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Enhancing Students' Academic Performance by Organizational Development Interventions - A Case Study in the College of Bioengineering of Beijing Polytechnic

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Abstract

The primary objective of this study is to use OD interventions to improve higher vocational students' academic self-efficacy, perceived teacher support, and peer relationship to improve their academic performance, with learning engagement as the mediating variable. The study was conducted on sixty first-year Beijing Polytechnic Bioengineering Department students using qualitative and quantitative research methods. Before implementing the OD intervention, the researcher collected data on academic self-efficacy, perceived teacher support, peer relationship, learning engagement, and academic performance through questionnaires and interviews. The OD interventions included goal setting, feedback, coaching, team building, appreciative inquiry, and team activities. After the intervention, the same questionnaires and interviews were used to gather data, and the changes were compared to evaluate the effectiveness of the ODI. The data collected before and after the ODI were analyzed, and it was found that the data were not normally distributed. The researcher used unary linear regression, linear regression, and Wilcoxon signed rank to validate the hypotheses. The results indicated that the students' academic self-efficacy, perceived teacher support, peer relationship, learning engagement, and academic performance had significantly improved after the ODI. In conclusion, this study suggests that goal setting, feedback, coaching, team building, appreciative inquiry, and team activities are effective ODI for enhancing academic self-efficacy, perceived teacher support, and peer relationships. Furthermore, the study found that academic self-efficacy, perceived teacher support, peer relationship, and learning engagement positively correlate with academic performance.

Keywords: academic performance, academic self-efficacy, perceived teacher support, peer relationship, learning engagement

Introduction

In China, higher vocational education is an essential aspect of higher education. In recent years, there has been unprecedented growth in vocational education, with higher vocational colleges playing an increasingly vital role in producing skilled professionals, improving employment opportunities, enhancing livelihoods, and promoting a learning-oriented society.

The 2019 Government Work Report emphasizes the government's plans to increase vocational college enrollment by a million, encouraging more high school graduates, demobilized soldiers, laid-off workers, and migrant workers to apply. In 2022, there are 14.07 million higher vocational students in China. However, the surge in enrollment has brought about challenges, including a rising number of students with low academic performance.

Many students who choose vocational colleges have poor academic records in secondary school. This lack of experience and confidence in their academic abilities is a significant problem in vocational education (Zhang, 2020). Additionally, some higher vocational students are unwilling to work hard, arrive late, leave early, and skip classes, resulting in weak learning ability and lower academic performance (Chen, 2014). These issues negatively impact school talent training quality and affect the student's future development.

Various studies conducted on high vocational students in China have shown that they generally have low academic self-efficacy and poor academic performance compared to university students. Researchers attribute this to students' incorrect attribution methods, insufficient effort, low self-efficacy, and poor learning initiative (Jiao, 2013). Therefore, it is crucial to develop good learning habits, motivate students to work hard and instill correct attribution methods to improve their academic performance. Higher vocational students are the central part of higher vocational education, with a large number and complex sources. Higher vocational students have weak learning abilities, lousy learning habits, and low academic performance (Zhang, 2011).

As one of China's top ten vocational colleges, Beijing Polytechnic (BP) has made significant progress in recent years but also faces threats and challenges. Under the background of popularizing higher vocational education, it is an urgent challenge for schools to improve students' abilities and enhance their core competitiveness. With the constantly changing external environment, students and schools face many opportunities. They urgently need to integrate their advantages, seize opportunities, and maintain competitiveness.

Through literature review and interviews with BP students, it is found that students in BP do not have good learning habits. A lack of good learning habits can lead to a poor learning effect (Chen, 2014). Some students in higher vocational colleges have a low interest in learning. They sleep in class, are late, are truant, and cheat in exams. As a result, most students in higher vocational colleges have less learning engagement and lower academic performance (Cai, 2008). If these phenomena are not effectively curbed in time, it will significantly impact students' studies at school and employment.

During higher vocational education, students do not receive specialized courses or systematic training to help them regulate their learning behavior and improve their academic performance. This is a significant issue that needs to be addressed. In higher vocational colleges, students primarily interact with their teachers and classmates. Teachers play a crucial role in guiding students' learning activities and can directly impact their academic progress (Li, 2018). The peer relationship of vocational college students can also influence their academic engagement and performance (Zhou, 2019). This study analyzes the impact of academic self-efficacy, perceived teacher support, peer relationships, and learning engagement on academic performance. It also uses OD intervention to improve students' academic self-efficacy, perceived teacher support, peer relationships, learning engagement, and academic performance.

The research objective of this study is to answer the following questions:

1. What is the current academic self-efficacy, perceived teacher support, peer relationship, learning engagement, and academic performance of higher vocational students?

2. What are the effective ODI that can improve the academic self-efficacy, perceived teacher support, and peer relationship of higher vocational students?

3. What is the difference between Pre- and post-ODI in academic self-efficacy, perceived teacher support, peer relationship, learning engagement, and academic performance?

4. How do academic self-efficacy, perceived teacher support, peer relationship, and learning engagement impact academic performance?

This study is valuable because it can help students improve learning engagement and academic performance, which has great practical significance. It can help vocational students develop correct learning habits that will enable them to better understand and master knowledge and skills in school and also prepare them for their future careers. The study can also provide decision-making references and practical guidance for improving the quality of higher vocational college education and the development of students.

Literature Review

Research on Academic Self-efficacy, Learning Engagement, and Academic Performance

Numerous studies have explored the connection between academic self-efficacy, learning engagement, and academic performance in students. Bassi (2007) discovered that students with low academic self-efficacy lacked interest in learning, while those with high academic self-efficacy were motivated to invest in their education. Similarly, Liao and Chen (2014) concluded that academic self-efficacy played a significant role in learning engagement among college students. Conversely, Yang (2011) found that stress had a negative impact on learning engagement, while self-efficacy had a positive correlation with it.

Wang (2011) focused on college students and found a positive correlation between academic self-efficacy and learning engagement. Gan and Lu (2015) uncovered a positive correlation between self-efficacy, professional commitment, and learning engagement among higher vocational students. Yan's (2016) research on college students revealed a significant positive correlation between positive emotions, academic self-efficacy, and learning engagement.

Academic self-efficacy is considered by some researchers as a predictor of academic performance, such as Zhang (2017). Hayat et al. (2020) study of medical college students found that self-efficacy greatly impacted learning-related emotions and metacognitive learning strategies, ultimately influencing academic performance. Basila (2016) found a positive correlation between academic self-efficacy and academic performance in online courses among college students. Similarly, Alyami et al. (2017) survey showed that academic self-efficacy significantly and positively influenced academic performance in Saudi Arabian college students.

Lew et al. (2019) study revealed a significant correlation between autonomous learning ability, academic self-efficacy, and academic performance among 197 students. Li (2018) found that perceived teacher support directly impacted academic performance through

academic self-efficacy and learning engagement. Finally, Tong et al. (2018) analysis of data from 4,627 college students in the College Student Growth Tracking Survey found a significant positive relationship between learning optimism, academic self-efficacy, and academic performance.

Research on Perceived Teacher Support and Academic Performance

Numerous studies have demonstrated that students who receive teacher support tend to perform better academically. According to Babad (1990) research, students who receive more attention and praise from their teachers are more likely to excel academically. Ou (2005) found that perceived teacher support is crucial in predicting students' performance. Du (2007) discovered that teachers' emotional support can impact students' academic autonomy and willingness to learn. Skinner (2008) suggests that students are more proactive in overcoming challenges and solving problems when their teachers provide them with complete understanding and encouragement during learning difficulties. Chen (2016) found that students who receive more support from their teachers show faster improvement in their academic performance. Xing (2018) suggests that perceiving teacher support can help reduce students' inferiority complex and boost their confidence. Studies conducted by Qiao (2014), Wang (2015) and Zhang (2019) also support the notion that perceived teacher support is essential in shaping students' learning behavior. When students are in a negative state or mood, teachers can provide the necessary support to change their learning state, stimulate their learning enthusiasm, reduce their learning burnout, and improve their learning commitment and academic performance.

Research on Peer Relationship and Academic Performance

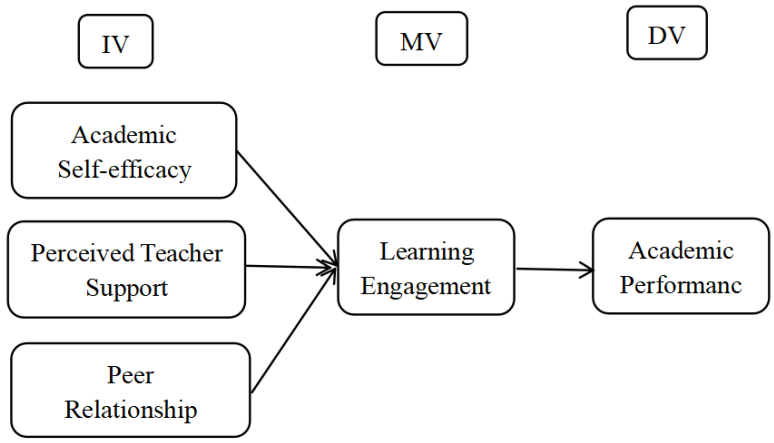
According to Wentzel's (1998) study, receiving social support from peers can give individuals a sense of security, leading to increased participation in learning and improved academic performance. Ladd's (1990) research found that students who can maintain relationships with their original friends or quickly make new friends in a new class tend to have positive emotions towards school, a positive attitude towards learning, and better academic performance. Additionally, Parker (1993) study demonstrated that peer relationships can help individuals adapt to school and reduce feelings of loneliness. When individuals are satisfied with their peer relationships, it can boost their self-esteem, promote engagement in learning, and enhance academic performance.

Conceptual Framework of the Study

Zhu (2012) tested the effects of achievement motivation, achievement goal orientation, and academic self-efficacy on academic performance. The results showed that academic self-efficacy had a significant positive effect on academic performance. Li’s theoretical framework explored how students' perceived teacher support and academic self-efficacy affect their academic performance. The results showed that learning engagement mediated between perceived teacher support and academic performance; improving perceived teacher support can improve academic performance (Li, 2018). The study by Yu (2008) found a significant correlation between peer relationships and academic performance. By analyzing the previous research framework, the conceptual framework of this study is as follows.

Figure 1

Conceptual Framework



This research delves into the effects of academic self-efficacy, perceived teacher support, and peer relationship on academic performance, with learning engagement acting as a mediator. The ultimate goal is to boost these variables through OD intervention and ultimately bolster academic achievements among higher vocational college students.

Academic self-efficacy pertains to an individual's belief in their ability to complete academic tasks successfully. Perceived teacher support encompasses the behavior and attitude of teachers towards supporting students in their learning journey. At the same time, peer relationships refer to interpersonal connections between individuals of similar age or psychological development levels. Learning engagement is a positive state of continuous learning, and academic performance denotes the knowledge and abilities acquired through learning and training.

The researcher employed questionnaire surveys and interviews to gain insight into the present status of students' academic self-efficacy, perceived teacher support, peer relationship, learning engagement, and academic performance. Based on these findings, the OD intervention was created to enhance the student's academic self-efficacy, perceived teacher support, peer relationship, learning engagement, and academic performance.

Research Methodology

Research Hypothesis

This study tests the following research hypotheses based on the research questions and conceptual framework.H_1-H_3 is the relationship between IV and DV. H_4-H_6 is the relationship between IV and MV. H_7 is the relationship between MV and DV. H_8-H_{10} are about MV's mediating effect on IV to DV. H_{11}-H_{15} are about the difference before and after OD intervention in each variable.

$H1_0$ Academic self-efficacy has no statistically significant impact on students' academic performance.

$H1_a$ Academic self-efficacy has a statistically significant impact on students' academic performance.

$H2_0$ Perceived teacher support has no statistically significant impact on students' academic performance.

$H2_a$ Perceived teacher support has a statistically significant impact on students' academic performance.

$H3_0$ Peer relationship has no statistically significant impact on students' academic performance.

$H3_a$ Peer relationship has a statistically significant impact on students' academic performance.

$H4_0$ Academic self-efficacy has no statistically significant impact on students' learning engagement.

$H4_a$ Academic self-efficacy has a statistically significant impact on students' learning engagement.

$H5_0$ Perceived teacher support has no statistically significant impact on students' learning engagement.

$H5_a$ Perceived teacher support has a statistically significant impact on students' learning engagement.

$H6_0$ Peer relationship has no statistically significant impact on students' learning engagement.

$H6_a$ Peer relationship has a statistically significant impact on students' learning engagement.

$H7_0$ Learning engagement has no statistically significant impact on student's academic performance.

$H7_a$ Learning engagement has a statistically significant impact on student's academic performance.

$H8_0$ Learning engagement has no mediating effect on academic self-efficacy to academic performance.

$H8_a$ Learning engagement has a mediating effect on academic self-efficacy to academic performance.

$H9_0$ Learning engagement has no mediating effect on perceived teacher support to academic performance.

$H9_a$ Learning engagement has a mediating effect on perceived teacher support to academic performance.

$H10_0$ Learning engagement has no mediating effect on peer relationship to academic performance.

$H10_a$ Learning engagement has a mediating effect on peer relationship to academic performance.

$H11_0$ There is no statistically significant difference in students' academic self-efficacy before and after OD intervention.

$H11_a$ There is a statistically significant difference in students' academic self-efficacy before and after OD intervention.

$H12_0$ There is no statistically significant difference in perceived teacher support before and after OD intervention.

$H12_a$ There is a statistically significant difference in perceived teacher support before and after OD intervention.

$H13_0$ There is no statistically significant difference in peer relationship before and after OD intervention.

$H13_a$ There is a statistically significant difference in peer relationship before and after OD intervention.

$H14_0$ There is no statistically significant difference in learning engagement before and after OD intervention.

$H14_a$ There is a statistically significant difference in learning engagement before and after OD intervention.

$H15_0$ There is no statistically significant difference in academic performance before and after OD intervention.

$H15_a$ There is a statistically significant difference in academic performance before and after OD intervention.

Research Design

The study employed a combination of qualitative and quantitative research methods to assess the impact of an OD intervention on higher vocational college students. Qualitative research involved literature review and interviews with students, while quantitative research was conducted through online surveys. The researcher designed a questionnaire based on a literature review and collected data through an online survey. Forty five participants were asked to complete and return the electronic questionnaire online. The intervention included goal setting, feedback, coaching, team building, appreciative inquiry, and team activities. Post-OD intervention, the same questionnaire was used to collect data, and the changes were compared to gauge the effectiveness of the intervention. Additionally, the study conducted semi-structured individual interviews with the research sample to qualitatively understand changes in learning behavior and academic performance pre- and post-OD intervention.

Research instruments

The researcher developed a questionnaire to assess the learning environments of students, utilizing established metrics academic self-efficacy, perceived teacher support, peer relationship, learning engagement, and academic performance. The questionnaire contained 31 questions divided into five categories, with each question evaluated on a Likert scale ranging from "Strongly disagree" to "Strongly agree." The five categories in the questionnaire were academic self-efficacy (consisting of nine questions), perceived teacher support (consisting of five questions), peer relationship (consisting of five questions), learning engagement (consisting of six questions), and academic performance (consisting of six questions). Each category also included a negative question.

Table1

The Structure of the Questionnaire

Variable	Number of items
Academic self-efficacy	9
Perceived teacher support	5
Peer relationship	5
Learning engagement	6
Academic performance	6
Total	31

To validate the questionnaire, it was sent to five OD experts for the Item Objective Congruence (IOC) test. Once the experts completed the IOC table, the researcher analyzed the results and found that each item had an average score of over 0.6, indicating strong questionnaire validity.

To gauge the questionnaire's reliability, a pilot test was conducted with forty-five first-year bioengineering students who were not part of the research sample. The reliability measurement results are presented in Table 2.

Table2

Summary of the reliability results (pilot test)

Variable	Cases	N	%	Cronbach's Alpha	N of items
Academic self-efficacy(ASE)	Valid	45	100	0.814	9
	Excluded	0	0		
	Total	45	100		
Perceived Teacher Support(PTS)	Valid	45	100	0.707	5
	Excluded	0	0		
	Total	45	100		
Peer Relationship (PR)	Valid	45	100	0.831	5
	Excluded[a]	0	0		
	Total	45	100		
Learning engagement (LE)	Valid	45	100	0.761	6
	Excluded[a]	0	0		
	Total	45	100		
Academic performance (AP)	Valid	45	100	0.813	6
	Excluded[a]	0	0		
	Total	45	100		

Used SPSS 26 analysis, Cronbach's Alpha of academic self-efficacy, perceived teacher support, peer relationship, learning engagement, and academic performance were 0.814, 0.707, 0.831, 0.761, and 0.813. Cronbach's Alpha of all five variables was more significant than 0.7. The questionnaire had good reliability.

This study conducted individual interviews with twelve participants before and after OD intervention to explore the impact of the intervention on students' learning behavior and learning performance. The researcher designed interview questions to qualitatively understand the changes in learning behavior and academic performance of the study subjects before and after OD intervention.

Research Sampling

This study centered around Bioengineering students at Beijing Polytechnic, specifically those in the School of Bioengineering, totaling 689 individuals. To ensure a receptive group, the researcher focused on first-year students who are often open to positive changes as they embark on their academic journey. Effective academic practices are crucial for students to excel in their studies and establish a strong foundation for their future careers. As such, the research sample was narrowed down to sixty first-year Bioengineering students for this study. The School of Bioengineering has a total of two hundreds and eleven first-year students, and these sample of sixty students are in the first-year pharmaceutical biology major.

The Implementation of the Intervention

Based on the Pre-ODI questionnaire and interview results, the author developed an 11-week intervention plan once a week for three hours and adopted different interventions each week. The researcher was responsible for organizing activities, participants were notified a week in advance of each activity, ensuring that all sixty participants can attend on time in each intervention activity. OD interventions for the research sample mainly included appreciative inquiry, team building, goal setting, coaching, team activities, and periodic group meetings for reflection. Goal setting, feedback, coaching, and appreciative inquiry were used to improve higher vocational students' academic self-efficacy. Feedback and appreciative inquiry were used to improve higher vocational students' perceived teacher support. Team building and team activities were used to improve higher vocational students' peer relationship. The process and results of the intervention were observed during and after the plan's implementation. Analyzing the OD intervention effect through reflection was the last step in implementing this plan and the basis for revising the next project and guiding the following work. According to the reflection situation, the researcher changed the work plan based on the previous stage and carried out a new round of action, observation, and reflection. The specific weekly OD intervention activities are shown in Table 3.

Table3

The OD interventions program

	Variables	Participants	Method	Content	Duration
Week1	Academic self-efficacy, Perceived teacher support, Peer relationship	60 students	Coaching	Unfreezing. Researchers and research sample meet in the first meeting and introduce the basic situation to build trust.	3 hours
Week2	Academic self-efficacy	60 students	Goal setting	Each person sets learning goals, including short-term goals (for the semester 3 months) and long-term goals (for the higher vocational level 3 years).	3 hours
Week3	Academic self-efficacy, Peer relationship	60 students	Team Building	Building a change leadership team, discussing improving students' learning behavior, perceiving teacher support and peer relationships, and proposing plans and specific arrangements.	3 hours
Week4	Academic self-efficacy	60 students	Appreciative inquiry	Share your past highlight moments and successful experiences to enhance your sense of achievement and transfer past successful experiences to the learning process. Adjust the learning method.	3 hours
Week5	Peer relationship	60 students	Team activities	Prepare and present class presentations in groups to promote team cohesion. The teacher assigned the presentation homework one week before, and the group members spent one week completing the task and presenting the presentation the following week	3 hours
Week6	Academic self-efficacy, Perceived teacher support	60 students	Evaluate	Evaluate the effect of the change by teachers, classmates, and yourself.	3 hours
Week7	Academic self-efficacy, Perceived teacher support, Peer relationship	60 students	Mid-term feedback	Hold a mid-term meeting to review successful experiences and publicly praise outstanding groups and students.	3 hours
Week8	Academic self-efficacy, Peer relationship	60 students	Coaching.	Students who have excelled in the change work introduce the experience to their classmates and conduct coaching to make progress together.	3 hours
Week9	Academic self-efficacy, Peer relationship	60 students	Team activities.	Teamwork to complete the comprehensive experiment.	3 hours
Week10	Academic self-efficacy, Perceived teacher support,	60 students	Summary	Hold summary meetings to communicate with teachers and students and summarize successful experiences.	3 hours

	Variables	Participants	Method	Content	Duration
	Peer relationship				
Week11	Academic self-efficacy, Perceived teacher support, Peer relationship	60 students	Feedback	Consolidate successful experiences, propose directions for improvement, and lay the foundation for new changes.	3 hours

Results and Discussion

Demographic Profile of Participants

Demographic data, including age, gender, and major, are shown in Table 4.

Table 4

Demographic Information of the Samples

Demographic information		Number of Samples	Percent
Gender	Male	31	52%
	Female	29	48%
Age	17-18	10	17%
	19-20	29	48%
	21-22	15	25%
	>22	6	10%
Major	Pharmaceutical Biotechnology	60	100%

Data Analysis

In analyzing the impact of OD intervention, the authors conducted a normality test on the data both before and after the intervention. Two methods, namely Shapiro-Wilk and Kolmogrov-Smirnov, were utilized to test the Pre-ODI and Post-ODI data consisting of thirty-one items with $p < 0.05$. The results of both methods were consistent, which led to the conclusion that the data in both stages did not follow a normal distribution. To assess the changes between the two stages, the authors calculated the mean of each question and used it to derive the mean of each variable. They then determined the percentage improvement for each item in the table by subtracting the Pre-ODI mean from the Post-ODI mean and dividing the result by Pre-ODI.

Table 5

The Pre- and Post-ODI Mean of each item

Variable	Item Number in the questionnaire	Pre-Mean	Post-Mean	Improvement
Academic self-efficacy	Q1	3.20	3.97	24%
	Q4	3.00	3.77	26%
	Q8	2.97	3.72	25%
	Q13	2.92	3.72	27%
	Q16	3.10	3.87	24%
	Q18	2.57	3.82	28%
	Q21	2.98	3.82	28%
	Q24	3.23	4.00	24%
	Q28	2.82	3.63	29%
Perceived Teacher Support	Q2	2.68	3.38	26%
	Q9	2.68	3.28	22%
	Q17	3.33	4.08	23%
	Q22	2.68	3.43	28%
	Q26	3.12	3.90	25%
Peer Relationship	Q6	3.02	3.82	26%
	Q12	3.02	3.78	25%
	Q19	3.12	3.87	24%
	Q27	2.72	3.40	25%
	Q31	2.65	3.48	30%
Learning Engagement	Q3	2.92	2.92	0
	Q7	3.08	3.88	26%
	Q10	2.58	3.20	24%
	Q14	3.07	3.83	25%
	Q23	2.93	3.77	29%
	Q29	3.02	3.87	28%
Academic Performance	Q5	2.50	3.28	31%
	Q11	3.27	4.07	24%
	Q15	2.70	3.47	29%
	Q20	3.20	3.95	23%
	Q25	3.15	3.98	26%
	Q30	2.63	3.38	29%

Table 5 presents data that clearly demonstrates the positive impact of the OD intervention on academic self-efficacy and perceived teacher support. The average scores for both variables increased substantially, indicating a significant improvement rate of 24% to 29% and 22% to 28%, respectively. This improvement highlights the vital role of the OD intervention in enhancing students' academic self-efficacy and teacher support. The majority of students felt encouraged and supported by their teachers, which helped them overcome their learning difficulties. The appreciative inquiry OD intervention helped students gain more confidence in their learning abilities and feel appreciated for their efforts.

Moreover, the average score for peer relationship also improved by 24% to 30% after the OD intervention. Students reported that their relationship with their peers became more harmonious, with more caring and assisting behaviors. Team-building activities fostered a sense of teamwork, leading to more appreciation for classmates' achievements and cultivating team spirit. Before the intervention, students mainly focused on individual learning, but after the OD intervention, many learning activities were carried out in teams, leading to stronger peer relationship.

Furthermore, the students' learning engagement increased by 24% to 29% after the OD intervention. Prior to the intervention, most students lacked a clear learning goal, leading to a lack of motivation. However, after setting clear short-term and long-term goals through the OD intervention, most students understood the purpose of learning and were willing to put in more effort.

Finally, the average score for academic performance increased by 23% to 31% after the OD intervention. Before the intervention, most students had low academic performance, but after the OD intervention, students' learning behavior and habits improved, leading to significant improvements in academic performance.

Table 6 shows that all five variables related to academic self-efficacy, perceived teacher support, peer relationships, learning engagement, and academic performance improved by 22% to 27% in the post-ODI stage compared to pre-ODI. The results of interviews and observations were consistent with the questionnaire, showing that all variables improved after the OD interventions.

Table 6

The summary result of each variable Pre-ODI and Post-ODI

Variable	Descriptive Statistical Result		Improvement
	Pre-ODI mean	Post-ODI Mean	
Academic self-efficacy	2.98	3.75	26%
Perceived teacher support	2.90	3.62	25%
Peer relationship	2.90	3.67	27%
Learning engagement	2.93	3.58	22%
Academic performance	2.91	3.69	27%

In order to examine the correlation between IV, MV, and DV, and assess the statistical significance of any changes that occurred before and after ODI, the study employed a range of statistical methods to test the research hypothesis. The research hypothesis was tested by performing unitary linear regression on H1-H7.

Table 7

Summarize the result of unitary linear regression

			Post-academic self-efficacy (IV)	**Post-perceived teacher support (IV)**	**Post-peer relationship (IV)**
Model Summary	Durbin-Watson	Post-academic performance (DV)	2.011	1.858	1.530
ANOVA	Sig.		0.000[b]	0.000[b]	0.000[b]
Model Summary	Durbin-Watson	Post-learning engagement (MV)	2.437	1.864	1.735
ANOVA	Sig.		0.000[b]	0.000[b]	0.000[b]
			Post-learning engagement (MV)		
Model Summary	Durbin-Watson	Post-academic performance (DV)	1.894		
ANOVA	Sig.		0.000[b]		

The unary linear regression of Post-academic self-efficacy and Post-academic performance showed DW = 2.011 between 1.5-2.5, and the P of ANOVA was 0.000 less than 0.05. The null hypothesis (H_{1o}) was rejected, and the alternative hypothesis (H_{1a}) was chosen.

The Unary linear regression of Post-perceived teacher support and Post-academic performance showed DW = 1.858, and the P of ANOVA was 0.000. The null hypothesis (H_{2o}) was rejected, and the alternative hypothesis (H_{2a}) was chosen.

The Unary linear regression of the Post-peer relationship and Post-academic performance showed DW = 1.530, and the P of ANOVA was 0.000. The null hypothesis (H_{3o}) was rejected, and the alternative hypothesis (H_{3a}) was chosen.

The Unary linear regression of Post-academic self-efficacy and Post-learning engagement showed DW = 2.437, and the P of ANOVA was 0.000. The null hypothesis (H_{4o}) was rejected, and the alternative hypothesis (H_{4a}) was chosen.

The Unary linear regression of Post-perceived teacher support and Post-learning engagement showed DW = 1.864, and the P of ANOVA was 0.000. The null hypothesis (H_{5o}) was rejected, and the alternative hypothesis (H_{5a}) was chosen.

The Unary linear regression of Post-peer relationship and Post-learning engagement showed DW = 1.735, and the P of ANOVA was 0.000. The null hypothesis (H_{6o}) was rejected, and the alternative hypothesis (H_{6a}) was chosen.

The Unary linear regression of Post-learning engagement and Post-academic performance showed DW = 1.894, and the P of ANOVA was 0.000. The null hypothesis (H_{7o}) was rejected, and the alternative hypothesis (H_{7a}) was chosen.

The author tested H_8-H_{10} using linear regression.

Table 8

Results of mediation verification ASE(IV)-LE(MV)-AP(DV)

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	22.421	1	22.421	200.256	.000[b]
	Residual	6.494	58	.112		
	Total	28.915	59			
2	Regression	23.622	2	11.811	127.198	.000[c]
	Residual	5.293	57	.093		
	Total	28.915	59			

a. Dependent Variable: Post-AP
b. Predictors: (Constant), Post-ASE
c. Predictors: (Constant), Post-ASE, Post-LE

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	.564	.225		2.509	.015
	Post-ASE	.833	.059	.881	14.151	.000
2	(Constant)	.426	.208		2.046	.045
	Post-ASE	.445	.120	.470	3.695	.000
	Post-LE	.445	.124	.458	3.596	.001

Excluded Variables[a]						
Model		**Beta In**	**t**	**Sig.**	**Partial Correlation**	**Collinearity Statistics**
						Tolerance
1	Post-LE	.458[b]	3.596	.001	.430	.198

a. Dependent Variable: Post-AP
b. Predictors in the Model: (Constant), Post-ASE

Based on the study's findings, it was discovered that the P-value for the impact of ASE on AP was 0.000, with a significance level of 0.05. Similarly, the P-value for the effect of ASE on LE was also 0.000, less than the significance level of 0.05. ASE is an independent variable, while AP is a dependent variable. However, after introducing the mediating variable LE, the P-value of ASE to AP persisted at 0.000, which is still less than the significance level of 0.05. Additionally, the P-value of LE to AP was 0.001, also below 0.05. Consequently, the study

concludes that academic self-efficacy's impact on academic performance among higher vocational college students is partially mediated by their learning engagement. Furthermore, the null hypothesis (H8o) was rejected, and the alternative hypothesis (H8a) was supported.

Table 9

Results of mediation verification PTS(IV)-LE(MV)-AP(DV)

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	15.049	1	15.049	62.952	.000[b]
	Residual	13.865	58	.239		
	Total	28.915	59			
2	Regression	23.350	2	11.675	119.574	.000[c]
	Residual	5.565	57	.098		
	Total	28.915	59			

a. Dependent Variable: Post-AP
b. Predictors: (Constant), Post-PTS
c. Predictors: (Constant), Post-PTS, Post-LE

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	1.397	.296		4.723	.000
	Post-PTS	.634	.080	.721	7.934	.000
2	(Constant)	.414	.217		1.907	.062
	Post-PTS	.218	.068	.248	3.193	.002
	Post-LE	.695	.075	.715	9.220	.000

Excluded Variables[a]						
Model		**Beta In**	**t**	**Sig.**	**Partial Correlation**	**Collinearity Statistics**
						Tolerance
1	Post-LE	.715[b]	9.220	.000	.774	.561

a. Dependent Variable: Post-AP
b. Predictors in the Model: (Constant), Post-PTS

The statistical analysis showed that there was a significant relationship between the independent variable (PTS) and the dependent variable (AP), with P values of 0.000 for both Post-PTS to Post-LE and Post-PTS to Post-AP. After introducing the mediating variable (LE), the P values for PTS to AP and LE to AP were 0.002 and 0.000, respectively. These results suggest that learning engagement plays a partial mediating role in the association between perceived teacher support and academic performance among vocational college students. Therefore, we can confidently reject the null hypothesis (H9o) and accept the alternative hypothesis (H9a).

Table 10

Results of mediation verification PR(IV)-LE(MV)-AP(DV)

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	16.484	1	16.484	76.913	.000[b]
	Residual	12.431	58	.214		
	Total	28.915	59			
2	Regression	22.818	2	11.409	106.661	.000[c]
	Residual	6.097	57	.107		
	Total	28.915	59			

a. Dependent Variable: Post-AP
b. Predictors: (Constant), Post-PR
c. Predictors: (Constant), Post-PR, Post-LE

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	.961	.317		3.032	.004
	Post-PR	.743	.085	.755	8.770	.000
2	(Constant)	.443	.234		1.897	.063
	Post-PR	.194	.093	.197	2.082	.042
	Post-LE	.708	.092	.728	7.695	.000

Excluded Variables[a]						
Model		**Beta In**	**t**	**Sig.**	**Partial Correlation**	**Collinearity Statistics**
						Tolerance
1	Post-LE	.728[b]	7.695	.000	.714	.413

a. Dependent Variable: Post-AP
b. Predictors in the Model: (Constant), Post-PR

According to the study, the Post-PR to Post-LE P-value and Post-PR to Post-AP p-value were both found to be less than 0.05, with a P-value of 0.000 for each. PR was identified as the independent variable, while AP was the dependent variable. The introduction of the mediating variable LE resulted in a P-value of 0.042 for PR to AP, which is also less than 0.05. The P-value for LE to AP was 0.000, further supporting the findings. Ultimately, the study concluded that higher vocational college students' learning engagement has a partially mediating effect on peer relationship to academic performance, with the null hypothesis (H10o) being rejected and the alternative hypothesis (H10a) being chosen. The data was also found to not be normally distributed, leading to the utilization of Wilcoxon signed rank to test H11-H15.

Table 11

Summarize the results of Wilcoxon Signed Rank

		N	Mean Rank	Sum of Ranks	Test Statistics[a]	
					Z	Sig. (2-tailed)
Post- Pre academic self-efficacy	Negative Ranks	1[a]	2.50	2.50	-6.568[b]	.000
	Positive Ranks	52[b]	27.47	1428.50		
	Ties	7[c]				
	Total	60				
Post- Pre perceived teacher support	Negative Ranks	0[a]	0	0	-6.465[b]	.000
	Positive Ranks	52[b]	26.50	1378.00		
	Ties	8[c]				
	Total	60				
Post- Pre peer relationship	Negative Ranks	0[a]	0	0	-6.504[b]	.000
	Positive Ranks	52[b]	26.50	1378.00		
	Ties	8[c]				
	Total	60				
Post- Pre learning engagement	Negative Ranks	3[a]	3.50	10.50	-6.730[b]	.000
	Positive Ranks	51[b]	28.91	1474.50		
	Ties	6[c]				
	Total	60				
Post- Pre academic performance	Negative Ranks	1[a]	3.00	3.00	-6.696[b]	.000
	Positive Ranks	52[b]	27.46	1428.00		
	Ties	7[c]				
	Total	60				

Table 11's statistical analysis, utilizing the Wilcoxon signed rank test, displayed a significant contrast between pre-ODI and Post-ODI findings for academic self-assurance, perceived teacher encouragement, peer connections, learning participation, and academic success. The P-value achieved was 0.000, indicating it is less than the significance level of 0.05. This outcome implies that the null hypotheses (H11o, H12o, H13o, H14o, H15o) can be dismissed while the alternative hypotheses (H11a, H12a, H13a, H14a, H15a) can be acknowledged.

Conclusion and Recommendations

Conclusion

The study found the current academic self-efficacy, perceived teacher support, peer relationship, learning engagement and academic performance of higher vocational students had been improve after implementing OD interventions of goal-setting, feedback, coaching, team building, appreciative inquiry, and team activities, yielded positive results in enhancing all of these variables. The Wilcoxon sign Rank test further demonstrated significant differences in these areas before and after the OD interventions.

In conclusion, the study found that OD interventions are suitable for improving academic self-efficacy, perceived teacher support, and peer relationship among higher vocational students. Moreover, the data revealed a positive correlation between academic self-efficacy, perceived teacher support, peer relationship, learning engagement, and academic performance. Regression analysis also confirmed that these variables play a crucial role in academic performance. Overall, the findings suggest that OD interventions have immense potential to improve the academic performance of higher vocational students.

Recommendations for future research

The goal of this study was to improve academic self-efficacy, perceived teacher support, peer relationship, learning engagement, and academic performance for higher vocational college students through OD intervention. The study also examined the relationship between these variables and drew conclusions. However, there were limitations in the research process that require further refinement.

Firstly, the research sample was limited to the same major within the same school, which may restrict the generalizability of the research findings. To achieve more comprehensive results, future research could expand the sample to include students from different majors within the same school or from different majors across different schools.

Secondly, the study lasted only three months, and thus, the data and conclusions can only reflect the intervention's effect for that duration. To strengthen the intervention's impact, future research could extend the study period to around six months and adjust the intervention based on feedback.

Thirdly, the researcher suggested to augment the sample size in subsequent studies. The sample size of merely sixty students' needs to be improved, and the statistical analyses have indicated a non-normal data distribution. By expanding the sample size, the data will be more indicative of the population, resulting in more dependable and valid outcomes.

Finally, the study did not consider demographic variables such as family background, student origin, gender, and age to explore changes in academic self-efficacy, teacher support, peer relationships, learning engagement, and academic performance among vocational college students due to time constraints. Future research could incorporate these variables to enrich the study's findings.

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