INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN PROGRESSIVE EDUCATION & DEVELOPMENT

OPEN ACCESS JOURNAL

Vol 14, Issue 3, (2025) E-ISSN: 2226-6348

The Impact of Feedback Methods on Student Achievement in Zhengzhou University, China: A Mediating Role of Self-Efficacy

Chen Qi, Norwaliza Binti Abdul Wahab

Sultan Idris Education University, Malaysia

Corresponding Authors Email: norwaliza@fpm.upsi.edu.my

DOI Link: http://dx.doi.org/10.6007/IJARPED/v14-i3/25804

Published Online: 11 August 2025

Abstract

In China, poor student achievement has negatively impacted students' motivation and learning capabilities, ultimately eroding the university's reputation. These issues stem from the inadequacy of perceived usefulness, feedback orientation, student engagement, and self-efficacy, which lead to poor academic achievement at Zhengzhou University. Hence, this study examines the impact of feedback methods on student achievement at Zhengzhou University, China, with a focus on the mediating role of self-efficacy. The population in this study comprised 70,683 students from Zhengzhou University, China. The researcher employed a descriptive and correlational design, focusing on quantitative analysis, and utilized a self-administered questionnaire as the data collection instrument. The researcher validated the instrument through expert review and conducted a pilot study using 30 samples. A sample of 277 students was selected using both simple and stratified random sampling techniques, yielding a success rate and response rate of 72.7%. SPSS was used to analyse the generated data and to assess the hypothesis testing using regression analysis. This study confirmed a significant and positive correlation between perceived usefulness, feedback orientation, student engagement, self-efficacy, and student achievement in Zhengzhou University, China. In addition, the results from regression analysis showed that perceived usefulness, feedback orientation, student engagement, self-efficacy, and student achievement have a P-value of 0.000, which is less than < 0.001. In conclusion, perceived usefulness and feedback orientation are significantly and positively associated with promoting student achievement by enhancing motivation, learning outcomes, and satisfaction. Perceived usefulness, student engagement, and self-efficacy significantly impact student achievement, continuously empowering student success, and feedback orientation, which in turn leads to improved student achievement. This study is significant in addressing the gap identified in previous studies while contributing to the body of knowledge and promoting student achievement at Zhengzhou University in China.

Keywords: Student Achievement, Perceived Usefulness, Feedback Orientation, Student Engagement, Self-Efficacy, Zhengzhou University

Introduction

Student achievement is one of the primary indicators of educational success, often serving as a measure of both individual student progress and the overall effectiveness of an educational system (Van Ryzin et al., 2020). Achievement is typically assessed through standardised tests, grades, or achievement-based evaluations, which reflect not only a student's mastery of subject material but also their cognitive, emotional, and social development (Spătărelu, 2020). Various factors influence student achievement, including socioeconomic background, institutional resources, teacher quality, parental involvement, and the learning environment. (Tan et al., 2024). However, one of the most critical and modifiable factors within the classroom is the method of feedback. (Zysberg & Schwabsky, 2021). Students who excel academically are more likely to develop problem-solving and analytical skills, which are crucial in all areas of life. The global issues related to inadequate education quality have raised significant concerns, impacted various countries, and led to a decline in student achievement (Li et al., 2024). In China, inadequate academic achievement among students is attributed to low student engagement, limited learning resources, and insufficient feedback from lecturers, which have negatively impacted the quality of academic outcomes for both students and faculty (Lai et al., 2024). At Zhengzhou University, enhancing student achievement has significantly influenced student perception, reduced their feedback orientation towards learning activities and interactions, led to poor student engagement, and resulted in low self-efficacy among students in attaining their academic goals (Oc et al., 2023). These effects create a negative disparity between student achievement and the ability of academic staff to promote effective teaching. Statistical data indicate a decline in student achievement records, from 28.1% in 2019 to 17.3% in 2023, attributed to inadequate perceived usefulness, poor feedback orientation, lack of student engagement, and low self-efficacy, which result in poor student achievement. The issues have damaged the students' perception of the university, reduced the enrollment rate, created a negative perception of the teachers' capabilities, and raised enormous concerns about investigating the reasons to alleviate student achievement within their academic environment (Doyle et al., 2023; Ifesinachi et al., 2024). Although previous studies have established that feedback generally improves student achievement, they often lack a detailed analysis of how various feedback methods interact with students' cognitive, emotional, and social development. (Jin et al., 2022; Al-khataneh, 2024). The literature lacks a clear understanding of how different types of feedback influence academic achievement. Moreover, there is a significant gap in understanding the role of different types of feedback in addressing regional and socioeconomic disparities that influence student achievement in China's educational system. While studies have documented the achievement gap between urban and rural students, there is a lack of research on how feedback methods might mitigate or exacerbate these disparities (Ma, Xiao, & Jiao, 2024). Few studies have examined whether certain types of feedback benefit students from disadvantaged backgrounds, who may have less access to quality instruction and technological resources (Gentrup et al., 2020; Si et al., 2020; Afzaal et al., 2024). This gap is particularly relevant in the context of China, where socioeconomic inequalities persist, and rural students often face disadvantages compared to their urban counterparts. Additionally, the cultural dimension of feedback has been underexamined in the literature. In traditional Chinese educational settings, such as those in China, feedback practices are often shaped by Confucian values of respect for authority, discipline, and academic excellence. (Chhaing, 2022). However, few studies have examined how these cultural norms influence the effectiveness of different feedback methods or how students interpret and respond to feedback in such environments.

Understanding this cultural context is crucial for developing effective feedback strategies that enhance academic outcomes and align with students' cultural expectations and learning preferences. Meanwhile, from a methodological perspective, much research has emphasised the positive effects of feedback on student achievement. (Nawaz, 2023), There is a scarcity of studies employing a quantitative approach to systematically compare the impact of different feedback methods on student achievement across various institutions and socioeconomic groups (Ozogul et al., 2022). Many studies rely on quantitative or small-scale research, limiting the generalizability of their findings (Van et al., 2020; Borgonovi & Pokropek, 2021; Zhou & Fu, 2022). This study aims to fill this gap by adopting a quantitative methodology to analyse how different feedback methods influence student achievement in China, thereby providing data-driven insights that can inform educational policy and practice. Additionally, despite numerous studies investigating various factors that influence student achievement in institutions, most have been conducted in Europe, the United States of America (USA), Australia, and Africa (Wessel et al., 2020; Lu et al., 2023). Paying less attention to the Asian continent, particularly in China, within distinct cultural and regional contexts, such as China, where examination pressure and traditional pedagogical norms significantly influence educational practices (Wang et al., 2024). Based on the above issues, the researcher tends to address the gap relating to student achievement concerning the disparities in perceived usefulness, poor feedback orientation, lack of student engagement and inadequate self-efficacy, thereby posing a threat to the students to excel in promoting academic activities to yield achievement, and to recommends some tactics to encourage and promotes the student participation and teacher contribution to alleviating the performance of student as it is imperative for student to excellence in their academic to enhance their continuous student achievement upon effective involvement of the students. This study aimed to investigate the impact of feedback methods on student achievement in Zhengzhou University, China: the mediating role of self-efficacy.

Literature Review

Student Achievement

Student Achievement has been defined as the academic achievement and success of students, often measured through standardized tests, grades, and other evaluative tools (Munir et al., 2023). Prior studies have demonstrated a positive correlation between student achievement and engagement (Lin, 2020; Wang et al., 2023). Ruado and Cortez (2024) examined the impact of Biology Interactive Slide Presentations, created using Pear Deck and Nearpod, on the achievement and engagement of Grade 12 STEM students. Six lessons on molecular biology were taught to 28 students. The results showed significant improvement in achievement, while focus group discussions indicated enhanced cognitive, emotional, and behavioural engagement. Tomaszewski et al. (2024) found that student achievement was influenced by differences across institution sectors globally and in Australia, such as institution climate and student engagement. Lin et al. (2023) examine the relationship between teacher qualities and student achievement in Indonesia, focusing on teacher evaluation scores in terms of professional and pedagogical competency. Results align with previous studies, indicating that teacher quality has a significant impact on student achievement. Other variables, like electricity access, also significantly relate to achievement, while family and government spending, teacher experience, and morbidity rates show partial significance. Khan (2019) examined the relationship between self-efficacy and student achievement of distance learners. Significant findings suggested that the majority of the

students were generally satisfied with learner-learner interaction, learner-content interaction, learner-technology interaction, and learner-instructor interaction. Learner-content interaction and Learner-Instructor interaction were significant predictors of general satisfaction, while Learner-learner interaction and Learner-technology interaction were not significant predictors of general satisfaction. Self-efficacy and achievement were not significantly correlated. The study recommends enhancing student-teacher and student-student interactions and suggests organizing orientation workshops on student achievement. Bondarenko et al. (2018) identify leadership practices that enhance student achievement and drive positive change in institutions. Results showed that principals in high-performing institutions use leadership practices more frequently, with "inspiring a shared vision" and "challenging the process" having the most significant impact on student achievement.

Perceived Usefulness

Perceived usefulness of learning refers to how a student subjectively perceives the capabilities of a mobile device to improve learning efficiency (Park & Kim, 2023). This perception has a direct impact on the perceived usefulness of a mobile device, which indirectly influences the consent to use mobile technologies in education. Alkhawaja et al. (2022) identified four groups of factors that influence the use of perceived learning, namely, technological, pedagogical, social, and personal. According to their research, the most significant factor in student acceptance of learning is the perceived usefulness of feedback methods. Haruna and Kiran (2023) investigate how feedback affects reading achievement through reading enjoyment, applying the Control Value Theory of Achievement Emotions (CVTAE) across 75 countries and economies using PISA 2018 data. Results indicate a strong link between perceived usefulness of feedback, enjoyment in reading, and higher reading scores among 15-year-olds, confirming cross-cultural applicability at the student level but less consistently at the institutional level. These findings underscore the importance of perceived usefulness feedback in enhancing reading outcomes globally. The study highlights the effectiveness of ML-driven feedback and the areas for improvement in science education. Amani (2022) found that perceived usefulness feedback on writing achievement among 88 first-year postgraduate students using an online system (Peerceptiv). Results indicated significant correlations between cognitive, affective, and behavioural engagement in peer feedback and writing quality. The study emphasises the importance of perceived usefulness feedback in enhancing writing skills and suggests avenues for further research to improve student achievement among postgraduate students. Thus, Hong et al. (2021) suggested that the university must seek to transform its environment and curricula to sharpen students' views on their achievement.

H_1: The perceived usefulness of students significantly impacts student achievement.

Feedback Orientation

Prior studies on feedback orientation methods and student achievement have demonstrated a relationship between feedback and student achievement (Nawaz, 2023). Feedback orientation, a term coined in the human resources literature, refers to an individual's openness to feedback, encompassing the ability to effectively receive, interpret, and utilize feedback to enhance performance (Park et al., 2024). Therefore, individuals with a higher feedback orientation can also be considered more feedback literate. Jin et al. (2022) identified four dimensions of feedback orientation: feedback utility, feedback social awareness, feedback accountability, and feedback self-efficacy. The feedback utility pertains to the

perceived usefulness of teachers' feedback in enhancing performance (Kleij, 2019; Lee et al., 2021). Feedback social awareness refers to the student's intention to utilise teacher feedback to maintain or foster social relationships (Nawaz, 2023; Afzaal et al., 2024). Given that feedback orientation influences students' use of feedback, a person who is more receptive to feedback may experience more positive emotions, even when confronted with negative feedback. Previous research identified that feedback perceptions are associated with different academic emotions (Mahvelati, 2021). Students who doubted the accuracy of their teachers' feedback reported feeling distressed and disappointed when receiving feedback (Ryan et al., 2024). Students who are more open and receptive to feedback tend to have more positive perceptions of it, which may lead to more positive emotions when receiving feedback. These positive academic emotions would lead to more adaptive learning outcomes for students' achievement. A student's achievement motivation could also influence feedback utilization. Achievement goals emerge as learning and performance orientation towards a task and are strong predictors of academic performance (Ma et al., 2024). Performance orientation is identified by outcome goals, ability goals, normative ability goals, and normative outcome goals (Gentrup et al., 2020). In contrast, feedback orientation is identified by goals and challenge-mastery goals (Jin et al., 2022). Feedback goals are associated with higher intrinsic motivation and greater academic improvement over time.

H_2: Feedback orientation of students significantly impacts student achievement.

Student Engagement

Saqr et al. (2023) address the scarcity of longitudinal research in online learning by examining four-year trajectories of student engagement and achievement for 106 participants. Using learning analytics, it finds varying associations between engagement and achievement over time. Continuous high engagement or grades predict stable academic success, while disengagement correlates with lower achievement, emphasising the importance of sustained engagement for academic achievement in online programs. Ruado and Cortez (2024) present a quantitative study that examines the impact of Biology Interactive Slide Presentations, created using Pear Deck and Nearpod, on the achievement and engagement of Grade 12 STEM students amid the challenges of Education 4.0 and the COVID-19 pandemic. It employs a one-group pre-test-post-test design, finding significant improvement in student achievement. Focus group discussions highlight enhanced cognitive, emotional, and behavioural engagement due to the interactive learning tools. Taleb et al. (2024) investigate the prevalence and impact of translanguaging in Jordanian English as a Second Language (ESL) classrooms. Employing surveys and assessments, it finds widespread use of translanguaging, enhancing student communication and educational quality. The study advocates for adopting translanguaging strategies to improve student engagement and comprehension, emphasising its importance for fostering inclusive and effective communication in multilingual educational settings. Brandmiller, Schnitzler, and Dumont (2024) examined the impact of Biology Interactive Slide Presentations, created with Pear Deck and Nearpod, on Grade 12 STEM students. A pre-test-post-test design with 28 students showed significant improvement in achievement. Engagement was assessed via focus groups, revealing enhanced cognitive, emotional, and behavioural engagement. The research underscores the effectiveness of these feedback methods in enhancing student learning outcomes and achievement.

H_3: Student engagement significantly impacts student achievement.

Self-Efficacy

Student self-efficacy plays a crucial role in helping students succeed in academic tasks and is strongly linked to their academic achievement (Chen, 2024). Students with higher self-efficacy tend to perform better academically, while those with lower self-efficacy may struggle. Zhong, Wen, and Li (2023) examine Adventus University's self-efficacy, focusing on academic outcomes and pedagogical practices. Gender, graduation year, and practice location have a significant influence on academic results. Quantitative perceptive supplements quantitative findings, suggesting avenues for further research on factors impacting self-efficacy in Adventus University's Pedagogy of Primary and Pre-institution Education program. Jian (2022) identifies effective strategies for student engagement in online courses. Key findings emphasize the importance of a positive learning environment, providing feedback orientation, student engagement, and perceived usefulness of technology. It suggests that further empirical studies be conducted to examine the influence of students and institutions on learner satisfaction. The study aims to guide instructors and course designers in enhancing online teaching practices that benefit online students. Li, Yang, Zhao, and Li (2023) examined the relationship between self-efficacy and student achievement among Master of Education distance learners at Allama Iqbal Open University, Islamabad. A stratified random sample of 351 students from Pakistan's four provinces participated. Findings indicated a feedback orientation and engagement with learner interactions; however, no significant correlation was found between satisfaction and student achievement. The study recommends enhancing interactions, feedback orientation, and student engagement, and suggests further research with randomised procedures across different programs and settings. Teng and Yang (2023) examine the factors that influence self-efficacy in higher education, particularly in nursing education. It identifies key elements, including service quality, institutional image, curriculum, feedback orientation, and social interaction. The study emphasises the importance of understanding these factors to improve student retention and educational quality in nursing programs.

H_4: Self-efficacy significantly impacts student achievement.

H_5: Self-efficacy mediates the effect between perceived usefulness, feedback orientation, student engagement, and student achievement.

Conceptual Framework

Based on the prior empirical evidence and theoretical gaps identified in the preceding sections, a conceptual framework for this study was developed, illustrating the role of self-efficacy as a mediating variable. The independent variables are perceived usefulness, feedback orientation, and student engagement. At the same time, student achievement is the dependent variable as depicted in Figure 1. Additionally, this study aims to investigate the impact of feedback methods on student achievement at Zhengzhou University, China, with a focus on the mediating role of self-efficacy.

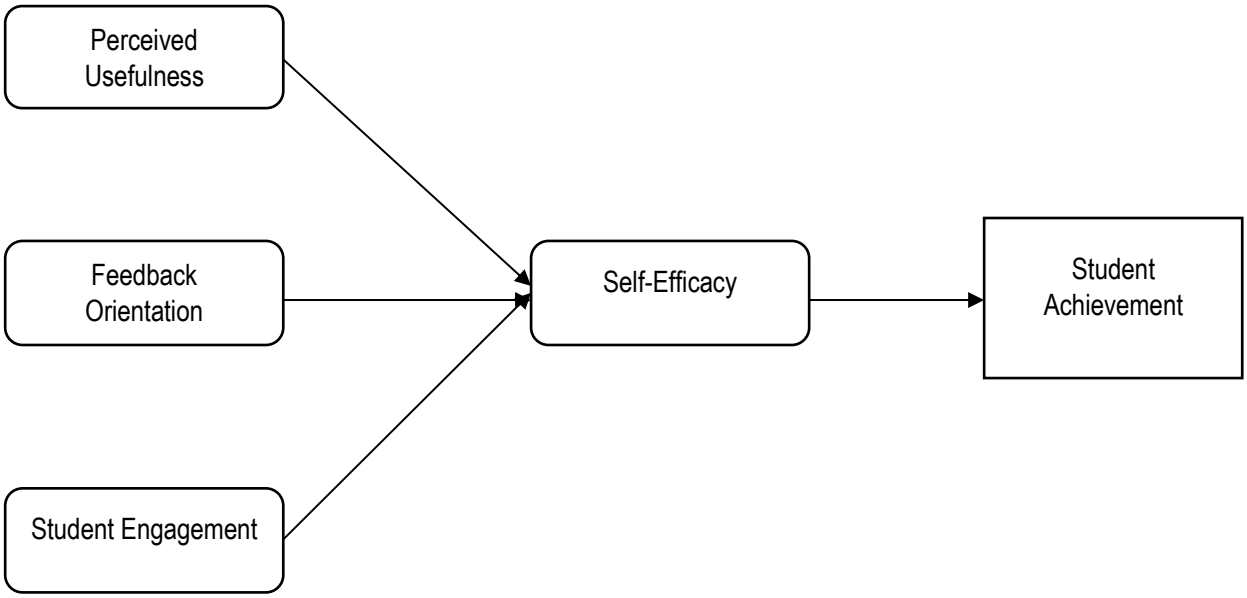

Figure 1: Conceptual Framework of the Study

Research Methodology

Sample Size and Population Procedure

Zikmund et al. (2020) classify the research design as a master plan, summarizing the procedures and methods for analysing and collecting the required information. There are two types of research designs: descriptive and correlational, which the researcher adopted to support the development of this research design (Hair et al., 2019). The researcher adopted simple and stratified random sampling in data collection among university students from Zhengzhou University. The population of students enrolled at Zhengzhou University is 70,683 as of 2023, which was the population used in this study. Krejcie and Morgan (1970) assert that a target population of 70,683 students would cover a sample size of 381 (50,000) to 382 (75,000) with a 5% margin of error and 95% confidence (Jacqueline, 2013; Sekaran & Bougie, 2016). This instrument (questionnaire) consists of six (6) sections, which include demographic data, perceived usefulness, feedback orientation, student engagement, self-efficacy, and student achievement. The questionnaire items were adapted for each construct. These questions further help provide students with the quality of information necessary to boost their student achievement. Each student is required to use 10 minutes of their time to complete a set of questionnaires. A structured questionnaire used a five-point Likert interval scale, ranging from "1=strongly disagree" to "5=strongly agree" (Joshi et al., 2015). The researcher distributed questionnaires to students at Zhengzhou University using a self-administered (face-to-face) method to collect the data (Flick, 2011). The instrument's pilot study was conducted with a sample size of 30, which yielded an acceptable level of reliable statistics, ranging from 0.736 to 0.922 for the constructs. Out of 381 questionnaires distributed, 277 were returned by the respondents (students), yielding a 72.7% response rate and success. Therefore, the sample size of this study is 277, which met the statistical criteria required in this study. The researcher focuses on university students, who help to provide adequate data for enhancing student achievement by effectively promoting the perceived usefulness, feedback orientation, student engagement, and self-efficacy of students.

Measurements of Variables

Constructs	Cronbach Alpha	Source of Adopted Items
Student Achievement	0.783.	Zysberg and Schwabsky (2021)
Perceived Usefulness	0.910	Subramanian and Budhrani (2020)
Feedback Orientation	0.750	Inayat and Ali (2020)
Student Engagement	0.823	Wahman et al. (2022)
Self-Efficacy	0.801	Yousaf et al. (2022)

Data Analysis

The data analysis tool was used to analyse the data generated from the respondents. The researcher adopted SPSS (version 28.0) to analyse the data generated (Rea & Parker, 2014). The adoption of SPSS facilitates the analysis of descriptive statistics, normality, multicollinearity, correlation, and regression (Flick, 2011). Lastly, regression analysis helped to determine the impact of perceived usefulness, feedback orientation, student engagement, and self-efficacy on student achievement. These analyses helped provide a desirable solution to the challenges associated with the impact of feedback methods on student achievement at Zhengzhou University, China: the mediating role of self-efficacy.

Results

Demographic Data Analysis

The students are categorized into male and female genders in this study, as follows: males, 51.6% (143 respondents), and females, 48.4% (134 respondents). It further indicated that most male students from Zhengzhou University participated in this study. According to Bao, Li, Xia, Zhu, Li and Yang (2022), males are more concerned and empathetic about the current issues associated with poor student achievement at the University, which resulted from the lack of perceived usefulness, feedback orientation, student engagement, and self-efficacy, leading to poor student achievement. The age group of students involved in this study, which is 16 – 20 years, 42.6% (118 respondents), 21 – 25 years, 36.8% (102 respondents), 26 – 30 years, 12.6% (35 respondents), and 31 years and above, 7.6% (22 respondents). In addition, the 16–20 age group comprises 42.6% (143 respondents), indicating the highest rate of participation in the study on the impact of perceived usefulness, feedback orientation, student engagement, and self-efficacy on student achievement at Zhengzhou University, China. This study confirms that the levels of study among students at Zhengzhou University are as follows: diploma, bachelor's, and master's programmes. The students studying the diploma programmes had a response rate of 42.6%, with 118 respondents. Bachelor students studying had a response rate of 54.9%, with 152 respondents. The master students' programmes had a response rate of 15.5%, with 43 respondents who were actively involved in the survey participation of this study. It further showed that students in the bachelor programmes make up 54.9% of the total and are considered the highest level of studies involved, as they are also the most populous enrolled in the university. They are also concerned about student achievement challenges, which hinder their academic activities and pursuits. In this study, the researcher conducted a respondent analysis using the highest feedback strategies and methods to enhance student achievement. These were highlighted: perceived usefulness, feedback orientation, student engagement, self-efficacy, and student achievement. Based on the findings, it was concluded that perceived usefulness was reported by 31.4% (87 respondents), feedback orientation by 23.1% (64 respondents), student engagement had 35.4% with 98 respondents, and self-efficacy by 10.1% (28 respondents), all

of which were fully integrated and participated in this study. The results showed that students agreed that student engagement has the highest impact, as it significantly contributes to the development of academic activities, leading to students' pursuit of achievement at Zhengzhou University, China. Engagement helps promote a willingness and capture knowledge to initiate the student's capabilities, enabling them to function well and achieve success (Garrin, 2014). In this study, the factors contributing to the development of student achievement were highlighted as follows: perceived usefulness, feedback orientation, student engagement, self-efficacy, and student achievement. Based on 72 respondents, feedback orientation was reported by 17.3% (48 respondents), student engagement by 46.6% (129 respondents), and self-efficacy by 10.1% (28 respondents), who fully integrated and participated in this study. The results showed that students agreed that student engagement has the highest impact, as it significantly contributes to the development of academic activities, leading to students' pursuit of achievement at Zhengzhou University, China. The findings further suggest that student engagement has a substantial impact on student achievement at the university, thereby promoting the creativity, knowledge, skills, and understanding of students' capacities and capabilities in handling and managing their academic activities towards excellence.

Table 1
Demographic Information

Items	Frequency (n = 277)	Percentage (%)
Gender		
Male	143	51.6
Female	134	48.4
Age Group		
16 – 20 years old	118	42.6
21 – 25 years old	102	36.8
26 – 30 years old	35	12.6
31 years old and above	22	7.9
Level of Study		
Diploma Programmes	82	29.6
Bachelor Programmes	152	54.9
Master Programmes	43	15.5
Highest Quality Feedback		
Perceived Usefulness	87	31.4
Feedback Orientation	64	23.1
Student Engagement	98	35.4
Self-Efficacy	28	10.1
Factors of Student Achievement		
Perceived Usefulness	72	26.0
Feedback Orientation	48	17.3
Student Engagement	129	46.6
Self-Efficacy	28	10.1

Normality Analysis

Data normality assessment is performed to ensure that the data distribution is normal, which is essential to assess before embarking on appropriate statistical testing to enhance the viability of data generated (Litwin, 2014). Several techniques are available

for assessing statistical normality, including box plots, the Kolmogorov-Smirnov test, and histograms. Skewness and kurtosis are widely accepted methods for assessing normality (Zikmund et al., 2020). Furthermore, the skewness value for the distribution of all items is within ±2, and the kurtosis values are within ±2. Therefore, they fulfil the requirement and meet the criteria of ±2 (Hair, Page, & Brunsveld, 2019).

Table 2
Assessment of Univariate Data Normality

Items	Mean	Std. Deviation	Skewness	Kurtosis
SA1	4.308	0.633	-0.310	0.727
SA2	4.348	0.596	-0.100	0.200
SA3	4.392	0.620	-0.019	0.314
SA4	4.264	0.649	-0.240	0.769
PU1	4.272	0.657	-0.208	0.363
PU2	4.296	0.720	-0.040	0.694
PU3	4.296	0.720	-0.213	0.272
FO1	4.104	0.781	-0.129	0.663
FO2	4.212	0.562	-0.103	0.513
FO3	4.264	0.569	-0.340	1.096
FO4	4.276	0.561	-0.010	0.457
SE1	4.296	0.725	-0.462	1.020
SE2	4.156	0.828	-0.404	1.131
SE3	4.180	0.781	-0.473	0.593
SE4	4.124	0.787	-0.385	0.292
SEF1	4.136	0.615	-0.206	0.492
SEF2	4.112	0.631	-0.459	0.910
SEF3	4.164	0.683	-0.044	0.661

Multicollinearity Analysis

Multicollinearity testing has helped to facilitate the eligibility of no strong correlation between two or more viable constructs. In addition, adopting multicollinearity analysis has helped mitigate this probability, indicating that a good predictor may construct insignificant findings, leading to the rejection of the results (Flick, 2011). Therefore, there is a need to examine the tolerance and variance inflation factor (VIF) to ensure that it is clear. Based on the rule of thumb, tolerance must be above 0.1, while VIF must be lower than 10.0 to meet the rule's criteria (Kumar, 2014). The variables perceived usefulness, feedback orientation, student engagement, and self-efficacy have met the requirements of tolerance, which must be above 0.1 and VIF lower than 10.0. Hence, the findings reveal no multicollinearity issues and further support the notion that perceived usefulness, feedback orientation, student engagement, and self-efficacy help to address the impact of feedback methods on student achievement at Zhengzhou University, China, by mediating the role of self-efficacy.

Table 3
Multicollinearity Test for Constructs

Model		Collinearity Statistics	
		Tolerance	**VIF**
	(Constant)		
	Perceived Usefulness (PU)	0.236	4.232
1	Feedback Orientation (FO)	0.211	4.745
	Student Engagement (SE)	0.152	6.561
	Self-Efficacy (SEF)	0.239	4.241

Dependent Variable: Student Achievement

Correlation Analysis

Correlation analysis examined the relationship between perceived usefulness, feedback orientation, student engagement, and self-efficacy in determining the dependent variable (student achievement). The results in Table 4 showed that the constructs were significantly and positively correlated. Correlations among variables such as perceived usefulness, feedback orientation, student engagement, and self-efficacy have "strong" and "very strong" correlations to student achievement as the dependent variable. The presence of common method bias helps verify the correlations; Johnson and Clark (2014) affirmed that correlation coefficients above 0.950 between constructs indicate common method bias.

Table 4
Descriptive Statistics and Correlations for all Constructs

Constructs	Mean	SD	1	2	3	4	5
1. SA	3.643	0.526	1				
2. PU	3.491	0.600	**.917****	1			
3. FO	3.566	0.739	.908**	**.745****	1		
4. SEng	3.580	0.631	.943**	.869**	**.825****	1	
4. SF	3.872	0.565	.887**	.777**	.853**	**.803****	1

Note: ** significant level at $p < 0.01$ (2-tailed).
SA: Student Achievement; **PU:** Perceived Usefulness; **FO:** Feedback Orientation; **SEng:** Student Engagement**; SE**: Self-Efficacy

Regression Analysis

In this study, the regression model yields an R^2 value of 0.71, indicating that the independent variable explains a significant portion of the variability. In contrast, the range of 0.30 to 0.70 explained a moderate portion of the variability. The analysis of these variables — R, R^2, beta, and significance values — helps determine the impact of perceived usefulness, feedback orientation, student engagement, and self-efficacy on student achievement at Zhengzhou University, China. The sig value was adopted to determine the homogeneity of variance of the data (Bryman & Bell, 2018). Therefore, it is necessary to verify the regression analysis assumptions to ensure the validity of the analysis results. One of the regression assumptions is that there should be no multicollinearity among the independent and mediating variables. Both the tolerance and VIF values meet the criteria, stating that the value of VIF must be lower than 10.0 and the value of tolerance must be greater than 0.1 (Dawes, 2012). The researcher emphasised the direct and indirect effects of student achievement in this study.

Table 5
Direct Effect (Regression Analysis) for all Constructs

Model		Standardised Coefficients			Collinearity Statistics	
		Beta	t	Sig.	Tolerance	VIF
1	(Constant)		12.757	0.000		
	Perceived Usefulness	0.398	34.275	0.000	0.236	4.232
	Feedback Orientation	0.205	16.625	0.000	0.211	4.745
	Student Engagement	0.204	14.095	0.019	0.152	6.561
	Self-Efficacy	0.279	23.989	0.000	0.239	4.241

a. Dependent Variable: Student Achievement

H1: The perceived usefulness of students significantly impacts student achievement.
The findings above showed the positive impact of perceived usefulness on student achievement at Zhengzhou University, China. Perceived usefulness has a beta coefficient (β = 0.398; p-value = 0.000, which is less than 0.001), indicating that it has a strong effect on student achievement, thereby enhancing students' ability to promote and harness academic success. Students believe that implementing and harnessing perceived usefulness would add value to their performance, brainstorming, teamwork, and excellence, which is reflected in their daily tasks toward achieving student excellence at universities in China (Haruna & Kiran, 2023). The positive impact of perceived usefulness indicates that students perceive it as a tactic and an additional strategy that enhances their contribution and effort towards promoting student achievement and success (Park & Kim, 2023). Thus, perceived usefulness is significant to student achievement. Therefore, hypothesis 1 of this study has been met, and the requirement has been achieved. Thus, H1 is accepted.

H2: Feedback orientation of students significantly impacts student achievement.
The findings revealed a positive impact of feedback orientation on student achievement at Zhengzhou University, China. Feedback orientation has a beta (β = 0.205; sig. = 0.000, which is less than 0.001) and indicates that it strongly affects student achievement, which would help increase students' capability in promoting, providing feedback, and assessing the lecturer's contribution to promoting their student achievement. Students from Zhengzhou University believe that a feedback-oriented approach would enhance students' feedback, assessment, and productivity, thereby reflecting the university's reputation and recognition based on student achievement and success (Mahvelati, 2021). Thus, feedback orientation is significant to student achievement. Therefore, hypothesis 2 of this study has been met, and the requirement has been achieved. Thus, H2 is accepted.

H3: Student engagement significantly impacts student achievement.
The findings showed the positive impact of student engagement on student achievement at Zhengzhou University, China. The student engagement has a beta coefficient (β = 0.204; sig. = 0.000, which is less than 0.001), indicating that student engagement has a substantial impact on student achievement, helping to increase students' capability in promoting and harnessing academic success. Students perceived and agreed that improving the quality of student engagement would add value to their academic struggles, nurture teamwork, collaboration of ideas and knowledge, and create an innovative path for students to nurture and improve, thereby drastically promoting their student achievement (Jin et al., 2022).

Therefore, hypothesis 3 of this study has been met, and the requirement has been achieved. Thus, H3 is accepted.

H4: Self-efficacy significantly impacts student achievement.

The findings asserted the positive impact of self-efficacy on student achievement at Zhengzhou University, China. The self-efficacy has a beta coefficient (β = 0.279; sig. = 0.000, which is less than 0.001), indicating that self-efficacy has a substantial impact on student achievement, thereby enhancing students' ability to promote and harness academic success. The positive impact of self-efficacy signifies that students believe that when there is adequate well-being, motivation, persistence, goal setting, resilience, and students tend to articulate their reading, learning, and capturing their mindset in the readiness for examination, which would reflect the accomplishment performed towards harnessing the student achievement of students (Yang et al., 2021; Zhong, Wen & Li, 2023). Thus, self-efficacy is significant towards promoting student achievement. Therefore, hypothesis 4 of this study has been met, as well as the requirement. Hence, H4 is accepted.

Table 5

Indirect Effect (Regression Analysis) for all Constructs

Model		Standardised Coefficients			Collinearity Statistics	
		Beta	t	Sig.	Tolerance	VIF
1	(Constant)		13.224	0.000		
	Perceived Usefulness	-0.154	-2.570	0.011	0.242	4.132
	Feedback Orientation	0.610	19.663	0.000	0.316	3.167
	Student Engagement	0.433	16.139	0.000	0.173	5.765

a. Dependent Variable: Self-Efficacy

H5: Self-efficacy mediates the effect between perceived usefulness, feedback orientation, student engagement, and student achievement.

The findings revealed that self-efficacy mediates the relationship between perceived usefulness, feedback orientation, student engagement, and student achievement at Zhengzhou University, China. This study's perceived usefulness has a beta coefficient (β = -0.362; p-value = 0.011), indicating that perceived usefulness has a substantial negative impact on student achievement through self-efficacy, suggesting that it does not enhance students' capability in promoting and harnessing academic success. The lack of perceived usefulness regarding self-efficacy highlighted the inadequacies of the curriculum, engagement, and learning outcomes, ultimately leading to unsatisfactory student achievement (Almulla, 2023). Feedback orientation has a beta (β = 0.610; sig.value = 0.000), and student engagement has a beta (β = 0.433; sig.value = 0.000). The feedback orientation and student engagement have a substantial positive impact on student achievement through self-efficacy. Feedback orientation helps to promote the orientation, learning experiences, and increase engagement by fostering a positive learning environment (Ma, Xiao, & Jiao, 2024). However, the collinearity statistics analysis confirmed that perceived usefulness has a tolerance of 0.242 and a VIF of 4.132, feedback orientation has a tolerance of 0.316 and a VIF of 3.167, and student engagement has a tolerance of 0.173 and a VIF of 5.765, which meet the tolerance and VIF values criteria. Based on these criteria and results, feedback orientation and student engagement, as influenced by self-efficacy, have impacted students' achievement. Thus, self-efficacy mediates between perceived usefulness, feedback orientation, student engagement,

and student achievement. Hypothesis 5 of this study has been met, as has the requirement. Thus, H5 is accepted.

Discussion

Objective 1 of this study revealed the positive impact of perceived usefulness on student achievement at Zhengzhou University, China. Perceived usefulness has a beta coefficient (β = 0.398; p-value = 0.000, which is less than 0.001), indicating that it has a positive impact on student achievement by enhancing students' ability to promote and harness academic success. Students believe that implementing and harnessing perceived usefulness would add value to their performance, brainstorming, teamwork, and excellence, which is reflected in their daily tasks toward achieving student excellence at universities in China (Jiang et al., 2023). The positive effect of perceived usefulness indicates that students perceive it as a tactic and an additional strategy that enhances their contribution and effort towards promoting student achievement and success (Kamran et al., 2023). Perceived usefulness contributes to higher levels of satisfaction, which in turn positively influences student achievement. When students are satisfied with their learning experience, they are more likely to continue engaging with the material and strive for higher grades (Ozogul et al., 2022). Lastly, perceived usefulness creates a positive feedback loop: students who find something helpful are more engaged, more satisfied, and more likely to continue using it, ultimately leading to improved academic achievement.

Objective 2 of this study demonstrated a positive impact of feedback orientation on student achievement at Zhengzhou University, China. Feedback orientation has a beta (β = 0.205; sig. = 0.000, which is less than 0.001) and indicates that it strongly affects student achievement, which would help increase students' capability in promoting, providing feedback, and assessing the lecturer's contribution to promoting their student achievement. Students from Zhengzhou University believe that a feedback-oriented approach would enhance students' feedback, assessment, and productivity, thereby reflecting the university's reputation and recognition based on student achievement and success (Mahvelati, 2021). Feedback orientation does impact student achievement. Students who are more receptive to and actively seek feedback tend to show greater learning gains and improve their performance. The positive effect of feedback orientation indicates that students perceive it as a strategy that significantly encourages higher participation in related academic activities, thereby enhancing their academic achievement (Nawaz, 2023). It is perceived as a critical factor that empowers students to enhance their creativity, critical thinking, and innovative strategy to harness and nurture academic excellence. Feedback orientation tends to harness students' capabilities and capacities with adequate feedback, assessment, and improvement in managing their academic activities, thereby reflecting student achievement (Lian, Pei, & Li, 2024).

Objective 3 of this study revealed that there is a positive impact of student engagement on student achievement at Zhengzhou University, China. The student engagement has a beta coefficient (β = 0.204; sig. = 0.000, which is less than 0.001), indicating that student engagement has a strong effect on student achievement, thereby helping to increase students' capability in promoting and harnessing academic success. Thus, student engagement is significant in promoting student achievement. Students perceived and agreed that improving the quality of student engagement would add value to their academic

struggles, nurture teamwork, collaboration of ideas and knowledge, and create an innovative path for students to nurture and improve, thereby drastically promoting their student achievement (Jin et al., 2022). The positive effect of student engagement signifies that students believe that when there is adequate well-being, active learning, feedback support, adequate student interest and students tend to articulate their reading, learning and capturing their mindset in the readiness for examination, which would reflect the accomplishment performed towards harness the student achievement of students (Ruado & Cortez, 2024). Student engagement tends to harness a student's capability and capacity for developing their skills in managing workloads, reflecting student achievement (Subramanian & Budhrani, 2020). Engaging with learning can foster a positive attitude toward learning, leading to a cycle of motivation and achievement.

Objective 4 of this study revealed that there is a positive impact of self-efficacy on student achievement at Zhengzhou University, China. The self-efficacy has a beta coefficient (β = 0.279; sig. = 0.000, which is less than 0.001), indicating that self-efficacy has a substantial impact on student achievement, thereby enhancing students' ability to promote and harness academic success. Thus, self-efficacy is significant towards promoting student achievement. Students perceived and agreed that improving their self-efficacy would add value to their academic struggles, nurture teamwork, collaboration of ideas, and knowledge, and create an innovative path for students to encourage and improve, which would drastically promote their student achievement (Yue, Sun & Ye, 2024). The positive effect of self-efficacy signifies that students believe that when there is adequate well-being, motivation, persistence, goal setting, resilience, and students tend to articulate their reading, learning, and capturing their mindset in the readiness for examination, which would reflect the accomplishment performed towards harnessing the student achievement of students (Yang et al., 2021). Students with high self-efficacy beliefs are more likely to engage in school and persist in learning until they have achieved their learning goals and attained academic success (Jurasek & Wawrosz, 2023).

Objective 5 of this study demonstrated that self-efficacy mediates the relationship between perceived usefulness, feedback orientation, student engagement, and student achievement at Zhengzhou University, China. This study's perceived usefulness has a beta coefficient (β = -0.362; sig.value = 0.011, which is greater than 0.001) and indicates that perceived usefulness strongly negatively affects student achievement through self-efficacy. Feedback orientation has a beta (β = 0.610; sig.value = 0.000) and indicates a substantial positive impact on student achievement through self-efficacy. Student engagement has a beta coefficient (β = 0.433; p-value < 0.001), indicating a substantial positive impact on student achievement through self-efficacy. It further helped to harness the success and capabilities in promoting academic success. Thus, self-efficacy mediates between perceived usefulness, feedback orientation, student engagement, and student achievement. The lack of perceived usefulness, combined with low self-efficacy, highlighted the inadequacies of the curriculum, engagement, and learning outcomes, resulting in unsatisfactory student achievement (Almulla, 2023). Self-efficacy often mediates the relationship between perceived usefulness and academic achievement. This means that a student's belief in their ability to perform a task (self-efficacy) plays a crucial role in how their perception of the usefulness of a tool or approach translates into actual academic success. When students believe that self-efficacy is a valuable factor in their success, they may develop a stronger belief in their ability to use that tool effectively

and achieve better academic outcomes (Al-khataneh, 2024). Student feedback orientation helps identify areas for improvement and ensures the program meets the needs of students, thereby fostering a positive learning environment (Afzaal et al., 2024). Feedback orientation helps to promote the orientation, learning experiences, and increase engagement by fostering a positive learning environment (Ma et al., 2024). Academic self-efficacy mediates the relationship between feedback orientation and academic achievement. This means that the connection between how students perceive and respond to feedback (their feedback orientation) and their academic performance is partly explained by their beliefs in their abilities (self-efficacy). The mediating role of self-efficacy suggests that the impact of feedback orientation on academic achievement is not direct, but is influenced by the learner's self-efficacy. Students with high self-efficacy are more likely to engage actively in learning activities, both cognitively and behaviourally. They are more inclined to persist in challenging tasks, seek help when needed, and employ effective learning strategies. Conversely, students with low self-efficacy may be less engaged, may avoid challenging tasks, and may be less inclined to use effective learning strategies (Brandmiller, Schnitzler & Dumont, 2024). Engaged students are more likely to attend class regularly, participate in discussions, complete assignments on time, and demonstrate a deeper understanding of the material. Research indicates a positive correlation between engagement and academic achievement, with higher levels of engagement typically resulting in improved academic performance (Li et al., 2023). Self-efficacy acts as a mediator, meaning it influences the relationship between engagement and achievement. In other words, the positive relationship between engagement and achievement is partially or fully explained by the mediating effect of self-efficacy (Anthonysamy & Singh, 2024). When students possess a high level of self-efficacy, they are more likely to engage, and this engagement, in turn, contributes to their academic success.

Conclusion

Based on empirical findings, perceived usefulness, feedback orientation, student engagement, and self-efficacy are found to determine student achievement at Zhengzhou University in China. This study concluded a significant relationship between perceived usefulness, feedback orientation, student engagement, self-efficacy, and student achievement. It was further agreed that improving perceived usefulness would help promote the students' sense of distinction or uniqueness compared to their peers, often stemming from their unique abilities, interests, or experiences. It would also help capture the necessity of identifying student differences, self-perception, and psychological impact in harnessing academic success. This study concluded that the feedback orientation influences student achievement, requiring students' overall receptivity to and engagement with feedback, encompassing their attitude towards feedback, how they seek and process it, and their likelihood of using it to improve their learning and performance. It further agreed that developing feedback assessment, practices, student motivation and engagement, and self-regulated learning would help nurture and enhance student achievement. This study further asserted and concluded that promoting feedback practices would add value to the teacher-student relationship, making their assessment and workload more proficient and of higher quality. The findings conclude that student engagement has a direct impact on student achievement, provided that adequate learning resources and conducive environments are in place to capture the quality of the self-regulated learning process. This study further agrees that student engagement needs to be explored at different levels of a student's involvement,

attention, and motivation in their learning and school activities. It encompasses behaviours, emotions, and thoughts related to their learning experiences. Engaged students demonstrate interest, participate actively, and feel connected to their education. High student engagement is crucial for a positive learning environment and student success. It would help improve learning outcomes, increase motivation and a love for learning, and give students a greater sense of belonging and connection to the university environment. This study concluded that the mediating effect of self-efficacy on student achievement affects the development of perceived usefulness, feedback orientation, and student engagement. Improving student self-efficacy has significantly promoted the students' belief in their ability to succeed in academic tasks and achieve desired outcomes. It also agreed that it contributed to the students' confidence in their capabilities to learn, perform, and persevere through challenges in their studies. Finally, it concluded that perceived usefulness, feedback orientation, student engagement, and self-efficacy influence student achievement, which has helped promote and navigate students' success at Zhengzhou University, China.

The theoretical and contextual contribution of this study emphasises promoting social cognitive theory, which highlights that high self-efficacy is linked to increased effort, persistence, and the adoption of effective learning strategies, all of which positively influence achievement. Utilisation theory supports positive perceptions of feedback, and engagement with feedback is associated with better academic outcomes, as students can use feedback to identify areas for improvement and adjust their learning strategies. The expectancy-value theory suggests that students' motivation to engage in learning is affected by their beliefs about the value of the task and their expectations of success. The significance of these findings demonstrates that high self-efficacy helps to foster greater engagement and a more positive attitude towards feedback, while effective feedback can boost self-efficacy and motivation. Similarly, student engagement can be both a cause and a consequence of positive feedback experiences and high self-efficacy. Therefore, understanding these complex relationships is vital for educators and researchers to develop effective strategies for promoting student success.

References

Afzaal, M., Zia, A., Nouri, J., & Fors, U. (2024). Informative Feedback and Explainable AI-Based Recommendations to Support Students' Self-regulation. *Technology, Knowledge and Learning*, *29*(1), 331–354. https://doi.org/10.1007/s10758-023-09650-0

Al-khataneh, O. K. D. (2024). *Evaluating the Role of Teachers' Feedback in Secondary School Students' Academic Achievement: An Empirical Evidence from Jordan*. *17*(61), 131–146.

Alkhawaja, M. I., Halim, M. S. A., Abumandil, M. S. S., & Al-Adwan, A. S. (2022). System Quality and Student's Acceptance of the E-learning System: The Serial Mediation of Perceived Usefulness and Intention to Use. *Contemporary Educational Technology*, *14*(2). https://doi.org/10.30935/CEDTECH/11525

Almulla, M. A. (2023). Constructivism learning theory: A paradigm for students' critical thinking, creativity, and problem solving to affect academic performance in higher education. *Cogent Education*, *10*(1). https://doi.org/10.1080/2331186X.2023.2172929

Amani, D. (2022). I Have to Choose This University: Understanding Perceived Usefulness of Word of Mouth (WOM) in Choosing Universities among Students of Higher Education. *Services Marketing Quarterly*, *43*(1), 1–16. https://doi.org/10.1080/15332969.2021.1982851

Anthonysamy, L., & Singh, P. (2024). Investigating the Interplay of Academic Dishonesty, Open Book Exams Perception, Preference, And Student Outcomes from The Self-Efficacy Theory Perspective. *Journal of Academic Ethics*, *August*. https://doi.org/10.1007/s10805-024-09554-3

Bondarenko, O. V., Mantulenko, S. V., & Pikilnyak, A. V. (2018). Google Classroom as a Tool of Support of Blended Learning for Geography Students. *CEUR Workshop Proceedings*, *2257*, 182–191.

Borgonovi, F., & Pokropek, A. (2021). The evolution of socio-economic disparities in literacy skills from age 15 to age 27 in 20 countries. *British Educational Research Journal*, *47*(6), 1560–1586. https://doi.org/10.1002/berj.3738

Brandmiller, C., Schnitzler, K., & Dumont, H. (2024). Teacher perceptions of student motivation and engagement: longitudinal associations with student outcomes. *European Journal of Psychology of Education*, *39*(2), 1397–1420. https://doi.org/10.1007/s10212-023-00741-1

Bryman, A., & Bell, E. (2018). *Business research methods*. New York. Oxford University Press.

Cai, J., & Kwan, M. P. (2023). Understanding Social Inequality in Individual Perceived Exposures to Air Pollution in Residential and Visited Neighborhoods: A Study Using Association Rule Mining. *Annals of the American Association of Geographers*, *0*(0), 1–25. https://doi.org/10.1080/24694452.2023.2236190

Chen, S. (2024). Structural modeling of Chinese students' academic achievement identity and basic psychological needs: do academic self-efficacy, and mindfulness play a mediating role? *BMC Psychology*, *12*(1). https://doi.org/10.1186/s40359-024-01571-6

Chhaing, S. (2022). Insights into Life of academics at private higher education institutions in Cambodia in light of neoliberalism. *Cogent Education*, *9*(1). https://doi.org/10.1080/2331186X.2022.2062891

Dawes, J. G. (2012). Do Data Characteristics Change According to the Number of Scale Points Used? An Experiment Using 5-Point, 7-Point and 10-Point Scales. *International Journal of Market Research, 50(*1), 61–77.

Doyle, L., Easterbrook, M. J., & Harris, P. R. (2023). Roles of socioeconomic status, ethnicity and teacher beliefs in academic grading. *British Journal of Educational Psychology*, *93*(1),

91–112. https://doi.org/10.1111/bjep.12541

Uwe, F. (2011). *Introducing Research Methodology*: A Beginner's Guide to Doing a Research Project. (London: Sage Publications Ltd).

Gentrup, S., Lorenz, G., Kristen, C., & Kogan, I. (2020). Self-fulfilling prophecies in the classroom: Teacher expectations, feedback and student achievement. *Learning and Instruction*, *66*(March 2019), 101296. https://doi.org/10.1016/j.learninstruc.2019.101296

Hair, J. F., Page, M., & Brunsveld, N. (2019). *Essentials of Business Research Methods*. Routledge.

Haruna, B., & Kiran, K. (2023). Intrinsic motivation as a determinant of perceived usefulness of library makerspace: the influence of learning dimensions. *Malaysian Journal of Library and Information Science*, *28*(1), 15–34. https://doi.org/10.22452/mjlis.vol28no1.2

Hong, J. C., Zhang, H. L., Ye, J. H., & Ye, J. N. (2021). The effects of academic self-efficacy on vocational students behavioural engagement at school and at firm internships: A model of engagement-value of achievement motivation. *Education Sciences*, *11*(8). https://doi.org/10.3390/educsci11080387

Ifesinachi, E. J., Dadzie, J., & Ocheni, A. C. (2024). Enhancing Students' Academic Achievement in Basic Science: The Role of Assessment for Learning, Classroom Management, and Teacher-Student Relationships. *European Journal of Education Studies*, *11*(5), 196–214. https://doi.org/10.46827/ejes.v11i5.5298

Inayat, A., & Ali, D. A. Z. (2020). Influence of Teaching Style on Students' Engagement, Curiosity and Exploration in the Classroom. *Journal of Education and Educational Development*, *7*(1), 87. https://doi.org/10.22555/joeed.v7i1.2736

Jacqueline Murray (2013). Likert Data: What to Use, Parametric or Non-Parametric? *International Journal of Business and Social Science, 4(*11), 7–16.

Jian, Z. (2022). Sustainable Engagement and Academic Achievement Under Impact of Academic Self-Efficacy Through Mediation of Learning Agility—Evidence from Music Education Students. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.899706

Jiang, L., Chen, Y., Liang, W., & Zhang, B. (2023). Convergence Analysis of Cross-Province Human Well-Being in China: A Spatiotemporal Perspective. *International Journal of Environmental Research and Public Health*, *20*(3). https://doi.org/10.3390/ijerph20031858

Jin, X., Jiang, Q., Xiong, W., Feng, Y., & Zhao, W. (2022). Effects of student engagement in peer feedback on writing performance in higher education. *Interactive Learning Environments*, 1–16. https://doi.org/10.1080/10494820.2022.2081209

Johnson, P., & Clark, M. (2014). *Business and Management Research Methodologies*. SAGE Publications LTD.

Joshi, A., Kale, S., Chandel, S., & Pal, D. K. (2015). Likert scale: Examined and Explained. *British Journal of Applied Science & Technology, 7(*4), 396.

Jurasek, M., & Wawrosz, P. (2023). How Does Self-Efficacy in Communication Affect the Relationship Between Intercultural Experience, Language Skills, and Cultural Intelligence? *SAGE Open*, *13*(4), 1–13. https://doi.org/10.1177/21582440231211687

Kamran, M., Siddiqui, S., & Adil, M. S. (2023). Breaking Barriers: The Influence of Teachers' Attitudes on Inclusive Education for Students with Mild Learning Disabilities (MLDs). *Education Sciences*, *13*(6). https://doi.org/10.3390/educsci13060606

Khan, J. (2019). Relationship between Student Satisfaction and Academic Achievement in Distance Education: A Case Study of AIOU Islamabad. *10*(2), 137–145.

Kleij, F. M. van der. (2019). Comparison of teacher and student perceptions of formative assessment feedback practices and association with individual student characteristics. *Teaching and Teacher Education*, *85*(1), 175–189.

Krejcie, R. V., & Morgan, D. W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement, 2(*2), 607–610.

Kumar, R. (2014) Research Methodology: *A Step-by-Step Guide for Beginners*. 4th Edition, SAGE Publications Ltd., London.

Lee, H. S., Gweon, G. H., Lord, T., Paessel, N., Pallant, A., & Pryputniewicz, S. (2021). Machine learning-enabled automated feedback: Supporting students' revision of scientific arguments based on data drawn from simulation. *Journal of Science Education and Technology*, *30*(2), 168–192. https://doi.org/10.1007/s10956-020-09889-7

Li, K., Wijaya, T. T., Chen, X., & Harahap, M. S. (2024). Exploring the factors affecting elementary mathematics teachers' innovative behavior: an integration of social cognitive theory. *Scientific Reports*, *14*(1), 1–14. https://doi.org/10.1038/s41598-024-52604-4

Li, N., Yang, Y., Zhao, X., & Li, Y. (2023). The relationship between achievement motivation and college students' general self-efficacy: A moderated mediation model. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.1031912

Lian, C., Pei, J., & Li, J. (2024). Heliyon Income inequality effect of government investment behavior : Comparisons based on different investment areas , different regions and different groups in China. *Heliyon*, *10*(5), e26452. https://doi.org/10.1016/j.heliyon.2024.e26452

Lin, W. (2020). Taiwanese higher education in a cultural perspective: a preliminary study of two premier universities. *Asia Pacific Journal of Education*, *40*(2), 212–229. https://doi.org/10.1080/02188791.2019.1690424

Lin, X., Li, R., Chen, Z., & Xiong, J. (2023). Design strategies for VR science and education games from an embodied cognition perspective: a literature-based meta-analysis. *Frontiers in Psychology*, *14*(January). https://doi.org/10.3389/fpsyg.2023.1292110

Litwin, M. (2014). *How to Measure Survey Reliability and Validity*. SAGE Publications, Inc.

Lu, D., Liu, T., Meng, X., Luo, B., Yuan, J., Liu, Y., Zhang, S., Cai, C., Gao, C., Wang, J., Wang, S., & Nie, S. (2023). Wearable Triboelectric Visual Sensors for Tactile Perception. *Advanced Materials*, *35*(7). https://doi.org/10.1002/adma.202209117

Ma, L., Xiao, L., & Jiao, Y. (2024). Mediation of Reading Enjoyment between Feedback and Reading Achievement: Cross-Cultural Generalizability across 75 Countries/Economies. *Journal of Experimental Education*, *92*(3), 431–451. https://doi.org/10.1080/00220973.2023.2208063

Mahvelati, E. H. (2021). Learners' perceptions and performance under peer versus teacher corrective feedback conditions. *Studies in Educational Evaluation*, *70*. https://doi.org/10.1016/j.stueduc.2021.100995

Munir, J., Faiza, M., Jamal, B., Daud, S., & Iqbal, K. (2023). The Impact of Socio-economic Status on Academic Achievement. *Journal of Social Sciences Review*, *3*(2). https://doi.org/10.54183/jssr.v3i2.308

Nawaz, M. (2023). Exploring the Preferred Corrective Feedback and Practiced Corrective Feedback among Pakistani ESL Secondary School Students and Teachers in Writing Class. *Matches and Mismatches. 6*(1), 31–45.

Oc, Y., Plangger, K., Sands, S., Campbell, C. L., & Pitt, L. (2023). Luxury is what you say: Analyzing electronic word-of-mouth marketing of luxury products using artificial intelligence and machine learning. *Psychology and Marketing*, *40*(9), 1704–1719. https://doi.org/10.1002/mar.21831

Ozogul, G., Zhu, M., & Phillips, T. M. (2022). Perceived and Actual Cognitive Presence: A Case Study of an Intentionally-Designed Asynchronous Online Course. *Online Learning Journal*, *26*(1), 38–57. https://doi.org/10.24059/olj.v26i1.3051

Park, D. Y., & Kim, H. (2023). Determinants of Intentions to Use Digital Mental Healthcare Content among University Students, Faculty, and Staff: Motivation, Perceived Usefulness, Perceived Ease of Use, and Parasocial Interaction with AI Chatbot. *Sustainability (Switzerland)*, *15*(1). https://doi.org/10.3390/su15010872

Park, L. E., Ward, D. E., Moore-Russo, D., Rickard, B., Vessels, V., & Hundley, J. (2024). Positive Feedback as a Lever to Boost Students' STEM Outcomes. *Personality and Social Psychology Bulletin*, *August*. https://doi.org/10.1177/01461672241265954

Rea, L. M., & Parker, R. A. (2014). *Using Focus Groups in the Survey Research Process*. In Designing and Conducting Survey Research: A Comprehensive Guide, 80-95.

Ruado, L. F., & Cortez, L. A. S. (2024). Enhancing Student Engagement and Achievement in Biology through Interactive Slide Presentations. *American Journal of Education and Technology*, *3*(1), 51–59. https://doi.org/10.54536/ajet.v3i1.2520

Ryan, A. T., Elliott, S., Judd, T., Wilson, C., Larsen, D. P., Kulasegaram, K., & Swanson, D. (2024). Timing's not Everything: Immediate and delayed feedback is equally beneficial for performance in formative multiple-choice testing. *July 2023*, 838–847. https://doi.org/10.1111/medu.15287

Saqr, M., López-Pernas, S., Helske, S., & Hrastinski, S. (2023). The longitudinal association between engagement and achievement varies by time, students' profiles, and achievement state: A full program study. *Computers and Education*, *199*(March). https://doi.org/10.1016/j.compedu.2023.104787

Sekaran, U., & Bougie, R. (2016). Research Methods for Business. *Angewandte Chemie International Edition, 6(11), 951–952.*, *4*(1), 1–23.

Spătărelu, E. (2020). *Student Satisfaction, Teaching Practicum and Academic Achievement*. 26–46.

Subramanian, K., & Budhrani, K. (2020). Influence of course design on student engagement and motivation in an online course. *SIGCSE 2020 - Proceedings of the 51st ACM Technical Symposium on Computer Science Education*, 303–308. https://doi.org/10.1145/3328778.3366828

Taleb Shawaqfeh, A., Khasawneh, A., jadallah abed Khasawneh, Y., & Ahmad Saleem Khasawneh, M. (2024). Unlocking Linguistic Diversity: Translanguaging in Jordanian Classrooms and Its Impact on Student Engagement and Academic Achievement. *Migration Letters*, *21*(2), 479–491.

Tan, C. Y., Dimmock, C., & Walker, A. (2024). How school leadership practices relate to student outcomes: Insights from a three-level meta-analysis. *Educational Management Administration and Leadership*, *52*(1), 6–27. https://doi.org/10.1177/17411432211061445

Teng, M. F., & Yang, Z. (2023). Metacognition, motivation, self-efficacy belief, and English learning achievement in online learning: Longitudinal mediation modeling approach. *Innovation in Language Learning and Teaching*, *17*(4), 778–794. https://doi.org/10.1080/17501229.2022.2144327

Tomaszewski, W., Xiang, N., & Huang, Y. (2024). School climate, student engagement and academic achievement across school sectors in Australia. *Australian Educational Researcher*, *51*(2), 667–695. https://doi.org/10.1007/s13384-023-00618-8

Van Ryzin, M. J., Roseth, C. J., & Biglan, A. (2020). Mediators of Effects of Cooperative Learning on Prosocial Behavior in Middle School. *International Journal of Applied Positive Psychology*, *5*(1–2), 37–52. https://doi.org/10.1007/s41042-020-00026-8

Wahman, C. L., Pustejovsky, J. E., Ostrosky, M. M., & Santos, R. M. (2022). Examining the Effects of Social Stories™ on Challenging Behavior and Prosocial Skills in Young Children: A Systematic Review and Meta-Analysis. *Topics in Early Childhood Special Education*, *41*(4), 267–279. https://doi.org/10.1177/0271121419855692

Wang, D., Guo, D., Song, C., Hao, L., & Qiao, Z. (2022). General Self-Efficacy and Employability Among Financially Underprivileged Chinese College Students: The Mediating Role of Achievement Motivation and Career Aspirations. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.719771

Wang, Y., Song, Z., & Lu, Y. (2024). How do the Chinese Gaokao tests narrate the history of other countries? A textual analysis of "the other" in official representations of history. *Theory and Research in Social Education*, *52*(2), 245–272. https://doi.org/10.1080/00933104.2023.2224248

Wessel, M., Serebrenik, A., Wiese, I., Steinmacher, I., & Gerosa, M. A. (2020). What To Expect from Code Review Bots on GitHub? A Survey with OSS Maintainers. In *ACM International Conference Proceeding Series* (pp. 457–462). https://doi.org/10.1145/3422392.3422459

Yang, X., Zhang, M., Kong, L., Wang, Q., & Hong, J. C. (2021). The Effects of Scientific Self-efficacy and Cognitive Anxiety on Science Engagement with the "Question-Observation-Doing-Explanation" Model during School Disruption in COVID-19 Pandemic. *Journal of Science Education and Technology*, *30*(3), 380–393. https://doi.org/10.1007/s10956-020-09877-x

Yousaf, H. Q., Rehman, S., Ahmed, M., & Munawar, S. (2022). Investigating students ' satisfaction in online learning : the role of students ' interaction and engagement in universities. *Interactive Learning Environments*, *0*(0), 1–18. https://doi.org/10.1080/10494820.2022.2061009

Yue, C., Sun, W., & Ye, Y. (2024). A study on the Relationship Between Students' Learning Burnout and Self-Efficacy at a Private University in China, China. *The EUrASEANs: Journal on Global Socio-Economic Dynamics*, *3*(3(46)), 323–333. https://doi.org/10.35678/2539-5645.3(46).2024.323-333

Zhong, J., Wen, J., & Li, K. (2023). Do Achievement Goals Differently Orient Students' Academic Engagement Through Learning Strategy and Academic Self-Efficacy and Vary by Grade. *Psychology Research and Behavior Management*, *16*, 4779–4797. https://doi.org/10.2147/PRBM.S424593

Zhou, W., & Fu, W. (2022). Can Transfer Payment Reduce the Inequality of Compulsory Education in Poor Areas? An Empirical Study Based on the Data from 18 Counties in 6 Provinces in China. *Best Evidence in Chinese Education, 10(*2), 1405–1413. https://doi.org/10.15354/bece.22.ar030

Zikmund W. G., Barry J. Babin, Jon C. Carr & Mitch Griffin (2020). *Business Research Methods*. 9th Edition.

Zysberg, L., & Schwabsky, N. (2021). School climate, academic self-efficacy and student achievement. *Educational Psychology*, *41*(4), 467–482. https://doi.org/10.1080/01443410.2020.1813690