A CONFIRMATORY FACTOR ANALYSIS ON TEACHING APTITUDE SCALE FOR STUDENT TEACHERS

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Abstract

The main purpose of this study was to establish the validity and reliability of the Teaching Aptitude Scale (TAS). Descriptive research design and quantitative survey method were used in this study. A total of 501 student teachers (fourth year, second semester) selected from three Universities of Education participated in this study. The required sample was selected by using simple random sampling technique. In the section of data analysis, exploratory factor analysis, confirmatory factor analysis, computing the values of composite reliability and Average Variance Extracted were used. According to the result, construct validity of Teaching Aptitude Scale (TAS) was satisfactory. All the values of fitness indexes for the final model have reached the level of acceptance. Six subscales found are Dynamic Personality, Optimistic Attitude, Attitude towards Teaching Profession, Interest in Teaching, Moral Character and Discipline, Co-operative Attitude. The validated scale consists of 38 items. Convergent validity, discriminant validity of the scale was also satisfactory. Reliability coefficient of the scale was .935. Therefore, the scale may contribute to identify teaching aptitude of student teachers across teacher education institutions in Myanmar.

Keywords: Aptitude, Teaching Aptitude, Confirmatory Factor Analysis

Introduction

Teaching is the process of changing the behavior and developing desirable skills in learner for his all-round development. The process of teaching to be conducted effectively depends upon effective teachers. Teaching needs three qualities: knowledge is the first, communication skill is the second, aptitude is the third. Although an education system has excellent resources, but if the teachers are lacking teaching aptitude and are incompetent or indifferent to their responsibilities, the whole program is likely to be ineffective and largely wasteful.

Several researchers pointed out that teaching aptitude is found to be a good predictor of teacher effectiveness. A person possesses an aptitude for teaching; it is assumed that he has a good proportion of the traits required for becoming successful in teaching. Therefore, teaching aptitude is considered as the determinant factor for choosing the teaching profession. For becoming a good teacher, a student teacher should have the teaching aptitude. It enforces the teacher to teach well according to norms, principles and condition of teaching profession.

Therefore, the student teachers should get admission in teacher training courses after checking entry behavior by administering teaching aptitude in order to find out how much they are serious in adopting the teaching profession and after completion of their studying, they would be able to become efficient, confident and qualified teachers. Thus, for selecting student teachers for teacher education institutions, it is essential to have a well-validated instrument as a teaching aptitude scale.

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Aim of the Study

The main aim of this study was to establish the validity and reliability of Teaching Aptitude Scale (TAS). The specific objectives are;

1. To assess construct validity of Teaching Aptitude Scale (TAS)
2. To determine the convergent validity, discriminant validity of (TAS)
3. To establish the reliability of Teaching Aptitude Scale (TAS).

Scope of the Study

A total of 501 (fourth year second semester) student teachers were selected from three Universities of Education (Yangon University of Education, Sagaing University of Education and University for the Development of National Races of the Union, Sagaing). This scope was limited within 2021-2022 Academic Year.

Definition of the Key Terms

Aptitude: Aptitude is a condition or set of characteristics regarded as symptomatic of an individual's ability to acquire with training, some specific field of knowledge, skill or set of responses (Freeman, 1971, cited in Jena, 2012).

Teaching Aptitude: Teaching aptitude is a specific capacity or special ability, distinct from the general intellectual ability of an individual, indicative of his probable success in a particular field after receiving appropriate opportunity for learning or training (Kaur, 2014).

Confirmatory Factor Analysis: Confirmatory Factor Analysis (CFA) is a statistical technique that analyzes how well indicators measure unobserved constructs and if unobserved constructs are uniquely from one another (DeCoster, 1998).

Literature Review

Some specific abilities are necessary for gaining success in personal activities. These abilities help an individual to acquire a required degree of proficiency or achieve success in a specific field is called "aptitude". The knowledge of aptitude helps in predicting the future success of an individual, under suitable training or experience in a particular area of activity.

Teaching aptitude is one of the major determinants of teacher effectiveness and it is found to be a good predictor of teacher effectiveness. When a student teacher who has teaching aptitude enters a teacher education program, he or she has interest and will actively perform in the activities of the program and will try hard to become proficient teacher. A teacher with good aptitude must be aware of the essentials of components of teaching viz. lesson planning, motivating students, content learning materials, learning subjects, teaching-learning strategies, consolidation, elaborations, group activity, continuous and comprehensive evaluation, discipline, multi-level and multi-grade activities, effective communication and interaction etc.

Various studies have proposed different criteria on how to assess teaching aptitude. The researcher had collected information related to the teaching aptitude tests, test batteries and scales by referring National Psychological Cooperation Catalogue (2020). To identify teaching aptitude, there are important common factors that need to be considered. In this research, researcher used 10 factors. They are Attitude towards Teaching Profession, Interest in Teaching, Co-operative

Attitude, Consideration, Wide Interest and Scholarly Taste, Fair Mindedness and Impartiality, Moral Character and Discipline, Optimistic Attitude, Motivational Aspect, Dynamic Personality.

Method

Sample of the Study

In order to obtain the required data, the sample of student teachers to be tested was selected from the three Universities of Education. The participants were 501 fourth year (second semester) student teachers.

Research Method

The student teachers participated in this study were selected by using simple random sampling method. Descriptive research design and quantitative survey method were used in this study.

Instrumentation of Teaching Aptitude Scale (TAS)

In this study, teaching aptitude scale was mainly constructed from Teaching Aptitude Test Battery (TATB) developed by Karim and Dixit (1986). The TATB measures teaching aptitude on the base of eight different subscales. Each of the subscales comprise of 10 items. A 5-point Likert scale form was prepared for the items included in the test. The reliability coefficient of the original test was 0.74.

Moreover, among 27 items of Attitude Scale for Student Teachers towards Teaching Profession developed by Ohmmar Win (2019), 10 items were included in this study. It is a 5-point Likert scale ranging from “strongly disagree” to “strongly agree”. The internal consistency (Cronbach’s alpha) of original scale was 0.819.

In addition, among 15 items of Teaching Interest Scale (TIS) developed by Eren (2012), 10 items were included in this study. The internal consistency (Cronbach’s alpha) of original scale was 0.79.

Finally, the Teaching Aptitude Scale (TAS) was constructed on the base of 10 subscales: (1) Attitude towards Teaching Profession, (2) Interest in Teaching, (3) Co-operative Attitude, (4) Consideration, (5) Wide Interest and Scholarly Taste, (6) Fair Mindedness and Impartiality, (7) Moral Character and Discipline (8) Optimistic Attitude, (9) Motivational Aspect, (10) Dynamic Personality.

The Teaching Aptitude Scale (TAS) consisting 100 items (each subscale consists of 10 items) which are more relevant to teaching aptitude of student teachers were translated into Myanmar version. It is a 5-point Likert scale ranging from “Strongly Disagree” to “Strongly Agree”. After preparing the measuring scale, expert review was conducted for face validity and content validity. According to the valuable advices of the experts, some items were modified.

Preliminary Test Administration of Teaching Aptitude Scale

Preliminary test administration was conducted on June, 2021. The test was done with total sample of 100 student teachers (fifth year second semester) from Sagaing University of Education. The reliability of the whole scale was 0.968 indicating that Teaching Aptitude Scale (TAS) has high reliable.

Data Collection Procedure

After pilot testing, Teaching Aptitude Scale (TAS) was administered to 501 (fourth year, second semester) student teachers from the three Universities of Education.

Data Analysis

After collecting the data, the Statistical Package for the Social Science (SPSS) version 23 and Analysis of Moment Structure (AMOS) version 24 and Stats Tool Package were used to analyze the quantitative data. In this study, exploratory factor analysis and confirmatory factor analysis were employed.

Data Analysis and Findings

Exploratory Factor Analysis for Teaching Aptitude Scale (TAS)

An exploratory factor analysis of the items was carried out in order to provide validity evidence based on internal structure. The principal axis factor analysis with varimax rotation was conducted to assess the underlying structure for the 100 items of teaching aptitude scale for student teachers.

Throughout this analysis process, items with initial value of less than 0.2 without loading were not included. The communalities were all above 0.3; it indicated that the relation between each item and other items is satisfactory. Among them, the items that had factor loading below 0.4 were eliminated.

In this study, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy was .950. It was above the recommended value of 0.7 that is indicating that there were enough items for each factor. And Bartlett's Test of Sphericity was significant ($p < 0.001$); this means that the variables are correlated highly enough to provide a reasonable basis for factor analysis. The six factors also have eigenvalues (a measure of explained variance) greater than 1.0, which is a common criterion for a factor to be useful.

After rotation, the first factor accounted for 12.131 % of the variance, the second factor accounted for 5.773 % of the variance, the third factor accounted for 4.742 % of the variance, the fourth factor accounted for 4.683 % of the variance, the fifth factor accounted for 4.347 % of the variance and the sixth factor accounted for 3.961 % of the variance. Therefore, the six factors explained 35.636 % of the total variance of the items.

Table 1 displays the items and factor loadings for the rotated factors and communalities based on principal axis factoring with varimax rotation for 50 items of the Teaching Aptitude Scale (TAS).

Table 1 Factor Loading for the Rotated Factors of Teaching Aptitude Scale (TAS)

Teaching Aptitude Scale (TAS)		Factors						Communality
		1	2	3	4	5	6	
Dynamic Personality	Item 98	.607						.594
	Item 97	.595						.560
	Item 78	.590						.627

Teaching Aptitude Scale (TAS)		**Factors**						**Communality**
		1	**2**	**3**	**4**	**5**	**6**	
	Item 68	.578						.690
	Item 96	.576						.619
	Item 69	.574						.679
	Item 83	.570						.576
	Item 85	.551						.628
	Item 82	.540						.653
	Item 80	.537						.591
	Item 86	.529						.623
	Item 94	.523						.550
	Item 81	.517						.580
	Item 70	.517						.597
	Item 90	.515						.578
	Item 79	.513						.566
	Item 100	.494						.545
	Item 48	.467						.618
	Item 84	.465						.531
	Item 67	.445						.596
	Item 65	.440						.616
	Item 91	.440						.535
	Item 87	.425						.527
Optimistic Attitude	Item 76		.629					.531
	Item 59		.529					.418
	Item 72		.527					.568
	Item 74		.512					.600
	Item 95		.495					.563
	Item 58		.476					.486
	Item 77		.420					.481
	Item 42		.419					.383
Attitude towards Teaching	Item 1			.685				.625
	Item 5			.662				.623

Teaching Aptitude Scale (TAS)		**Factors**						**Communality**
		1	**2**	**3**	**4**	**5**	**6**	
Profession	Item 3			.628				.544
	Item 2			.628				.599
	Item 4			.600				.554
	Item 6			.490				.496
Interest in Teaching	Item 13				.619			.519
	Item 14				.610			.556
	Item18				.524			.548
	Item16				.510			.539
	Item 20				.480			.549
	Item 11				.450			.550
	Item 12				.431			.543
Moral Character & Discipline	Item 62					.677		.629
	Item 61					.575		.563
	Item 52					.424		.628
Cooperative Attitude	Item 24						.569	.612
	Item 23						.559	.607
	Item 27						.462	.602
Eigenvalues		29.092	3.680	3.259	2.122	1.926	1.750	
Explained Variance %		12.131	5.773	4.742	4.683	4.371	3.961	

According to the result of Table 1, it was verified that 23 items were grouped into factor 1 and it was defined as Dynamic Personality (DP). In the second factor, this factor was named as Optimistic Attitude (OA) and it has 8 items. In the third factor, this factor was assigned as Attitude towards Teaching Profession (ATTP) and it includes 6 items. In the fourth factor, this factor was marked as Interest in Teaching (IIT) and it consists of 7 items. In the fifth factor, this factor was named as Moral Character and Discipline (MCD) and it has 3 items. In the sixth factor, this factor was named as Co-operative Attitude (COA) and it has 3 items.

Confirmatory Factor Analysis for Teaching Aptitude Scale (TAS)

Firstly, confirmatory factor analysis of a six-factor model obtained from the exploratory factor analysis was carried out. The model obtained from exploratory factor analysis (including 50 items) was re-specified as the fitness indexes were below those considered satisfactory. Based on the factor loadings of the items, it was decided to remove 12 items (item 11, 12, 42, 48, 59, 65, 67, 77, 84, 87, 91, 100). Then, the model is presented in Figure 1.

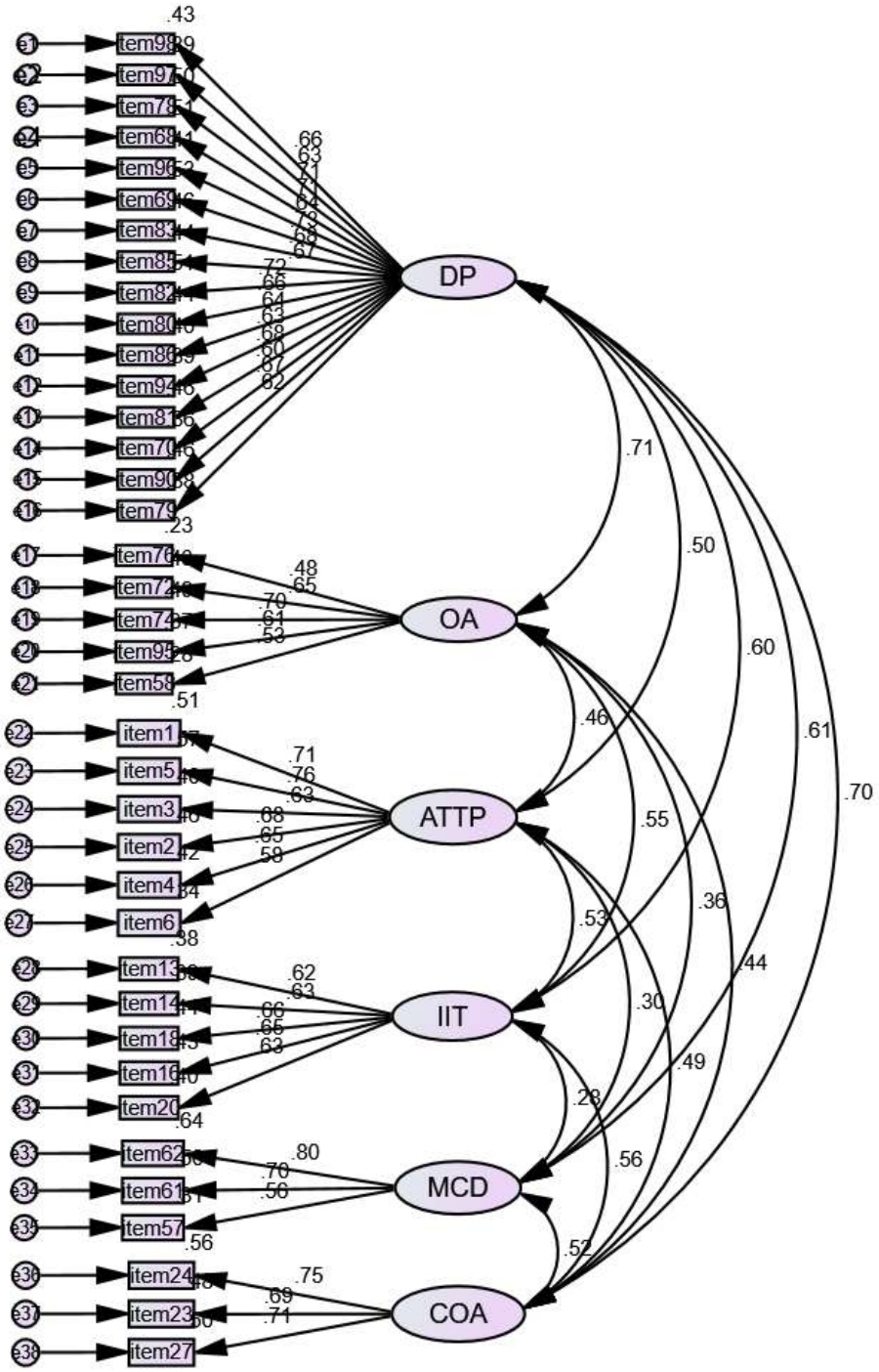

Figure 1 Model Showing the Six-Factor Structure of Teaching Aptitude Scale (TAS)

A final structure of 38 items has adequate fitness indexes that reflect how fit is the model to the data. Some values of fitness indexes for the model have achieved the level of acceptance, following the criteria proposed by Hu and Bentler (1998). The result of the Root Mean Square Error of Approximation (RMSEA), Chi-square/DF (CMIN/DF), Incremental Fit Index (IFT), Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), Parsimonious Normed Fit Index (PNFI) and Parsimonious Comparative Fit Index (PCFI) were presented in Table 2.

Table 2 Summary of Fitness Indexes of the Model

Test Index	Test Standard	Result	Model Fit Verification
RMSEA	≤ 0.08	0.051	Good Fit
CMIN / DF	≤ 3.84	2.294	Good Fit
IFI	≥ 0.9	0.892	Close
TLI	≥ 0.9	0.883	Close
CFI	≥ 0.9	0.891	Close
PNFI	≥ 0.5	0.761	Good Fit
PCFI	≥ 0.5	0.824	Good Fit

From the result of measurement model, some fitness indexes meet the required level.

Convergent Validity

Convergent validity is also evidence to test construct validity. It is verified through Composite Reliability (CR) and Average Variance Extracted (AVE). The results for convergent validity assessment of measurement model are presented in Table 3.

Table 3 Convergent Validity of Teaching Aptitude Scale (TAS)

Construct	Composite Reliability (CR)	Average Variance Extracted (AVE)
Dynamic Personality (DP)	0.927	0.493
Optimistic Attitude (OA)	0.736	0.492
Attitude towards Teaching Profession (ATTP)	0.829	0.449
Interest in Teaching (IIT)	0.776	0.409
Moral Character & Discipline (MCD)	0.733	0.483
Co-operative Attitude (COA)	0.759	0.513

Although Average Variance Extracted (AVE) values were less than 0.5, Composite Reliability (CR) values of all latent factors were above the recommended value 0.7 so that convergent validity was achieved.

Discriminant Validity

The discriminant validity of measurement model is assessed based on the values of the square root of Average Variance Extracted (AVE) of the constructs comparing with the values of all inter-construct correlations. In Table 4, the diagonal values in bold are the square root of AVE

for the construct while other values are the correlation between the respective constructs. For discriminant validity, the values of all inter-construct correlations should be lower than 0.85 and the diagonal values in bold should be higher than the values in its row and column following the criteria proposed by Ahmad, Zulkurnain and Khairushalimi (2016). Therefore, the discriminant validity was achieved.

Table 4 Discriminant Validity of Teaching Aptitude Scale (TAS)

Construct	DP	OA	ATTP	IIT	MCD	COA
Dynamic Personality (DP)	**.702**					
Optimistic Attitude (OA)	.701	**.701**				
Attitude towards Teaching Profession (ATTP)	.503	.457	**.670**			
Interest in Teaching (IIT)	.601	.553	.534	**.640**		
Moral Character & Discipline (MCD)	.611	.355	.303	.279	**.695**	
Co-operative Attitude (COA)	.699	.436	.490	.556	.524	**.716**

From the above table, the values of all inter-construct correlations were lower than 0.85 and the diagonal values in bold were higher than the values in its row and column following the criteria proposed by Ahmad, Zulkurnain and Khairushalimi (2016). Therefore, the discriminant validity was achieved.

Establishment of Reliability

For the establishment of reliability, the internal consistency of reliability of Teaching Aptitude Scale (TAS) was 0.935 above the recommended value of 0.7 indicating that the present scale is high reliable.

Conclusion, Discussion and Suggestion

The main purpose of this study was to assess the validity and reliability of Teaching Aptitude Scale (TAS) for student teachers. A total of 501 student teachers from three Universities of Education were participated. In this study, content validity, construct validity, convergent validity and discriminant validity were assessed for the establishment of validity evidence of the scale. Besides, internal consistency reliability was also assessed for the establishment of reliability evidence.

The findings of this study show that the validated teaching aptitude scale has a high reliability and validity. It can contribute to the selection procedure of teacher education institutions as a part of the trainee selection procedure.

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