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The Causal Linkage Between Perceived E-Learning Usefulness and Student Learning Performance: An Empirical Study from Vietnam

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Abstract

The current study adds to the body of knowledge about the mediation in the causal link between students' perceptions of the utility of eLearning and their learning performance. The data was collected from 500 questionnaires that were delivered to the students at the Vietnam National University of Ho Chi Minh City. Only 422 finished questionnaires were usable for analyses, indicating a responding rate of 84.4%. Multiple regressions were used to investigate causal correlations, whereas Goodman's (1960) techniques were used to investigate mediating relationships. The major findings reveal that both the utility and adoption of eLearning have an impact on students' learning performance, with usefulness being a crucial determinant of eLearning adoption for study. More meaningfully, statistical evidence on the mediation of adopting eLearning for study in the causal linkage from the usefulness of eLearning perceived by students to their learning performance was provided. The relevance of using eLearning for study is stressed in this study, where it is not only one of the key antecedents of their learning performance, but also acts as a mediator between the usefulness of eLearning and learning performance in the research model.

Keywords: Adoption of eLearning, Mediation, Perceived Usefulness, Performance, TAM

JEL Classification Code: C10, C51, I129, P17

1. Motivation

As stated in a study by Richard and Haya (2009), the information on technology and network has been gradually reflected as one of the most important tools to provide students with research resources to attain knowledge. The system of traditional training has been steadily changed into a new one, acknowledged as eLearning, which is applied to facilitate training methods by applying procedures created from the information of technology and network. Recently, eLearning has become an important practice, broadly chosen by educational establishments in the world (Salloum et al., 2019). eLearning makes teachers shape the educational perception. On the contrary, it also allows students to acquire knowledge through discussion. This could cultivate thinking skills for them. Consequently, various benefits have been established as a result of the adoption of eLearning. Numerous educational institutions have adopted eLearning to provide students with distance training programs. The distance learning and teaching system is a practice to provide training and instructions to students who cannot attend traditional face-to-face classes owing to difficulties in geographical remoteness. The adoption of eLearning in learning and training is regarded as a beneficial factor to the training of lecturers and the learning of learners, where they needn't meet in person to discuss lectures. These interests in the industrialized nations can be more prolonged as a result of the physical infrastructure that has been better and better developed. Nevertheless, the eLearning infrastructure in emerging nations has been partly and ineffectively accepted, the application of which is not accomplished and is regarded to be less than the reasonable threshold (Tarhini et al., 2017). These arguments reflect a shortage of comprehensive understanding of the antecedents and consequences of eLearning in emerging nations (Salloum et al., 2019).

As confirmed by Davis (1986), perceived usefulness is the personal view of consumers in which they consider that applying some technologies could advance their

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working efficiency. Additionally, perceived usefulness is one of the vital factors in the technology implementation model. Perceived usefulness is also deemed as an important determinant of adopting a specific technological tool for the user's job or life (Salloum et al., 2019). Those arguments lead to a suggestion that perceived usefulness could be an antecedent to accepting eLearning among users. In the educational and training setting, the usefulness of eLearning perceived by students could enable them to accept eLearning in their learning; however, the adoption of eLearning in the study may lead to their good studying performance (Franklin & Nahari, 2018; Harwell & Jackson, 2021; Hartshorne, & Ajjan, 2009). Furthermore, the research results of Jawad and Shalash (2020) indicated that the adoption of eLearning in higher educational institutes is one of the important factors in enhancing students' learning performance; however, it may be decided by the perceived usefulness of eLearning for study.

Consequently, the adoption of eLearning for study can be a mediator in the link between the usefulness of eLearning perceived by students and their learning performance (Baron & Kenny, 1986). However, to the best of my knowledge, no research projects on eLearning have analyzed the intermediation of adopting eLearning for study in the association between students' perception of the usefulness of eLearning and their learning performance. The current research tries to analyze the intervention of adopting eLearning for training in the linkage between students' perception of the usefulness of eLearning and their learning performance. The techniques advocated by Goodman (1960) were applied to test the statistical significance of the interceding link. The current work will be structured as follows. Next, the development of research hypotheses is presented in the literature review. Then, the procedures used to gather and analyze the research data are discussed in the research design. Afterward, the empirical findings are discussed in the research result. In conclusion, some summaries are provided in the conclusion.

2. Literature Review

To Bhuasiri et al. (2012), eLearning has been becoming one of the factors making success in training establishments because it improves the quality of education. The adoption of eLearning in training establishments has become an interesting topic for scholars and educational administrators owing to the vital role of eLearning in simplifying training processes. The way of adopting eLearning is similar to that of the new technology adoption, as Davis (1986) presented in the technology acceptance model (TAM) where a significant determinant of adopting a new technology, which is perceived usefulness, is investigated. According to Cheong and Park (2005), perceived usefulness is regarded as the degree to that a user believes adopting a specific means can improve their effectiveness (Cheong & Park, 2005). Grounded on TAM recommended by Davis (1986), it could suggest that, the perceived usefulness of eLearning in training is one of the important antecedents to the adoption of eLearning in training, which alternatively leads to student learning performance (Hwang et al., 2019). Furthermore, Baron and Kenny (1986) recommended the aforementioned relationships could result in interventions in the research model. Specifically, it may propose that the adoption of eLearning in training can intervene in the linkage between the perceived usefulness of eLearning and students' learning performance. These relationships will be analyzed and clarified below.

2.1. Perceived Usefulness of E-Learning

Davis (1986) asserted a user's perception of the usefulness of a new technology practice as one of the vital antecedents of adopting this practice for their job or life. The causal linkage between the perceived usefulness to the adoption of a new technology practice is established in a research project by Igbaria et al. (1997). Furthermore, Abbad et al. (2009) emphasize that students who perceive eLearning as useful for their study probably adopt it for training. Similarly, Al-alak and Alnawas (2011) also determined that perceived usefulness is one of the decisive factors in adopting eLearning. In addition, the perceived usefulness of eLearning is also considered an important determinant of a technology-oriented training method (Chen, 2011) and leads to the behavior intention (Kimathi & Zhang, 2019; Doan, 2021), which results in the eLearning using the behavior of users (Marlina et al., 2021). According to Salloum et al. (2019), when students perceive eLearning as a method to enhance their learning performance, they can adopt this system for study. A significant causal link between the perceived usefulness of eLearning to learners' intention to adopt the eLearning method is discovered. Moreover, there exists strong statistical support for the causal association from the perceived usefulness of eLearning to the favorable attitude towards the use that results in the actual adoption of the eLearning method.

Baber (2021) examined the technology acceptance model (perceived usefulness) on the behavioral intention of students to adopt the eLearning system. The empirical outcomes show the perceived usefulness of eLearning positively affects students' behavioral intention to adopt the eLearning method. Mohammadi (2015) described perceived usefulness as a major antecedent of behavioral intention that motivates the users to adopt a new and user-friendly tool and has an affirmative effect on actual adoption (Botero et al., 2018). The empirical findings by Prasetyo et al. (2021) discovered the perceived usefulness of eLearning has an effect on students' behavioral intentions that could result

in the actual adoption of eLearning by them. A person's behavioral intention to adopt new methods is positively determined by the perceived usefulness of these practices (Chang et al., 2017); nonetheless, it is in the eLearning setting a driving force for the actual adoption of eLearning by learners (Sukendro et al., 2020; Budu et al., 2018; Li, 2011). Additionally, Weerathunga et al. (2021) affirm the perceived usefulness of eLearning is one of the important factors that explain students' behavioral intention to adopt eLearning. Though students' behavioral intention to adopt eLearning for the study is supposed as the foremost determinant of their actual usage of eLearning, it has been repetitively considered less imperative to the actual usage. The behavioral intention can explain only about 50% of the actual use of eLearning. In regard to social media, Lee et al. (2016) contended that the use of social media is an imperative determinant explaining behavioral intention to adopt social media. They found that the use of social media has a positive directional influence on the path diagram. The abovementioned discussions can lead to the hypothesis that is:

H1: *Students' perceived usefulness of eLearning can positively influence their actual adoption of eLearning for training.*

2.2. E-Learning on Learning Performance

The usage of eLearning for training stimulates efficient engagement of the students, improvement in training, and authorization of the students to manage their training schedule; which facilitates interactions between students and materials, and students and instructors by using animation, image, and sound together in the training process (Eslamian & Khademi, 2017). The effect of eLearning is evaluated based on whether learners can acquire what is conveyed to them. According to Rosenberg (2005), the adoption of eLearning may lessen learners' ability to gain what is conveyed, because of clear differences between the methods of traditional face-to-face and eLearning. Therefore, the method of eLearning could have a negative influence on students' learning performance (Johnson, 2005). In contrast, Cavanaugh (2001) stressed the method of online training and the approach of traditional face-to-face training are comparable. This scholar argued the method of eLearning can positively affect learners' learning performance, which will encourage them to enroll in online training courses. Additionally, students who take online education services can attain better learning performance compared with the training programs of face-to-face (Franklin & Nahari, 2018; Park & Lee, 2021). They also investigated the effect of eLearning on learning performance and disclosed the adoption of eLearning for training has positive effects on the learning performance of instructors and learners.

Sibanda and Donnelly (2014) highlight a positive causal linkage from the adoption of eLearning to the engagement of learners that leads to their desired learning performance. They also established the influence of introducing online programs on learners' learning performance. The empirical findings demonstrate no marked changes in learning performance where the method of eLearning was delivered. Nevertheless, enhancements in the delivery and dispersal of the grades were found. Students from Africa were the most badly affected due to the delivery of online training programs; whereas students from India enjoyed the most benefit from adopting eLearning practices. Mothibi (2015) evaluated the causal link between the adoption of eLearning and students' learning performance in educational organizations. The researchers point out a significant positive effect of eLearning on apprentices' overall learning performance.

From Fatima and Jabeen (2021), the adoption of eLearning can augment users' ability to undertake tasks more quickly with speed and exactness in training. This changes the role of instructors and students, facilitates training, and results in interaction during training, which improves self-sufficiency and self-confidence among learners. Al-Qahtani and Higgins (2013) explore the influence of eLearning on learners' learning performance. They evaluated learners' performance using two different groups. The empirical findings revealed a statistical difference in learning performance among different methods of training including eLearning.

Educators adopt eLearning not only to convey knowledge but also to offer motivation for learners and to develop their knowledge and emotive aspects. The system of eLearning should be completely grasped by instructors, so that information is likely well conveyed to learners noticeably and efficiently (Tuna et al., 2018). Therefore, the adoption of eLearning for training could allow instructors and learners to accomplish efficient training objectives (Hakim et al., 2019). Additionally, the previous findings discovered the adoption of eLearning for training can improve learners' concentration and incentive (Sugiyanta & Sukardjo, 2018), and learning performance (Hwang et al., 2019; Hoerunnisa et al., 2019). Overall, it can hypothesize that:

H2: *Students' adoption of eLearning for training can make their learning perform better.*

2.3. Perceived Usefulness on Learning Performance

According to Kumar and Bajpai (2015), learners' perception of the usefulness of eLearning determines their inspiration, which is important to their adoption of eLearning for training. Consequently, the adoption of eLearning is deemed as one of the most vital factors in learners' learning performance. Nugroho at el. (2018) addressed the matter

associated with the effect of learners' perceived usefulness of eLearning on their learning performance when an eLearning method is compulsorily applied and discover learners' perception of the usefulness of eLearning improves their learning performance.

Pham and Tran (2018) argued the practices of eLearning have been becoming imperative for training establishments to enhance the quality of training and to provide learners the resources of valuable and great learning. Nevertheless, to encourage learners to adopt eLearning for training and to improve students' learning performance via the practice of eLearning, the usefulness of eLearning to users should be taken into account. The empirical results suggest that to enhance learners' learning performance, it needs to augment the usefulness of eLearning practices. Omar et al. (2019) affirmed users' perception of the usefulness of eLearning is a vital antecedent of their behavioral intention to adopt this system. The extent to which a user has convinced the adoption of a specific practice of eLearning likely improves their working performance. Therefore, the adoption of that practice will enable them to increase their working performance. The evaluation of the usefulness of the practice perceived by users is also considerably improved. That is, users or learners can become familiar with the practice of eLearning which will consequently remain to increase their working performance as well.

Kassim et al. (2020) indicate that users' perception of the usefulness of technology is utilized to measure their adoption level of technology, referred to as a situation in which a user considers the usage of a specific practice will augment their working performance. Consequently, it is one of the important determinants leading to good working performance. The empirical results of that research show that users' perception of the usefulness is statistically significant toward working performance. Zhu et al. (2009) recommended a causal linkage between the usefulness of management accounting systems and organizational performance and indicate the higher the users' perception of the usefulness of management accounting systems information, the better their organizational performance can obtain.

Soudani (2012) examined users' perceptions of the usefulness of accounting information systems for operative organizational performance. They evaluate the usefulness of accounting information systems on financial performance such as economic and financial effectiveness and found the positive effect of the usefulness of accounting information systems on economic and financial effectiveness. From Iswanto (2021), users' perception of the usefulness of Whatsapp is one of the explanatory factors on users' engagement that results in their working performance. It then can hypothesize that:

H3: *Students' perception of the usefulness of eLearning for training can augment their learning performance*.

2.4. Mediation

As above mentioned; students' perception of the usefulness of eLearning could lead to their adoption of eLearning for study (H1); which is conjectured an effect on the students learning performance (H2). In addition, the usefulness of eLearning perceived by students is deemed as one of the important factors resulting in better learning performance for their study (H3).

It is based on the mediating hypothesis of the discussions by Baron and Kenny (1986), where if the predicting variable imposes statistically impacts on an intermediate variable and also on the predicted variable and at the same time the intermediate variable has a statistically significant unique impact on the predicted variable, it can be postulated that the intermediate variable may mediate the connection between the predicting variable and the predicted variable. Additionally, Spencer (2011) pointed out that when there is a link between two variables at least partly through an intermediate variable, the intermediate variable can be suggested to mediate the relationship between those two variables. Grounded on H1, H2, and H3 as well as on the arguments by Baron and Kenny (1986) and Spencer (2011), we can establish the following intermediating hypothesis:

H4: *The adoption of eLearning may mediate the relationship between students' perception of the usefulness of eLearning for training and their learning performance.*

3. Research Design

The abovementioned four hypotheses have been developed and are statistically checked. Then, the research design is applied to measure the research variables, instruct the research data collection and present the statistical analyses.

3.1. Research Variables

Adoption of eLearning is calculated based on the four components, which are (ADE1) - I intend to use eLearning as much as possible for my study, (ADE2) - I intend to use online instruction to assist my study, and (ADE3) - I intend to recommend the eLearning system to others, (ADE4) - I intend to use eLearning to assist my study (Okazaki & Renda dos Santos, 2012). A five-point scale is applied to compute the items.

Usefulness of eLearning is based on the four items. They are (USE1) – My productivity is elevated through the use of eLearning in my study, (USE2) – ELearning practices

augment my learning performance, (USE3) – I find the eLearning practice to be useful in my learning, and (USE4) - Using eLearning practices improve my learning efficiency (Salloum et al., 2019). A five-point scale is applied to compute the items.

Performance of learning is measured on the six dimensions, which are (PEL1) - The online classes have sharpened my analytic skills, (PEL2) - An online class tries to get the best out of all its students, (PEL3) - This course has helped me develop the ability to plan my own work, (PEL4) - Online classes has encouraged me to develop my academic interests as far as possible, (PEL5) - Online classes have improved my written communication skills, and (PEL6) - As a result of doing online classes, one feels more confident about tackling unfamiliar problems (Gopal et al., 2021). A five-point scale is applied to compute the items.

3.2. Data Collection

The research sample was undertaken at the beginning of 2022 by allocating self-administered surveys among the students in the Vietnam National University of Ho Chi Minh City, which is one of the biggest universities in Vietnam. Overall, 500 questionnaires were delivered to the students. However, 78 questionnaires become unusable because of insufficient information. Therefore, only 422 finished questionnaires delivered adequate information for analyses, indicating a responding rate of 84.4%. The research sample of 422 satisfies the sampling threshold for quantitative analyses (Hair et al., 2012). The personal data of the respondents are presented in Table 1. The proportion of males was 52.37%; whereas only 47.63% were female. The proportion of under 25 was 56.40%; while that of above 55 was only 0.47%. The proportion of 25 to under 35 was 32.46%; whereas 9.00% of the respondents were aged from 35 to under 45, and 1.66% of the respondents were aged from 45 to under 55.

3.3. Statistical Analyses

This research work applied multiple regression to investigate the causal relationships; whereas it employed Goodman's (1960) procedures to analyze the mediating linkage. Before testing the research hypotheses in the research model, this research tried to evaluate convergent and discriminant validity. Different items need to be taken into account by assessing the convergent validity. Drawing on Salloum et al. (2019), the convergent indicators comprise factor loading, Chronbach's α, construct reliability (CR), and average variance extracted (AVE). The factor loadings, Chronbach's αs, and CRs had better surpass the 0.7 value, while the AVEs are supposed to exceed the 0.5 thresholds. Differences across factors need to take into account by evaluating the discriminant validity. Based on Salloum et al. (2019), the discriminant measures encompass the Fornell-Larcker analyses, cross-loadings, and Heterotrait-Monotrait analyses. The Fornell-Larcker ratio in every measure ought to exceed the correlation of latent measures. The loading of every construct should exceed that of its equivalent factor. The Heterotrait-Monotrait ratios should be below the 0.85 level.

Table 1: Respondents' Personal Profile

Characteristics		Frequence	Proportion %
Gender	Male	221	52.37%
	Female	201	47.63%
∑		**422**	100.00%
Age	under 25	238	56.40%
	25 to under 35	137	32.46%
	35 to under 45	38	9.00%
	45 to under 55	7	1.66%
	Above 55	2	0.47%
∑		**422**	100.00%
Education	Bachelor	280	66.35%
	Master	121	28.67%
	Docterate	21	4.98%
∑		**422**	100.00%

4. Research Results

To explore the convergent and discriminant validity of the data, this research performed the procedures stipulated by Salloum et al. (2019). The findings are exhibited in Tables 2, 3, 4 & 5. The results of the convergent assessment are demonstrated in Table 2. It indicates that all the factor loadings, Chronbach's αs, and CRs are above the recommended 0.7 level. Moreover, it was also demonstrated that the AVEs are the recommended 0.5 value. These figures confirm the convergent validity of the data. As Table 3 shows, the square root of AVE (diagonal value) in every factor in the correlation matrix is larger than the correlation of latent factors that is fulfilled by this research. The loading of every dimension is greater than that of its equivalent factor as Table 4 illustrates. Therefore, this criterion is satisfied. Additionally, the Heterotrait-Monotrait ratios are all smaller than the 0.85 value as shown in Table 5, which confirms this criterion.

Subsequently, multiple regression analyses were undertaken to examine the causal linkages in the research model. The results are displayed in Table 6. In Model 1,

Table 2: Convergent Analyses

Factor	Dimension	Loading	Cronbach's α	CR	AVE
USE	USE1	**0.736**	0.877	0.894	0.681
	USE2	**0.838**			
	USE3	**0.881**			
	USE4	**0.837**			
ADE	ADE1	**0.803**	0.878	0.914	0.726
	ADE2	**0.856**			
	ADE3	**0.868**			
	ADE4	**0.879**			
PEL	PEL1	**0.834**	0.889	0.919	0.551
	PEL2	**0.846**			
	PEL3	**0.768**			
	PEL4	**0.799**			
	PEL5	**0.711**			
	PEL6	**0.892**			

Table 3: Fornell-Larcker (Square Root of AVE) Analyses

	USE	ADE	PEL
USE	0.**824**		
ADE	0.245	0.**852**	
PEL	0.489	0.244	**0.742**

Table 4: Cross-Loading Analyses

	USE	ADE	PEL
USE1	**0.736**	0.175	0.231
USE2	**0.838**	0.050	0.217
USE3	**0.881**	0.066	0.180
USE4	**0.837**	0.101	0.228
ADE1	0.162	**0.803**	0.047
ADE2	0.099	**0.856**	0.170
ADE3	0.054	**0.868**	0.021
ADE4	0.047	**0.879**	0.149
PEL1	0.109	0.110	**0.834**
PEL2	0.124	0.165	**0.846**
PEL3	0.194	0.035	**0.768**
PEL4	0.228	0.168	**0.799**
PEL5	0.167	–0.007	**0.711**
PEL6	0.374	0.080	**0.892**

Table 5: Heterotrait-Monotrait Analyses

	USE	ADE	PEL
USE			
ADE	0.208		
PEL	0.459	0.224	

the F of the model reaches the 26.790 value with P_F less than 1%; and R^2 indicates that the usefulness of eLearning explains 24.5% of the variance in the adoption of eLearning (F = 26.790; P_F = 0.000; R^2 = 0.245), which demonstrates the goodness of fit for Model 1. The usefulness of eLearning perceived by students positively affects their adoption of eLearning for their study at the 1% statistical significance with the influential coefficient of 0.220 (β = 0.220; t = 5.176; P_t = 0.000), which provides statistical support for H1: "Students' perceived usefulness of eLearning can positively influence their actual adoption of eLearning for training". In Model 2, the F of the model obtains the 71.968 level at the 1% statistical significance; and R^2 shows that the adoption and usefulness of eLearning jointly explain 50.6% of the variance in learning performance (F = 71.968; P_F = 0.000; R^2 = 0.506), indicating the goodness of fit for Model 2. Both the adoption and usefulness of e-learning improve students' learning performance at a 1% statistical significance with the coefficients of 0.171 and 0.364 respectively (β = 0.117 & 0.364; t = 3.033 & 10.511; P_t = 0.003 & 0.000), statistically supporting H2 and H3: "Students' adoption of eLearning for training can make their learning performance better" and "Students' perception of the usefulness of eLearning for training can augment their learning performance".

To investigate the mediating relationship, the current research first explored the causal linkage between the usefulness of eLearning perceived by students in their learning performance. Then, the adoption of eLearning was included in the research model and examine changes in the causal linkage. In the beginning, the influential coefficient of the causal linkage is 0.390 with $t_{\text{statisctics}}$ of 11.496 (untabulated); however, the inclusion of the adoption of eLearning makes the causal linkage reduce to the 0.364 with $t_{\text{statisctics}}$ of 10.511; which suggests the adoption of eLearning can play a mediating role in the research model. Goodman's (1960) practices were utilized to investigate the statistical significance of the mediation, which produced the results in Table 7. It discloses that the adoption of eLearning for study mediates the causal association from the usefulness of eLearning perceived by students to their learning performance at the 1% statistical significance with the

Table 6: Regression Analyses

Model	Dependent Variable	Independent Variable	β	S.E.	t	P_t	R^2	F	P_F
1	ADE	C	2.287	0.171	16.331	0.000	0.245	26.790	0.000
		USE	0.220	0.042	5.176	0.000			
2	PEL	C	1.890	0.173	10.948	0.000	0.506	71.968	0.000
		ADE	0.117	0.039	3.033	0.003			
		USE	0.364	0.035	10.511	0.000			

Table 7: Mediating Analyses

Mediator	Causal linkage	$t_{indirect}$	P_t
ADE	USE $\rightarrow$ PEL	2.639	0.008

$t_{statistics}$ of 2.639 ($t_{indirect}$ = 2.639; P_t = 0.008), in support for H4: "The adoption of eLearning may mediate the relationship between students' perception of the usefulness of eLearning for training and their learning performance". The correlation between the usefulness of eLearning perceived by students to their learning performance likely decreases if the adoption of eLearning for the study is taken into the model. Consequently, when investigating the causal linkage between the perceived usefulness of eLearning and eLearning performance, the mediation of the adoption of eLearning should be taken into consideration.

5. Conclusion

The current study seeks to discover the interactions between the usefulness of eLearning, the adoption of eLearning for study, and learning performance. Importantly, it highlights the mediation of the adoption of eLearning. The empirical findings unveil that both the usefulness and adoption of eLearning affect learning performance; whereas the usefulness is an important determinant of adopting eLearning for study.

More significantly, the results provide statistical evidence on the mediation of adopting eLearning for study in the causal linkage from the usefulness of eLearning perceived by students to their learning performance. The importance of adopting eLearning for study is highlighted in this research, where it is not only one of the vital antecedents of their learning performance, but is also a mediator in the research model between the usefulness of eLearning and learning performance. The findings make some contributions.

The current research is one of the first to deliver statistical evidence on the intervention of the adoption of eLearning between the usefulness of eLearning and learning performance. It is helpful to school managers because it provides them with insight into the multifaceted linkages between the usefulness of eLearning, and the adoption of eLearning for study and learning performance. Consequently, the school managers can make better decisions on designing good education programs using eLearning so that they can improve their students' learning performance.

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