

The Collaborative Effort and Efficiency of Inquiry-Based Learning: Effect on the Teacher Performance – The Role of Student Performance

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ABSTRACT

This study investigates the effect on the teacher's performance of collaborative effort and efficiency of inquiry-based learning. It also determines the impact of the mediating role of student performance. The research framework was constructed based on the unified technology acceptance and use of technology theory. A quantitative analysis was done with surveys to collect primary data from the teacher and lecturers of Malaysia. The researcher used a Likert scale of 7 to evaluate elements of the building. This study focuses on the top 10 public university students in Malaysia. The universities are University Malaya (UM), University Kebangsaan Malaysia, University Putra Malaysia (UPM), University Sains Malaysia (USM), University Teknologi Malaysia (UTM), Universiti Utara Malaysia (UUM), International Islamic University Malaysia (IIUM), University Teknologi Mara (UiTM), University Malaysia Perlis (UniMap), and University Tun Hussein Rongg (UTHM). Finally, researchers selected the total number of students, 368,881, which is the population of this study. Using systematic random sampling with an interval, researchers sent students an electronic link to respond to a Google Doc questionnaire. This is a unique study in the field of teacher performance that used a diverse and necessary variable known as teaching pedagogy. Therefore, it uniquely integrates leading pedagogy variables into teacher performance. The result of this study helps to meet the education qualification requirement (EQR), and the newly acquired knowledge from this study may help spur the development of the education sector. In addition, it may provide an extensive understanding of making government policies for educational institutions.

KEYWORDS

Collaborative Effort, Efficiency of Inquiry-Based Learning, Student Performance, Teachers' Performance

INTRODUCTION

Student activeness is a significant factor in teacher performance (Moybeka et al., 2023). Research

DOI: 10.4018/IJOPCD.323569

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explained that more proactive students have critical questions and need more examples and discussion during the lecture (Lee, et al., 2023; Saqr et al., 2023). Likewise, another study revealed that quality students asked logical questions and preferred various instances to their study to understand the topic leading the course to learn more about it (Jia et al., 2023). Research indicates that only regular and quality students have the most difficult questions during lessons (Antonietti et al., 2023). To clarify the query, the lecturer needs solid ground for a topic, or the subject, which is a teacher's or lecturer's continuous improvement (Howard, 2023; Sandberg & Fröjdendahl, 2023). A finding mentions that only poor and average students need an extension of assignments and have fewer questions leading to less progress in a lecture or teacher (Sloan et al., 2020). Although, teacher performance is directly impacted by students' critical queries and their expectations (Rusticus et al., 2023). Student success gains are favourably associated with teaching experience throughout a teacher's career (Reeves et al., 2022).

Although the aforementioned studies contributed significantly to developing and improving teacher's performance, a few factors are not yet incorporated (Tseng et al., 2022). One of the factors is a collaborative effort that reveals the fundamentals of doing things united by a student. This applies to the student's collaboration, hardship, and dedication to their education. These are key roles of students and needful action for success in life; therefore, they are imperative as variables in this study.

The efficiency of inquiry-based learning is not defined as the teaching technique process (Abdul et al., 2023). It enhances understanding by monitoring students' study, daily education activity, and education tasks; moreover, assignment inquiry has not been studied in teaching pedagogy and teacher performance (Siantuba et al., 2023). Student performance defines the teacher's performance, and this considers the fact that student performance as a mediator has not been identified yet (Glover et al., 2023). Student performance reflects the collaboration activity related to teachers' daily education; the collaborative effect and student performance combination construct a strong correlation between learning and the development of interpersonal skills, thinking beyond the shell, and bright ideas that a teacher leads. Moreover, inquiry-based learning and student performances are on a parallel measurement scale that defines the teachers' achievements during their teaching activities during class and has not been covered in teacher performance (Cai & Yang, 2023). Therefore, this study constructs the research questions and objectives based on the identified problem.

Research Questions

For this study we used the following research questions:

1. How does collaborative effort influence student performance in the academic industries globally?
2. How does the efficiency of inquiry-based learning influence student performance in the academic industries globally?
3. How does student performance influence teachers' performance in the academic industries globally?
4. How does student performance mediate the relationship between the collaborative effect, efficiency of inquiry-based learning, and teacher performance?

Research Objectives

In this study we focused on the following research objectives:

1. To find out how the collaborative effort influences student performance in the academic industries globally.
2. To determine how the efficiency of inquiry-based learning influences student performance in the academic industries globally.
3. To find out how the student performance influences teachers' performance in the academic industries globally.
4. To determine the effect of student performance mediation on the collaborative effect, efficiency of inquiry-based learning, and teacher performance.

LITERATURE REVIEW

Namaziandost et al. (2023) disclosed three factors in line with teachers' performance: reflective teaching (RT), emotion regulation (ER), and immunity. In addition to these factors, teacher attitude and quality supervision also affect teacher performance (Hidayat & Zaini, 2018). Other studies revealed several constructs: safety and protection, culture, incentive, personalities, motivation (Costello & Lambert, 2019), leadership, and tools and media (Mashari & Umami, 2019). Likewise, Hartinah et al. (2020) elaborates on behavior, motivation level (Costello & Lambert, 2019), attitude, professional development, and responsibility correlated with teacher performance. Additionally, community participation, political context, principal leadership, school effectiveness, and student achievement influence teacher performance (Ulfatin et al., 2022). Muliati et al. (2022) used transformational leadership, competency, and self-efficacy as a variable to measure teacher performance. Sudibjo and Riantini (2023) used servant leadership, work engagement, and extra-role behavior to measure teachers' performance.

The efficiency of inquiry-based learning is defined as the teaching technique process (Muniandy & Abdullah, 2023). It enhances learning by monitoring their study, daily education activity, education tasks, and assignment inquiry (Brittz et al., 2023). It describes the teacher's efficiency and effectiveness, the ability to teach, the adaption of situations, and expertise and skill to the gain the student performance. Student performance is another variable that reflects student learning outcomes (Alharbi, 2022). It shows the amount of learning students achieved during a specific time and their overall development and measurable scale during the teaching (Costello & Lambert, 2019). Student performance defines the teacher's performance, and this study considers the fact that student performance as a mediator has not been identified yet. It reflects the collaboration activity related to teachers' daily education (Costa et al., 2019); the collaborative effect and student performance combination construct a strong correlation between learning and the development of interpersonal skills, thinking beyond the shell, and bright ideas that a teacher leads (Brittz et al., 2023). Moreover, inquiry-based learning and student performances are on a parallel measurement scale that defines the teachers' achievements during their teaching activities during class (Khan, 2020). Inquiry-based learning is elaborated by query and answer sessions to find the solution based on reason; therefore, it is very important for students and constructs a bright future for a student.

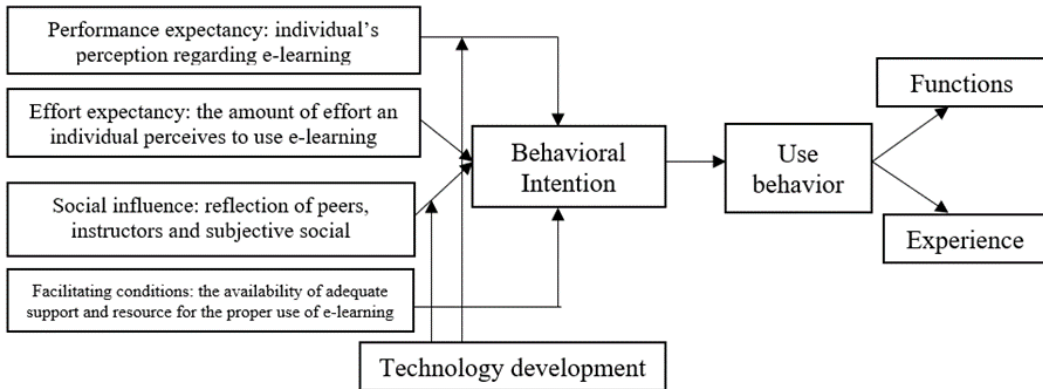
Teacher Efficacy Theory and Rotter's Social Cognitive Theory are related to these variables because the collaborative effect is one of the significant variables we derive from the theory (Tschannen-Moran & Hoy, 2001). The collaborative effect is used as a variable of technology adoption by the theory of Teacher Efficacy Theory and Rotter's Social Cognitive Theory (Schunk & Usher, 2012; Tschannen-Moran & Hoy, 2001). Likewise, the collaborative effort is the modern education paradigm. Teacher Efficacy Theory and Rotter's Social Cognitive Theory are focused on seeing the insight into an individual attempt to accomplish tasks or assignments. Efficiency is another variable mentioned in this study, measured by Teacher Efficacy Theory and Rotter's Social Cognitive Theory (Schunk & DiBenedetto, 2020; Schunk & Usher, 2012); this study extends the idea and merges it with teaching pedagogy. Other studies used those variables as attributes of teaching pedagogy (Schunk & DiBenedetto, 2020; Tschannen-Moran & Hoy, 2001). Teaching pedagogy (collaborative effort and efficiency of inquiry-based learning) can be a significant variable in enhancing teacher performance. Finally, we constructed the efficiency of inquiry-based learning. It occurs only using its combined effect. Another theory is the transformational school leadership theory that determines how the teacher performance affects the role of student performance.

This study incorporates the Unified Technology Acceptance and the Use of Technology (UTAUT) theory as a grounded study theory as shown in Figure 1 (Qiao, et al., 2021). It is essential to mention that UTAUT constructs used 4 to 5 items for each construct (Venkatesh, 2022). Subsequently, our study followed the concept, constructed novel objects, and integrated UTAUT into teacher performance in a new paradigm.

Teacher Performance

According to Irnawati and Nuryani (2023), a teacher's/lecturer's performance can be considered a collection of attitudes and behaviors that ultimately result in student learning through the lecture. Since

Figure 1. Unified technology acceptance and the use of technology (UTAUT; Qiao et al., 2021)



then, Hartinah et al. (2020) stated that the more the students improve their knowledge capabilities, the higher we rate the teacher's performance. Nevertheless, teachers' performance increases students' thinking, makes them more intelligent, and makes graduates of high calibre (Almulla & Al-Rahmi, 2023). Hasibuan (2022) mentions that teachers' performance is an essential factor that creates attention in their lectures to the student. Determining how a teacher can have a positive influence on the academic performance of their students is done by student test scores (Hakim, 2015). Dian et al. (2022) explained that teachers' performance enhances students learning, grading, individual thinking, and efficiency.

Collaborative Effort

Collaborative effort refers to the interpersonal and intrapersonal skills and competencies we draw upon to solve a problem or make headway toward achieving a shared objective (Bricker et al., 2022; Goldsmith, 2007). Collaborative is an adjective that can describe an endeavor that involves multiple people working together—that is, one in which they collaborate (Bochatay et al., 2022). The phrase “collaborative effort” is frequently used positively to describe two or more people successfully working together on a common goal or project (Patel & Parikh, 2022) because collaborative effort comes from the English phrase collaboration, which means “the effort of working together,” or to work together with other people, particularly in the pursuit of academic goals (Assefa, 2022).

To truly engage in a collaborative effort, one must look beyond themselves and make an effort to understand the perspectives of others (Koehler et al., 2022). In addition, collaboration is found only in particular circumstances to do certain things effectively (Garivaldis et al., 2022). This statement indicates that educators' attitudes to doing something more straightforward and efficient are known to have a collaborative effect (Aldriwesh et al., 2022). According to Runtuwene et al. (2022), collaboration effort refers to skills and competencies used by the individual or working together to resolve a problem or make headway toward a shared objective.

Efficiency of Inquiry-Based Learning

The efficiency of inquiry-based learning is one of the ways of learning in the classroom and what teachers are experiencing through their teaching (Liu & Wang, 2022). Problem-solving and experiential learning—that is, problem-solving through open-ended questions—are led by the efficiency of inquiry-based learning (Larsen & Jang, 2022). The efficiency of inquiry-based learning is one of the most effective ways to educate students (Adhami & Taghizadeh, 2022). It reduces boredom in students' learning, which is encouraged at all educational levels (Bush et al., 2022). The efficiency of inquiry-based learning increases attention to the lesson taught. It also expresses a better learning process and experience (Alberto de la Puente Pacheco et al., 2022). Recent research uses evidence

to support that efficiency of inquiry-based learning is a process and procedure for educating students in real life and case-solving (Sun et al., 2022).

Student Performance

Student performance is the measurement scale of students' improvement in their education roles (Manz et al., 2022). Higher educational success is typically reflected in a student's GPA, which is usually measured on a performance scale (Aucejo et al., 2022; Gao et al., 2022). Student performance is one of the most critical influences on students' learning and accomplishing the task more quickly (Abu-Eisheh & Ghanim, 2022; Fischer et al., 2022). According to Jokhan et al. (2022), student performance significantly justifies a student's gradual improvement and effectiveness in education learning.

Therefore, we conclude that this variable significantly impacts teachers' performance. Finally, we drive a review focusing on the variable's effect on teachers' performance to see the impact.

METHOD

Collaborative Effort and Student Performance

The current educational institution/university trend based on learning and teaching inspires collaboration between students and teachers (Costley et al., 2022). A collaborative effort is significant for student performance. Studies show that an average student can perform better when collaborating with brilliant students (Choong et al., 2022). Another study signifies that collaboration is a procedure for student and personal skill development Kousloglou et al., 2023. Likewise, European research defined collaboration as phenomenal to upskilling and boosting student thought toward education (Daou et al., 2022).

Furthermore, collaboration is a tool that breaks the student thinking barrier (Ko et al., 2022). Additionally, some researchers distinguished that collaborative effort can create innovations and provide extensive guidelines for new research (Loughland & Ryan, 2022). A few researchers claim that collaborative effort is the key to a more extensive project and large study (Godbout & Grehaigne, 2022).

The findings in the studies cited in this section led us to form the following hypothesis:

H1: Collaborative effort influences student performance in the academic industries globally.

Efficiency of Inquiry-Based Learning (EIBL) and Student Performance

The efficiency of inquiry-based learning is highly suggested to increase student performance (Adhami & Taghizadeh, 2022). One study shows that inquiry-based learning can influence student performance (Fischer et al., 2022). The efficiency of inquiry-based learning provides insightful queries about the student activity, an excellent guideline for understanding student performance (Kor et al., 2022). In addition, Liu and Wang (2022) found that the efficiency of inquiry-based learning is significant because it shows student engagement and their capabilities toward teaching and performance. Likewise, a study by Fischer et al. (2022) revealed that inquiry-based learning is critical in identifying students' lack of performance, and Saleh et al. (2022) found that the efficiency of inquiry-based learning provides an insightful efficiency to a student to increase their performance.

The findings in these studies led us to form the following hypothesis:

H2: Efficiency of inquiry-based learning influences student performance in the academic industries globally.

STUDENT PERFORMANCE AND TEACHER PERFORMANCE

Student performance is essential to enhancing the teacher's performance (Kulikowski et al., 2022). A study shows that a student's good performance influences teacher performance. It is imperative

to emphasize that a collaborative effort toward student learning is directly affected by teacher performance (Shen et al., 2022). Student performance directly influences teacher performance globally in the academic industry (Hafour, 2022). Fischer et al. (2022) posited that inquiry-based learning has an influential ability to enhance teacher performance. A recent study described how teachers' performance depends on student performance (Tran, 2022), and a similar study also revealed that student performance influences teachers' performance (Qiu et al., 2022).

Additionally, student performance influences the interaction between the student and teacher (Aucejo et al., 2022). It discloses that interaction between students and teachers has a parallel impact on student performance (Khalil, 2022). In addition, another study found that collaborative projects positively impacted student achievement, thus improving student performance (Saeed & Mohamedali, 2022). Student performance was also a factor in the relationship between the student and teacher (Jerrim & Sims, 2022). There is a correlation between student-teacher collaboration and inquiry-based learning increase and student performance.

Furthermore, Joshi et al. (2022) discovered that the quality of students having more creative questions and proactive attention influences the teacher's preparation for class, extending the performance of a teacher-in-class lecturer. A study by Hsia et al. (2022) described that quality students get more time in class and are more interactive and collaborative, thereby leading to teacher performance through student advancement. However, it is unlikely to get a handful of quality students in class. Still, most quality students insist on better preparation and lecture activity from their teachers, and their demand enhances the teacher's performance (Abu-Eisheh & Ghanim, 2022); therefore, the study demonstrates that students' performance improves teachers' lecture performance.

The findings in these studies led us to form the following hypothesis:

H3: Student performance influences teachers' performance in the academic industries globally.

Student Performance as Mediator

According to Cao and Smith's (2023) criteria, a meaningful relationship exists between the predictor variable and the criterion variable, between the predictor variable and the mediating variable, and between the mediating variable and the criterion variable; they contended that no significant overall impact of the predictor variable on the criterion variable was required for mediation (Zhao et al., 2010). These ideas align with others. According to Preacher and Hayes (2008), researchers might theoretically and procedurally explore mediation where a causal relationship between the predictor, mediator, and criterion variables could be constructed.

Mediation is a series of triggers in which a second variable influences a third variable. According to Ngah et al. (2022), a potent mediator that is proven by several studies is student performance (SP). SP is a valuable mediating construct. Collaborative effect (CE) acknowledges hardship in teacher performance (TP) through student performance, which influences teacher performance (Chen et al., 2020). After initial use, if students work collaboratively, their performance improves so that the teacher can perform better (Wiyono et al., 2021). The student's understanding and performance enhance the teacher's performance (Rubinstein & McCarthy, 2016). Student group work can improve the process of doing things through collaboration, boosting teacher performance (Lai, 2011). Additionally, student performance is an inspiration for teachers to teach students because they are good at learning, so the teachers are more aware of education, which boosts the teachers' performance (Azmin, 2016).

The efficiency of inquiry-based learning (EIBL) is one of the essential factors that help student performance (Laksana, 2017). When the student becomes good, the teacher needs to prepare them better, leading to improved performance of the teacher (Avsec & Kocijancic, 2014). If the student is not performing well, the teacher is unwilling to upgrade their level (Abdi, 2014). Therefore, EIBL is a fact that leads to teacher performance through the mediation of student performance.

Regarding student performance as a mediator, we formed these hypotheses:

- H4_A:** Student performance mediates the relationship between the collaborative effect and teacher performance.
- H4_B:** Student performance mediates the relationship between efficiency of inquiry-based learning and teacher performance.

This study constructed the research framework in Figure 2.

Measurements

The researcher used a Likert scale of 7, moving from the “Strongly Agree” to “Strongly Disagree,” to evaluate elements of the building. This study has four constructs; collaborative effort, the efficiency of inquiry-based learning, student performance, and teachers’ performance scale were adapted from previous research (Chao, 2019; Himawan, 2016; Tuan et al., 2005; Venkatesh et al., 2003).

Population

This study focused on the top 10 public university students in Malaysia. The universities are University Malaya (UM), University Kembangan Malaysia (Raimi & Sule), University Putra Malaysia (UPM), university since Malaysia (USM), University Technology Malaysia (UTM), Universiti Utara Malaysia (UUM), International Islamic University Malaysia (IIUM), University Technology Mara (UiTM), University Malaysia Perlis (UniMap), and University Tun Hossain (UTHM). We confirmed the population from the respective university websites and selected the total number of students (368,881), which is the population of this study.

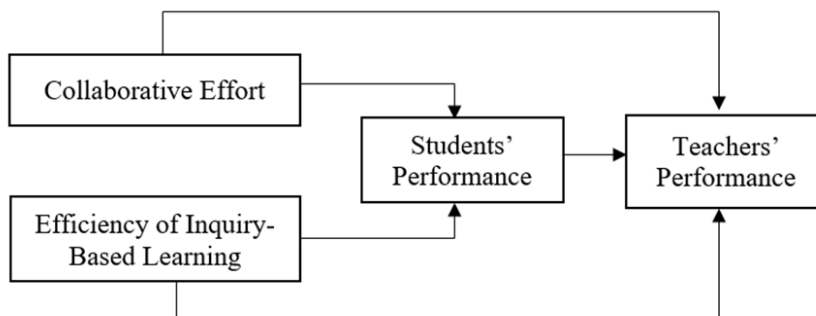
Sample

Salimon et al. (2023) recommended taking a test size of 384 if the population size is below 1 million. Moreover, Westland (2010) and Mulder et al. (2013) proposed using G*Power (3.1.9.4) programming to decide the base example estimate. Using the parameter at a 7-point Likert scale and medium-impact measure (0.15), we used the G-Power program to find at least 104 examples that were essential for this examination. Considering all these examples, we decided on 385 as the estimated respondents for this research.

Data Collection

We went to individual campuses to meet the students face-to-face because many studies defined face-to-face study mode as the backbone of the physical university and tertiary education (Alabdulaziz & Tayfour, 2023; Buhl-Wiggers et al., 2023). We also waited for the students to meet at the library’s foyer,

Figure 2. Research framework



entrance, central university lobby, hall, university hot spot, and canteens. Finally, using systematic random sampling with an interval, we distributed the questionnaire for the survey. Additionally, we sent them (respondents) an electronic link via cell phone via WhatsApp and an email to respond to the questionnaire. Hence, we built an online questionnaire using Google Docs. Lastly, we sent the Google Docs links to the interval number (respondents) for the data collection.

Respondents' Demographic Profile

Table 1 indicates the age, and the study revealed that 132 respondents were in the 18–25 group and 215 were in the 26–35 group. In addition, 45 respondents were in the 36–45 group, significantly less. Table 1 also demonstrates that the percentage of respondents with academic degrees (master's [198] and bachelor's [116]) are higher than those with a Ph.D. (71). Regarding marital status, 151 respondents indicated that they are married, and 235 stated that they were single. Finally, the total number of males is 158, whereas 227 female respondents is significantly high.

Pilot Study

We also ran a pilot test based on the study by Bani-Issa et al. (2023) to determine the reliability of the questionnaire. The questionnaire must pass the pilot test to be improved (Liebenberg et al., 2023). This test is done to find questionnaire errors. A sample size of 30 people is adequate for a pilot study (Byrne et al., 2023). We used the IBM Statistical Package for the Social Sciences (SPSS) program to obtain the Cronbach's Alpha values because Cronbach's Alpha guarantees the dependability of the coefficient or the internal consistency of the scales (Hernández et al., 2023). Furthermore, an alpha value of equal to or greater than 0.8 is highly trustworthy, or greater than or equal to 0.7 is reasonable (Koo et al.), and greater than or equal to 0.6 reveals poor reliability (Xie et al., 2023). The constructs' dependability results are included in Table 2.

RESULTS AND DISCUSSION

Measurement Model

We followed Henseler et al. (2009) to test the model and used a two-step procedure. Before evaluating the measurement model's discriminant validity, we used Cronbach's alpha and composite reliability to determine whether it was convergently valid.

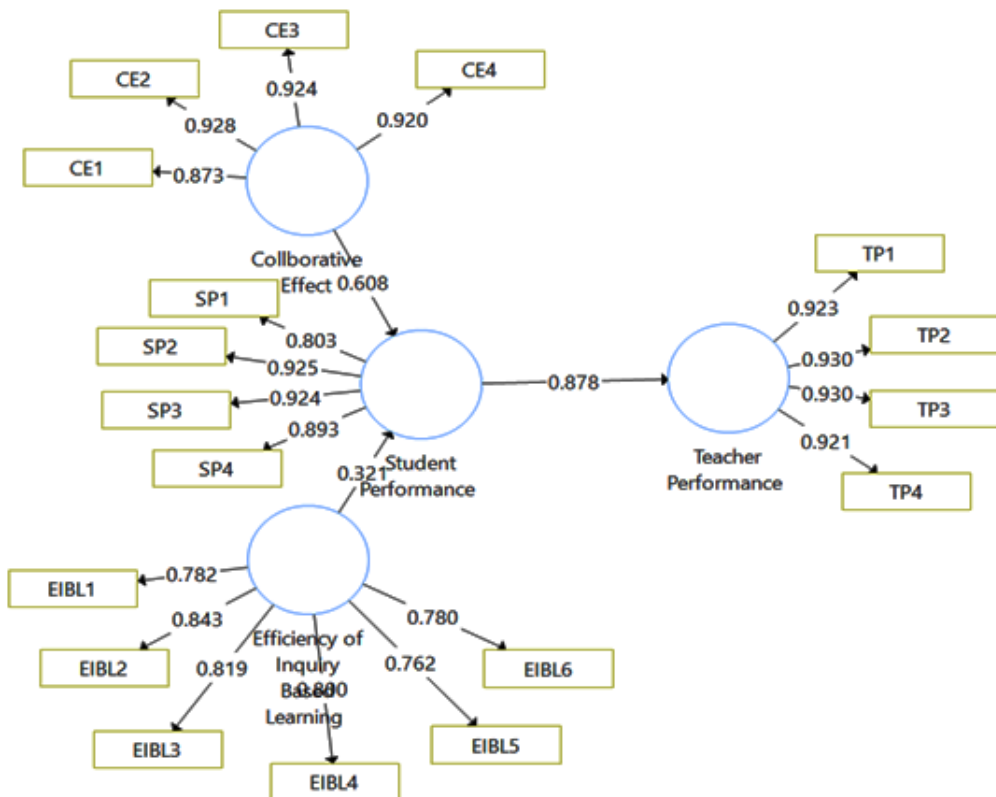
Table 1. Demographic characteristics of the respondents (N = 385)

		Frequency	Percent
Gender	Male	158	41
	Female	227	59
Age	18–25	132	34.2
	26–35	215	55.9
	36–45	38	9.9
Academic degree	Bachelor's	116	30.1
	Master's	198	51.4
	PhD	71	18.5
Married	Married	151	40
	Unmarried	234	60

Table 2. Reliability of the variables

No	Variables	Cronbach's Alpha	No of Item
1	Teacher's Performance	0.823	4
2	Efficiency of inquiry-based learning	0.755	6
3	Collaborative Effort	0.773	4
4	Student Performance	0.892	4

Figure 3. Measurement model



Outliers, Multicollinearity (VIF)

In this study we used the distance from the Mahalanobis values below 0.001 as outliers (Fino et al., 2023). In this analysis, 13 values were listed as outliers and were consequently excluded. Finally, for further review, 385 cases were included.

The multicollinearity statistical approach involves using variance inflation factor (VIF) and tolerance levels (Salim & Ernanda, 2023). The acceptable value of 5.0 and higher is 0.20 or lower with a tolerance level and shows multicollinearity. Table 3 summarizes the product of multicollinearity.

Table 3 shows that the VIF was less than 5, and the tolerance was more than 0.20 among the independent variables in this sample. Thus, following Hair et al. (2013), no multicollinearity problems occurred in this analysis.

Table 3. Collinearity statistics

Dependent Variable	Independent Variable	VIF
Teacher Performance	Collaborative effect	1.891
	Efficiency of inquiry-based learning	1.891
	Student performance	1.000

Reliability, AVE, Discriminant Validity

The indicator's reliability is often called outer loadings, indicating that the latent design explains the indicator's variation. The composite reliability values in this study were acceptable because they were above the threshold of 0.7. In this analysis, the average variance extracted (AVE) values of the latent variables (Table 4) were above the cut-off value (0.50).

Henseler et al. (2009) suggested assessing the Fornell-Larcker criterion for detecting discriminative validity. The value of the Fornell-Larcker criterion must be diagonal, and the top value has to be bigger than the lower value. This study finds no discrimination, as shown in Table 5.

Table 6 shows that CE directly predicted SP because their relationship was significant ($\beta = 0.608$, $t = 11.275$, and $p = 0.000$); hence, H1 is supported. Similarly, the relationship between EIBL and SP was significant ($\beta = 0.321$, $t = 6.093$, and $p < 0.000$); hence, H2 is supported. Additionally, the relationship between SP and TP was significant ($\beta = 0.878$, $t = 40821$, and $p = 0.000$); hence, H3 is supported.

Table 4. Psychometric properties of the constructs

Constructs	Items	Loadings	CR	AVE
Collaborative effect	CE1	0.873	0.952	0.831
	CE2	0.928		
	CE3	0.924		
	CE4	0.920		
Efficiency of inquiry-based learning	EIBL1	0.782	0.913	0.637
	EIBL2	0.843		
	EIBL3	0.819		
	EIBL4	0.800		
	EIBL5	0.762		
	EIBL6	0.780		
Student performance	SP1	0.803	0.937	0.788
	SP2	0.925		
	SP3	0.924		
	SP4	0.893		
Teacher performance	TP1	0.923	0.960	0.857
	TP2	0.930		
	TP3	0.930		
	TP4	0.921		

Table 5. Fornell-Larcker criterion of discriminant validity

	1	2	3	4
1. Collaborative effect	0.912			
2. Efficiency of inquiry-based learning	0.686	0.798		
3. Student performance	0.828	0.738	0.888	
4. Teacher performance	0.810	0.704	0.878	0.926

Table 6. Assessment of path model

Hypothesis	Relationships	Beta Values	SD	T Values	P Values	Findings
H1	Collaborative effect-> Student performance	0.608	0.054	11.275	0.000	Supported
H2	Efficiency of inquiry-based learning-> Student performance	0.321	0.053	6.093	0.000	Supported
H3	Student performance -> Teacher performance	0.878	0.022	40.821	0.000	Supported
H4A	Collaborative effect-> Student performance-> Teacher performance	0.534	0.054	9.942	0.000	Supported
H4B	Efficiency of inquiry-based learning-> Student performance-> Teacher performance	0.282	0.045	6.248	0.000	Supported

Structural Model

The t values greater than 1.96 are significant. A p value of 0.05 and below is accepted or supported (Ramayah et al., 2018). The conceptual model for this analysis, including the latent exogenous mechanisms (collaborative effect and efficiency of inquiry-based learning), a mediator (student performance), and the latent endogenous component (teacher performance), is calculated in Figure 4 and Table 6.

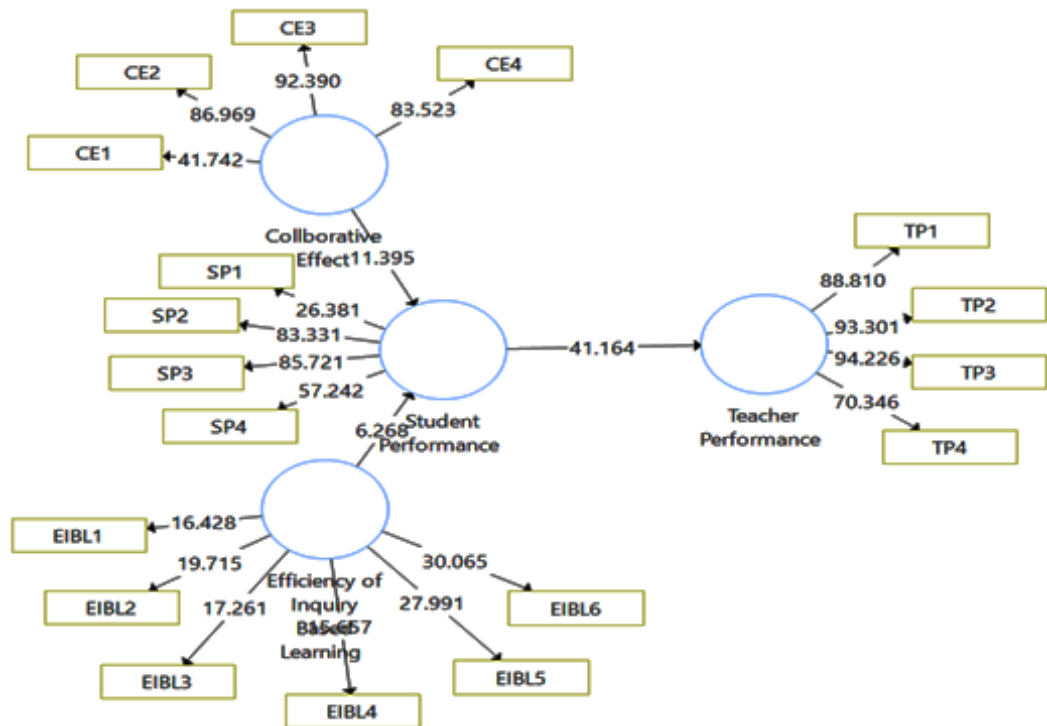
A structural model showing hypothesized interactions is presented in Table 6. According to Figure 4 and Table 6 The relationship between CE and TP through the mediation of student performance was insignificant, and hypothesis H4A showed that CE indirectly predicts TP because their relationship was significant ($\beta = 0.534$, $t = 9.942$, and $p = 0.000$). Similarly, the relationship between EIBL and TP through the mediation of student performance was significant ($\beta = 0.126$, $t = 2.592$, and $p < 0.10$); thus, H4B is supported.

DISCUSSION

A significant relationship was found between CE and SP (H1). The results also indicate that the collaborative effect substantially contributes to student performance in the academic industry (Chen et al., 2020; Rubinstein & McCarthy, 2016; Wiyono et al., 2021). This outcome was similar to the findings of previous studies. The collaborative effect predicts student performance in Malaysia's academic institutions (Abuhassna et al., 2020). The collaborative effect is considered a collaboration of an individual student (Rubinstein & McCarthy, 2016). It enhances the effort of a student and the resultant better understanding of student performance (Wiyono et al., 2021). Therefore, it encourages students are more likely to collaborate for better enhancement of the education industry.

A positive and significant relationship was found between the EIBL and SP (H2) (Abdi, 2014). This finding is supported by the results of previous studies (Avsec & Kocijancic, 2014). Thus, EIBL is a good predictor of SP in academia. Similarly, EIBL impacts SP and creates a more fantastic sensation

Figure 4. Structure model



of student enhancement. This finding is consistent with the results of previous studies (Azmin, 2016; Laksana, 2017). Likewise, a study has disclosed that the effect of inquiry on learning is a paradigm for finding the learning improvement on a specific task (Lin et al., 2022). It also wholly justifies a particular student or a group of student progress by following inquiry-based learning (Brumann et al., 2022). Inquiry-based learning is a proven element that significantly affects a student's quality assurance.

We observed that SP positively and significantly affects teacher performance (H3) (Azmin, 2016; Wiyono et al., 2021). This result suggests that a higher level of student performance boosts teacher performance and the student learning process (Iyamuremye et al., 2022). It also shows that when student performance is visible, it enhances teacher performance (Van Waeyenberg et al., 2022). A possible explanation for this result could be that student performance has developed sustainability in the academic industry (Förster et al., 2022). Student performance is a student's finding that improvement increases teacher performance (Aldrup et al., 2022). While we are discussing student improvement, teacher performance is interrelated (Ma et al., 2022). This study explains student performance's influence on teacher performance (Liu et al., 2022). Without student performance, teachers cannot produce their performance (Bellés-Obrero & Lombardi, 2022). Therefore, student performance is an influential variable for teacher performance.

Regarding H4A, this study finds the significance of teacher performance as a mediator in the relationship between collaborative effect and student performance in Malaysia's academic industry (Rubinstein & McCarthy, 2016; Wiyono et al., 2021). A study showed that collaboration and teacher performance are interrelated and are enhanced through student performance (Mendoza et al., 2022; Tang et al., 2022). Likewise, another study disclosed that student performance can influence collaborative effect and teacher performance (Alinejad et al., 2022). Therefore, this study considers student performance as a mediation variable between the efficiency of inquiry-based learning and teacher performance.

Regarding H4B, this study supports student performance as a mediator in the relationship between the efficiency of inquiry-based learning and teacher performance (Avsec & Kocijancic, 2014; Laksana, 2017). This finding is consistent with that of a past study. The results are also compatible with a previous study (Yang et al., 2022). Another study showed a significant relation between EIBL and teacher performance, and the results revealed significant improvement in student performance (Sarfraz et al., 2022). Likewise, student performance is an impactful mediation by the collaborative effect and inquiry-based learning (Pianta et al., 2022). Therefore, this study shows that student performance is a decisive mediation variable between the efficiency of inquiry-based learning and teacher performance.

IMPLICATION OF THE STUDY

This research includes direct relations in its theoretical context, which explores its effects on teachers' performance. A direct relationship means it is vital to strengthen teacher performance related to the top public universities in Malaysia.

Theoretical Implication

This empirical study has a significant impact from a theoretical viewpoint developed with Unified Technology Acceptance and Use of Technology. This study is planned to integrate the Teacher Efficacy Theory and Rotter's Social Cognitive Theory from a theoretical standpoint. This theory is used in relationship analysis, taking the performance through the adoption model channel (Tschannen-Moran & Hoy, 2001; Wiyono et al., 2021).

This principle is fitted from the teacher's performance through the adoption point of view. This research is also a new and novel attempt to propagate the idea of teacher performance by Teacher Efficacy Theory and Rotter's Social Cognitive Theory. Moreover, the phenomenon described in this study has been better explained and generalized. An approach based on Teacher Efficacy Theory and Rotter's Social Cognitive Theory better understands the technology and uses associated with an individual teacher's performance. Therefore, this study used the collaborative effect and efficiency of inquiry-based learning to construct a relationship between student performance and teachers' performance.

Methodological Implication

Besides functional and theoretical contributions, several methodological contributions have been established. For the first time, a complex teacher performance model was created, as Hair et al. (2017) proposed that more than four variables were seen as a complex model. We evaluated eight independent variables, one mediator, and one dependent latent teacher performance construct. Thus, this work provided the effect of four independent variables and one mediator simultaneously on the separate construct in the performance through the adoption model. This research has conceptualized teacher performance by integrating different dimensions.

Practical Implication

The findings of this analysis offer valuable insights into reality. This study is significant for academic contributions to universities, the Malaysian government, and other developing countries. Apart from practical implications, multiple aspects apply to this analysis. Teacher performance is also beneficial for Malaysia's education section. Hence, it obtains a significant understanding of this study regarding the relationships between teacher performance and the enhancement of student performance.

This is a unique and new study in the field of teacher performance. It also used a very diverse and necessary variable known as teaching pedagogy. Therefore, it uniquely integrates leading pedagogy variables into teacher performance.

CONCLUSION

This research examined the variables affecting student and teacher performance in Malaysia's academic industry. The Malaysian education industry needs to improve its teacher performance because the student is the key element. The following conclusion can be drawn from the results of this study:

1. The collaborative effect and efficiency of inquiry-based learning have significantly influenced teacher performance in the Malaysian education sector.
2. The study also revealed that student performance directly influenced the teacher-performance relationship in Malaysia's education section. It means that the higher the level of student performance is, the higher the teacher's performance is too.
3. The study also discovered that student performance is indirectly influenced by teacher performance in Malaysia's education industry. It demonstrated the interrelation of the predictor, mediator, and dependent variables. The study also found that the predictor variable (CE and EIBL) and teacher performance mediate through student performance.

This research addresses sustainable academic management globally. A societal impact paradigm will be created in the global teaching institution, and a positive quality impact will enhance the quality of future generations globally. In line with the educational vision, it will create a new paradigm and support government plans for education management. In addition, it will provide an extensive understanding of making government policies for educational institutions. Finally, the variable of this study is unique. This new study integrates the performance model Teacher Efficacy Theory and Rotter's Social Cognitive Theory in a single study. This study also incorporates a new mediation and dependable variable, thus making the study novel.

LIMITATIONS OF THE STUDY AND SUGGESTIONS FOR FUTURE RESEARCH

This study focuses on only the top 10 public universities. It also used only four constructs. The respondents were students. Researchers don't use university administration as respondents. Therefore, the scope of the report was to use university students as respondents and all the universities in Malaysia.

ACKNOWLEDGMENT

The authors thank the students of University Malaya (UM), University Kebangsaan Malaysia, University Putra Malaysia (UPM), university since Malaysia (USM), University Technology Malaysia (UTM), Universiti Utara Malaysia (UUM), International Islamic University Malaysia (IIUM), University Technology Mara (UiTM), University Malaysia Perlis (UniMap), and University Tun Hossain (UTHM) for partly supporting material, completing the questionnaire, and participating in our survey.

COMPETING INTERESTS

The authors declare that there is no conflict of interest in the current study.

FUNDING AGENCY

During the conduction of the current study, materials were partly supported by Curtin University, Malaysia. However, there is no funding for the publication fee of this study.

REFERENCES

- Abdi, A. (2014). The effect of inquiry-based learning method on students' academic achievement in science course. *Universal Journal of Educational Research*, 2(1), 37–41. doi:10.13189/ujer.2014.020104
- Abdul Rabu, S. N., Mohamad, S. K., Awwad, S. A. B., Ismail, N. H. A., & Yeen, K. S. (2023). Effectiveness of inquiry-based learning with the aid of BLOSSOMS video on students' performance and motivation. *Education and Information Technologies*, 1–26. doi:10.1007/s10639-023-11616-9
- Abu-Eisheh, S. A., & Ghanim, M. S. (2022). Improving senior-level students' performance in traffic systems management using multimedia contents. *Ain Shams Engineering Journal*, 13(1), 101511. doi:10.1016/j.asej.2021.05.025
- Abuhassna, H., Al-Rahmi, W. M., Yahya, N., Zakaria, M. A. Z. M., Mohd Kosnin, A. B., & Darwish, M. (2020). Development of a new model on utilizing online learning platforms to improve students' academic achievements and satisfaction. *International Journal of Educational Technology in Higher Education*, 17(1), 1–23. doi:10.1186/s41239-020-00216-z
- Adhami, N., & Taghizadeh, M. (2022). Integrating inquiry-based learning and computer supported collaborative learning into flipped classroom: Effects on academic writing performance and perceptions of students of railway engineering. *Computer Assisted Language Learning*, 1–37. doi:10.1080/09588221.2022.2046107
- Alabdulaziz, M. S., & Tayfour, E. A. (2023). A comparative study of the effects of distance learning and face-to-face learning during the COVID-19 pandemic on learning mathematical concepts in primary students of the kingdom of Bahrain. *Education Sciences*, 13(2), 133. doi:10.3390/educsci13020133
- Alldriwesh, M. G., Alyousif, S. M., & Alharbi, N. S. (2022). Undergraduate-level teaching and learning approaches for interprofessional education in the health professions: A systematic review. *BMC Medical Education*, 22(1), 1–14. doi:10.1186/s12909-021-03073-0 PMID:34980083
- Aldrup, K., Carstensen, B., & Klusmann, U. (2022). Is empathy the key to effective teaching? A systematic review of its association with teacher-student interactions and student outcomes. *Educational Psychology Review*, 34(3), 1177–1216. doi:10.1007/s10648-021-09649-y
- Alharbi, A. A. (2022). Is the emergency distance teaching experience different in postgraduate programs?: Students' voices. *International Journal of Online Pedagogy and Course Design*, 12(1), 1–16. doi:10.4018/IJOPCD.302084
- Alinejad, V., Parizad, N., Yarmohammadi, M., & Radfar, M. (2022). Loneliness and academic performance mediates the relationship between fear of missing out and smartphone addiction among Iranian university students. *BMC Psychiatry*, 22(1), 1–13. doi:10.1186/s12888-022-04186-6 PMID:35962328
- Almulla, M. A., & Al-Rahmi, W. M. (2023). Integrated social cognitive theory with learning input factors: The effects of problem-solving skills and critical thinking skills on learning performance sustainability. *Sustainability (Basel)*, 15(5), 3978. doi:10.3390/su15053978
- Antonietti, C., Schmitz, M.-L., Consoli, T., Cattaneo, A., Gonon, P., & Petko, D. (2023). Development and validation of the ICAP technology scale to measure how teachers integrate technology into learning activities. *Computers & Education*, 192, 104648. doi:10.1016/j.compedu.2022.104648
- Assefa, Y. (2022). Exploring “intersectoral collaboration” towards the integration of indigenous knowledge into adult education programs in North Wollo, Ethiopia. *Education Research International*, 2022, 1–10. Advance online publication. doi:10.1155/2022/5075195
- Aucejo, E., Romano, T., & Taylor, E. S. (2022). Does evaluation change teacher effort and performance? Quasi-experimental evidence from a policy of retesting students. *The Review of Economics and Statistics*, 104(3), 417–430. doi:10.1162/rest_a_00962
- Avsec, S., & Kocijancic, S. (2014). Effectiveness of inquiry-based learning: How do middle school students learn to maximise the efficacy of a water turbine? *International Journal of Engineering Education*, 30(6), 1436–1449.
- Azmin, N. H. (2016). Effect of the jigsaw-based cooperative learning method on student performance in the general certificate of education advanced-level psychology: An exploratory Brunei case study. *International Education Studies*, 9(1), 91–106. doi:10.5539/ies.v9n1p91

- Bani-Issa, W., Radwan, H., Saqan, R., Hijazi, H., Fakhry, R., Alameddine, M., Naja, F., Ibrahim, A., Lin, N., Naing, Y. T., & Awad, M. (2023). Association between quality of sleep and screen time during the COVID-19 outbreak among adolescents in the United Arab Emirates. *Journal of Sleep Research*, 32(1), e13666. doi:10.1111/jsr.13666 PMID:35670277
- Bellés-Obrero, C., & Lombardi, M. (2022). Teacher performance pay and student learning: Evidence from a nationwide program in Peru. *Economic Development and Cultural Change*, 70(4), 1631–1669. Advance online publication. doi:10.1086/714012
- Bochatay, N., Bajwa, N. M., Ju, M., Appelbaum, N. P., & van Schaik, S. M. (2022). Towards equitable learning environments for medical education: Bias and the intersection of social identities. *Medical Education*, 56(1), 82–90. doi:10.1111/medu.14602 PMID:34309905
- Bricker, D. D., Felimban, H. S., Lin, F. Y., Stegenga, S. M., & Storie, S. O. (2022). A proposed framework for enhancing collaboration in early intervention/early childhood special education. *Topics in Early Childhood Special Education*, 41(4), 240–252. doi:10.1177/0271121419890683
- Brittz, K., Madisa, M., Hugo-Van Dyk, L., Filmlalter, C., & Heyns, T. (2023). A cost-effective work-based interprofessional collaboration program for healthcare professionals. *International Journal of Online Pedagogy and Course Design*, 13(1), 1–16. doi:10.4018/IJOPCD.315589
- Brumann, S., Ohl, U., & Schulz, J. (2022). Inquiry-based learning on climate change in upper secondary education: A design-based approach. *Sustainability (Basel)*, 14(6), 3544. doi:10.3390/su14063544
- Buhl-Wiggers, J., Kjærgaard, A., & Munk, K. (2023). A scoping review of experimental evidence on face-to-face components of blended learning in higher education. *Studies in Higher Education*, 48(1), 151–173. doi:10.1080/03075079.2022.2123911
- Bush, S., Calloway, A., Bush, E., & Himelblau, E. (2022). A course-based teaching experience for stem undergraduates improves student perceptions of teaching self-efficacy and attitudes toward teaching careers. *CBE Life Sciences Education*, 21(1), 1–9. doi:10.1187/cbe.21-04-0105 PMID:34978924
- Byrne, M. K., Easpaig, B. N. G., Gray, R., Creek, R., Jones, M., Brown, E., Mitchell, D., Zhai, J., Tan, J.-Y., Denis, S., & Bressington, D. (2023). Behavioural activation for depressive symptoms in young people with emerging or early psychosis: A pilot study protocol. *PLoS One*, 18(1), e0280559. doi:10.1371/journal.pone.0280559 PMID:36662764
- Cai, Y., & Yang, Y. (2023). The development and validation of the scale of design thinking for teaching (SDTT). *Thinking Skills and Creativity*, 48, 101255. doi:10.1016/j.tsc.2023.101255
- Cao, B., & Smith, K. (2023). Gay dating apps in China: Do they alleviate or exacerbate loneliness? The serial mediation effect of perceived and internalized sexuality stigma. *Journal of Homosexuality*, 70(2), 347–363. doi:10.1080/00918369.2021.1984751 PMID:34613888
- Chao, C.-M. (2019). Factors determining the behavioral intention to use mobile learning: An application and extension of the UTAUT model. *Frontiers in Psychology*, 10, 1652. doi:10.3389/fpsyg.2019.01652 PMID:31379679
- Chen, W.-L., Elchert, D., & Asikin-Garmager, A. (2020). Comparing the effects of teacher collaboration on student performance in Taiwan, Hong Kong and Singapore. *Compare: A Journal of Comparative Education*, 50(4), 515–532. doi:10.1080/03057925.2018.1528863
- Choong, Y.-O., Ng, L.-P., & Lau, T.-C. (2022). Creating the path towards organisational citizenship behaviour through collective efficacy and teacher's self-efficacy. *Asia Pacific Journal of Education*, 1–18. doi:10.1080/02188791.2022.2053063
- Costa, C., Alvelos, H., & Teixeira, L. (2019). Investigating the use and acceptance of technologies by professors in a higher education institution. *International Journal of Online Pedagogy and Course Design*, 9(2), 1–20. doi:10.4018/IJOPCD.2019040101
- Costello, R., & Lambert, M. (2019). Motivational influences for higher education (HE) students. *International Journal of Online Pedagogy and Course Design*, 9(1), 38–50. doi:10.4018/IJOPCD.2019010103

- Costley, J., Courtney, M., & Fanguy, M. (2022). The interaction of collaboration, note-taking completeness, and performance over 10 weeks of an online course. *The Internet and Higher Education*, 52, 100831. doi:10.1016/j.iheduc.2021.100831
- Daou, D., Chakhtoura, M., El-Yazbi, A., Mukherji, D., Sbaity, E., Refaat, M. M., & Nabulsi, M. (2022). Teaching critical appraisal to large classes of undergraduate medical students using team-based learning versus group discussions: A randomized controlled trial. *BMC Medical Education*, 22(1), 1–8. doi:10.1186/s12909-022-03145-9 PMID:35120498
- de la Puente Pacheco, M. A., de Oro Aguado, C. M., Lugo Arias, E., Rico, H., Cifuentes, D., & Tafur, M. (2022). Effectiveness of model ASEAN meeting in enhancing critical thinking: A Colombia case study. *Interactive Learning Environments*, 1–23. doi:10.1080/10494820.2022.2046109
- Dian, D., Trisna, M. Y., & Huda, N. N. (2022). The effect of school principles motivation in efforts to improve teacher performance at integrated Islamic elementary school. *Al-Tanzim: Jurnal Manajemen Pendidikan Islam*, 6(1), 27–40. doi:10.33650/al-tanzim.v6i1.3221
- Fino, E., Iliceto, P., Carcione, A., Giovani, E., & Candilera, G. (2023). Validation of the Italian version of the 25-item Hikikomori questionnaire (HQ-25-I). *Journal of Clinical Psychology*, 79(1), 210–227. doi:10.1002/jclp.23404 PMID:35708975
- Fischer, C., Nguyen, H., Estrella, G., & Collins, P. (2022). Examining lecture and inquiry-based laboratory performance for language minority students in science gateway courses. *PLoS One*, 17(4), e0267188. doi:10.1371/journal.pone.0267188 PMID:35482743
- Förster, N., Humberg, S., Hebbeker, K., Back, M. D., & Souvignier, E. (2022). Should teachers be accurate or (overly) positive? A competitive test of teacher judgment effects on students' reading progress. *Learning and Instruction*, 77, 101519. doi:10.1016/j.learninstruc.2021.101519
- Gao, L., Zhao, Z., Li, C., Zhao, J., & Zeng, Q. (2022). Deep cognitive diagnosis model for predicting students' performance. *Future Generation Computer Systems*, 126, 252–262. doi:10.1016/j.future.2021.08.019
- Garivaldis, F. J., Chung, J., Braganza, L., Arulkadacham, L., Sharma, R., Reupert, A., McKenzie, S., Rose, G., Gupta, T., Aziz, Z., Mowbray, T., Ilic, D., & Mundy, M. (2022). Out of sight, but not out of mind: A case study of the collaborative development of a university-wide orientation resource for online students. *Educational Technology Research and Development*, 70(2), 531–558. doi:10.1007/s11423-022-10090-3 PMID:35228785
- Glover, T. A., Reddy, L. A., & Crouse, K. (2023). Instructional coaching actions that predict teacher classroom practices and student achievement. *Journal of School Psychology*, 96, 1–11. doi:10.1016/j.jsp.2022.10.006 PMID:36641220
- Godbout, P., & Grehaigine, J.-F. (2022). Regulation of tactical learning in team sports—The case of the tactical-decision learning model. *Physical Education and Sport Pedagogy*, 27(3), 215–230. doi:10.1080/17408989.2020.1861232
- Goldsmith, D. J. (2007). Enhancing learning and assessment through e-portfolios: A collaborative effort in Connecticut. *New Directions for Student Services*, 2007(119), 31–42. doi:10.1002/ss.247
- Hafour, M. F. (2022). The effects of MALL training on preservice and in-service EFL teachers' perceptions and use of mobile technology. *ReCALL*, 34(3), 1–17. doi:10.1017/S0958344022000015
- Hakim, A. (2015). Contribution of competence teacher (pedagogical, personality, professional competence and social) on the performance of learning. *The International Journal of Engineering and Science*, 4(2), 1–12. <https://www.theijes.com/papers/v4-i2/Version-3/A42301012.pdf>
- Hartinah, S., Suharso, P., Umam, R., Syazali, M., Lestari, B. D., Roslina, R., & Jermstittiparsert, K. (2020). Retracted: Teacher's performance management: The role of principal's leadership, work environment and motivation in Tegal City, Indonesia. *Management Science Letters*, 10(1), 235–246. doi:10.5267/j.msl.2019.7.038
- Hasibuan, S. (2022). The effect of organizational culture, principal leadership and motivation on teacher performance in Madrasah. *Al-Tanzim: Jurnal Manajemen Pendidikan Islam*, 6(1), 41–53. doi:10.33650/al-tanzim.v6i1.3228

- Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. In R. R. Sinkovics & P. N. Ghauri (Eds.), *New challenges to international marketing* (Advances in International Marketing, Vol. 20) (pp. 277–319). Emerald Group Publishing Limited. doi:10.1108/S1474-7979(2009)0000020014
- Hernández, F. F., López, S. M., Castillo, Y. O. R., Varela, T. V., & Millán-Hernández, M. (2023). Adaptation of the psychological wellbeing scale in Mexican medical students. *Salud Mental*, 46(2), 89–95. doi:10.17711/SM.0185-3325.2023.012
- Hidayat, A., & Zaini, Z. (2017). Factors affecting teacher performance at junior high schools in DKI Jakarta, Indonesia. *International Journal of Scientific Research*, 6(11), 203–208. <https://www.ijsr.net/archive/v6i11/ART20177855.pdf>
- Howard, N.-J. (2023). Kahoot! Gamification as an instructional technology: A socio-material account of nursing lecturers' subjectivities. In M. Garcia, M. Lopez Cabrera, & R. de Almeida (Eds.), *Handbook of research on instructional technologies in health education and allied disciplines* (pp. 196–219). IGI Global. doi:10.4018/978-1-6684-7164-7.ch009
- Hsia, L.-H., Hwang, G.-J., & Lin, C.-J. (2022). A WSQ-based flipped learning approach to improving students' dance performance through reflection and effort promotion. *Interactive Learning Environments*, 30(2), 229–244. doi:10.1080/10494820.2019.1651744
- Irnawati, W., & Nuryani, L. K. (2023). The mediation role of organizational commitment on the influence of participatory leadership, competence on lecturer performance. *Al-Tanzim: Jurnal Manajemen Pendidikan Islam*, 7(1), 260–273. <https://ejournal.unuja.ac.id/index.php/al-tanzim/article/viewFile/4487/pdf>
- Iyamuremye, A., Mukiza, J., Nsabayeze, E., Ukobizaba, F., & Ndhokubwayo, K. (2022). Web-based discussions in teaching and learning: Secondary school teachers' and students' perception and potentiality to enhance students' performance in organic chemistry. *Education and Information Technologies*, 27(2), 2695–2715. doi:10.1007/s10639-021-10725-7 PMID:34483703
- Jerrim, J., & Sims, S. (2022). School accountability and teacher stress: International evidence from the OECD TALIS study. *Educational Assessment, Evaluation and Accountability*, 34(1), 5–32. doi:10.1007/s11092-021-09360-0 PMID:36339019
- Jia, C., Hew, K. F., Jiahui, D., & Liuyufeng, L. (2023). Towards a fully online flipped classroom model to support student learning outcomes and engagement: A 2-year design-based study. *The Internet and Higher Education*, 56, 100878. doi:10.1016/j.iheduc.2022.100878
- Jokhan, A., Chand, A. A., Singh, V., & Mamun, K. A. (2022). Increased digital resource consumption in higher educational institutions and the artificial intelligence role in informing decisions related to student performance. *Sustainability (Basel)*, 14(4), 2377. doi:10.3390/su14042377
- Joshi, P. R., Digari, S., & James, M. C. (2022). The difference a female teacher makes: Analysis of girls' school achievement in Nepal. *Educational Studies (Ames)*, 58(4), 511–529. doi:10.1080/00131946.2022.2051032
- Khalil, M. K. (2022). Weekly near-peer tutoring sessions improve students' performance on basic medical sciences and USMLE Step1 examinations. *Medical Teacher*, 44(7), 1–6. doi:10.1080/0142159X.2022.2027901 PMID:35073221
- Khan, I. H. (2020). The impact of appropriate planning and robust evaluation strategies on continuous improvement of student learning. *International Journal of Online Pedagogy and Course Design*, 10(3), 19–36. doi:10.4018/IJOPCD.2020070102
- Ko, M.-L. M., Hall, A., & Goldman, S. R. (2022). Making teacher and researcher learning visible: Collaborative design as a context for professional growth. *Cognition and Instruction*, 40(1), 27–54. doi:10.1080/07370008.2021.2010212
- Koehler, A. A., Cheng, Z., Fiock, H., Wang, H., Janakiraman, S., & Chartier, K. (2022). Examining students' use of online case-based discussions to support problem solving: Considering individual and collaborative experiences. *Computers & Education*, 179, 104407. doi:10.1016/j.compedu.2021.104407
- Koo, S. K., Byon, K. K., & Baker, T. A. III. (2014). Integrating event image, satisfaction, and behavioral intention: Small-scale marathon event. *Sport Marketing Quarterly*, 23(3). <https://link.gale.com/apps/doc/A383574165/AONE?u=googlescholar&sid=bookmark-AONE&xid=66381ff7>

- Kor, P. P. K., Liu, J. Y. W., & Kwan, R. Y. C. (2022). Exploring nursing students' learning experiences and attitudes toward older persons in a gerontological nursing course using self-regulated online enquiry-based learning during the COVID-19 pandemic: A mixed-methods study. *Nurse Education Today*, 111, 105301. doi:10.1016/j.nedt.2022.105301 PMID:35202963
- Kousloglou, M., Petridou, E., Molohidis, A., & Hatzikraniotis, E. (2023). Assessing Students' Awareness of 4Cs Skills after Mobile-Technology-Supported Inquiry-Based Learning. *Sustainability (Basel)*, 15(8), 6725. doi:10.3390/su15086725
- Kulikowski, K., Przytuła, S., & Sułkowski, Ł. (2022). E-learning? Never again! On the unintended consequences of COVID-19 forced e-learning on academic teacher motivational job characteristics. *Higher Education Quarterly*, 76(1), 174–189. doi:10.1111/hequ.12314
- Lai, E. R. (2011). *Collaboration: A literature review*. Pearson Assessments.
- Laksana, D. N. L. (2017). The effectiveness of inquiry based learning for natural science learning in elementary school. *Journal of Education Technology*, 1(1), 1–5. doi:10.23887/jet.v1i1.10077
- Larsen, N. E., & Jang, E. E. (2021). Instructional practices, students' self-efficacy and math achievement: A multi-level factor score path analysis. *Canadian Journal of Science, Mathematics, and Technology Education*, 21(4), 803–823. doi:10.1007/s42330-021-00181-3
- Lee, A. R., Dastpish, F., Freemon, M., & Parks, J. (2023). Insights into intercultural communication from a global citizenship framework: Voices of South Korean university students. *Intercultural Education*, 34(3), 271–287. doi:10.1080/14675986.2023.2180488
- Liebenberg, P., van der Linde, J., Schimper, I., de Wet, F., Graham, M., & Bornman, J. (2023). Describing the spoken language skills of typically developing Afrikaans-speaking children using language sample analysis: A pilot study. *Language, Speech, and Hearing Services in Schools*, 54(2), 518–534. doi:10.1044/2022_LSHSS-22-00077 PMID:36787151
- Lin, V., Liu, G.-Z., & Chen, N.-S. (2022). The effects of an augmented-reality ubiquitous writing application: A comparative pilot project for enhancing EFL writing instruction. *Computer Assisted Language Learning*, 35(5–6), 989–1030. doi:10.1080/09588221.2020.1770291
- Liu, Y., Li, L., & Huang, C. (2022). To what extent is shared instructional leadership related to teacher self-efficacy and student academic performance in China? *School Effectiveness and School Improvement*, 33(3), 381–402. doi:10.1080/09243453.2022.2029746
- Liu, Y., & Wang, J. (2022). The mediating–moderating model of inquiry-based learning and science self-efficacy: Evidence from PISA 2015. *International Journal of Science Education*, 44(7), 1096–1119. doi:10.1080/09500693.2022.2067364
- Loughland, T., & Ryan, M. (2022). Beyond the measures: The antecedents of teacher collective efficacy in professional learning. *Professional Development in Education*, 48(2), 343–352. doi:10.1080/19415257.2020.1711801
- Ma, L., Liu, J., & Li, B. (2022). The association between teacher-student relationship and academic achievement: The moderating effect of parental involvement. *Psychology in the Schools*, 59(2), 281–296. doi:10.1002/pits.22608
- Manz, J. A., Iverson, L. M., Hawkins, K., Tracy, M. E., Hercinger, M., & Todd, M. (2022). Assessing student performance in a dedicated education unit: Validity of the Creighton competency evaluation instrument. *Nursing Education Perspectives*, 43(3), 184–186. doi:10.1097/01.NEP.0000000000000838 PMID:34107518
- Mashari, A., & Umami, I. (2019). The contribution of teachers' motivation and characteristics on the teachers' performance in junior high school of Maarif Metro Lampung. *International Journal for Educational and Vocational Studies*, 1(6), 599–603. doi:10.29103/ijevs.v1i6.1660
- Mendoza, N. B., Yan, Z., & King, R. B. (2022). Domain-specific motivation and self-assessment practice as mechanisms linking perceived need-supportive teaching to student achievement. *European Journal of Psychology of Education*, 38(2), 607–630. doi:10.1007/s10212-022-00620-1
- Moybeka, A. M. S., Bosco, F. H., Apalem, C. R., & Chandra, D. A. (2023). Developing EFL students' writing ability through contextual teaching and learning (a classroom action research study). *Journal of English Culture, Language, Literature and Education*, 11(1), 79–97.

- Mulder, V. L., de Bruin, S., & Schaepman, M. E. (2013). Representing major soil variability at regional scale by constrained Latin Hypercube Sampling of remote sensing data. *International Journal of Applied Earth Observation and Geoinformation*, 21, 301–310. doi:10.1016/j.jag.2012.07.004
- Muliati, L., Asbari, M., Nadeak, M., Novitasari, D., & Purwanto, A. (2022). Elementary school teachers performance: How the role of transformational leadership, competency, and self-efficacy? *International Journal of Social and Management Studies*, 3(1), 158–166.
- Muniandy, T., & Abdullah, N. (2023). A comprehensive review: An innovative pedagogy for future education. *International Journal of Online Pedagogy and Course Design*, 13(1), 1–15. doi:10.4018/IJOPCD.315816
- Namaziandost, E., Heydarnejad, T., Rahmani Doqaruni, V. R., & Azizi, Z. (2023). Modeling the contributions of EFL university professors' emotion regulation to self-efficacy, work engagement, and anger. *Current Psychology (New Brunswick, N.J.)*, 42(3), 2279–2293. doi:10.1007/s12144-022-04041-7 PMID:36531192
- Ngah, A. H., Kamalrulzaman, N. I., Mohamad, M. F. H., Rashid, R. A., Harun, N. O., Ariffin, N. A., & Osman, N. A. A. (2022). The sequential mediation model of students' willingness to continue online learning during the COVID-19 pandemic. *Research and Practice in Technology Enhanced Learning*, 17(1), 1–17. doi:10.1186/s41039-022-00188-w PMID:35350391
- Panggabean, M. S., & Himawan, K. K. (2016). The development of Indonesian teacher competence questionnaire. *Journal of Educational. Health and Community Psychology*, 5(2), 1–15. doi:10.12928/jehcp.v5i2.5134
- Patel, M. M., & Parikh, J. R. (2022). Education of radiologists in healthcare disparities. *Clinical Imaging*, 81, 98–102. doi:10.1016/j.clinimag.2021.09.019 PMID:34678654
- Pianta, R. C., Lipscomb, D., & Ruzek, E. (2022). Indirect effects of coaching on pre-K students' engagement and literacy skill as a function of improved teacher–student interaction. *Journal of School Psychology*, 91, 65–80. doi:10.1016/j.jsp.2021.12.003 PMID:35190080
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40(3), 879–891. doi:10.3758/BRM.40.3.879 PMID:18697684
- Qiao, P., Zhu, X., Guo, Y., Sun, Y., & Qin, C. (2021). The development and adoption of online learning in pre-and post-COVID-19: Combination of technological system evolution theory and unified theory of acceptance and use of technology. *Journal of Risk and Financial Management*, 14(4), 162. doi:10.3390/jrfm14040162
- Qiu, F., Zhang, G., Sheng, X., Jiang, L., Zhu, L., Xiang, Q., Chen, P., & Jiang, B. (2022). Predicting students' performance in e-learning using learning process and behaviour data. *Scientific Reports*, 12(1), 1–15. doi:10.1038/s41598-021-03867-8 PMID:35013396
- Raimi, L., & Sule, R. (2021). Plausibility of precision agriculture as a COVID-19-compliant digital technology for food security and agricultural productivity in Nigeria. In N. Baporikar (Ed.), *Handbook of research on strategies and interventions to mitigate COVID-19 impact on SMEs* (pp. 383–402). IGI Global. doi:10.4018/978-1-7998-7436-2.ch019
- Ramayah, T., Hwa, C. J., Chuah, F., Ting, H., & Memon, M. A. (2018). *Partial least squares structural equation modeling (PLS-SEM) using SmartPLS 3.0: An updated and practical guide to statistical analysis*. Pearson.
- Reeves, T. D., Hamilton, V., & Onder, Y. (2022). Which teacher induction practices work? Linking forms of induction to teacher practices, self-efficacy, and job satisfaction. *Teaching and Teacher Education*, 109, 103546. doi:10.1016/j.tate.2021.103546
- Rubinstein, S. A., & McCarthy, J. E. (2016). Union–management partnerships, teacher collaboration, and student performance. *Industrial & Labor Relations Review*, 69(5), 1114–1132. doi:10.1177/0019793916660508
- Runtuwene, L. R., Sathirapongsasuti, N., Srisawat, R., Komalamisra, N., Tuda, J. S. B., Mongan, A. E., Aboge, G. O., Shabardina, V., Makalowski, W., Nesti, D. R., Artama, W. T., Nguyen-Thi, L. A., Wan, K.-L., Na, B.-K., Hall, W., Pain, A., Eshita, Y., Maeda, R., Yamagishi, J., & Suzuki, Y. (2022). Global research alliance in infectious disease: A collaborative effort to combat infectious diseases through dissemination of portable sequencing. *BMC Research Notes*, 15(1), 1–6. doi:10.1186/s13104-022-05927-2 PMID:35151353

- Rusticus, S. A., Pashootan, T., & Mah, A. (2023). What are the key elements of a positive learning environment? Perspectives from students and faculty. *Learning Environments Research*, 26(1), 161–175. doi:10.1007/s10984-022-09410-4 PMID:35574193
- Saeed, N., & Mohamedali, F. (2022). A study to evaluate students' performance, engagement, and progression in higher education based on feedforward teaching approach. *Education Sciences*, 12(1), 56. doi:10.3390/educsci12010056
- Saleh, A., Phillips, T. M., Hmelo-Silver, C. E., Glazewski, K. D., Mott, B. W., & Lester, J. C. (2022). A learning analytics approach towards understanding collaborative inquiry in a problem-based learning environment. *British Journal of Educational Technology*, 53(5), 1321–1342. doi:10.1111/bjet.13198
- Salim, F., & Ernanda, Y., & Yenny, W. (2023). Effect of work discipline, work environment and work motivation on employee performance at PT. Autostar Mandiri Technotama. *Journal of Management Science*, 6(1), 5–9.
- Salimon, M. G., Kareem, O., Mokhtar, S. S. M., Aliyu, O. A., Bamgbade, J. A., & Adeleke, A. Q. (2023). Malaysian SMEs m-commerce adoption: TAM 3, UTAUT 2 and TOE approach. *Journal of Science and Technology Policy Management*, 14(1), 98–126. doi:10.1108/JSTPM-06-2019-0060
- Sandberg, Y., & Fröjdendahl, B. (2023). Perspectives of the degree project: Small-scale action research in Swedish higher education. *Social Sciences & Humanities Open*, 7(1), 100429. doi:10.1016/j.ssaho.2023.100429
- Saqr, M., López-Pernas, S., Helske, S., & Hrastinski, S. (2023). The longitudinal association between engagement and achievement varies by time, students' subgroups, and achievement state: A full program study. *Computers & Education*, 199, 104787. doi:10.1016/j.compedu.2023.104787
- Sarfraz, M., Khawaja, K. F., & Ivascu, L. (2022). Factors affecting business school students' performance during the COVID-19 pandemic: A moderated and mediated model. *International Journal of Management Education*, 20(2), 100630. doi:10.1016/j.ijme.2022.100630
- Shunk, D. H., & DiBenedetto, M. K. (2020). Motivation and social cognitive theory. *Contemporary Educational Psychology*, 60, 101832. doi:10.1016/j.cedpsych.2019.101832
- Shunk, D. H., & Usher, E. L. (2019). Social cognitive theory and motivation. In R. M. Ryan (Ed.), *The Oxford handbook of human motivation* (pp. 11–26). Oxford University Press. doi:10.1093/oxfordhb/9780190666453.013.2
- Shen, Y., Martinek, T., & Dyson, B. P. (2022). Navigating the processes and products of the teaching personal and social responsibility model: A systematic literature review. *Quest*, 74(1), 91–107. doi:10.1080/00336297.2021.2017988
- Siantuba, J., Nkhata, L., & de Jong, T. (2023). The impact of an online inquiry-based learning environment addressing misconceptions on students' performance. *Smart Learning Environments*, 10(1), 22. doi:10.1186/s40561-023-00236-y
- Sloan, D., Manns, H., Mellor, A., & Jeffries, M. (2020). Factors influencing student non-attendance at formal teaching sessions. *Studies in Higher Education*, 45(11), 2203–2216. doi:10.1080/03075079.2019.1599849
- Sudibjo, N., & Riantini, M. G. D. (2023). Factors affecting teachers' work engagement: The case of private school teachers in Jakarta Metropolitan, Indonesia. *REICE. Revista Iberoamericana sobre Calidad, Eficacia y Cambio en Educación*, 21(1), 119–137. https://doi.org/10.15366/reice2023.21.1.006
- Sun, Y., Yan, Z., & Wu, B. (2022). How differently designed guidance influences simulation-based inquiry learning in science education: A systematic review. *Journal of Computer Assisted Learning*, 38(4), 960–976. doi:10.1111/jcal.12667
- Tang, Y., Tseng, H., & Tang, X. (2022). The impact of information-seeking self-efficacy and online learning self-efficacy on students' performance proficiency. *Journal of Academic Librarianship*, 48(5), 102584. doi:10.1016/j.acalib.2022.102584
- Tran, H. (2022). Revolutionizing school HR strategies and practices to reflect talent centered education leadership. *Leadership and Policy in Schools*, 21(2), 238–252. doi:10.1080/15700763.2020.1757725
- Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education*, 17(7), 783–805. doi:10.1016/S0742-051X(01)00036-1

Tseng, J.-J., Chai, C. S., Tan, L., & Park, M. (2022). A critical review of research on technological pedagogical and content knowledge (TPACK) in language teaching. *Computer Assisted Language Learning*, 35(4), 948–971. doi:10.1080/09588221.2020.1868531

Tuan, H. L., Chin, C.-C., & Shieh, S.-H. (2005). The development of a questionnaire to measure students' motivation towards science learning. *International Journal of Science Education*, 27(6), 639–654. doi:10.1080/0950069042000323737

Ulfatin, N., Mustiningsih, , Sumarsono, R. B., & Yunus, J. N. (2022). School-based management in marginal areas: Satisfying the political context and student needs. *Management in Education*, 36(3), 124–134. doi:10.1177/0892020620959739

Van Waeyenbergh, T., Peccei, R., & Decramer, A. (2022). Performance management and teacher performance: The role of affective organizational commitment and exhaustion. *International Journal of Human Resource Management*, 33(4), 623–646. doi:10.1080/09585192.2020.1754881

Venkatesh, V. (2022). Adoption and use of AI tools: A research agenda grounded in UTAUT. *Annals of Operations Research*, 308(1), 641–652. doi:10.1007/s10479-020-03918-9

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *Management Information Systems Quarterly*, 27(3), 425–478. doi:10.2307/30036540

Westland, J. C. (2010). Lower bounds on sample size in structural equation modeling. *Electronic Commerce Research and Applications*, 9(6), 476–487. doi:10.1016/j.elerap.2010.07.003

Wiyono, B. B., Rasyad, A., & Maisyarah, . (2021). The effect of collaborative supervision approaches and collegial supervision techniques on teacher intensity using performance-based learning. *SAGE Open*, 11(2). Advance online publication. doi:10.1177/21582440211013779

Xie, Q., Liu, X., Fan, L., Peng, S., & Zeng, Y. (2023). Evaluation of equivalent crack propagation length and fracture energy of two commonly used rock fracture toughness test configurations based on Bažant's size effect law. *Engineering Fracture Mechanics*, 281, 109067. doi:10.1016/j.engfracmech.2023.109067

Yang, J., Xu, J., & Zhang, H. (2022). Resiliency and academic engagement: A moderated mediation model. *Psychology in the Schools*, 59(5), 900–914. doi:10.1002/pits.22654

Zhao, X., Lynch, J. G. Jr, & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *The Journal of Consumer Research*, 37(2), 197–206. doi:10.1086/651257

APPENDIX A

Table 7. Variables and items

Variable	Adapted Items	Adapted From
Collaborative effect	My interaction through collaborative effect would be evident in education success.	(Tschannen-Moran & Hoy, 2001; Wiyono et al., 2021) Effort expectancy
	It would be easy for me to become an education success through the collaborative effect of education success	
	I would find the collaborative effect easier the education success	
	Learning to integrate the collaborative effect is easy for me	
Efficiency of inquiry-based learning	The efficiency of inquiry-based learning is one particular way of teaching.	(Himawan, 2016) Professional Skill a. Pedagogies
	The efficiency of inquiry-based learning asks an open-ended question.	
	The efficiency of inquiry-based learning has various ways of teaching.	
	The efficiency of inquiry-based learning reduces boredom in education learning.	
	The efficiency of inquiry-based learning always has some ways to make the students pay attention to the lessons taught.	
	The efficiency of inquiry-based learning gains a better learning experience.	
Students' performance	Student performance would improve education success.	(Chao, 2019) Performance expectancy
	Student performance increases the chances of achieving educational success.	
	Student performance allows one to accomplish learning tasks more quickly.	
	Student performance would enhance my effectiveness in education learning.	
Teachers' performance	Teachers' performance improves learning and a good grade.	(Tuan et al., 2005) Performance goal
	Teachers' performance increases individual students' capabilities.	
	Teachers' performance enhances students' thinking that they're smart.	
	The teacher's performance shows that the teacher pays attention to me.	

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