EVALUATING FOUR FACTORS OF STUDENTS' CAREER ADAPTABILITIES (CAA) USING PLS-SEM APPROACH

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ABSTRACT

This article discusses the four factors affecting students' career adaptability abilities (CAA). These four factors are professional awareness, implementation ability, curiosity attitude, and confidence level in the academic setting. This study engaged a survey of Career Adapt Abilities among 345 Pre-service Physics Students of Teacher Education. The study utilized Smart-PLS version 4 to apply the PL-SEM method. PLS-SEM (Partial Least Squares Structural Equation Modelling) analyses relationships between latent variables. It is particularly useful when the number of variables is large, and there is a limited sample size. PLS-SEM provides a combination of the strengths of both structural equation modelling (SEM) and partial least squares regression (PLS), making it suitable for investigating complex causal relationships in data with a high degree of collinearity and limited sample size. Additionally, PLS-SEM allows for examining direct and indirect effects among latent variables and can handle multiple dependent variables. These features make PLS-SEM suitable for this study. Results confirmed the positive and significant impact of four factors on the career adaptability of students: professional awareness (PA), implementation ability (IA), curiosity attitude (CA), and confidence level (CL). Based on these findings, recommendations are proposed to improve the student's career adaptability.

Keywords: *PLS-SEM, Professional Awareness (PA), Implementation Ability (IA), Confidence Level (CL), Career Adapt Abilities (CAA)*

INTRODUCTION

Pre-service physics students in local undergraduate normal colleges in western Inner Mongolia face difficulties adapting to the role of teachers upon entering the workplace. This leads to a lower teaching level, management ability, and self-confidence level compared to other regions, resulting in a lower employment rate compared to developed regions in the east and a lower competitiveness compared to key universities. To address these issues, it is crucial to improve the professional adaptability of these students.

One important aspect of improving their professional adaptability is to cultivate their professional awareness (PA), implementation ability (IA), curiosity attitude (CA), and confidence level (CL). In particular, enhancing their self-confidence level can significantly impact their overall professional adaptability. Thus, it is necessary to take action to improve these factors in pre-service physics students in western Inner Mongolia.

Strong career adaptability is crucial for students as it brings them closer to their career goals. Career adaptabilities refer to an individual's ability to adjust to changes and challenges in their work environment and to be flexible in exploring new opportunities and making career transitions. This skill set helps students better navigate the ever-changing job market and equips them with the resilience and confidence to pursue their desired career paths. By fostering career adaptability, students can better

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prepare themselves for the challenges they may encounter professionally and increase their chances of reaching their career objectives. Thus, developing strong career adaptability is an important step for students as they strive to achieve their career aspirations (Korkmaz, 2022).

The Career Adapt-abilities Scale (CAA) validity was evaluated in this study using Partial Least Squares-Structural Equation Modeling (PLS-SEM) approach. PLS-SEM is a statistical method used to assess a measurement instrument's validity and examine the relationships between variables. In this study, the PLS-SEM model was used to validate the four dimensions of the CAA - professional awareness, implementation ability, curiosity attitude, and confidence level in the academic setting - and their relationship with the outcome variables. The analysis showed that the CAA had strong construct validity, meaning that it measures what it intended to measure. The study's findings confirmed the relevance and importance of the four dimensions in predicting career success, providing further support for the validity of the CAA (Xu, 2020). This study provides valuable insights into the usefulness of the CAA in measuring career adaptability. It highlights the importance of using statistical methods such as PLS-SEM to validate measurement instruments in career development research.

This study addressed the problem of evaluating the four factors of students' Career Adapt-abilities (CAA) and examining their relationship with career success. The four factors include professional awareness, implementation ability, curiosity attitude, and confidence level in the academic setting. The study's research question was, "How valid and reliable is the measurement of the four factors of students' CAA using the Partial Least Squares-Structural Equation Modeling (PLS-SEM) approach?" The significance of this study lies in the fact that a better understanding of the factors that contribute to students' career adaptability can help educators, career counsellors, and researchers provide more effective support to students in navigating their career paths. Furthermore, using the PLS-SEM approach in validating the measurement of the CAA factors adds to the growing literature on career development. It provides valuable insights into the validity and reliability of this measurement tool. This study contributes to the advancement of the field by providing empirical evidence to support the usefulness of the four factors of students' CAA in predicting career success.

In sum, this paper aims to address the difficulties faced by pre-service physics students in local undergraduate normal colleges in western Inner Mongolia in adapting to the role of teachers and propose strategies for improving their professional adaptability. The study focuses on the four dimensions of career adaptability: professional awareness, implementation ability, curiosity attitude, and confidence level in the academic setting, and examines their relationship with career success. The paper also aims to evaluate the validity and reliability of the Career Adapt-abilities Scale (CAA) using the Partial Least Squares-Structural Equation Modeling (PLS-SEM) approach. The significance of the study lies in providing insights into the factors that contribute to students' career adaptability and the usefulness of the CAA in measuring it. The study's findings can inform educators, career counsellors, and researchers in supporting students more effectively in achieving their career aspirations.

LITERATURE REVIEW

Career adapt abilities (CAA) among pre-service physics students of teacher education are essential. The professional adaptability of physics teachers who are about to become physics teachers in elementary and middle schools need to have directions on what they will do after completing their studies. In the context of the new era, colleges and universities need to do a good job in researching the needs of college students' professional ability development and attach importance to promoting the development of college students' professional ability to achieve a good match with the job competency requirements put forward by social employers (Cao, 2021).

Professional Awareness (PA) refers to the in-depth thinking and planning for the professional career of future physics teachers and having the mental preparation that is willing to act for them. Yang et al. (2021), by combing through the conceptual connotations of professional self-concept, employability, and positive emotions, a moderated model is constructed. The analysis results show that college students' professional self-concept will positively impact employability.

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Implementation Ability (IA) helps to maintain a positive and optimistic attitude and use practical actions to achieve your career goals based on your characteristics. Facing the new needs of society, applied universities must establish a comprehensive education concept in talent training, focusing not only on the education of basic professional knowledge but also the training of professional core competence, and integrating the training of college students' professional core competence into professional teaching and daily behaviors management of students, Cultivate college students' sense of innovation and core competence (Li, 2019).

Curiosity Attitude (CA) is another vital factor in career adaptability abilities. To achieve career goals, continue to explore, conduct investigations, and actively seek and grasp opportunities for personal growth. The indispensability of curiosity is not only for creativity but also closely related to the rich life in the world (Yang, 2021).

Confidence Level (CL) assists in establishing efficient execution, working carefully and conscientiously, constantly learning new skills, overcoming various difficulties, and solving problems encountered. For new teachers, whether they can adapt to the teaching profession as soon as possible and complete the identity transformation from "prospective teachers" to "teachers" directly affects their teaching beliefs, professional attitudes and professional abilities and then relates to the stability and development of the whole teaching team (Wang, 2021).

In sum, there are four research hypotheses in this study. They are:

H1: Professional awareness (PA) will significantly positively affect career adaptability abilities (CAA) among pre-service physics students of teacher education.

H2: Implementation ability (IA) will significantly positively affect career adapt abilities (CAA) among pre-service physics students of teacher education.

H3: Curiosity attitude (CA) will significantly positively affect career adapt abilities (CAA) among pre-service physics students of teacher education.

H4: Confidence level (CL) significantly positively affects career adapt abilities (CAA) among pre-service physics students of teacher education.

METHODOLOGY

The research design of this study is a quantitative method used in most model validation research. This survey-based study will keep the anonymity and requires the researcher to protect the loss of confidentiality and privacy of the participant. Considering the value of anonymity for the samples being surveyed in hopes of more honest answers, the quantitative method is chosen to complete this study. The PLS-SEM approach will be applied for model measurement and testing. Figure 1 below shows the research process of this study. The research flowchart guides the whole process of this study.

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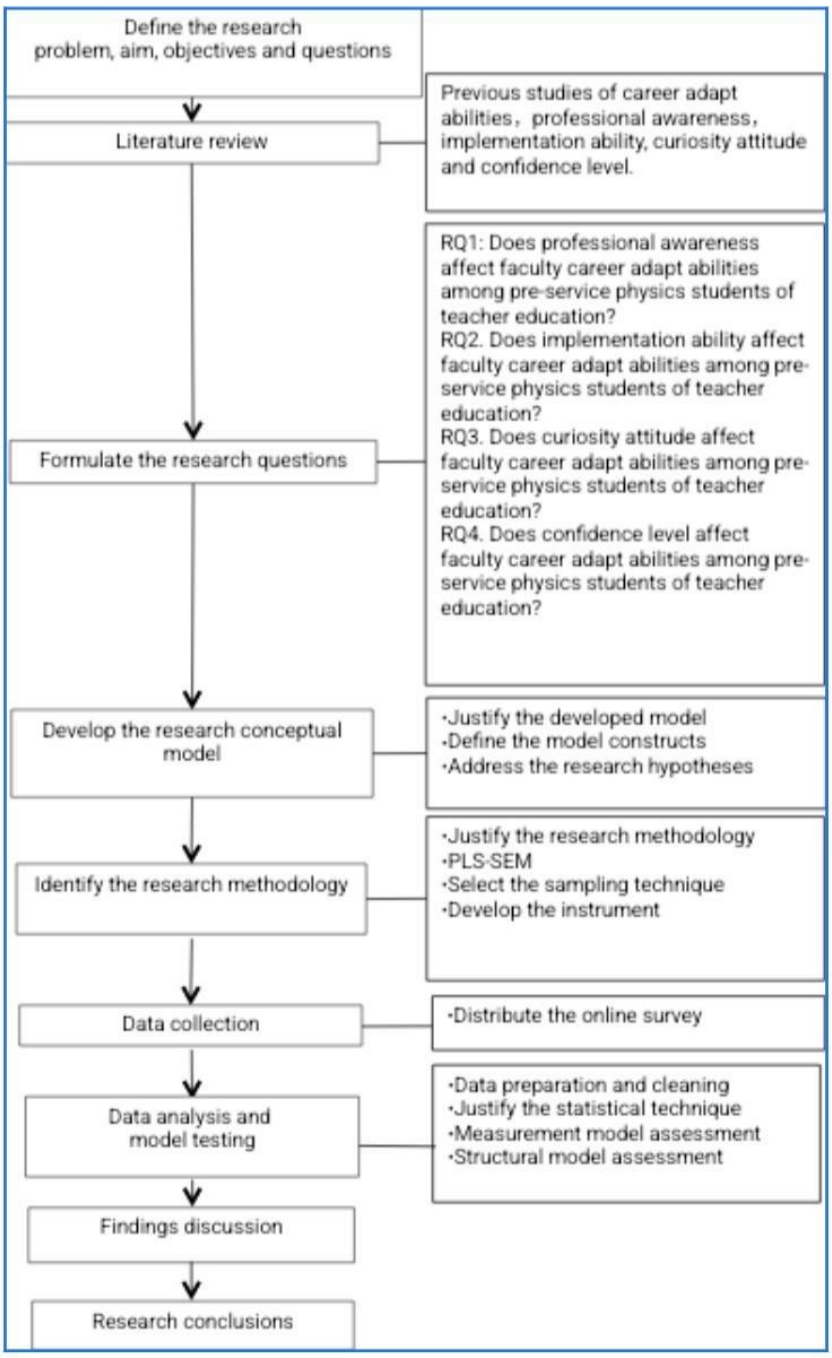

Figure 1. Research flowchart

The participants of this study were purposively sampled from higher educational institutions in Inner Mongolia and were physics students. They were selected through an online questionnaire which was informed to them by their teachers. This sampling method was chosen to target the population of interest and gather meaningful data specifically. The sample calculator of Daniel Soper can be accessed at https://www.danielsoper.com/statcalc/calculator.aspx?id=89. The anticipated effect size is set at 0.3, the acceptance effect size. The desired statistical power level is set at 0.8, a high-power level. There are five latent variables, one dependent variable and 4 Independent variables in this study. There are altogether 28 observed variables which represent the 28 items in this questionnaire. The probability level is set to 0.05. Thus, the minimum sample size is 148, and the recommended sample size is 150. However, to obtain better results and prepare for any invalid data found, 345 samples are used in this study.

The survey items used to measure the model's constructs in this study are included in Table 1 below. Table 2 shows Cronbach's Alpha value if the item is deleted. All values are above 0.7, indicating

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higher and stronger reliability indices. The reliability indices for all dimensions were above 0.7 and below 0.95. Thus, no issues of multicollinearity and auto-collinearity occurred. This instrument is suitable for PLS-SEM analysis later in this study.

Table 1. Items in the Instrument of This Study

Item number	Item	Reference
Dv	**Career Adapt Abilities (CAA)**	
1	I consider career adapt abilities are important.	
2	I am willing to improve my career adapt abilities.	
3	I will improve my career adapt abilities.	
4	I will make sure that I obtain career adapt abilities.	
Iv 1	**Professional Awareness (PA)**	
5	I will think about what my future will be like.	
6	I often realize that my today's choices shape my future.	
7	I know the educational and career choices I have to make.	
8	I have a plan how to achieve my goal.	
9	I am very concerned about my future career.	
10	I will try to prepare for the future.	
Iv 2	**Implementation Ability (IA)**	
11	I will remain optimistic.	
12	I will make my own decisions about the important things.	Sibunruang et al (2015)
13	I will take responsibility for my actions.	
14	I will stick to my beliefs for my professional goals.	
15	I would count on myself to achieve my career goals.	
16	I will seriously do what suits me.	
Iv 3	**Curiosity Attitude (CA)**	
17	I like to constantly explore my surroundings.	
18	I try to find opportunities to grow as a person.	
19	I will investigate the options before making a choice.	
20	I often observe different ways of doing things.	
21	I will dig into my question in depth.	
22	I would be curious about new opportunities.	
Iv 4	**Confidence Level (CL)**	
23	I can perform tasks relatively and efficiently.	
24	I will take care to do things well.	
25	I like to keep learning new skills.	
26	I will try my best to improve my confidence level.	
27	I am able to do my best to overcome obstacles.	
28	I can try to solve all kinds of career problems.	

Table 2. Reliability Indices of the Dimensions

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
DVM	13.733	12.686	.910	.841	.951
PAM	13.590	13.101	.920	.856	.950
IAM	13.790	13.035	.895	.832	.954
CAM	13.681	12.719	.893	.836	.954
CLM	13.715	13.504	.857	.761	.960

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FINDINGS

Table 3 gives information about the participants' demographics, respectively, calculated in SPSS. No missing values are found.

DESCRIPTIVE STATISTICS

Table 3 presents the demographic information of the study participants. The data includes various demographic items and 28 observed items. Standard deviation, kurtosis, and skewness are all statistical measures that describe the shape of a dataset. Standard deviation measures the spread of a dataset and indicates how much the data deviates from the mean. The normal range for standard deviation is typically between 0 and 1, although it can be higher or lower depending on the dataset. Kurtosis is a measure of the peakedness of a distribution, with a value of 0 indicating a normal distribution. A kurtosis value greater than 0 indicates a more peaked distribution, while a less than 0 indicates a flatter distribution. Skewness is a measure of the asymmetry of a distribution, with a value of 0 indicating a symmetrical distribution. A positive skewness value indicates that the distribution has a longer tail on the positive side, while a negative skewness value indicates a longer tail on the negative side. The normal range for skewness is typically between -3 and 3, although values outside of this range are also possible

The results indicate that all the standard deviation, kurtosis, and skewness values for all the items are within the normal distribution range. This suggests that the demographic information and observed items are evenly distributed and do not show any outliers or significant skewness.

This supports the validity and reliability of the results obtained from this study.

Table 3. Demographic Information of the Study

Name	Missing	Mean	Median	Scale min	Scale max	Observed min	Observed max	Standard deviation	Excess kurtosis	Skewness
gender	0	1.256	1	1	2	1	2	0.437	-0.749	1.120
age	0	1.610	2	1	2	1	2	0.488	-1.801	-0.452
year of study	0	1.616	2	1	2	1	2	0.486	-1.778	-0.477
result	0	1.748	2	1	2	1	2	0.434	-0.689	-1.146
institutions	0	1.894	2	1	3	1	3	0.644	-0.618	0.102
item1	0	4.514	5	1	5	1	5	0.713	2.173	-1.483
item2	0	4.639	5	1	5	1	5	0.652	6.542	-2.242
item3	0	4.611	5	1	5	1	5	0.671	4.555	-1.962
item4	0	4.376	5	1	5	1	5	0.835	1.615	-1.338
item5	0	4.467	5	1	5	1	5	0.788	3.827	-1.767
item6	0	4.297	5	1	5	1	5	0.880	0.741	-1.131
item7	0	4.483	5	1	5	1	5	0.776	2.576	-1.584
item8	0	3.994	4	1	5	1	5	1.041	-0.165	-0.757
item9	0	4.456	5	1	5	1	5	0.806	1.448	-1.426
item10	0	4.428	5	1	5	1	5	0.771	1.698	-1.325
item11	0	4.394	5	1	5	1	5	0.851	1.715	-1.419
item12	0	4.301	5	1	5	1	5	0.845	0.777	-1.096
item13	0	4.531	5	1	5	1	5	0.719	3.596	-1.735
item14	0	4.365	5	1	5	1	5	0.827	1.153	-1.232
item15	0	4.451	5	1	5	1	5	0.788	2.471	-1.559
item16	0	4.482	5	1	5	1	5	0.764	2.475	-1.555

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item17	0	4.130	4	1	5	1	5	0.993	0.271	-0.959
item18	0	4.297	5	1	5	1	5	0.871	0.750	-1.117
item19	0	4.207	4	1	5	1	5	0.933	0.738	-1.078
item20	0	4.253	4	1	5	1	5	0.888	0.578	-1.056
item21	0	4.243	4	1	5	1	5	0.874	0.103	-0.913
item22	0	4.336	5	1	5	1	5	0.861	1.295	-1.268
item23	0	4.175	4	1	5	1	5	0.879	0.342	-0.889
item24	0	4.389	5	1	5	1	5	0.809	1.696	-1.333
item25	0	4.310	5	1	5	1	5	0.844	0.372	-1.016
item26	0	4.362	5	1	5	1	5	0.822	1.127	-1.214
item27	0	4.345	5	1	5	1	5	0.821	1.057	-1.171
item28	0	4.227	4	1	5	1	5	0.885	0.115	-0.901

OUTER LOADINGS

Table 4 below depicts the measurement model of this study. In this research, the outer factor loadings between items and their underlying constructs calculated by Smart-PLS version 4 (Ringle et al., 2022) showed that each item had an indicator loading greater than 0.707 and a significant value smaller than 0.050. As shown in Table 4 below, all of the factor loadings of the items to corresponding constructs are above 0.7 and significant (p-value < 0.05), which is excellent. Hence, the measurement model has indicator reliability.

Table 4. The Model with Outer Loadings

	CA	CAA	CL	IA	PA
CA1	0.811				
CA2	0.865				
CA3	0.854				
CA4	0.866				
CA5	0.898				
CA6	0.853				
CAA1		0.838			
CAA2		0.864			
CAA3		0.907			
CAA4		0.795			
CL1			0.818		
CL2			0.847		
CL3			0.861		
CL4			0.879		
CL5			0.892		
CL6			0.858		
IA1				0.808	
IA2				0.847	
IA3				0.860	
IA4				0.877	
IA5				0.892	
IA6				0.868	
PA1					0.834

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PA2	0.835
PA3	0.836
PA4	0.760
PA5	0.838
PA6	0.836

INTERNAL CONSISTENCY RELIABILITY AND CONVERGENT VALIDITY ANALYSIS

Besides, construct internal consistency reliability indicates how well and to what extent the indicators of one construct measure that construct (Herzog & Tonchia, 2014). In other words, constructing internal consistency shows that the items measure the same thing. Cronbach's alpha assesses scales or test items' internal consistency or reliability (calculated in Smart-PLS version 4 in this study). In other words, the reliability of any given measurement refers to the extent to which it is a consistent measure of a concept. Cronbach's alpha is one way of measuring the strength of that consistency (Urbach & Ahlemann, 2010). The higher amount of α indicates the items have more shared covariance and probably measure the same underlying concept. According to Gefen et al. (2011), to check internal consistency, the value of Cronbach's α statistics for exploratory research should be more than 0.6, and for confirmatory research (i.e., CFA) should be more than 0.7. In addition, in CFA and SEM, internal consistency can be checked by composite reliability (CR) and should be more than 0.7 (Urbach & Ahlemann, 2010). The values of Cronbach's α and CRs are shown in Table 5. As shown in Table 5, all values of Cronbach's α and CRs are greater than 0.7, so the measurement model has internal consistency reliability.

Table 5. The Results of Internal Consistency Reliability and Convergent Validity Analysis

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	The average variance extracted (AVE)
CA	0.929	0.933	0.944	0.737
CAA	0.873	0.876	0.914	0.726
CL	0.929	0.931	0.944	0.739
IA	0.929	0.932	0.944	0.738
PA	0.905	0.909	0.927	0.678

The results of both Models with Outer Loadings and Related P- Values and the results of Internal Consistency Reliability and Convergent Validity Analysis have confirmed that the instrument developed in this study is of no question. Therefore, the measurement model is standard, and this instrument can be used to assess the structural model.

ASSESSMENT OF STRUCTURAL MODEL

Table 6 below shows the Assessment of the Structural Model of this study. Table 6 below shows the path coefficients between all constructs are significant (p-value < 0.01). The results show that all the independent variables significantly and positively affect the dependent variable.

Table 6. Assessment of Structural Model: Path coefficients between all construct

	Path Coefficients	P Values	Explained Variance (R^2)
CA -> CAA	-0.021	0.737	0.576
CL -> CAA	0.177	0.006	
IA -> CAA	0.222	0.001	
PA -> CAA	0.445	0.000	

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GRAPHIC REPRESENTATION OF THE MODEL WITH PATH COEFFICIENTS AND EXPLAINED VARIANCE

Besides, as shown in Figure 2 below and Table 6 above, the explained variance of all the constructs (r square is equal to 0.576, which means 57.6% of the variance in the dependent variable construct can be explained by its predictors, which shows all the independent variables are having a substantial effect on the dependent variable in this study, namely SPE.

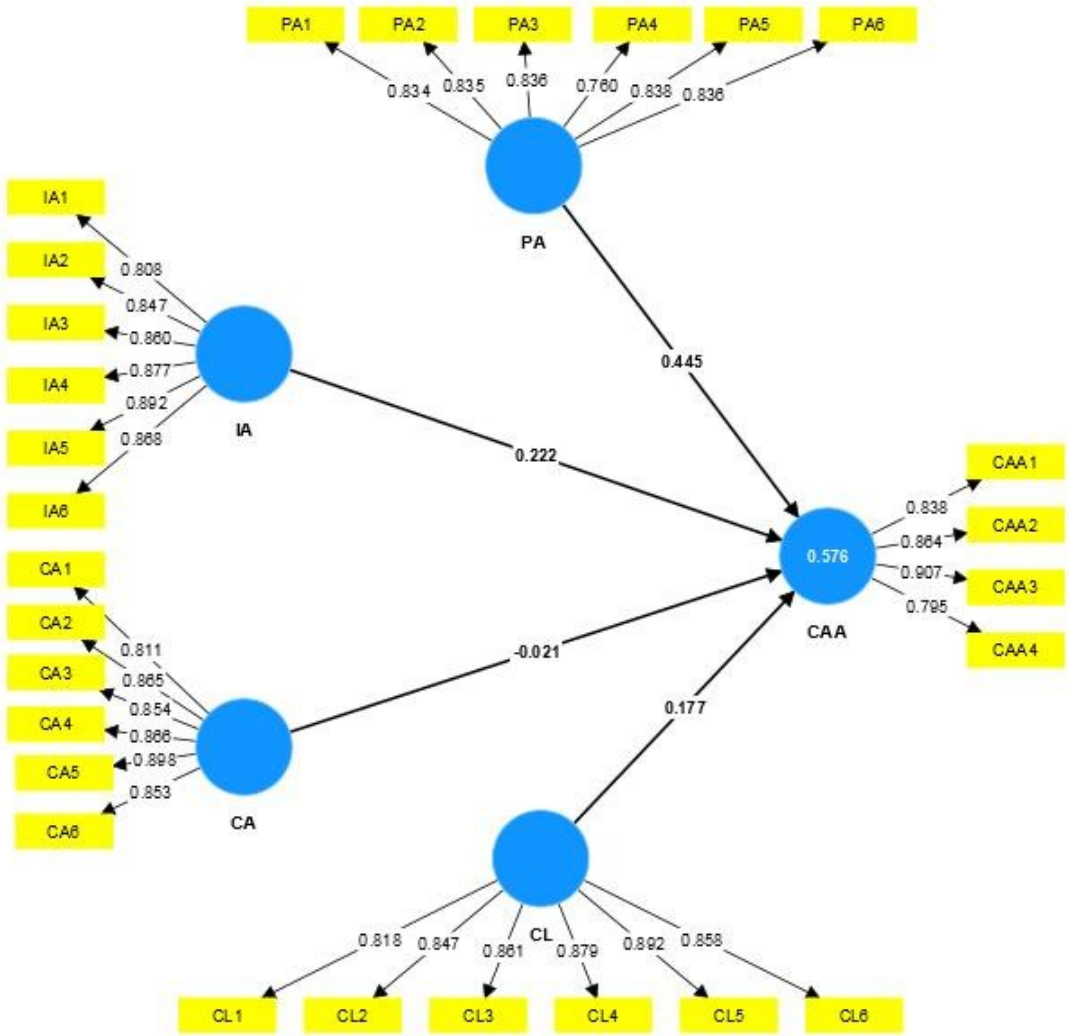

Figure 2. The Graphic Representation of the Model with Path Coefficients and Explained Variance

HYPOTHESES TESTING

With the confirmation of Structural Model assessment results and the high value of r square, as shown in Figure 2 and Table 6 above, this study's hypotheses can be tested. Table 7 below shows the major findings on the hypotheses testing of this study.

Table 7. Hypotheses Testing

Hypothesis	Relationships	T value	Decision	95% CILL	95% CIUL
H1	CA -> CAA	0.336	Rejected	-0.146	0.103
H2	CL -> CAA	2.737	Accepted	0.058	0.308
H3	IA -> CAA	3.351	Accepted	0.093	0.356
H4	PA -> CAA	7.548	Accepted	0.326	0.554

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For hypothesis 1, the t value is -0.246. A zero value is between 95% CI LL and 95%CI UL. Hence, hypothesis 1 is rejected. For hypothesis 2, the T-value is 2.316. No zero value is between 95% CI LL and 95%CI UL. Hence, hypothesis 2 is accepted. For hypothesis 3, the t-value is 2.375. No zero value is between 95% CI LL and 95%CI UL. Hypothesis 3 is accepted. For hypothesis 4, the T value is 2.659. No zero value is between 95% CI LL and 95%CI UL. Hypothesis 4 is accepted. The study's results highlighted the students' positive relationships towards tasks in blended learning courses. As such, the four hypotheses confirmed in this study were:

1: Curiosity attitude (CA) does not significantly affect career adapt ability abilities (CAA) among pre-service physics students of teacher education.

2: Confidence level (CL) significantly positively affects career adapt abilities (CAA) among pre-service physics students of teacher education.

3: Implementation ability (IA) significantly positively affects career adapt abilities (CAA) among pre-service physics students of teacher education.

4: Professional awareness (PA) significantly positively affects career adaptability abilities (CAA) among pre-service physics students of teacher education.

DISCUSSION AND CONCLUSION

The study has confirmed that Professional awareness (PA), Implementation ability (IA), and Confidence level (CL) have significant positive effects on career adapt abilities (CAA) among pre-service physics students of teacher education with only the exception of Curiosity attitude (CA). Therefore, efforts must be made on these four factors to enhance the level of career adaptability abilities (CAA) among the students, especially the three significant factors.

The current study intensifies that Professional awareness is related to career adaptability abilities. Implementing career-related instruction can prepare students well prepared for their careers (Kärkkäinen & Keinonen, 2019). Students' perceptions are an important input in understanding and raising science-related career professional awareness, leading to better career adaptability abilities (Soobard et al., 2020). Therefore, various methods must be used in the study process to provide professional awareness through workshops, exhibitions, talks, experience-sharing sessions of graduated students, etc.

Implementation abilities are vital in instilling career adaptability (Anthony et al., 2020). Assessing students' implementation abilities is essential to understanding career adaptability determinants (Nguyen, 2017). Implementation abilities are also related to self-regulatory behaviors (Van Laer & Elen, 2020). The abilities to implement what has been learned are handy for instilling career adaptability abilities. Knowledge in mind would not be helpful until they are being used and implemented. Some suggestions about this aspect may include having simulation sessions, experience sharing of graduated students, seminars, student conferences, professional talks, etc. might be helpful.

The indispensability of curiosity is not only for creativity but also closely related to the rich life in the world (Yang, 2021). The results of regression analysis show that among the seven independent variables of autonomous learning ability, the ones that can predict professional adaptability most are "learning motivation", "self-learning awareness", and "learning strategy" (Zhuang, 2016). The indispensability of curiosity is not only for creativity but also closely related to the rich life in the world (Yang, 2021). Curiosity attitude helps in solving career-related problems (Zetriuslita, 2017). It is necessary for a career to adapt abilities. These can be improved by having problems solving skills seminars, change preparation talks, practical visits, experience sharing of graduated students, interviews with experts of the fields, visiting experts of the field, etc.

Lastly, the confidence level regarding a chosen career reflects the belief in the future profession student plans to pursue. (Malureanu et al, 2021). The confidence level can be a significant predictor of career adaptability abilities. Analysis of various variables about a career's confidence level must be verified (Kalita, 2021). If the students have a high confidence level towards their future careers, they will tend to have high intentions in their career adaptability abilities (Garaika et al., 2019). Student-peer,

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student-faculty, student-parents, student society, and other forms of interaction will affect their confidence in their future careers (Plecha, 2021). At the same time, professional performance is also affected by the confidence level of the future career (Axelrod, 2017), in which better professional performance is often related to a higher confidence level. Some suggestions may include providing professional development training, career-related skill training, sharing sessions of successfully graduated students, questions and answers sessions with field experts, etc.

In sum, Table 8 below summarizes the efforts and suggestions in upholding the four aspects that will positively affect career adaptability abilities. These efforts should be implemented to ensure that career adaptability abilities are upholstered before the students graduate.

Table 8. Efforts and suggestions in upholding the four aspects that will bring positive effects on career adapt abilities

	Factor	Efforts and suggestions
1	Professional awareness	various methods have to be done to provide professional awareness through workshops, exhibitions, talks, experience sharing graduated students, etc.
2	Implementation abilities	simulation sessions, experience sharing of graduated students, seminars, students conference, professional talks, etc.
3	Curiosity attitude	problems-solving skills seminar, change preparation talk, practical visit, experience sharing of graduated students, interviews with experts of the fields, visiting experts of the field, etc.
4	Confidence level	providing professional development training, career-related skill training, and sharing sessions of successful graduated students, questions and answers sessions with experts in the fields, etc.

There are some limitations in this study, and some future suggestions are proposed to tackle these limitations. Similar to prior studies, the current study has some limitations—first, data was collected through a convenience sampling method which might restrict the generalizability of results. For future studies, large samples and with stratified sampling method can be employed to increase the generalizability of the findings.

Second, there were only four factors involved only in this study. For future studies, more determinants can be added to produce a more fruitful understanding for developing a better and more comprehensive model, which includes many factors in determining the enhancing the level of career adaptability abilities among the students.

Third, the current study took only the effects of four selected independent variables on the dependent variable. Moderators and mediators that will affect the relationships studied in this study should be considered for future studies to yield a greater understanding of the effects of these moderators and mediators on the relationships studied.

Fourth, this study employed the basic method of PLS-SEM in the assessment process. Future studies should employ other more advanced techniques in PLS-SEM analysis, such as assessing the common method variance (construct level correction), using multi-group analysis (MGA) in evaluating the moderating factors affecting the relationships, etc.

In conclusion, this study has verified that Professional awareness (PA), Implementation ability (IA), Curiosity attitude (CA), and Confidence level (CL) have significant positive effects on career adaptability abilities (CAA) among pre-service physics students of teacher education. Thus, instructors must ensure that various strategies and suggestions about the four vital factors examined in this study should be carried out to prepare the students by enhancing their career adaptability abilities.

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DATA AVAILABILITY DECLARATION

The original data and materials supporting the findings of this study are comprehensively documented in the article and its supplementary materials. Any additional inquiries or requests for data should be directed to the corresponding author.

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CONFLICT OF INTEREST

The authors affirm that the research was conducted without any influence from commercial or financial affiliations that could be perceived as potential conflicts of interest.

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