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Students' Readiness on Practical Learning in Mechanical Engineering Education: Post-Pandemic Survey

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ABSTRAK

Era pasca pandemi COVID-19 masih menyisakan permasalahan krusial bagi pendidikan vokasi (PV), termasuk pendidikan teknik mesin (PTM). Kesiapan pembelajaran praktik (KPP) yang meliputi dimensi kesiapan pengetahuan pendukung, kondisi fisik dan psikis pada mahasiswa menjadi permasalahan mendasar yang harus dipecahkan melalui pemetaan yang sistematis. Oleh karena itu, penelitian ini bertujuan mengukur tingkat kesiapan pada ketiga dimensi tersebut. Selain itu, kami juga menguji perbedaan antara dimensi dan indikator serta menguji determinasi dalam membangun KPP untuk menentukan pemecahan masalah yang sistematis. Survei dilakukan terhadap 386 mahasiswa PTM, namun jumlah akhir adalah 339 orang, dengan pertimbangan bahwa 47 orang diantaranya tidak memiliki kriteria tingkat penalaran data yang baik. Hasil analisis deskriptif mengkonfirmasi bahwa kondisi psikologis dan pengetahuan pendukung memiliki tingkat yang rendah, sedangkan kondisi fisik memiliki tingkat yang tinggi. Hasil uji perbandingan menunjukkan bahwa ketiganya secara umum tidak berbeda secara signifikan, meskipun terdapat catatan di beberapa indikator. Meskipun semua dimensi berkontribusi secara signifikan dalam membangun KPP, namun kondisi psikologis memberikan kontribusi tertinggi. Hal ini mengindikasikan bahwa kondisi psikologis yang rendah merupakan langkah awal terjadinya PV. Selanjutnya, beberapa catatan terkait penurunan praktik pendukung pengetahuan juga menjadi upaya kedua yang harus dilakukan PTM dalam mendongkrak KPP pada mahasiswanya.

ABSTRACT

The post-pandemic era of COVID-19 still leaves crucial problems for vocational education (VE), including mechanical engineering education (MEE). Practical learning readiness (PLR), which includes the dimensions of readiness for supporting knowledge, physical and psychological conditions in students, is a fundamental problem that must be solved through systematic mapping. Therefore, this research aims to measure the level of readiness in these three dimensions. In addition, we also examine the differences between dimensions and indicators and test the determination in constructing the PLR to determine systematic problem-solving. The survey was conducted on 386 MEE students, but the final number was 339, considering that 47 of them did not have good data rationale level criteria. The results of the descriptive analysis confirmed that the psychological condition and supporting knowledge had a low level, while the physical condition had a high level. The results of the comparison test show that the three are generally not significantly different, although there are notes in several indicators. Although all dimensions contribute significantly to constructing PLR, psychological conditions contribute the highest. This indicates that low psychological conditions are the first step for VE to suffer. Furthermore, several notes related to the decrease in knowledge-supporting practice are also the second effort that MEE must make in boosting PLR in its students.

1. INTRODUCTION

Vocational education (VE) has the essence of equipping students with job skills through their learning (Billett, 2011; Clark & Winch, 2007). arious majors are the focus of VE; one of the important majors is mechanical engineering education (MEE). This major is one of the favorite majors with the achievement that graduates can master the knowledge and work skills in engineering and developing the design and

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operationalization of manufacturing machines (Hadi & Rabiman, 2019; Rabiman et al., 2021; Suherman et al., 2021). In addition, work attitudes are also the basis that must be possessed as learning outcomes (Wagiran et al., 2020). However, the dynamics and developments experienced by various aspects have affected the effectiveness of MEE implementation in realizing these learning outcomes in its graduates. This is identified in several studies that highlight the need for market demand for work competencies in mechanical engineering is not matched by the adequate quality of MEE graduates (Zainal Badri & Wan Mohd Yunus, 2022). Even the unemployment impact is also felt by graduates of the field. If left unchecked, this could prolong the MEE gap in bridging graduates with the world of work (Kurniawan et al., 2021).

Realizing graduate learning outcomes that align with the world of work's qualifications has been dealt with well. For VE institutions, one of whose majors is MEE, practical learning readiness (PLR) is an important key that significantly impacts student learning achievement (Rabiman et al., 2021). Therefore, so far, PLR has been defined as the institution's readiness as a whole in organizing practice, including aspects of strategy, infrastructure, lecturers, and students (Billett, 2011). Of these four aspects, student readiness in practical learning is identified as one of the most crucial aspects that impact low student learning achievement (Alawajee & Almutairi, 2022). Learning readiness is a self-condition that individuals have prepared or planned to carry out learning activities (Dangi & Saat, 2021). Similar research conveys that readiness greatly impacts the results obtained from an important activity (Karim & Mustapha, 2022). In addition, research from Alam & Parvin (2021) convinces that low learning outcomes in students are due to readiness that students themselves have not built. PLR in students generally includes three dimensions: the readiness of knowledge supporting practice, physical condition, and psychological condition (Billett, 2011; Santrock, 2007). These three dimensions are also identified based on reports from various studies that emphasize important aspects studied to solve the problem of student readiness in learning (Leong et al., 2020; Wagiran et al., 2022; Yawson & Yamoah, 2020). The readiness of knowledge to support practice is very important, considering that learning theory says that the cognitive aspects of individuals play a role in leading them to systematic procedures needed in practice (Billett, 2011; Clark & Winch, 2007). Then, the physical condition provides strength in implementing knowledge into practical learning activities (Rabiman et al., 2021). Finally, the psychological condition will act as an important foundation that can encourage the spirit of learning.

However, various studies have reported that, since the world faces the COVID-19 pandemic, PLR has become an affected aspect of this situation (Rasmitadila et al., 2020; Thaheem et al., 2022). There has been a significant decline in PLR in EE students, and even graduates have lower competencies than before (Azizan et al., 2022; Syauqi et al., 2020). Transforming offline to online greatly disrupted practical learning, resulting in low-quality outcomes (Saripudin et al., 2020; Tang & Siti Zuraidah, 2022). Although currently learning has returned to normal, the post-pandemic still leaves crucial problems felt by VEs. Research from Putra et al. (2022) reported that the learning achievement of VE students has not improved significantly, even though learning has returned to normal. Some claim that student attendance is still limited and discipline in lectures is also low (Hews et al., 2022; Sukiman et al., 2022). This leads to practical learning outcomes that are not as expected (Mutohhari, Sudira, et al., 2021). This problem indicates that PLR has not recovered from before. Meanwhile, no research identifies aspects of PLR that have low levels. Therefore, this study aims to identify the level of PLR so that aspects of PLR that need strengthening can be identified. In addition, a construction test was also conducted to determine the priority scale in improving aspects of PLR in terms of supporting knowledge, physical conditions, and psychological conditions.

2. METHOD

This study focuses on uncovering and describing the level of practical learning readiness (PLR) in college students by conducting a survey that adopts the design Rea & Parker (2014). Research begins by observing phenomena related to symptoms or shadows related to problems in practical learning (PL). The existing phenomena are then studied in depth to analyze the interrelationships between aspects as a cause of learning problems. The observed phenomena are identified as the scope that forms the concept of practical learning readiness. Given the limitations of the researcher to explore further, it was then decided to measure the extent of practical learning readiness in students to analyze the level of each dimension (supporting knowledge, physical and psychological). All three are interpreted in terms of levels, and comparisons between dimensions are carried out to clarify the weaknesses or strengths between dimensions that contribute to PLR. The influence of the three dimensions is also measured to test their contribution to the PLR, thus clarifying the possibility of determining the priority scale of sequential improvement of dimensions based on the resulting correlation coefficient.

The research was conducted at four higher education institutions in the Provinces of Yogyakarta and Central Java, Indonesia. The mechanical engineering education study program or the automotive

engineering education study program is involved in data collection. Our first consideration in selecting participants was to ensure their willingness to follow the process of filling out the questionnaire. This is important as an anticipatory step to avoid the irrationality of the resulting data. Furthermore, the second consideration, we adjusted the research context by not involving new students or students over five years old so that participants focused on their learning experience in tertiary institutions in the range of two to five years. This was done, considering that the context of this research refers to PLR students who were previously affected by online learning during the COVID-19 pandemic. We reached the end by acquiring 386 students to be involved in filling out the PLR questionnaire. 216 (55.96%) participants were male students, and the rest were female. Then, 181 (46.89%) participants had a learning experience in the range of 2-3 years, 173 (44.82%) participants had a learning experience range of 3-4 years, and the rest were participants with a learning experience of 4-5 years.

The questionnaire to measure the level of PLR is prepared based on the development of instruments formulated by previous relevant studies. We screened various research instruments to obtain instrument criteria that matched the research characteristics we were conducting. Measurements in the questionnaire adopted a four-point Likert scale, with the options Very Low (VL), Low (L), High (H), and Very High (VH). The PLR instrument in question includes the dimensions of supporting knowledge, physical and psychological conditions. The supporting knowledge dimension refers to the aspects of capital needed as a basis for practicing in VE. We arranged the nine items by adopting the instruments formulated, which are specified into five indicators related to supporting knowledge (Johnston, 1992); Sirisha et al. (2020). The five indicators include philosophical knowledge, working principle knowledge, procedural knowledge, work safety knowledge, and problem-solving knowledge. Then, a questionnaire to measure physical condition totalling six items was adopted who examined student readiness regarding physical health with coverage of three important indicators (Reeves et al., 2022; Spinazze et al., 2020). The three indicators include changes in body immunity, body stamina, and thinking power. Finally, the dimensions of the students' psychological condition are measured by a total of nine items adopted by covering five main indicators, namely emotional resilience, mental health, learning motivation, self-efficacy and learning intention (Ahmad et al., 2022; Ke et al., 2022; Qazi et al., 2021).

Before being used for data collection, the questionnaire has been confirmed again related to its validity and reliability. We adopted two methods to strengthen the validity index, namely content validity based on expert opinion interpreted with Aiken scores and construct validity based on field trials analyzed using confirmatory factor analysis (CFA). The results of this test are shown in table 1. In addition, we also consider the level of rationality of the data based on the PLR questionnaire filling criteria. At least, it took a minimum of eight minutes to answer a total of 24 items in the questionnaire, so data from participants who completed them in less than eight minutes were not included for analysis. In this case, there were 47 data that did not meet these criteria and were eliminated, so that the final participant data analyzed totalled 339.

Table 1. Measuring the Validity of the Questionnaire

Indicator	Expert (Rater)				S_1	S_2	S_3	S_4	∑s	n(c-1)	V	Construct	
	I	2	3	4								LF	p
SK 1	4	4	4	4	3	3	3	3	12	12	1.000	0.783	0.000
SK 2	3	4	4	4	2	3	3	3	11	12	0.917	0.722	0.000
SK 3	4	4	4	4	3	3	3	3	12	12	1.000	0.777	0.000
SK 4	3	4	3	4	2	3	2	3	10	12	0.833	0.782	0.000
SK 5	4	4	4	4	3	3	3	3	12	12	1.000	0.827	0.000
PhC 1	4	4	4	4	3	3	3	3	12	12	1.000	0.880	0.000
PhC 2	4	4	4	4	3	3	3	3	12	12	1.000	0.912	0.000
PhC 3	4	4	4	4	3	3	3	3	12	12	1.000	0.822	0.000
PC 1	3	4	3	4	2	3	2	3	10	12	0.833	0.884	0.000
PC 2	4	4	4	4	3	3	3	3	12	12	1.000	0.893	0.000
PC 3	4	3	4	3	3	2	3	2	10	12	0.833	0.922	0.000
PC 4	4	4	4	4	3	3	3	3	12	12	1.000	0.786	0.000
PC 5	3	4	4	4	2	3	3	3	11	12	0.917	0.885	0.000

Based on the results of the validity test, it is generally clear that the validity is strong, so that it meets the credibility requirements of the questionnaire. First, test the validity of the content based on the opinions of four experts, the Aiken (V) score for all indicators is greater than 0.800, so that it is declared to have a high validity index (Baharuddin et al., 2020). The construct test further strengthens the validity stated by the loading factor (LF) value above 0.700 in testing using Smart-PLS (Hair Jr et al., 2021). Then the reliability test is described through the Composite Reliability (CR) coefficient, Alpha value, and Average

Variance Extracted (AVE). As a result, all constructs have high reliability. Table 2 details the results of the reliability test in this study.

Table 2. Measuring the Reliaility of the Questionnaire

Construct	Mean	Standard Deviation	Alpha	CR	AVE
Practical readiness (PR)*	3.442	0.791	0.852	0.900	0.692
Physical conditions (PhC)	3.524	0.828	0.842	0.905	0.761
Supporting knowledge (SK)	3.723	1.059	0.838	0.885	0.607
Psychological conditions (PC)	3.782	0.906	0.923	0.942	0.766

Note: *=main construct

Before being analyzed, the data was first filtered based on the criteria described in the previous point to ensure its level of rationality. We used three different methods of statistical analysis to measure the depth of the collected data. First, the data were analyzed descriptively related to their central tendencies (mean, median, mode, standard deviation) and followed by categorizing the average scores based on five categories, namely very low, low, average, high and very high, which are detailed in Table 3. Next, we conducted a comparison test to visualize comparisons between dimensions and indicators. Post Hoc test with Dunnet C Test and Tukey Test method was adopted to measure comparisons accurately. Descriptive tests and Post Hoc tests were carried out using SPSS V 23 software. Finally, we tested the effect of three dimensions separately in constructing PLR on students. In this case, we adopt path analysis to analyze the correlation coefficient of the independent variables (SK, PC and PhC) to the dependent variable (PR). This test was carried out using the Smart-PLS software together with the construct test on the instrument.

Table 3. PLR Level Categorization

Interval Score	Based on Mean	Category
$Mi + 1.5\ SDi < M \leq Mi + 3.0\ SDi$	3.26 – 4.00	Very High
$Mi + 0\ SDi < M \leq Mi + 1.5\ SDi$	2.51 – 3.25	High
$Mi - 1.5\ SDi < M \leq Mi + 0\ SDi$	1.76 – 2.50	Low
$Mi - 3.0\ SDi \leq M \leq Mi - 1.5\ SDi$	1.00 – 1.75	Very Low

(Mardapi, 2012)

3. RESULT AND DISCUSSION

Result

Practical learning readiness (PLR) level describes the extent to which students are ready knowledge, physically and psychologically. These three are the basic constructions of inherent PLR and are able to become readiness capital for students to undergo practice. In this case, all PLR dimensions are determined by level category, which refers to the mean score obtained by each indicator as well as the total score of each dimension. The scoring on the raw data was carried out by adopting the minimum score and maximum score from the Likert questionnaire scale (1-4). Early consideration is carried out to facilitate further analysis, so that comparative tests can be carried out. As shown in Table 5, only the physical condition dimension is the PLR dimension with the acquisition of readiness in the high category. As analyzed, the dimensions of the physical condition of students occupy the highest level (M=2.86). In this dimension, body stamina has not changed much from the pandemic and post-pandemic eras (M=3.26). While changes in thinking power occur quite drastically, by occupying the lowest level in that dimension (M=2.11). Meanwhile, the psychological condition dimension occupies the lowest level (M=2.18). In this dimension all indicators are in the spotlight because they have a low category. PRL level measurement results showed in Table 4.

Table 4. PRL Level Measurement Results

Dimension	Indicator	Mean	Percentage	Category
Supporting knowledge	Philosophical knowledge (SK 1)	2.31	57.75 %	Low
	Procedural knowledge (SK 2)	2.68	67.00 %	High
	Knowledge of working principles (SK 3)	2.20	55.00 %	Low
	Occupational safety and health knowledge (SK 4)	3.12	78.00 %	High
	Problem solving knowledge (SK 5)	2.06	51.50 %	Low
Total	**Supporting knowledge (SK)**	**2.47**	**61.85 %**	**Low**

Dimension	Indicator	Mean	Percentage	Category
Physical condition	Changes in body immunity (PhC 1)	3.22	80.50 %	High
	Changes in body stamina (PhC 2)	3.26	81.50 %	High
	Changes in thinking power (PhC 3)	2.11	52.75 %	Low
Total	**Physical condition (PhC)**	**2.86**	**71.58 %**	**High**
Psychological condition	Emotional resilience (PC 1)	2.38	59.50 %	Low
	Mental health (PC 2)	2.30	57.50 %	Low
	Learning motivation (PC 3)	2.41	60.25 %	Low
	Self-efficacy (PC 4)	1.87	46.75 %	Low
	Learning intention (PC 5)	1.93	48.25 %	Low
Total	**Psychological condition**	**2.18**	**54.45 %**	**Low**

Changes in PLR in the pandemic and post-pandemic eras can be seen from the descriptions presented earlier. The most crucial problem is the readiness of the psychological condition dimension which is still low, marked by this being the lowest dimension. Nevertheless, comparisons need to be made as an effort to consider the tendency of priority scales to be directed to improvement. We ensure that the comparison reference scale ranges from one to four to avoid analysis errors in SPSS. We ran two tests at the same time using the one percent and five percent significance levels. As presented in Table 5, the Post Hoc test using the Dunnet C Test method shows that significant differences are only seen in the dimensions of physical condition and psychological condition (p=0.048 at 5% significance level). This means that the psychological condition dimension has significantly lower readiness than the physical condition of students. With these results, it can be concluded that psychological condition is a dimension that should receive the leading priority scale in improvement. Differences in PLR levels between dimensions showed in Table 5.

Table 5. Differences in PLR Levels between Dimensions

PLR level dimension		Mean diff.	Sig.	Evaluation
Supporting knowledge	Physical condition	-0.39	0.092	No different
	Psychological condition	0.29	0.126	No different
Physical condition	Supporting knowledge	0.39	0.092	No different
	Psychological condition	0.68	0.048*	Different
Psychological condition	Supporting knowledge	0.29	0.126	No different
	Physical condition	-0.68	0.048*	Different

The level of significance : * p < 0.05; ** p < 0.01

Unlike the previous test, in this section, the comparative test focuses on comparing indicators on each dimension. The goal is not much different, namely as an effort to consider the tendency of priority scales to be directed to improvements in the scope of dimensions. This is done bearing in mind that each dimension certainly needs improvement, so that improvements will be directed in line with the priority scale that has been determined based on the differences. As with the previous test, Table 6 which shows the results of the Post Hoc test with the tukey test also only reveals a few dimensions that experience significant differences. First, knowledge of working principles (SK 3) on the dimensions of supporting knowledge is a significantly lower indicator than occupational safety and health knowledge (SK 4). Then, still in the same dimension, problem solving knowledge (SK 5) is also a significantly lower indicator than occupational safety and health knowledge (SK 4). This indicates the need for these two indicators to become priority improvements in order to increase supporting knowledge in MEE students. Then, shifting in the physical readiness dimension, the test results revealed a significant difference between changes in body immunity (PhC 1) and changes in thinking power (PhC 3), where PhC 3 has the lowest value in that dimension. Thus, it is clear that improving thinking power is something that needs to be prioritized on this dimension. Differences in levels between indicators on the PLR dimension showed in Table 6.

Table 6. Differences in Levels Between Indicators on the PLR Dimension

PLR Level Dimension	Between Indicators		Mean diff.	Sig.	Evaluation
Supporting knowledge	SK 1	SK 2	-0.37	0.095	No different
		SK 3	0.11	0.196	No different
		SK 4	-0.81	0.092	No different
		SK 5	0.25	0.137	No different
	SK 2	SK 3	0.48	0.078	No different
		SK 4	-0.44	0.084	No different

PLR Level Dimension	Between Indicators		Mean diff.	Sig.	Evaluation
		SK 5	0.62	0.060	No different
	SK 3	SK 4	-0.92	0.041*	Different
		SK 5	0.14	0.188	No different
	SK 4	SK 5	1.06	0.029*	Different
Physical condition	PhC 1	PhC 2	-0.04	0.368	No different
		PhC 3	1.11	0.024*	Different
	PhC 2	PhC 3	1.15	0.022*	Different
Psychological condition	PC 1	PC 2	0.08	0.318	No different
		PC 3	-0.03	0.373	No different
		PC 4	0.51	0.071	No different
		PC 5	0.45	0.080	No different
	PC 2	PC 3	-0.11	0.196	No different
		PC 4	0.43	0.087	No different
		PC 5	0.37	0.095	No different
	PC 3	PC 4	0.54	0.066	No different
		PC 5	0.48	0.078	No different
	PC 4	PC 5	-0.06	0.347	No different

The level of Significance: * p < 0.05; ** p < 0.01

Although various theories give confidence that learning readiness in students is inseparable from the extent of knowledge, physical and psychological conditions possessed by them. However, we do not propose hypotheses that depart from existing theories. We only tested the extent to which these three aspects construct PLR in MEE students. Our main consideration in analyzing it is to map priority scales on dimensions to make systematic improvements. We ran two tests at the same time using the one percent and five percent significance levels. In this case, each dimension represents the data from each indicator, while the PLR represents the total data from each dimension. Smart-PLS is used as a tool for data analysis, and it has been confirmed that the number of samples meets the criteria. Table 7 and Figure 1 present the results of a detailed analysis of the relationship between the PLR dimensions and the PLR as well as the relationship between variables. PLR constructs that include all three dimensions are significantly tested. However, the psychological condition dimension is the dimension with the highest construction contribution (r=0.578). This gives a strong signal that psychological readiness is a big basic capital in students in influencing practical learning readiness. Path analysis result showed in Table 7 and Figure 1.

Table 7. Path Analysis Result

Path of PLR construction	Estimated correlation	t-Value	SE	p
Supporting knowledge → practical readines	0.324	3.442	0.002	0.000**
Physical condition → practical readiness	0.321	2.098	0.002	0.000**
Psychological condition → practical readiness	0.578	7.130	0.000	0.000**
Correlation between variables				
Suporting knowledge ↔ physical condition	0.268	1.963	0.008	0.000*
Supporting knowledge ↔ Psychological condition	0.482	4.116	0.005	0.000**
Physical condition ↔ Psychological condition	0.198	1.608	0.001	0.004*

The level of significance: * p < 0.05; ** p < 0.01

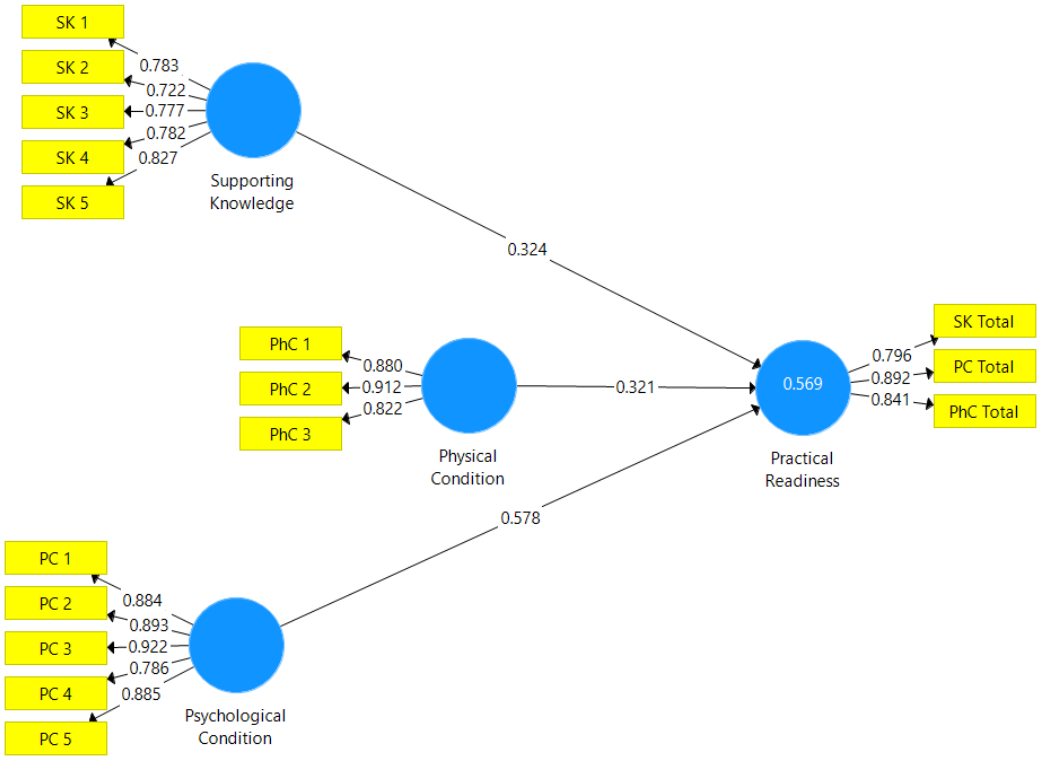

Figure 1. Path analysis.

Discussion

After the COVID-19 pandemic, it seems that there are still a number of significant problems, especially for vocational education (VE). One that feels this problem is the mechanical engineering education study program (MEE) which is part of VE. The need for intensive practice seems to be still disrupted, so this has resulted in learning outcomes that have not been optimally improved since the presence of the pandemic (Muktiarni et al., 2022). A very crucial issue is related to the basic capital to carry out learning, especially practical learning which is the hallmark of VE (Clark & Winch, 2007; Syauqi et al., 2020). Even though recent research has not revealed much, this research provides significant evidence that even though the pandemic has passed, practical learning has not been able to be improved optimally. Practical learning readiness (PLR) in students identified by this research is a crucial basic problem. How could it not be, this refers to his findings which reveal that as a whole, the PLR of MEE students is still on the lower threshold. This is supported by previous relevant research which revealed that recent student learning outcomes at VE have not been optimal (Saripudin et al., 2020; Thaheem et al., 2022). This certainly gives a strong signal that the low PLR identified by this study is a reality that exists and requires an immediate response to resolve it.

Psychological conditions are the most crucial factor in forming PLR in MEE students. This is confirmed through this study that psychological conditions are the dimension that contributes the highest influence on PLR. However, psychological conditions were revealed in this study to be the lowest dimension for the readiness category. We highlight all the indicators that have a low level, so this indicates a comprehensive problem on that dimension. Not without reason, various studies have revealed the extraordinary psychological impact on VE students from the prolonged COVID-19 pandemic. Some said that online learning in the midst of a pandemic had minimal direct interaction between students and lecturers, so this caused their mental health and emotional resilience to experience prolonged problems. (Ahmad et al., 2022; Salta et al., 2021; Xue et al., 2020). Not a few also revealed that the self-efficacy of VE students when practicing was very low which was caused because during the pandemic they lacked interaction with tools, work materials and had not practiced directly for a long time (Namubiru Ssentamu et al., 2020; Salta et al., 2021; Tang & Siti Zuraidah, 2022). This is also based on the low motivation and learning intentions of students during online learning, and currently there has been no significant effort to overcome them.

In addition, actually VE has five characteristics of knowledge that must be mastered before carrying out practice. These five characteristics include philosophical, procedural knowledge, system work principles, occupational safety and health, and problem solving (Billett, 2011; Clark & Winch, 2007). These five indicators must be possessed by students to succeed in their practical activities (Rojewski, 2009). It's just that, in this study, knowledge of occupational safety and health was the only indicator that was

identified as having high acceptance of EEC students in this post-pandemic era. The rest have low acceptability, so this is also the cause of the low student learning outcomes. This may indeed naturally occur, given the research reveal the impact of long-term online learning that is less interactive during the pandemic, where student cognitive achievement is not optimal. One thing that is most astonishing is that knowledge about problem solving has the lowest level among the indicators of knowledge supporting practice (Nguyen et al., 2022; Salta et al., 2021; Wagiran et al., 2022). Problem solving was identified as a skill that must be mastered in VE, and became the most crucial skill nomination in the 21st century to achieve (Mutohhari, Sutiman, et al., 2021; Trilling & Fadel, 2012).

Furthermore, even though physical condition is a dimension of PLR which is revealed to have high acceptance, we highlight one important thing. Where this refers to the low thinking power of students, so we have the perception that this also contributes to low learning outcomes caused by low PLR. Low thinking power is a parameter of the unstable condition of the body to focus the mind intensively to solve or carry out a complex activity. This was also confirmed through previous research which revealed changes in students' thinking power which had a direct impact on their learning outcomes (Mohamad et al., 2022; Santrock, 2007).

Overall, all dimensions do not have significant differences in their acceptance in the post-COVID-19 pandemic era. It's just that there are several priority scales that must be prioritized to improve the PLR and the dimensions of the highlighted PLR have significant differences at the lower threshold. In addition, the three dimensions of PLR studied are also significant constructs for PLR, so it is very important to improve them systematically to prepare MEE students before practicing. The psychological condition identified as the most crucial factor must be the first focus of attention for VE, especially MEE to solve. Moreover, psychological condition is a dimension of PLR which has a low level of acceptance at this time. Specific recommendations for improving the psychological aspects of students by conducting counseling, practical learning simulations, and strengthening their motivation through interactive learning innovations (Naidoo & Cartwright, 2020; Siow et al., 2021; Skipor & Vorobieva., 2021). What's more, the institution must also fight for the growth of knowledge as a foundation for practical learning. Currently, it is very easy with digital technology to obtain various sources of student learning needs, and only requires guidance and monitoring from lecturers to facilitate and improve student digital literacy (Astuti et al., 2022; Jaedun et al., 2022). Lastly, stimulations are important things to do to boost the thinking power of students who are still identified as low on the dimensions of their physical condition (Rabiman et al., 2021).

4. CONCLUSION

The results of descriptive analysis confirm that psychological conditions and supporting knowledge have a low level, while physical conditions have a high level. The results of the comparison test show that the three generally do not differ significantly, although there are notes on several indicators. Although all dimensions contribute significantly in building practical learning readiness, psychological conditions provide the highest contribution. Even though the COVID-19 pandemic has passed, the learning process in vocational education (VE), especially mechanical engineering education (MEE) still needs to be re-evaluated. The not yet optimal learning outcomes resulting from the non-return of practical learning readiness (PLR) in students is proven through this research. The most important thing that is still neglected by VE, especially MEE is that the identified psychological condition is still low. Especially in terms of self-efficacy and low learning intentions, of course, it contributes to strong problems affecting student readiness. Therefore, it is very important that this dimension is the first focus of attention to be resolved through reinforcements such as counseling guidance, learning simulations and learning motivation through learning innovations.

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