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Determinants of learning effectiveness in SAP-based Enterprise Resource Planning courses?

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Determinants of learning effectiveness in SAP-based Enterprise Resource Planning courses

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Abstract

This study aims to determine the factors that influence learning effectiveness in the SAP-based Enterprise Resource Planning courses at Universitas Islam Indonesia (UII). Based on the Theory of Embodied Learning, this study hypothesizes that activeness, level of suitability, perceived immersion, motivation, and technology support positively affect learning effectiveness in the SAP-based ERP courses. A quantitative method with a survey method was used to collect data from 371 students across six study programs who had taken the SAP-based ERP courses. The results of multiple regression analysis showed that physical involvement, level of suitability, motivation, and technology support had a significant positive effect on the learning effectiveness of SAP-based ERP courses. However, perceived immersion had a significant and negative effect on learning effectiveness in the SAP-based ERP courses, which is contrary to the formulated hypothesis. These findings contribute to ERP curriculum design by emphasizing the importance of active participation, aligning course materials with software features, fostering motivation, and ensuring adequate technology infrastructure to improve learning effectiveness in the SAP-based ERP courses.

Introduction

The development of information technology has a significant impact on various aspects of life, including education (Shelly et al., 2012). One such technology frequently implemented in the context of education is Enterprise Resource Planning (ERP) (Helm et al., 2005). ERP is an integrated system designed to manage and coordinate various business processes across departments in an organization (Jacobs & Weston, 2007). In an academic setting, ERP systems are used to demonstrate and teach cross-functional business concepts, such as operations, logistics, accounting, and human resources (Hawking et al, 2001). However, several problems arise in the implementation of SAP-based ERP learning that need attention. One of the main problems is the lack of learning effectiveness felt by students (Li & Liang, 2020). This is a critical concern considering the large investment required to implement and maintain this SAP-based ERP system. Several previous studies have examined factors that influence learning effectiveness. For example, research conducted by Li and Liang (2020) found that students' physical involvement, such as active participation in class discussions, the alignment of course material with the textbook, and their perceived immersion in the lecturer's explanation, were the important factors in China. Their study showed that physical activeness and congruence between posture and learning materials had significant effects on learning satisfaction. Meanwhile, perceived immersion significantly affected learning satisfaction but did not directly influence learning effectiveness. In contrast, Maheshwari (2021) revealed that the availability of technological resources and motivation were the main factors influencing learning outcomes in Vietnam. Maheshwari (2021) also found that institutional support and perceived satisfaction influenced the effectiveness of technology-assisted student learning in Vietnam.

To analyze the effectiveness of SAP-based ERP courses, the Theory of Embodied Learning can be employed as a research framework. Embodied Learning Theory emphasizes the use of body and physical interaction in the learning process. This theory explains how individuals understand and respond to bodily engagement and the physical learning environment that allows for a better understanding of the impact of technology use in an educational context (Lindgren, 2013). A proper understanding of the causes will have a positive impact on student motivation and learning outcomes (Hariyanto, 2021).

Universitas Islam Indonesia (UII) has implemented the use of SAP-based ERP systems in its learning process. Therefore, the purpose of this study is to analyze the factors that influence the learning effectiveness of SAP-based ERP courses at UII. Several potential factors affecting learning have been studied, including activeness, perceived immersion, level of suitability (Li & Liang, 2020), motivation, and technological support (Maheshwari, 2021). Activeness is the extent to which a person is physically engaged in an activity through body movements (Li & Liang, 2020). Level of suitability is the degree to which the structure or characteristics of an element match or harmonize with other elements (El-Zanfaly, 2015). Perceived immersion is a feeling of being deeply engaged in a particular activity, to the extent that time seems to pass quickly (Csikszentmihalyi, 2008). Motivation is the internal drive that forces a person to act or do something (Graham, 2012). Technological support is the technology provided to assist the learning process (Martha et al., 2001). In the context of this study, several issues related to the effectiveness of SAP-based ERP learning need attention, as stated by Selim (2017) that students' perception of success or failure in the technology-assisted learning process is a very important factor. In addition, it is necessary to understand what obstacles students may face in achieving effective learning in SAP-based ERP courses.

Relevant studies, such as those conducted by Li and Liang (2020) and Maheshwari (2021), have provided initial insights into the factors that influence the effectiveness of ERP learning. However, these studies were conducted in different contexts from the environment of Universitas Islam Indonesia (UII), so more specific research is needed within the various study programs at UII that offer SAP-based ERP courses to better understand how these factors apply in this particular context.

This study is a development of the research by Li and Liang (2020) by adding two independent variables that were not included in their original work, namely motivation and technology support, as identified by Maheshwari (2021). The results of this study are expected to provide deeper insight into the factors that influence the learning effectiveness in SAP-based ERP courses at Universitas Islam Indonesia, thereby providing practical guidance for curriculum development and instructional strategies. A better understanding of how information technology supports learning can improve both the quality of learning and its benefits for students (Dorothy & Sirkka, 1995).

The cited studies provide valuable insights into the factors influencing the effectiveness of SAP-based ERP learning. Li and Liang (2020) identified that activeness and material suitability significantly influenced learning satisfaction, while perceived immersion affected satisfaction but not learning effectiveness. Maheshwari (2021) argues that motivation and technology support are crucial for positive learning outcomes. This study highlights the importance of aligning educational content with technological tools and fostering active student engagement. However, there is a crucial research gap since the context of the study is different from that of the Indonesian educational system, especially at Universitas Islam Indonesia, where cultural and institutional factors can affect learning dynamics. In Indonesia, educational institutions face unique challenges, including varying levels of technological infrastructure and diverse pedagogical approaches. The integration of ERP systems in Indonesia requires a tailored approach that considers those factors. To address this gap, this study focuses on conducting research within UII and considering the specific educational system and cultural environment of the institution.

Literature Review

Embodied Learning Theory

Since the 1980s, embodied learning has been increasingly applied in cognitive science and artificial intelligence (Ziemke, 2016). According to the theory of Embodied Learning, learning is an interactive process involving the body and interaction with the physical environment. Students are encouraged to actively participate, feel, and move to gain a deeper understanding of the concept (Rold, 2018). In the context of this study, students' physical involvement and perception of immersion in SAP-based ERP materials are key factors to analyze. Learning that involves physical engagement and interaction with technology allows students to better experience and understand complex concepts (Johnson-Glenberg et al., 2014).

Theory of Embodied Learning emphasizes activeness and participation in learning process to provide deeper insights (Corcoran, 2018; Weiskopf, 2010). Therefore, the Embodied Learning Theory provides a strong basis for understanding how the variables of activeness, motivation, perception of immersion, and level of suitability as internal variables and technology support as external variable interact with each other and contribute to the learning effectiveness in SAP-based ERP courses in the academic environment of Universitas Islam Indonesia.

Constructivist Learning Theory

This theory posits that learners construct knowledge through experiences and interactions with their environment. In the context of SAP-based ERP courses, the constructivist approach can enhance learning by encouraging students to engage in problem-solving and critical thinking activities that reflect real-world scenarios. This is parallel with the need for active participation and alignment of course materials with ERP software features, as highlighted in previous studies.

Learning Effectiveness

According to Biggs (1996), learning effectiveness depends on students' understanding of the learning process, how they process information, and how they organize and manage learning resources. The role of students is highly emphasized, including their learning strategies and management of learning resources. Previous research also shows that students' understanding of how to learn and use effective learning strategies can affect their learning outcomes (Pintrich et al., 1991).

Hypothesis Development

Rohmawati (2015) states that learning effectiveness refers to the level of success achieved through a particular learning method in accordance with the planned learning objectives. Meanwhile, activeness is the level of an individual's participation in a particular activity through bodily movements (Li & Liang, 2020). In recent years, studies both in China and internationally have shown that activeness plays an important role in an individual’s performance in work, study, and social interactions (Barsalou et al., 2003) Teaching should not only limited to blackboard method, but should also engage students' visual, auditory, tactile, and motor senses to enhance their learning experiences (Montessori, 1912). Therefore, to improve the effectiveness of learning, it is important to incorporate body language and physical expression (Chao et al., 2013). Educational journey emphasizes learning in the laboratory. In addition, participation in learning has been proven to improve the effectiveness of learning. The results of research by Li and Liang (2020) and Maheshwari (2021) confirm that activeness affects learning outcomes.
H1: Activeness has a positive effect on the learning effectiveness of SAP-based ERP courses.

Research conducted by El-Zanfaly (2015) highlights the importance of suitability level between physical movements and learning materials. Suitability level refers to the extent to which

the learning materials align with the features, activities, and interfaces of the platform/software used in the learning process (Li & Liang, 2020). In terms of learning, this level of suitability can improve learning effectiveness by promoting a better understanding of concepts (Wu et al., 2021). In the context of SAP-based ERP courses, the compatibility between lecture materials and SAP software features can significantly affect learning outcomes.
H2: The level of suitability has a positive effect on the learning effectiveness of SAP-based ERP courses.

A study conducted by Csikszentmihalyi (2008) highlights the importance of focus in learning. A high level of focus and being deeply engaged in the learning environment can make learning more effective. In the context of SAP-based ERP courses, the level of students' focus on the materials and become immersed in the process can contribute to increasing learning effectiveness. Students who feel carried away by the learning atmosphere are more likely to achieve better learning outcomes.
H3: Perceived immersion has a positive effect on the learning effectiveness of SAP-based ERP courses.

Maheshwari (2017) explains that student motivation plays an important role in determining the effectiveness of learning. Graham (2012) also states that motivation is an internal factor that plays a major role in determining the effectiveness and success of learning. A high level of motivation encourages students to actively participate, pay greater attention, invest more effort in understanding the material, and diligently work on assignments and solve problems. These factors can ultimately increase the overall effectiveness of learning. The higher the student's motivation to learn, the better the learning outcomes, thus resulting in more effective SAP-based ERP learning.
H4: Student motivation has a positive effect on the learning effectiveness of SAP-based ERP courses.

High-quality technology, such as up-to-date SAP software and smooth access, can help students to understand concepts more effectively, develop necessary skills, and apply knowledge in real-world contexts. Appropriate technological support can motivate students to actively participate in learning (Maheshwari, 2021). Likewise, efficient technological support can affect learning effectiveness (Maheshwari, 2021). Jones' (2019) research exploring the role of technology in learning concluded that efficient technological support was a key element in achieving learning effectiveness. Advanced and well-integrated technology can enrich students' experiences and help them achieve better learning outcomes.
H5: Technology support has a positive effect on the learning effectiveness of SAP-based ERP courses.

Research Framework

Figure 1 demonstrates the research framework describing the effects of the independent variables, consisting of activeness, level of suitability, perceived immersion, motivation, and technology support, on learning effectiveness as the dependent variable.

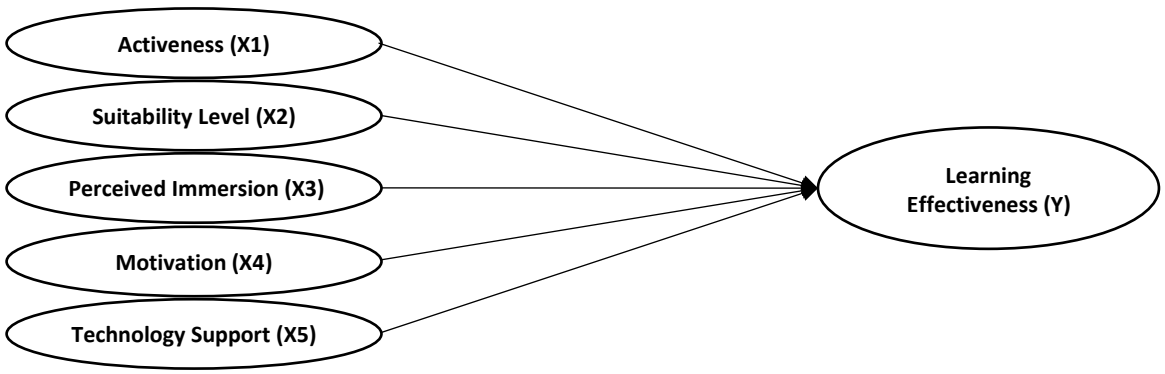

Figure 1. Research Framework

Research Methods

Research Population and Sample

The population of this study is all students in the study programs that implement SAP-based ERP learning at Universitas Islam Indonesia (UII). The samples were selected through a purposive sampling method with the criteria of being students from any study programs that provide SAP-based ERP courses. Therefore, the research sample consists of the students of Accounting, IP Accounting, Management, IP Management, Industrial Engineering, and IP Industrial Engineering Study Programs who took or were taking SAP-based ERP courses. 2,020 students from the 2020 and 2021 intakes participated in this study.

The minimum required sample size in this study was determined following the Slovin formula as follows.

$$n = \frac{N}{(1 + Ne^2)}$$

$$n = \frac{2040}{1 + 2040(0.05)^2}$$

$$n = \frac{2040}{6.1}$$

$$n = 334.426 = 334$$

The distribution of questionnaires in this study was conducted by providing a Google Form to all students of the Accounting (Regular), Accounting (International Program), Management (Regular), Management (International Program), Industrial Engineering (Regular), and Industrial Engineering (International Program) study programs at Universitas Islam Indonesia who had taken SAP-based ERP courses. The distribution of questionnaires is presented in Table 1.

Table 1. Questionnaire Distribution

Description	Total	Percentage
Questionnaires distributed via Gmail and WhatsApp	2,040	100%
Unreturned questionnaires	(1,663)	(81.5%)
Returned questionnaires	377	18.5%
Ineligible respondents	(6)	(0.3%)
Eligible respondents	371	18.2%

Source: Primary Data, 2024

Table 1 shows that the number of Google Form questionnaires distributed through a link via email and WhatsApp is 2,040. Of the total number, 377 (18.5%) questionnaires were returned, and 371 (18.2%) respondents met the requirements as the sample of the study.

Research Method

This study uses both primary and secondary data. The primary data were collected from the questionnaires distributed in November 2023. The questionnaire was designed to measure the respondents' perceptions of each variable in the study. Each variable was assessed using a series of statements rated on a 4-point Likert scale. A score of 4 indicated "strongly agree"; 3 indicated "agree", 2 indicated "disagree", and 1 indicated "strongly disagree." The secondary data are the demographic data of the students who have taken SAP-based ERP courses that were collected from the PDDikti (Higher Education Database) website: www. pddikti.kemdikbud.go.id.

Definition and Measurement of Variables

The variables in this study consist of a dependent variable and independent variables. The dependent variable is learning effectiveness. According to Smith (2010), learning effectiveness can be measured by the extent to which students understand the material taught and are able to apply it in real-world contexts. The instrument to measure learning effectiveness was developed by adapting those of Maheshwari (2020) and Li and Liang (2020). The indicators of learning effectiveness included: (1) Students' perception of the success of SAP-based ERP learning, (2) Students' ability to apply SAP-based ERP materials, and (3) Students' level of understanding of SAP-based ERP materials. This variable was measured by an instrument consisting of four question items adopted from the research of Fatimah and Wardani (2017).

The independent variables in this study consist of five variables, namely activeness, motivation, perceived immersion, level of suitability, and technology support.

1. Activeness (X1)
   Activeness is the level of an individual's physical involvement in the learning process (Li & Liang, 2020). The indicators of activeness were developed and adopted from Li and Liang (2020), consisting of (1) Frequency of active participation in SAP-based ERP learning, and (2) Frequency of timely assignment submission. This variable was measured using an instrument consisting of four question items, which were adopted from the research by Fatimah and Wardani (2017).
2. Suitability Level (X2)
   The level of suitability refers to the alignment between the learning materials and the contents delivered during learning (Li & Liang, 2020). The suitability level indicators were developed and adopted from Li and Liang (2020), including (1) Suitability of SAP-based ERP lecture material with SAP features and modules, and (2) Suitability of SAP-based ERP material with the students' level of understanding. This variable was measured using an instrument consisting of four question items adopted from the research by Fatimah and Wardani (2017).
3. Perceived Immersion (X3)
   Perceived immersion is the extent to which an individual feels fully engaged in the learning experience (Li & Liang, 2020). The indicators for perceived immersion were developed and adopted from Li and Liang (2020), involving (1) Level of interest when learning ERP using SAP, and (2) Level of focus and challenge when practicing SAP-based ERP. This variable was measured using an instrument consisting of four question items adopted from the research by Fatimah and Wardani (2017).
4. Motivation (X4)
   Motivation is an individual's drive to engage in specific activities. A high level of motivation tends to enhance satisfaction, thus improving learning effectiveness (Maheshwari, 2021). Motivation is an element that influences behavior and drives individuals toward change (Soemanto, 2006). The indicators of motivation were developed and adopted from Maheshwari (2021), including (1) Level of motivation to learn SAP-based ERP, and (2) Encouragement to continue learning SAP-based ERP. This variable was measured using an instrument consisting of four question items adopted from the research by Fatimah and Wardani (2017).
5. Technology Support (X5)
   Technology support is the availability of adequate technological infrastructure and reliable internet access (Maheshwari, 2021). The indicators of technology support were developed and adopted from Maheshwari (2020), including: (1) Perception that technology helps enhance the effectiveness of SAP-based ERP learning, and (2) Technology facilitates better learning outcomes. This variable was measured using an instrument consisting of four question items adopted from the research by Fatimah and Wardani (2017).

Data Analysis

The analysis method used to test the research hypotheses is the multiple linear regression with the following equation:

$$Y = \alpha+b1X1+b2X2+b3X3+b4X4+b5X5+e$$

Where:
α = Constant
b1-b5 = Regression coefficients
Y = Learning Effectiveness
X1 = Activeness
X2 = Suitability Level
X3 = Perceived Immersion
X4 = Motivation
X5 = Technology Support
e = error term

Results and Discussion

Respondent Data

Tables 2, 3, and 4 present the respondents' data on study program, gender, and year of enrollment respectively.

Table 2. Data on Respondents' Study Program

Study Program	Total	Percentage
Accounting (Regular)	142	38.3%
Accounting (IP)	6	1.6%
Management (Regular)	103	27.7%
Management (IP)	39	10.5%
Industrial Engineering (Regular)	71	19.1%
Industrial Engineering (IP)	10	2.7%
Total	371	100%

Source: Data Processing Results, 2024

Table 2 shows that the respondents in this study were mostly from Accounting Regular Program with 142 students (38.3%), followed by Accounting International Program (IP) with 6 students (1.6%), Management Regular Program with 103 students (27.7%), Management IP with 39 students (10.5%), Industrial Engineering Regular Program with 71 students (19.1%), and Industrial Engineering IP with 10 students (2.7%).

Table 3. Data on Respondents' Gender

Gender	Total	Percentage
Male	204	54.9%
Female	167	45.1%
Total	371	100%

Source: Data Processing Results, 2024

Table 3 exhibits that the respondents in this study were mostly male, accounting for 204 students (54.9%).

Table 4. Data on Respondents' Enrollment Year

Enrollment year	Total	Percentage
2018	1	0.3%
2019	8	2.2%
2020	48	12.9%
2021	314	84.6%
Total	371	100%

Source: Data Processing Results, 2024

The data on the year of intake show that the respondents in this study were mostly from the 2021 year intake, namely 314 students (84.6%), followed by the enrollment years of 2020 totaling 48 students (12.9%), 2019 with 8 students (2.2%), and 2018 with only 1 student (0.3%)

Validity and Reliability Test

The results of the validity test using Pearson correlation showed that all the correlation values between each item score and the total score were > 0.50 with a significance value of <0.05. This indicates that all statement items for each variable were valid and could be used in this study. The results of the reliability test also showed that the seven research instruments met the reliability requirements with a Cronbach's alpha value > 0.6.

Descriptive Statistics

Descriptive statistical analysis is used to provide a description or picture of data from all variables, including minimum value, maximum value, average, and standard deviation. The results of descriptive statistical analysis are presented in Table 5.

Table 5. Descriptive Statistical Analysis

Variable	n	Minimum	Maximum	Mean	Std. Deviation	Category
Activeness (X1)	371	2.25	4.00	3.29	0.406	Medium
Suitability Level (X2)	371	2.25	4.00	3.33	0.357	Medium
Perceived Immersion (X3)	371	2.25	4.00	3.29	0.388	Medium
Motivation (X4)	371	2.50	4.00	3.48	0.381	Medium
Technology Support (X5)	371	2.50	4.00	3.34	0.371	Medium
Learning Effectiveness (Y)	371	2.50	4.00	3.40	0.361	Medium

Source: Data Processing Results, 2024

In the descriptive statistical analysis, all variables are grouped into three categories, namely low, medium, and high, based on their class intervals. After the length of the class interval is known, the category range for each variable is calculated by adding the minimum value to the class interval length to find the maximum value. The results of the category range are presented in Table 6.

Table 6. Range of Variable Categories

Variable	Class Interval Length	Category Range		
		Low	Medium	High
Activeness (X1)	0.583	2.25-2.83	2.83-3.42	3.42-4.00
Suitability Level (X2)	0.583	2.25-2.83	2.83-3.42	3.42-4.00
Immersion Perception (X3)	0.583	2.25-2.83	2.83-3.42	3.42-4.00
Motivation (X4)	0.5	2.50-3.00	3.00-3.50	3.50-4.00
Technology Support (X5)	0.5	2.50-3.00	3.00-3.50	3.50-4.00
Learning Effectiveness (Y)	0.5	2.50-3.00	3.00-3.50	3.50-4.00

Source: Data Processing Results, 2024

Classical Assumption Tests

The classical assumption tests conducted in this study include normality test, multicollinearity test, and heteroscedasticity test. The results of the normality test employing Kolmogorov-Smirnov showed a significance value of 0.282. This indicates that the research data had a normal distribution. The results of the multicollinearity test showed that all independent variables had tolerance values of > 0.1 and VIF < 10. This indicates that there was no correlation between the independent variables in the regression model. The results of the heteroscedasticity test using Glejzer showed that all independent variables had a sig value of > 0.05, which indicates that there was no heteroscedasticity.

Hypothesis Test

Hypothesis testing in this study used the multiple regression analysis method. Multiple regression analysis is conducted to determine the effect of the independent variable on the dependent variable. The results of the hypothesis test are presented in Table 7.

Table 7. Hypothesis Test Results

Model	Prediction	Coefficient	T. statistic	Sig.	Conclusion
(Constant)		2.871	10.918	0.000	
Activeness (X1)	Positive	0.186	3.940	0.000	Ha1 Supported
Suitability Level (X2)	Positive	0.219	4.265	0.000	Ha2 Supported
Immersion Perception (X3)	Positive	-0.176	-3.494	0.001	Ha3 Not Supported
Motivation (X4)	Positive	0.111	2.344	0.020	Ha4 Supported
Technology Support (X5)	Positive	0.183	3.375	0.001	Ha5 Supported
F statistic = 11.396, sig F=0.000, *Adjusted R-Squared=0.123*					

Source: Data Processing Results, 2024

Table 7 shows that the F statistic is 11.396 with a significance value of 0.000. This indicates that the regression model has passed the model fit test. The Adjusted R-Squared value of 0.123 shows that the five independent variables including activeness, motivation, perceived immersion, level of suitability, and technology support can explain the variation in the learning effectiveness variable as much as 12.3%, and the remaining 87.7% can be explained by other factors that are not included in this research model.

Discussion

The Influence of Activeness on Learning Effectiveness of SAP-based ERP Courses

The results of the hypothesis test show that Ha1 is supported, which means that activeness has a significant and positive effect on the effectiveness of SAP-based ERP learning. This finding is in line with the research conducted by Li and Liang (2020), which concludes that students' physical involvement in the form of active participation during learning contributes positively to improved satisfaction and learning effectiveness.

Chao et al. (2013) explain that activeness during learning can increase students' cognitive and sensory engagement, thereby improving learning effectiveness. When students actively practice skills or apply concepts using certain software and technology, they gain the opportunity to truly understand and implement the knowledge acquired. This can ultimately increase learning effectiveness because students gain a deeper understanding and ability in practical application.

In the context of SAP-based ERP learning in higher education, a high level of student activeness, such as actively making presentations and participating in discussions related to the ERP system, can help them better understand the integrated business concepts inherent in the ERP

system. Direct interaction with SAP ERP features and components allows students to truly understand how ERP system is applied in a real-world context. Thus, activeness plays an important role in increasing the effectiveness of ERP learning because it provides more contextual learning for students.

The Influence of Suitability Level on Learning Effectiveness of SAP-based ERP Courses

The results of the hypothesis test show that Ha2 is supported, indicating that the level of suitability is proven to have a significant and positive effect on the effectiveness of SAP-based ERP learning. This finding supports the study by El-Zanfaly (2015), which emphasizes the importance of compatibility between physical movements and learning materials. El-Zanfaly proved that a high degree of congruence between the two elements can improve students' understanding and retention of knowledge. Keshavarz (2011) also explains that a high level of suitability between learning materials and the features and modules available on the platform, software, or learning aids used can improve learning effectiveness. This is because a high level of suitability allows students to gain a deeper understanding of the concepts being taught. In the context of SAP-based ERP learning, the suitability between ERP lecture materials and the features and modules contained in SAP software is very important. If lecturers can align and adjust the material taught with SAP features, this can improve students' understanding and ability to apply ERP knowledge in real-world scenarios. Hence, a high degree of conformity between ERP learning materials and SAP-based ERP systems contributes positively to increasing the effectiveness of SAP-based ERP learning as a whole. The results of this study support the argument that a high degree of conformity between learning materials and supporting learning infrastructure, such as software, is very important to increase learning effectiveness. The higher the degree of conformity between the two, the greater the potential for students to improve their understanding and competence.

The Influence of Perceived Immersion on Learning Effectiveness of SAP-based ERP Courses

The results of the hypothesis test show that Ha3 is not supported, which means that the perceived immersion is not proven to have a significant and positive effect on the effectiveness of SAP-based ERP learning. On the contrary, perceived immersion negatively affects learning effectiveness. This suggests that though a high level of immersion may increase student interest, it may also lead to distraction from the core concepts as students might overly focus on interacting with computer devices rather than engaging with the learning material. To address this, educational institutions should prioritize the alignment of course materials with the features of ERP software and ensure the adequate IT infrastructure to enhance learning outcomes. Lecturers should also employ interactive teaching strategies and provide challenging case studies to maintain student motivation and focus.

This finding is in contrast to the study performed by Csikszentmihalyi (2008) which highlights the importance of high level of immersion in learning activities to increase learning effectiveness. However, the results of this study can logically be explained since the level of immersion in SAP ERP learning activities can cause students to dislike the learning materials. It is possible because students are overly engaged with the computer, thus losing attention to the core concepts being taught. Although a high perception of immersion may increase students' interest in SAP ERP, it does not necessarily improve the students' focus on the instructional content. In fact, excessive immersion may cause students distracted from their learning materials.

Therefore, it is necessary to mediate the effect of immersion through the implementation of appropriate learning strategies and activities to increase the effectiveness of SAP-based ERP learning. For example, incorporating interesting case studies, interactive quizzes, and hands-on practice using SAP-based ERP systems can help direct students' attention toward conceptual

understanding and application. Although the level of students' perceived immersion is high, the learning process which is not followed by engaging activities that can simulate the implementation of the concepts learned, will not significantly increase the learning effectiveness. The results of this study indicate that relying solely on perceived immersion as an instrument to increase the effectiveness of SAP-based ERP learning may not be sufficient. Therefore, designing engaging yet practical learning activities and appropriate teaching strategies is crucial to mediate the perceived immersion to ensure the expected impact on increasing the effectiveness of SAP-based ERP learning in higher education.

The Influence of Motivation on Learning Effectiveness of SAP-based ERP Courses

The results of the hypothesis test show that Ha4 is supported, demonstrating that motivation has a significant and positive effect on the effectiveness of SAP-based ERP learning. This finding is in line with Maheshwari's study (2021) which concludes that motivation is one of the important factors influencing the effectiveness of online learning. Graham (2012) also explains that motivation is an internal factor that plays a major role in determining the effectiveness and success of learning. High motivation encourages students to actively participate, pay more attention, and make more efforts in understanding the materials, working on the assignments, and solving the problems.

These factors can ultimately increase the overall effectiveness of learning. In the context of SAP-based ERP lectures, students' intrinsic and extrinsic motivation to learn the ERP system plays a significant role in determining how effective their learning will be. Students who are highly motivated tend to be more persistent in learning SAP-based ERP features and modules, actively practice using the system, and invest more effort in solving problems. This can ultimately improve students' understanding and ability to implement ERP systems in real-world scenarios, which is the main goal of ERP learning. The results of this study consistently support the findings of previous studies that emphasize the vital role of motivation in determining the level of effectiveness of learning activities. The higher the motivation of students to learn SAP-based ERP systems, the greater the potential for increasing the effectiveness of SAP-based ERP learning in higher education.

The Influence of Technology Support on Learning Effectiveness of SAP-based ERP Courses

The results of the hypothesis test show that Ha5 is supported, implying that technological support has a significant and positive effect on the effectiveness of SAP-based ERP learning. This finding is in line with Maheshwari's study (2021) which concludes that the availability of adequate technological resources (technological support) is a key factor influencing the effectiveness of online learning. Jones (2019) also explains that reliable and up-to-date technological support can facilitate a more effective learning process. Well-integrated technology allows for the delivery of more interesting, interactive, and contextual learning materials. This can ultimately improve students' understanding and help them achieve more optimal learning outcomes.

In the context of SAP-based ERP learning, the availability of technological support, such as stable internet access, up-to-date SAP software versions, and qualified hardware, is essential for a learning process to run effectively. Reliable technological support allows students to efficiently practice the features and modules of SAP ERP system, thereby improving their understanding and skills to implement the ERP concepts. This ultimately contributes positively to achieving the effectiveness of ERP learning. Thus, the results of this study are in line with previous studies which state that the availability of adequate technological support is vital to facilitate effective learning activities in today's digital era.

Conclusion

The results of the study show that four of the five independent variables prove to have significant and positive effects on the learning effectiveness of SAP-based ERP courses, involving activeness, level of suitability, motivation, and technology support. Meanwhile, perceived immersion has a significant and negative effect on the learning effectiveness of SAP-based ERP courses.

The results of this study contribute to the development of information technology-based learning systems, especially in designing a system that can increase user activity and motivation. This study also has important implications for higher education institutions, especially for study programs that offer SAP-based ERP courses, by encouraging the improvement in curriculum design and SAP-based ERP learning activities, for example, by ensuring that the materials taught are in line with the features of the ERP software. Study programs must ensure the availability of adequate IT infrastructure, reliable internet access, updated SAP-based ERP system versions, and appropriate hardware to support effective ERP learning. In addition, the results of this study also have implications for lecturers involved in SAP-based ERP teaching by highlighting the need to motivate students to learn SAP-based ERP by applying interactive teaching, giving more appreciation, and providing challenging case studies to promote more interest in ERP concept.

The limitations of this study include: (1) The data were solely collected through questionnaires that limited the depth of analysis. Therefore, future research is recommended to complement the data collection conducted through a questionnaire with interviews with selected respondents to allow a more in-depth exploration of the research findings. (2) This study only analyzed the influence of independent variables on dependent variables and did not examine the potential mediating or moderating variables. Therefore, future researchers are advised to examine the possible mediating or moderating variables that influence the relationship between independent variables and dependent variables.

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