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Easy to use and competency development on websites as determining factors of digital learning effectiveness

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A B S T R A C T

This study aims to identify the factors influencing the effectiveness of digital learning among university students. The main focus of the research is to examine the impact of easy-to-use, competency development on websites, and motivation to learn on learning effectiveness. The study employs a quantitative approach with a survey method, where data was collected through online questionnaires distributed to final-year students at Universitas PGRI Malang. Out of 300 distributed questionnaires, 204 were returned and deemed complete, thus used as the final sample for analysis. The data were analyzed using Structural Equation Modeling (SEM) techniques with the help of SmartPLS software to examine the relationships between variables. The results show that ease of use has a significant impact on motivation to learn, but does not have a direct impact on learning effectiveness. Competency development on websites does not have a significant impact on motivation to learn, but it does have a significant impact on learning effectiveness. Additionally, motivation to learn was found to have a significant impact on learning effectiveness and mediates the relationship between ease of use and learning effectiveness, but does not mediate the relationship between competency development on websites and learning effectiveness.

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1. Introduction

Since the COVID-19 pandemic, online education or e-Learning has become a new trend in the education sector (Fauzi, 2022). The adoption of technology in higher education has been a key factor in the evolution of teaching and learning methods. One significant outcome of this technological application is the emergence of hybrid education models. Hybrid education, or blended learning, combines elements of traditional face-to-face teaching with digital technology to create a more flexible and dynamic learning experience (Aldulaimi et al., 2021; Roma Singh, 2021). The hybrid education method allows access to online learning materials, such as video lectures, digital readings, and forum discussions, which complement physical classroom activities. This model enables students to learn independently (Roy, 2020; Mier et al., 2023). Hybrid education also provides opportunities to personalize the learning process, allowing students to revisit difficult material and accelerate through lessons they have already mastered (Hutasuhut et al., 2022). This approach helps to increase engagement and comprehension of the material. Moreover, hybrid education supports the development of digital skills that are crucial for students in the modern era. However, the success of hybrid education depends on adequate access to technology and the ability of both educators and students to adapt to new

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teaching and learning methods. Hediansah & Surjono (2020) state that, with proper planning, hybrid education can provide a richer and more comprehensive learning experience.

The rapid development of information technology demands that educational curricula quickly adapt to remain relevant and effective in facing future challenges (Raes et al., 2020; Singh et al., 2021). Many stakeholders, including educators, parents, and policymakers, highlight the importance of a more adaptive curriculum that not only focuses on mastering traditional material but also on essential 21st-century skills. These skills include digital literacy, which involves the ability to use information technology effectively and ethically; critical thinking, which helps students analyze and evaluate information wisely; creativity, which encourages innovation and problem-solving in unique ways; collaboration, which teaches teamwork in an increasingly global environment; and awareness of current technological developments, which enables students to quickly adapt to changes in the workforce and society (Sayaf et al., 2021; Rafiee & Abbasian-Naghneh, 2021).

Thus, ease of use is a key factor influencing how learners interact with technology and digital learning platforms (Chopra et al., 2019; Martin et al., 2020). Websites or platforms designed with intuitive and user-friendly interfaces can enhance the learning experience, facilitate access to learning materials, and reduce technical barriers that often hinder digital learning. Additionally, the development of learner competencies is a significant factor in determining the effectiveness of digital learning. Competencies include the ability of learners to use technology effectively and manage independent learning. Furthermore, learner motivation is another crucial factor in the success of digital learning. Therefore, the purpose of this study is to analyze the impact of ease of use and competency development on websites on learning effectiveness. Additionally, this study also analyzes the mediating role of motivation to learn in the relationship between ease of use, competency development on websites, and learning effectiveness.

2. Literature Review

In the ever-evolving digital era, digital learning has become an integral part of the educational process across various levels (Shurygin et al., 2022). Digital technology provides a range of platforms that make learning more flexible, efficient, and affordable. The effectiveness of digital learning refers to the extent to which learners' educational goals are achieved through the use of online learning media (Gopal, 2020; Mahdi, 2023). Effectiveness is measured based on student learning outcomes; if learning outcomes improve, the learning model can be considered effective. Conversely, if learning outcomes decline or remain unchanged, the model is deemed ineffective. According to Lane & Goode (2021), the effectiveness of digital learning heavily relies on several critical factors, including ease of use, competency development, and motivation to learn. Information and Communication Technology (ICT)-based learning has increasingly become an integral part of modern education systems (Al-Rahmi et al., 2020). A key concept in digital learning is ease of use, which refers to how easily a system, application, or digital device can be used without excessive effort or in-depth technical knowledge from the user (Miskiah et al., 2019). This concept is crucial as it affects the adoption and effectiveness of technology in teaching and learning processes. According to Al-Fraihat et al. (2020), perceived ease of use has a significant impact on technology adoption in education. Ease of use also helps reduce technical barriers that users may encounter, allowing them to focus on content and learning processes rather than how to operate the technology (Aljawarneh, 2020). Furthermore, mastering easy-to-use digital learning tools enables educators to guide students more effectively in solving problems critically, creatively, and collaboratively. With intuitive and accessible technology, educators can use various digital tools to encourage discussion, simulation, and collaboration among students (Wang & Tahir, 2020; Almulla, 2020). This not only enriches the learning experience but also helps students develop essential 21st-century skills such as critical thinking, creativity, and teamwork. Puspitarini & Hanif (2019) emphasize that accessible and user-friendly technology allows educators to integrate innovative teaching methods, such as project-based or collaborative learning, into the curriculum. This supports a more dynamic and interactive learning environment where students can actively participate and engage deeply in the learning process (Basar et al., 2021). Thus, ease of use plays a crucial role not only in technical ease but also in how technology can support broader educational goals and enhance learning outcomes.

H_1: *Easy-to-use has a significant effect on motivation to learn.*
H_2: *Easy-to-use has a significant effect on learning effectiveness.*

Competency development in education is crucial for preparing students to face future challenges. In the digital era, necessary competencies include technical skills, digital literacy, critical thinking, creativity, and the ability to collaborate effectively (Morris, 2019). Websites or digital platforms can support this competency development by providing various tools and resources that facilitate active and participatory learning. In the context of digital learning, approaches to competency development require strategies different from conventional education (Anas, 2019; Abelha et al., 2020). According to Chopra et al. (2019), effective digital learning is not just about presenting informative content but also about designing learning experiences that help students develop the skills needed for independent and collaborative learning. Digital platforms should offer interactive features such as discussion forums, quizzes, and group projects that allow students to apply the knowledge they have learned and collaborate with their peers (Martin et al., 2019). Additionally, these platforms should encourage students to explore, experiment, and solve problems

independently by providing access to diverse learning resources (Falloon, 2020). Thus, competency development in a digital environment involves both the absorption of knowledge and the development of relevant skills for success in an increasingly digital world.

H_3: *Competency development on websites has a significant effect on motivation to learn*.
H_4: *Competency development on websites has a significant effect on learning effectiveness.*

Furthermore, student motivation is a crucial factor in the success of digital learning. According to Filgona et al. (2020), motivation can stem from interest in the subject matter, the desire to achieve personal or professional goals, and support from the learning environment. In digital learning, high motivation is often linked to active engagement and better learning outcomes, as motivated students are generally more enthusiastic about participating in the learning process and completing assigned tasks (Law et al., 2019; Ferrer et al., 2022). Panagiotidis et al. (2023) suggest that several strategies can be applied to enhance student motivation in digital learning. The use of gamification elements, such as points, badges, or leaderboards, can make learning more engaging and enjoyable. Rewards for achievements and constructive feedback are also important for encouraging participation and continuous improvement (Thanasi-Boçe, 2021). Therefore, designing digital learning experiences that consider motivational factors can improve student engagement and learning outcomes (Nadya & Pustika, 2021).

H_5: *Motivation to learn has a significant effect on learning effectiveness.*
H_6: *Motivation to learn mediating the effect of easy-to-use on learning effectiveness.*
H_7: *Motivation to learn mediating the effect of competency development on websites on learning effectiveness.*

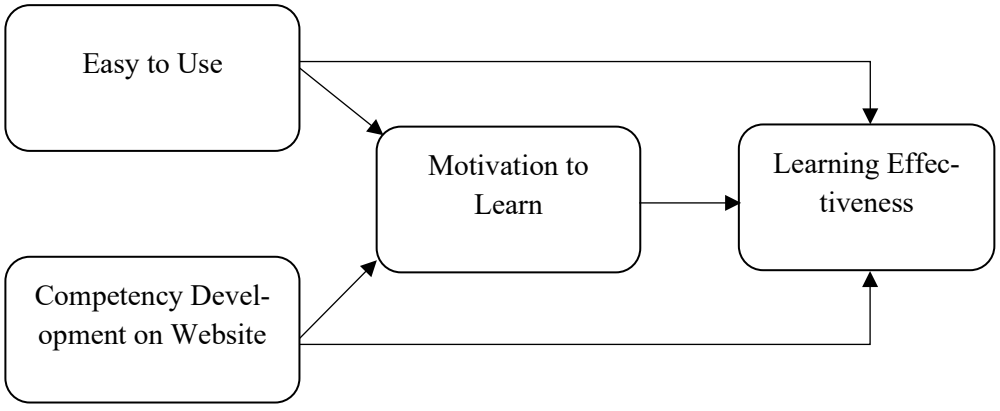

Fig. 1. Analysis Framework

3. Research Methods

This study employs a quantitative method with data collected through an online questionnaire. A 7-point Likert scale is used to measure respondents' perceptions of various research variables. The respondents are final-year students at Universitas PGRI Malang. Out of 300 distributed questionnaires, 226 were successfully collected. However, after review, 22 questionnaires were found to be incomplete. Therefore, the final sample size used in this study is 204 samples. The variables analyzed in this study include easy-to-use, competency development on the website, motivation to learn, and learning effectiveness. Indicators used to measure the variable easy-to-use include ease of navigation, clarity of instructions, and access speed on the digital platform. For the variable competency development on the website, indicators measured are content relevance and platform interactivity. The variable motivation to learn is assessed through indicators of student participation, frequency of platform use, and received feedback. Meanwhile, the variable learning effectiveness is measured using indicators of knowledge improvement, student satisfaction, and information retention. Furthermore, the obtained data are analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS software to test the relationships between variables and determine the model that best fits the collected data.

4. Results and Discussion

Data analysis in this study is conducted through several stages of testing. The first stage is outer loading testing, which aims to determine the relationship between latent variables and their indicators. This test ensures that the indicators used accurately reflect the latent variable constructs being measured. Next, reliability testing is performed to assess the consistency of the questionnaire, which serves as an indicator of the latent variables. Reliability testing ensures that the measurement instrument provides consistent results when used under similar conditions. Validity testing is conducted to evaluate whether the instrument is valid in measuring a research variable. This test is crucial to ensure that the indicators accurately measure the intended concept. Further, hypothesis

testing is carried out to examine the validity of the relationships between variables at the population level based on statistical data. This testing helps determine whether the hypothesized relationships between variables are supported by the collected data. Outer loading testing is an important part of Partial Least Squares Structural Equation Modeling (PLS-SEM) analysis using SmartPLS software. The factor loading values indicate the strength of the relationship or correlation between each indicator and the latent variable being measured. According to Ghozali (2016), a loading value greater than 0.7 is considered good. This value indicates that the indicator has a strong contribution to describing the measured latent variable. Conversely, indicators with low loading values suggest that they are less effective in measuring the latent variable. Therefore, indicators with loading values below 0.7 are often considered for removal or re-evaluation in the research model.

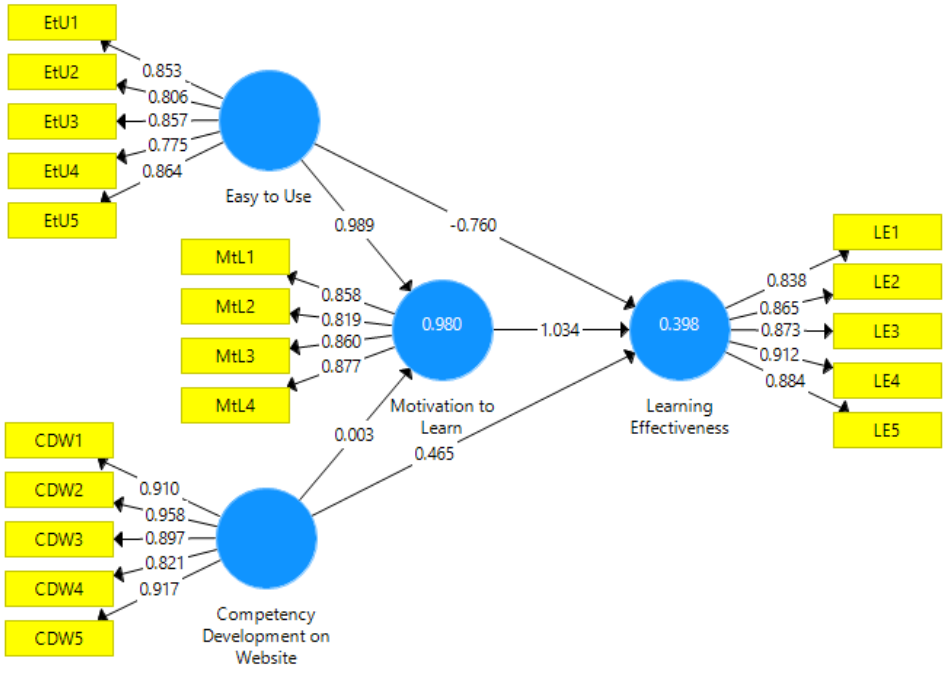

Fig. 2. Outer Model

Table 1
Standard Loading Factor

Variable	Outer Loading
Easy to Use:	
EtU1	0.853
EtU2	0.806
EtU3	0.857
EtU4	0.775
EtU5	0.864
Competency Development on Website:	
CDW1	0.910
CDW2	0.958
CDW3	0.897
CDW4	0.821
CDW5	0.917
Motivation to Learn:	
MtL1	0.858
MtL2	0.819
MtL3	0.860
MtL4	0.877
Learning Effectiveness:	
LE1	0.838
LE2	0.865
LE3	0.873
LE4	0.912
LE5	0.884

Based on the analysis results in Table 1, the outer loading values for each indicator show the strength of the relationship between these indicators and the measured latent variables. For the variable easy-to-use, all indicators have high factor loading values, with EtU1 (0.853), EtU2 (0.806), EtU3 (0.857), EtU4 (0.775), and EtU5 (0.864). These values indicate that each indicator has a strong correlation with the easy-to-use variable, exceeding the minimum threshold recommended by Ghozali (2016), which is >0.7. For the competency development on website variable, the indicators CDW1 (0.910), CDW2 (0.958), CDW3 (0.897), CDW4 (0.821), and CDW5 (0.917) also show very high factor loading values, all above 0.7. This indicates that these indicators have a very strong relationship with the competency development on website construct, making them highly effective in measuring competency development on the website. The motivation to learn variables shows factor loading values as follows: MtL1 (0.858), MtL2 (0.819), MtL3 (0.860), and MtL4 (0.877). All these values are also above the threshold of 0.7, indicating that these indicators have a strong and significant correlation with the motivation to learn variables, thus providing consistent measurement. For the learning effectiveness variable, the obtained outer factor values are LE1 (0.838), LE2 (0.865), LE3 (0.873), LE4 (0.912), and LE5 (0.884). All indicators show high factor loading values above 0.7, demonstrating that each indicator is strongly related to the learning effectiveness construct and effectively measures learning effectiveness. Thus, the results confirm that the constructs measured by each indicator in this research model are consistent and reliable. Reliability testing is a process used to measure the consistency and stability of measurement instruments in research. In reliability testing, two key indicators used to assess the reliability of instruments are Cronbach's Alpha and Composite Reliability. According to Sugiyono (2017), the minimum acceptable value for Cronbach's Alpha and Composite Reliability is 0.7. Values of Cronbach's Alpha and Composite Reliability above 0.7 indicate that the variables being studied have high reliability and that the measurement instrument is dependable. Consequently, the instrument can produce consistent results when used repeatedly under similar conditions, making it reliable for accurately measuring research variables.

Table 2
Reliability Testing

Variable	Cronbach's Alpha	Composite Reliability	Information
Easy to Use	0.889	0.918	Reliable
Competency Development on Website	0.942	0.956	Reliable
Motivation to Learn	0.876	0.915	Reliable
Learning Effectiveness	0.923	0.942	Reliable

The reliability testing results in Table 2 indicate that for the variable easy-to-use, the Cronbach's Alpha value is 0.889 and the Composite Reliability value is 0.918. These values exceed the minimum threshold of 0.7, indicating that the easy-to-use variable has high reliability and can be trusted. For the variable competency development on the website, the Cronbach's Alpha value is 0.942 and the Composite Reliability value is 0.956. These values are well above the minimum threshold of 0.7, indicating very high reliability. Therefore, the indicators for this variable provide very consistent and reliable results in measuring competency development on the website. The motivation to learn variable has a Cronbach's Alpha value of 0.876 and a Composite Reliability value of 0.915, also exceeding the minimum threshold of 0.7. This indicates that the instrument for the motivation to learn variables is reliable and provides stable and consistent measurements. Furthermore, learning effectiveness shows a Cronbach's Alpha value of 0.923 and a Composite Reliability value of 0.942. These values, which exceed the threshold, also indicate that the learning effectiveness variable is reliable. This shows that the instrument for this variable is dependable and provides consistent results in measuring learning effectiveness. In validity testing, the Average Variance Extracted (AVE) value is the primary indicator used to assess the validity of a variable. The AVE value measures the amount of variance captured by the latent variable from its indicators compared to the total variance. According to Ghozali (2016), an AVE value greater than 0.6 indicates adequate convergent validity. This means that the latent variable explains more than half of the variance of its indicators on average. In other words, an AVE value above 0.6 indicates that the indicators have high internal consistency in representing the construct or latent variable being measured.

Table 3
Validity Testing

Variable	Average Variance Extracted (AVE)	Information
Easy to Use	0.692	Valid
Competency Development on Website	0.814	Valid
Motivation to Learn	0.729	Valid
Learning Effectiveness	0.765	Valid

Based on Table 3, the validity testing results show that the easy-to-use variable has an AVE value of 0.692, which is above the 0.6 threshold. This indicates that the easy-to-use variable has adequate convergent validity, meaning that more than 69.2% of the variance of its indicators can be explained. The competency development on website variables has an AVE value of 0.814, which is well above the minimum threshold of 0.6. This indicates that the competency development on website variables has very good convergent validity, with more than 81.4% of the variance of its indicators explained by this construct. This suggests that the

indicators consistently and accurately reflect competency development on the website. The motivation to learn variables shows an AVE value of 0.729. With this value being higher than 0.6, the motivation to learn variables also demonstrates adequate convergent validity. This means that 72.9% of the variance of its indicators can be explained by this latent variable, indicating good consistency in measuring motivation to learn. The learning effectiveness variable has an AVE value of 0.765. This value indicates that the variable has a relatively high convergent validity, as more than 76.5% of the variance of its indicators is explained by this construct. This suggests that the indicators are effective in depicting learning effectiveness. In hypothesis testing, the key indicators used to assess the significance of the relationships between variables are the T statistic and P value. A T statistic value greater than 1.96 indicates that the relationship between variables is significant at the 95% confidence level, thus the hypothesis can be accepted. Additionally, the significance of the relationship between variables can also be proven through the P value. A P value less than 0.05 indicates that the relationship between variables is statistically significant. Therefore, with a P value smaller than 0.05, the hypotheses proposed in this study can be accepted, as there is strong statistical evidence supporting significant relationships between the variables tested.

Table 4
Hypothesis Testing

Hypothesis	T Statistics	P Values
Easy to Use → Motivation to Learn	248.151	0.000
Easy to Use → Learning Effectiveness	1.862	0.063
Competency Development on Website → Motivation to Learn	0.272	0.786
Competency Development on Website → Learning Effectiveness	5.594	0.000
Motivation to Learn → Learning Effectiveness	2.598	0.010
Easy to Use → Motivation to Learn → Learning Effectiveness	2.586	0.010
Competency Development on Website → Motivation to Learn → Learning Effectiveness	0.252	0.801

Based on Table 4 in hypothesis testing, the analysis results show that in the first hypothesis testing the effect of easy-to-use on motivation to learn, the T Statistic value for this relationship is 248.151, and the P Value is 0.000. The T Statistic value, which is much greater than 1.96, and the P Value, which is less than 0.05, indicate that the relationship between easy-to-use and motivation to learn is significant. Therefore, this hypothesis is accepted, suggesting that ease of use has a significant impact on learning motivation. The second hypothesis, which examines the effect of easy-to-use on learning effectiveness, has a T Statistic value of 1.862 and a P Value of 0.063. This indicates that the relationship is not significant at the 95% confidence level. Thus, the second hypothesis is not accepted. The third hypothesis, which tests the effect of competency development on the website on motivation to learn, has a T Statistic value of 0.272 and a P Value of 0.786. This shows that the relationship between competency development on the website and motivation to learn is not significant. Therefore, the third hypothesis is not accepted, indicating that competency development on the website does not have a significant effect on learning motivation. The fourth hypothesis, which tests the effect of competency development on the website on learning effectiveness, has a T Statistic value of 5.594 and a P Value of 0.000. This means that the relationship between competency development on the website and learning effectiveness is significant, so the fourth hypothesis is accepted, indicating that competency development on the website has a significant effect on learning effectiveness.

In the fifth hypothesis, which examines the effect of motivation to learn on learning effectiveness, the T Statistic value for this relationship is 2.598, and the P Value is 0.010, which indicates that the relationship between motivation to learn and learning effectiveness is significant. Therefore, this hypothesis is accepted, showing that learning motivation has a significant impact on learning effectiveness. For the sixth hypothesis, which uses a mediation variable, the variable motivation to learn mediates the relationship between easy-to-use and learning effectiveness, showing a T Statistic value of 2.586 and a P Value of 0.010. The T Statistic value is greater than 1.96 and the P Value is less than 0.05, indicating that this mediation is significant. Thus, this hypothesis is accepted, meaning that motivation to learn acts as a significant mediator in the relationship between easy-to-use and learning effectiveness. This indicates that the ease of use of technology not only directly affects learning effectiveness but also through the enhancement of learners' motivation. For the seventh hypothesis, the role of mediation of motivation to learn in the relationship between competency development on the website and learning effectiveness shows a T Statistic value of 0.252 and a P Value of 0.801. The T Statistic value is far below 1.96 and the P Value is well above 0.05, indicating that this mediation is not significant. Thus, it shows that competency development on the website directly affects learning effectiveness without passing through an increase in learning motivation.

5. Conclusion

The research results indicate that the variable of easy-to-use has a significant effect on motivation to learn. This emphasizes that the easier a technology or digital learning platform is to use, the higher the learners' motivation. Although easy-to-use has a significant effect on motivation to learn, this variable does not show a significant direct effect on learning effectiveness. This means that the ease of using educational technology alone is not sufficient to directly improve learning effectiveness. The study found that competency development on the website does not have a significant effect on motivation to learn. This implies that

competency development through a website does not necessarily increase learners' motivation. On the other hand, competency development on the website has a significant effect on learning effectiveness. This suggests that the competency development provided by the website can directly enhance learning effectiveness without needing to affect motivation to learn. Furthermore, motivation to learn was found to have a significant effect on learning effectiveness. This indicates that high motivation to learn positively contributes to improved learning effectiveness. Additionally, motivation to learn significantly mediates the relationship between easy-to-use and learning effectiveness, showing that the ease of using educational technology improves learning effectiveness through increasing learners' motivation. However, motivation to learn does not mediate the relationship between competency development on the website and learning effectiveness. This means that competency development through the website contributes directly to learning effectiveness without needing to increase motivation to learn. The study concludes that the ease of using digital learning technology plays a crucial role in enhancing learning motivation, which in turn can improve learning effectiveness. Meanwhile, competency development provided by the website has a direct impact on learning effectiveness without needing to increase learning motivation. Therefore, to improve learning effectiveness, digital learning platforms should be designed to be user-friendly and also focus on relevant competency development. The findings imply that digital learning platforms should be designed to be easy-to-use to enhance student motivation, as ease of use affects motivation, which impacts learning effectiveness. Moreover, learning content should be relevant and interactive to boost engagement and understanding. Strategies such as gamification and constructive feedback should also be applied to maintain and enhance learning motivation. Continuous evaluation based on user feedback and personalized learning approaches can further improve effectiveness and learning outcomes.

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