thematic analysis to identify key patterns and insights. The quantitative component adopts a survey method involving a sample of one hundred tourism vocational school students. Data are collected using a structured questionnaire with Likert-scale items designed to measure students' perceptions, engagement, and readiness toward digital learning innovations.

To ensure the quality of the instrument, validity and reliability tests are conducted. Content validity is established through expert judgment, while construct validity is assessed using item-total correlation analysis. Reliability is measured using Cronbach's alpha coefficient, with a threshold value of 0.70 indicating acceptable internal consistency.

Data analysis techniques include both descriptive and inferential statistics. Descriptive statistics (mean, standard deviation, and percentage) are used to summarize the data. Inferential analysis is conducted to test the proposed hypotheses. A normality test (e.g., Kolmogorov-Smirnov test) is performed to determine data distribution. Subsequently, a t-test is used to examine differences between groups, while simple or multiple linear regression analysis is applied to analyze the relationship between variables. All statistical analyses are conducted using statistical software such as SPSS. The integration of qualitative and quantitative findings provides a more comprehensive and robust understanding of the research problem, thereby strengthening the validity of the study.

RESULTS

1. Instrument Validity Analysis

Table 1. Validity Analysis (X)

	X1	X2	X3	X4	X6	X7	X8	X9	X10	X11	X12	X13	TOTAL_X
Pearson Correlation	.829**	.799**	.772**	.843**	.852**	.797**	.821**	.832**	.862**	.825**	.866**	.764**	1
Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	
N	100	100	100	100	100	100	100	100	100	100	100	100	100

****.** Correlation is significant at the 0.01 level (2-tailed).

Table 2. Validity Analysis (Y)

	Y1	Y2	Y3	TOTAL_Y
Pearson Correlation	.880**	.923**	.876**	1
Sig. (2-tailed)	.000	.000	.000	

N	100	100	100	100
**. Correlation is significant at the 0.01 level (2-tailed)				

The validity test was conducted using Pearson Product-Moment Correlation to determine whether each indicator accurately measured its respective construct. The results indicate that all twelve indicators of the independent variable (X), representing the implementation and quality of the 360-based digital module, have strong positive correlations with the total score (TOTAL_X), ranging from 0.764 to 0.866, with significance values of 0.000 ($p < 0.01$). These coefficients exceed the critical r-value for a sample size of 100 respondents, confirming that each item is statistically valid. This means that all indicators consistently reflect the conceptual dimensions of digital module transformation within the Digital Education 5.0 framework.

Similarly, for the dependent variable (Y), which measures learning outcomes and student responses, all three indicators (Y1, Y2, Y3) demonstrate high correlations with TOTAL_Y, ranging from 0.876 to 0.923, with significance values of 0.000. These findings confirm that the instrument effectively captures students' perceived learning improvements, satisfaction, and engagement. Therefore, all research instruments used in this study meet the validity criteria and are suitable for further statistical analysis.

2. Instrument Reliability Analysis

Reliability testing was conducted using Cronbach's Alpha to assess the internal consistency of the research instrument. The analysis showed that the independent variable (X), consisting of 12 items, obtained a Cronbach's Alpha value of 0.956, while the dependent variable (Y), consisting of 3 items, achieved a Cronbach's Alpha value of 0.872. Both values exceed the minimum acceptable threshold of 0.70, indicating that the instrument has a high level of reliability. Specifically, the Cronbach's Alpha value of 0.956 for the independent variable reflects excellent internal consistency, suggesting that the indicators measuring the effectiveness, usability, engagement, and instructional quality of the 360-based digital module consistently measure the same underlying construct. Likewise, the dependent variable demonstrates strong reliability with a Cronbach's Alpha value of 0.872, indicating that its items are also internally consistent. Therefore, the research instrument can be considered reliable and capable of producing stable and consistent measurements, making it suitable for subsequent statistical analyses, including regression analysis and hypothesis testing.

3. Descriptive Statistical Analysis

Table 3. Statistical Analysis (X)

	N	Minimum	Maximum	Mean	Std. Deviation
X1	100	1	5	3.91	.922
X2	100	1	5	4.05	.845
X3	100	1	5	4.00	.932
X4	100	1	5	4.03	.893
X6	100	1	5	3.95	.796
X7	100	1	5	4.02	.864
X8	100	1	5	4.07	.844
X9	100	1	5	4.03	.881



	N	Minimum	Maximum	Mean	Std. Deviation
X10	100	1	5	3.93	.844
X11	100	1	5	3.93	.844
X12	100	1	5	3.88	.879
X13	100	1	5	3.99	.823
TOTAL_X	100	12	60	47.79	8.520
Valid (listwise)	N100				

The descriptive analysis shows that the mean scores of the twelve indicators of variable X range from 3.88 to 4.07 on a five-point Likert scale. The overall mean of TOTAL_X is 47.79 out of a maximum possible score of 60, indicating a high level of student agreement regarding the effectiveness and quality of the digital module.

These findings suggest that students perceive the 360-based digital module as engaging, easy to use, informative, and supportive of their learning process. The relatively small standard deviations (approximately 0.79–0.93) indicate consistent responses among participants. In the context of tourism vocational education, where practical exposure and contextual understanding are essential, the immersive virtual 360 environment appears to provide meaningful experiential learning opportunities.

Table 4. Statistical Analysis (Y)

	N	Minimum	Maximum	Mean	Std. Deviation
Y1	100	1	5	4.02	.864
Y2	100	1	5	4.01	.927
Y3	100	1	5	3.95	.947
TOTAL_Y	100	3	15	11.98	2.445
Valid (listwise)	N100				

The descriptive results for the dependent variable show a total mean (TOTAL_Y) of 11.98 out of a maximum score of 15, indicating a very positive learning outcome perception. The mean scores for Y1 (4.02), Y2 (4.01), and Y3 (3.95) suggest that students experienced improvements in motivation, satisfaction, and understanding after using the module.

These findings demonstrate that the digital module not only enhances cognitive comprehension but also positively influences affective dimensions such as engagement and learning enthusiasm. This outcome is particularly relevant in vocational education, where student motivation significantly influences skill acquisition and competency development.

4. Simple Linear Regression Analysis

Table 5. Simple Linear Regression Analysis

Coefficients ^a					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1	(Constant)	-.253	.636		
				-.398	.692

X	.256	.013	.892	19.523	.000
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a. Dependent Variable: Y

To examine the influence of the 360-based digital module on learning outcomes, a simple linear regression analysis was conducted. The regression equation obtained is: The positive regression coefficient ($B = 0.256$) indicates that for every one-unit increase in the effectiveness of the digital module, learning outcomes increase by 0.256 units. The standardized coefficient ($Beta = 0.892$) reveals a very strong positive relationship between the variables. Furthermore, the t-value of 19.523 with a significance level of 0.000 ($p < 0.05$) confirms that the effect is statistically significant. These results indicate that the implementation of the 360-based digital module has a strong and significant positive impact on student learning outcomes. The magnitude of the Beta coefficient suggests that the digital module plays a dominant role in determining improvements in learning performance within the research model.

5. Development Report

The development of science and technology (Science and Technology) has been very rapid in the last century. This brings a new paradigm to learning media in the world of education. Products from technology and information provide alternative learning media that can be utilized by students in digital form such as interactive e-modules. Utilization of learning media Interactive has been implemented by various educational institutions, but not evenly distributed. Development of science and technology pushes renewal in utilization of products from results of technology in the learning process. In Indonesia, the use of digital media in the learning process is supported by a fairly high level of technological literacy. The We Are Social (2018) survey shows Internet penetration in Indonesia in the use of electronic media continues to increase, as shown in figure 1.

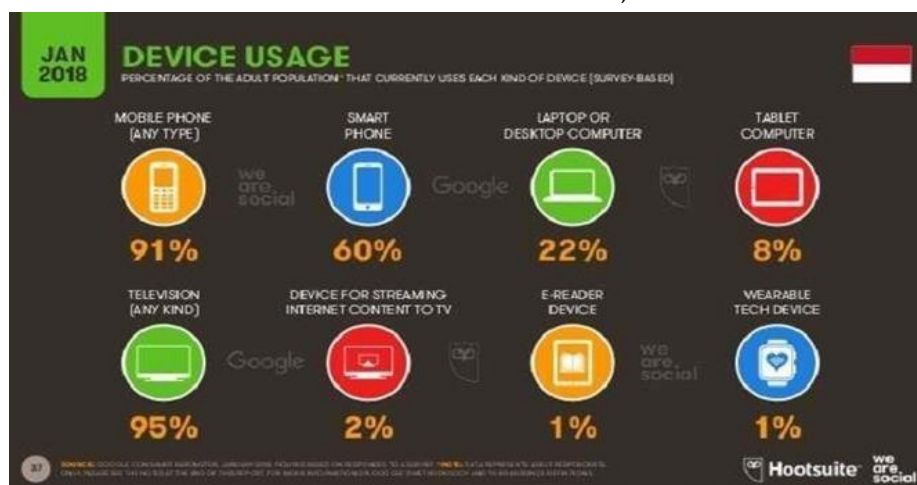


Figure 1. Electronic Device Users in Indonesia

Figure 1. above shows that Indonesian people are no longer foreign to this with electronic media, especially cellphone and smartphone devices and their use in life daily, including in field education. Wrong One benchmark success Teacher in teach seen from How Teacher transform knowledge to students. Ahmed and Ahmed's (2005) research on students' perceptions of use And benefit from media learning on lesson social in Oman concluded that if schools want to improve the quality of their learning, very important for teachers to using media learning. Information



technology products have provided alternative learning media digital form, such as interactive multimedia-based electronic modules, or so-called with e-module interactive.

Media learning e-module interactive This supported by Regulation Government RI Number 19 Chapter 19 (1 year 2005 concerning National Standards Education which states that learning in schools is carried out interactively, inspirational, pleasant, challenge, motivating students for participate active. Arsyad (2014) disclose that e-module interactive possible student No only involve senses hearing, However Also vision. The more Lots senses Which used to receive information, the greater the possibility of that information remembered and understood. Experts prove that there is a marked difference in the results Study Which obtained through senses vision And hearing (Prihantana, et al., 2014).

DISCUSSION

The results of this study demonstrate that 360-based digital modules have a significant positive effect on students' learning outcomes, as indicated by the strong regression coefficient ($\beta = 0.892$). This finding reinforces the concept of Digital Education 5.0, which emphasizes the integration of advanced technologies—such as immersive media and interactive systems—to create learner-centered educational environments. The use of 360-degree virtual environments enables students to simulate real hospitality and restaurant management settings, thereby enhancing both contextual understanding and procedural competence.

These findings are consistent with prior research on Technology-Enhanced Learning (TEL), which highlights the effectiveness of digital media in improving student engagement and learning performance. For instance, the study by Imansary and Sunaryantiningsih (2017) found that interactive e-modules were categorized as “very good,” achieving an average score of 84.72%, and were considered suitable as learning media. Similarly, the present study confirms that digital modules—particularly those enhanced with immersive 360 technology—can significantly improve the quality of learning. However, this study extends previous findings by demonstrating that immersive elements provide a deeper level of experiential learning compared to conventional interactive e-modules.

From a theoretical perspective, these results align with experiential learning theory, which posits that knowledge is constructed through active engagement and real-world simulation. Unlike traditional instructional media, 360-based modules allow students to observe service procedures, spatial arrangements, and operational workflows in a realistic and interactive environment. This not only enhances cognitive understanding but also supports affective and psychomotor learning domains, which are essential in vocational education. In the context of tourism vocational education, the findings further support the importance of competency-based training that integrates theoretical knowledge with practical application. The positive descriptive results and strong regression outcomes indicate that the 360-based module effectively bridges the gap between theory and practice. Students are able to gain virtual exposure to professional hospitality environments without the constraints of physical access. This finding supports previous literature emphasizing the need for industry-relevant learning experiences in vocational education; however, it also highlights that immersive technology can serve as a viable alternative or complement to traditional internships and field practice.

Moreover, the high validity and reliability values (Cronbach's $\alpha > 0.87$) strengthen the credibility of this study. The strong internal consistency indicates that the constructs were measured accurately, while the significant regression results provide empirical evidence of the effectiveness of immersive digital modules. In contrast to some earlier studies that positioned digital tools merely as supplementary learning aids, this study demonstrates that 360-based modules function as key determinants of learning outcomes. This suggests a shift in the role of educational technology – from supportive tools to central components of instructional design in the era of digital transformation.

From the researcher's perspective, one important insight is that the success of 360-based learning is not solely dependent on the technology itself, but also on how well it is integrated into pedagogical design. The immersive experience must be aligned with learning objectives, competency standards, and student needs. Without proper instructional design, even advanced technologies may fail to produce optimal learning outcomes. Therefore, educators must not only adopt technology but also develop the pedagogical competencies required to maximize its potential.

The development of the 360-based digital module in this study followed several systematic stages. The initial stage involved a field survey conducted to assess the feasibility of locations for creating virtual 360 media. This activity was carried out at De Braga Hotel by Artotel Bandung, a representative hospitality environment relevant to tourism vocational education.

Based on the survey results, several locations were selected for the development of the virtual module, including the restaurant area (buffet room and dining room), meeting rooms, and banquet rooms. These locations were chosen to represent key operational areas in the hospitality industry. The selection of authentic and industry-relevant environments is crucial, as it enhances the realism and applicability of the learning experience. From a research perspective, the use of real-world locations in developing 360-based modules adds significant value to the learning process. It ensures that students are not only exposed to theoretical concepts but also to realistic professional settings. This approach strengthens the alignment between vocational education and industry demands, which is a critical factor in improving graduate employability.

The development of the 360-based digital module for the Dish Management course followed a systematic instructional design process, beginning with conceptualization and continuing through design, material collection, assembly, testing, and distribution. The module was designed to support lecturers in delivering learning materials more efficiently while providing students with an interactive and flexible learning experience. During the conceptual stage, the module was intended to function as a computer-based learning medium that enhances student engagement and facilitates independent learning. The design stage focused on integrating Virtual 360 technology into the learning environment, while the material collection stage involved gathering learning resources through observations, interviews with academics and industry practitioners, and existing course materials. Subsequently, all multimedia components were assembled into a cohesive digital module, tested for functionality, and distributed through the SPADA UPI, SPOT, and the Ministry of Education's SPADA platforms for implementation in the learning process.

The preparation of learning materials emphasized the creation of authentic multimedia content to support experiential learning. Photographs, videos, and audio recordings were collected from real culinary environments and transformed into learning resources through editing and digital production. The instructional content was organized according to a storyboard that aligned learning objectives with visual and interactive elements. In accordance with the principles of



microlearning, learning videos were developed in short durations of one to five minutes, enabling students to access concise and focused explanations. These videos were synchronized with Virtual Tour 360 environments, allowing learners to explore realistic restaurant and kitchen settings while simultaneously receiving theoretical explanations. This integration of multimedia and immersive technology supports constructivist learning by enabling students to actively interact with learning content rather than merely receiving information passively.

The implementation stage transformed the prepared multimedia materials into an interactive web-based learning module using 3D Vista software. Learning videos, photographs, virtual tours, quizzes, and other instructional resources were integrated into a unified learning platform accessible through the Learning Management System (LMS). The digital module was designed primarily for students enrolled in the Tourism Education and Catering Industry Management programs taking the Dish Management course. Through this implementation, students were able to experience authentic restaurant environments virtually while accessing instructional videos, quizzes, and supporting materials in a single digital platform. Such integration provides opportunities for self-paced learning and increases accessibility to practical learning experiences that may otherwise be limited by physical resources or scheduling constraints.

The content of the digital module was developed in accordance with the Indonesian National Work Competency Standards (SKKNI) for Hotels and Restaurants while remaining aligned with the learning outcomes of the Dish Management course. The module consists of fourteen learning topics covering both theoretical and practical aspects of restaurant operations, including the history of hotels and restaurants, food and beverage department concepts, restaurant waiter responsibilities, waiter grooming, dining concepts, and other related competencies. Each learning topic includes explainer videos, presentation materials, quizzes or assignments, and summative assessments in the form of midterm and final examinations. The inclusion of multiple instructional media ensures that students receive comprehensive learning experiences that address different learning preferences and support knowledge retention through repetition and interaction.

The evaluation of the digital module indicates that the implementation of immersive learning technology offers significant educational benefits despite several implementation challenges. Limited human resources, insufficient expertise in digital module development, and the necessity for continuous revision were identified as the primary obstacles during development. These findings are consistent with previous studies suggesting that successful digital transformation in higher education requires not only technological infrastructure but also adequate institutional support, professional competencies, and sustainable development strategies. Nevertheless, the developed module represents a substantial improvement over conventional teaching materials by combining interactive multimedia, instructional videos, motion graphics, narration, quizzes, and immersive 360-degree virtual environments into a single learning ecosystem.

Expert validation and usability evaluation further confirmed the quality of the developed module. Content experts verified the appropriateness and relevance of the learning materials, while usability testing using the USE Questionnaire demonstrated a usefulness score of 93%, indicating very high user acceptance. These findings suggest that students perceive the module as useful, easy to use, engaging, and supportive of their learning activities. The results are consistent with previous research emphasizing that usability is a critical factor influencing learners' acceptance of digital learning technologies. Furthermore, compared with conventional interactive e-modules, the

integration of immersive 360-degree technology appears to enhance experiential learning by allowing students to visualize authentic work environments and develop a deeper understanding of practical restaurant management concepts.

From a pedagogical perspective, the findings demonstrate that the effectiveness of digital learning modules depends not only on advanced technological features but also on the alignment between instructional design, learning objectives, and user needs. The integration of multimedia elements, virtual environments, and interactive assessments creates meaningful learning experiences that promote student engagement and independent learning. However, technology alone does not guarantee improved learning outcomes. Continuous evaluation, iterative refinement, and institutional support remain essential to ensure that digital learning innovations continue to meet educational objectives and user expectations. Therefore, this study supports the view that successful implementation of immersive digital learning requires the integration of technological, pedagogical, and organizational dimensions. Overall, the developed 360-based digital module provides an effective and innovative learning solution for vocational tourism education while highlighting the importance of sustainable development and ongoing quality improvement.

CONCLUSIONS

This study aimed to examine the effectiveness of 360-based digital modules within the framework of Digital Education 5.0 in tourism vocational education. The findings reveal that immersive digital modules have a significant positive effect on students' learning outcomes, as indicated by the strong regression results. The integration of 360-degree virtual environments enables students to experience realistic simulations of hospitality settings, thereby enhancing their cognitive understanding, practical skills, and learning engagement. Furthermore, the results confirm that the use of immersive technology supports competency-based learning by bridging the gap between theoretical knowledge and practical application. The high validity and reliability of the research instruments strengthen the robustness of these findings. This study also demonstrates that 360-based modules are not merely supplementary tools but play a central role in improving the quality of vocational education, particularly in tourism.

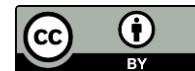
Overall, the implementation of Digital Education 5.0 through immersive learning technologies provides an effective and innovative approach to addressing current challenges in vocational education, especially in increasing student motivation, engagement, and readiness for industry demands.

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