Construct Validity Test of Academic Resilience Inventory (ARI): A Potential Scale for Assessing Students' Academic Resilience During Pandemic COVID-19

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ABSTRACT

This study aims to test the reliability and validity of the Academic Resilience Inventory (ARI), which was developed by Samuel (2004) for the Indonesian context. The inventory adaptation procedure that the researchers did in this research refers to the journal Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures (Beaton, 2000). The total amount of sample used in this study was 200 students of Public Vocational School 1 Pandeglang, taken by using accidental sampling. To test the validity of the measurement inventory, the researcher used Confirmatory Factor Analysis (CFA) with Lisrel software. The result revealed that, in general, the Academic Resilience Inventory (ARI) by Samuel (2004) is significantly unidimensional, meaning it only measures the construct of the academic resilience inventory. However, in the result of CFA, the validity test known that item no.8 on the intelligence factor, item no. Forty on temperamental factors, items no. 2, 14, 25, 26, and 28 on social relations factors, item no. Three on the factor of family relations, item no. 6 on academic factors are invalid. Further psychometric properties analysis and education are described.

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1. INTRODUCTION

Academic resilience is [1] a high probability of student achievement in school despite initial features, conditions, and experiences. In other words, resilience can retain high levels of achievement, motivation, and performance despite difficult life events and circumstances that could lead them to misbehave at school and eventually drop out. Resilience is a universal capacity; with this capacity, individuals, groups, or communities can prevent, minimize or counter the effects that can damage them when they experience disaster or misfortune [2]. Resilience refers to an individual's or

community's strength to cope with stress, overcome adversity or unfavorableness, or adapt positively to a change [3]. Resilience is the power to bounce back or recover from disappointments, obstacles, or setbacks [4].

According to Reivich and Shatte (2003), resilience is under individual control. Individuals can teach themselves to be resilient [5]. Individuals can make a big difference in handling setbacks and how enthusiastically individuals approach challenges. In fact, individuals may need to learn how to be resilient. However, some individuals have to learn how to face adversity without hiding [6]. Individuals must learn how to think sharply when involved in a conflict and how to gain knowledge and meaning from setbacks and failures. Individuals must also learn to listen to their thoughts and inner voices, which can guide them through a life that sometimes brings unwanted changes. All humans can be resilient because everyone can learn how to deal with the inevitable sufferings of life.

Academic resilience is termed to describe students who can maintain high levels of achievement, motivation, and performance, even in the presence of stressful events and conditions that put them at risk for doing bad things at school and in danger of being expelled from school [6]. Resilience in education provides a framework for understanding why some at-risk students do well in school while others do not [7]. Many studies and studies on the factors that influence academic resilience have been carried out. Studies on resilience are very important to develop. Research on resilience as a standard contract, especially concerning education or academic resilience, is still very limited.

Academic Resilience Inventory (ARI) Scale

Academic resilience is the ability to effectively deal with stress or pressure in academic matters [8]. Resilience can represent a dynamic developmental process that refers to maintaining positive adjustments despite high academic demands [9]. Academic resilience is a student's endurance in the face of academic demands, namely as a high level of achievement of motivation and performance in school in stressful situations. Academic resilience describes students who can maintain high levels of achievement, motivation, and performance, even in stressful events and conditions that put them at risk for doing bad things at school and threatening expulsion from school [10].

The measurement of academic resilience used by the author is the Academic Resilience Inventory (ARI) developed by Samuels in 2004, with a total of 40 items [11]. Initially, the Academic Resilience Inventory (ARI) consisted of 67 items, but after item selection and validation conducted by Samuels (2004) only 40 items had a Cronbach alpha reliability value of 0.89 [25].

The scale in this study consists of 40 items and has five alternative answers, namely 1 = does not indicate my characteristics at all, 2 = slightly shows my characteristics, 3 = quite shows my characteristics, 4 = shows my characteristics, and 5 = strongly indicates my characteristics.

Table. 1 Blueprint of Academic Inventory Scale

Indicator	**Favorable**	**Unfavorable**	**Total**
Intelligence	12 4, 8 7	5	5

Temperamental	16, 40 17, 32, 34 20, 31	18, 23	9
Social Relations	14 25 2	 28 26	5
Family relationship	13 39	21 3, 15	5
Achievement Motivation	1, 11, 22 38 37	10	6
Academic	29 9, 36	6, 30	5
Religiosity, Self-Confidence & Hope	33 34 19, 24 27		5

Adaptation Process and Data Analysis

The scale adaptation process that the researchers carried out in this study refers to the journal Guidelines for the Cross-Cultural Adaptation of Self-Report Measures [12]. The adaptation process that the researchers carried out was 5 stages. The description of the process is as follows:

1. Initial Translation At this stage, the researcher, translates the scale into Indonesian. Two people carried out the translation process. The first translator has an educational basis in English literature and works in the same field. The second translator is a psychology graduate. It aims to get a comprehensive translation result because it is the result of a combination of a linguist and someone who understands the concept of this scale.
2. Synthesis of Translations After getting the results from translator one (P1) and translator two (P2), the researcher synthesized the results of P1 and P2. If a difference is found between the two translations, the researcher will choose which one has the most appropriate meaning according to the initial scale. The researcher also considers cultural factors in choosing the translation results in this process.
3. Back Translation At this stage, the translation is carried out back to the initial language of the scale. Two translators carried out the retranslation process (different from stage 1). This process is carried out to see if there is a difference in meaning when the scale in Indonesian is translated into the original language. If there is a difference in meaning, the researcher must review the item again.
4. Expert Committee After improving the translation by considering the results of the back translation, the researcher discussed the results with the experts. In this study, the discussion was conducted under the guidance of a lecturer in Psychology Measuring Instrument Construction course.

5. Test of the Prefinal Version At this stage, the scale that had been agreed upon through the discussion results was piloted to several respondents. This stage is to determine whether the respondents can understand the scale that has been adapted [21].

2. METHOD

2.1 Research Design

The kind of research performed in this study was quantitative, with data analysis utilizing Confirmatory Factor Analysis (CFA)[15]. The factors in the questionnaire were confirmed using confirmatory factor analysis. Further, to test the validity of the Academic Resilience Inventory, the researcher used Confirmatory Factor Analysis (CFA) with Lisrel software. The steps to get good item criteria in the CFA are as follows [13]:

a. That a concept or trait is defined operationally so that questions or statements can be prepared to measure it. This trait is called a factor, and the measurement of this factor is done through an analysis of the responses to the items.
b. It is theorized that each item measures one item, and the sub-indicators only measure one factor, meaning that each item and sub-test is unidimensional.
c. The available data can be used to estimate the correlation matrix between items that should be obtained if it is unidimensional. The correlation matrix is called sigma (Σ), then compared with a matrix of empirical data called the S matrix. If the theory is true (unidimensional), then there is no difference between the S matrix, or it can also be stated - S = 0.
d. The statement is used as a null hypothesis, then tested with a chi-square. If the chi-square is not significant P > 0.05, then the null hypothesis is "not rejected." This means that the unidimensional theory can be accepted that the item or instrument subtest only measures one factor.
e. Modifying the measurement model is done by freeing parameters in the form of correlation of measurement errors. This occurs when an item measures other than the factor to be measured. After some measurement errors are freed to correlate with each other, a fit model will be obtained, so this last model will be used in the next step.
f. If the model is fit, the next step is to test whether the item is significant or not, measuring what you want to measure using the t-value. If the t-value is not significant (t1.96) and positive factor loads, then the significant and positive items were processed to obtain the factor score [22]. The factor score is calculated to avoid estimation bias from measurement error. For convenience in interpreting the analysis results, the authors transform the factor score measured on a standard scale (Z score) into a T-score, which has a mean = 50 and a standard deviation (SD) = 10 so that no respondent gets a negative score.

2.2 Participant in The Research

Research participants in this research are a student of Public Vocational High School (SMK Negeri) 1 Pandeglang. With the total amount of sample, 200 students were taken by accidental sampling.

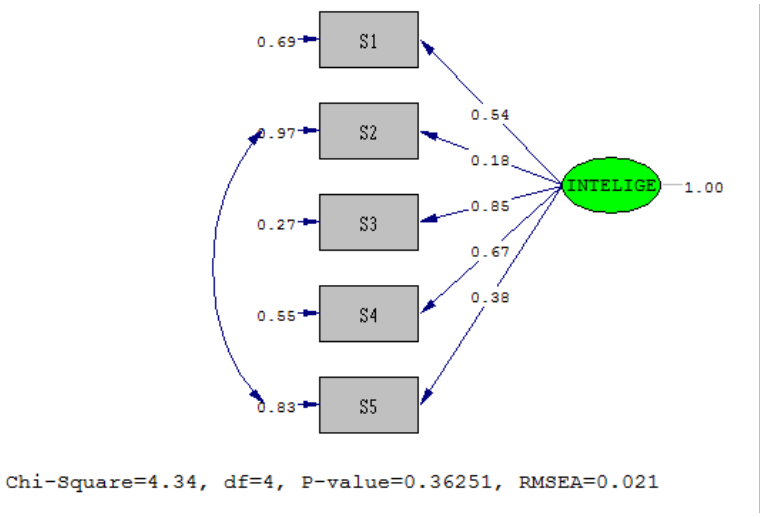
3. RESULTS AND DISCUSSION

The result of validity testing on the content dimension of the Academic Resilience Inventory

3.1 Intelligence

The author tested whether the 5 (five) items were unidimensional, meaning they only measured the intelligence factor. From the results of the CFA analysis carried out with the one-factor model, a fit model was obtained with Chi-square = 4.34, df = 4, P-value = 0.36251, and RMSEA value = 0.021. P-value has resulted in a value > 0.05, so it can be stated that the model with one factor is acceptable [16]. This means that all items in this factor are significant, measuring only one factor: intelligence.

Figure A.1 Path Diagram of Intelligence Factors



Then the researcher sees whether the item measures the factor to be measured significantly and, simultaneously, determines whether the item needs to be dropped. The test is carried out by looking at the t value for each factor loading coefficient, as shown in the following table:

Table A.1 Loads of Intelligence Factor Items

Item	Item Scale	Coefficient	Standard Error	t-score	Significant
1.	(4)	0.54	(0.08)	7.13	V
2.	(5)	0.18	(0.08)	2.30	V
3.	(7)	0.85	(0.08)	10.86	V
4.	(8)	8.78	(0.08)	0.67	X
5.	(12)	0.38	(0.08)	4.93	V

Description: V = significant (t> 1.96) ; X = not significant

Based on the table above, the Lambda coefficient is positive for all items. Meanwhile, the t-value for the factor loading coefficient of all items is qualified to be significant except for item no.4 (item no.8). All items except no.4 (item no.8) can be used for

further analysis; in other words, nothing needs to be dropped (no.4 (item no.8) needs to be dropped) and is not included in the score calculation factor.

3.2 Temperamental

The author tested whether the 9 (nine) items were unidimensional, meaning they only measured the temperamental factor. A fit model was obtained from the CFA analysis carried out with the one-factor model, with Chi-square = 28.99, df = 21, P-value = 0.11425, and RMSEA value = 0.044. P-value has resulted in a value > 0.05, so it can be stated that the model with one factor is acceptable. This means that all items in this factor are significant, measuring only one factor, namely the temperamental factor.

Figure B.1 Path Diagram of Temperamental Factors

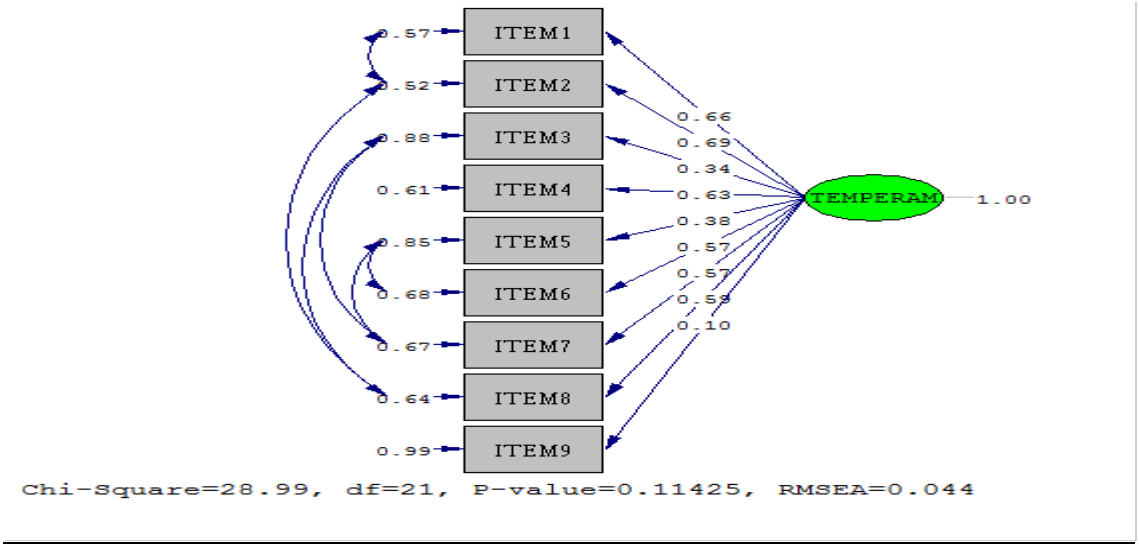


Table B.1 Loading Items Temperamental Factors

Item	Item Scale	Coefficient	Standard Error	t-score	Significant
1.	(16)	0.66	(0.07)	9.28	V
2.	(17)	0.69	(0.07)	9.66	V
3.	(18)	0.34	(0.08)	4.22	V
4.	(20)	0.63	(0.07)	8.97	V
5.	(23)	0.38	(0.08)	4.83	V
6.	(31)	0.57	(0.07)	7.83	V
7.	(32)	0.57	(0.07)	7.77	V
8.	(35)	0.59	(0.07)	8.06	V
9.	(40)	0.10	(0.08)	1.30	X

Description: V = significant (t> 1.96) ; X = not significant

Based on the table above, the Lambda coefficient is positive for all items. Meanwhile, the t-value for the factor loading coefficient of all items is qualified to be significant except for item no.9 (item no.40). All items except no.9 (item no.40) can be used for further analysis; in other words, nothing needs to be dropped (no.9 (item no.40) needs to be dropped) and is not included in the score calculation factor.

3.3 Social Relations

The author tested whether the 5 (five) items were unidimensional, meaning they only measured social relationship factors. A fit model was obtained from the CFA analysis carried out with the one-factor model, with Chi-square = 7.32, df = 5, P-value = 0.19782, and RMSEA value = 0.048. P-value has resulted in a value > 0.05, so it can be stated that the model with one factor is acceptable [23]. This means that all items in this factor are significant, measuring only one factor, namely the social relationship factor.

Figure C.1 Path Diagram of Social Relationship Factors

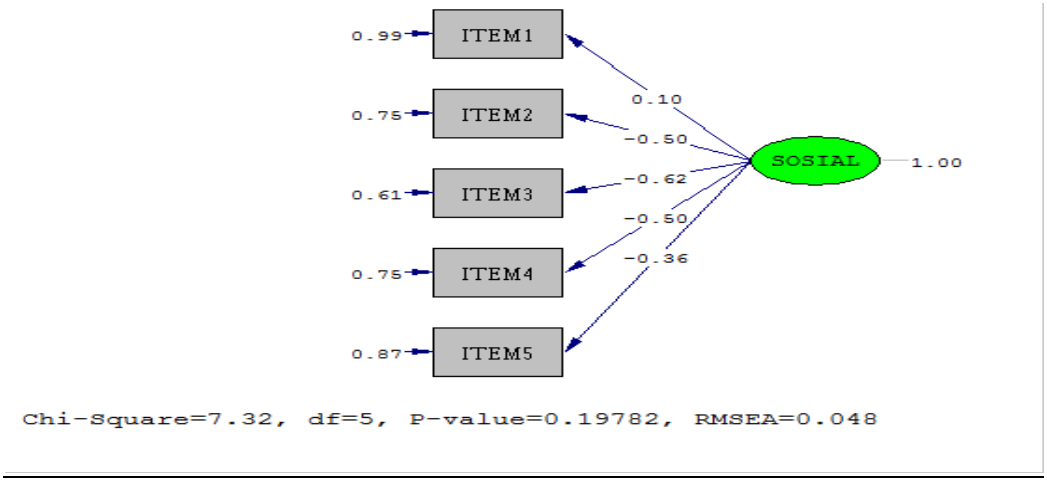


Table C.1 Load of Item Factors Social Relationship Factor

Item	Item Scale	Coefficient	Standard Error	t-score	Significant
1.	(2)	0.10	(0.09)	1.12	X
2.	(14)	-0.50	(0.09)	-5.32	X
3.	(25)	-0.62	(0.10)	-6.19	X
4.	(26)	-0.50	(0.09)	-5.32	X
5.	(28)	-0.36	(0.09)	-3.93	X

Description: V = significant (t> 1.96) ; X = not significant

Based on the table above, the Lambda coefficient is positive for item no. 1 (item no. 2) and the Lambda coefficient is negative for items no. 2, 3, 4, and 5 (items no. 14, 25, 26, and 28). Meanwhile, the t-value for the factor loading coefficient of all items does not qualify for significance. All items cannot be used for further analysis; in other words, all items need to be dropped and not included in the calculation of factor scores.

3.4 Family relationship

The author tested whether the 5 (five) items were unidimensional, meaning they only measured family relationship factors. From the results of the CFA analysis carried out with the one-factor model, a fit model was obtained with Chi-square = 0.96, df = 3, P-value = 0.81001, and RMSEA value = 0.000. P-value has resulted in a value > 0.05, so it can be stated that the model with one factor is acceptable. This means that

all items in this factor are significant, measuring only one factor, namely the family relationship factor.

Figure D.1 Path Diagram of Family Relationship Factors

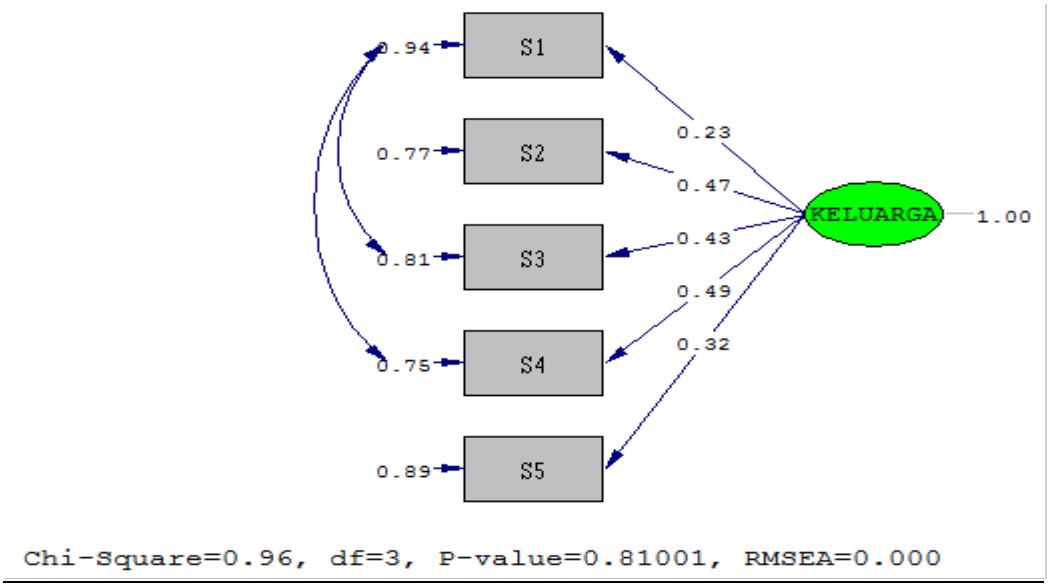


Table D.1 Loading Items Factors Family Relationships

Item	Item Scale	Coefficient	Standard Error	t-score	Significant
1.	(3)	0.23	(0.12)	1.86	X
2.	(13)	0.47	(0.11)	4.25	V
3.	(15)	0.43	(0.11)	3.98	V
4.	(21)	0.49	(0.11)	4.31	V
5.	(39)	0.32	(0.10)	3.10	V

Description: V = significant (t> 1.96) ; X = not significant

Based on the table above, the Lambda coefficient is positive for all items. Meanwhile, the t-value for the factor loading coefficient of all items is qualified to be significant except for item no.1 (item no. 3). All items except no.1 (item no. 3) can be used for further analysis; in other words, nothing needs to be dropped (no.1 (item no. 3) needs to be dropped) and is not included in the score calculation factor.

3.5 Achievement Motivation

The author tested whether the 6 (six) items were unidimensional, meaning they only measured the achievement motivation factor. A fit model was obtained from the CFA analysis conducted with the one-factor model with Chi-square = 4.35, df = 5, P-value = 0.50016, and RMSEA value = 0.000. P-value has resulted in a value > 0.05, so it can be stated that the model with one factor is acceptable. This means that all items in this factor are significant, measuring only one factor, namely the achievement motivation factor.

Figure E.1 Path Diagram of Achievement Motivation Factors

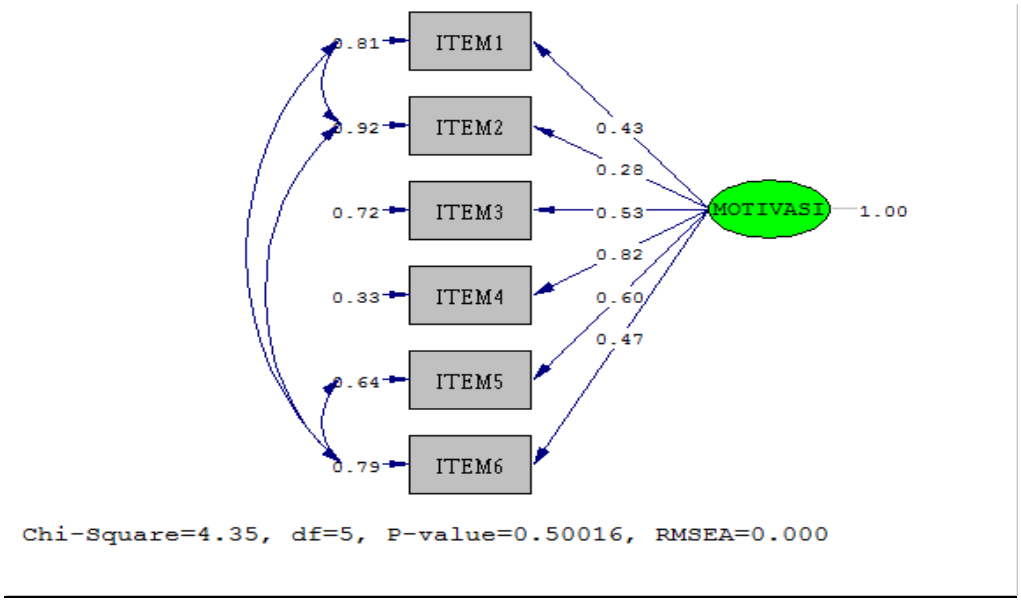


Table E.1 Item Loads of Achievement Motivation Factors
Conclusion

Item	Item Scale	Coefficient	Standard Error	t-score	Significant
1.	(1)	0.43	(0.08)	5.50	V
2.	(10)	0.28	(0.08)	3.42	V
3.	(11)	0.53	(0.08)	7.02	V
4.	(22)	0.82	(0.08)	10.57	V
5.	(37)	0.60	(0.08)	7.72	V
6.	(38)	0.47	(0.08)	5.76	V

Description: V = significant (t> 1.96) ; X = not significant

Academic

The author tested whether the 5 (five) items were unidimensional, meaning they only measured academic factors. From the results of the CFA analysis conducted with the one-factor model, a fit model was obtained with Chi-square = 0.95, df = 3, P-value = 0.81309, and RMSEA value = 0.000. P-value has resulted in a value > 0.05, so it can be stated that the model with one factor is acceptable. This means that all items in this factor are significant, which only measures one factor, namely the academic factor

Figure F.1 Path Diagram of Academic Factors

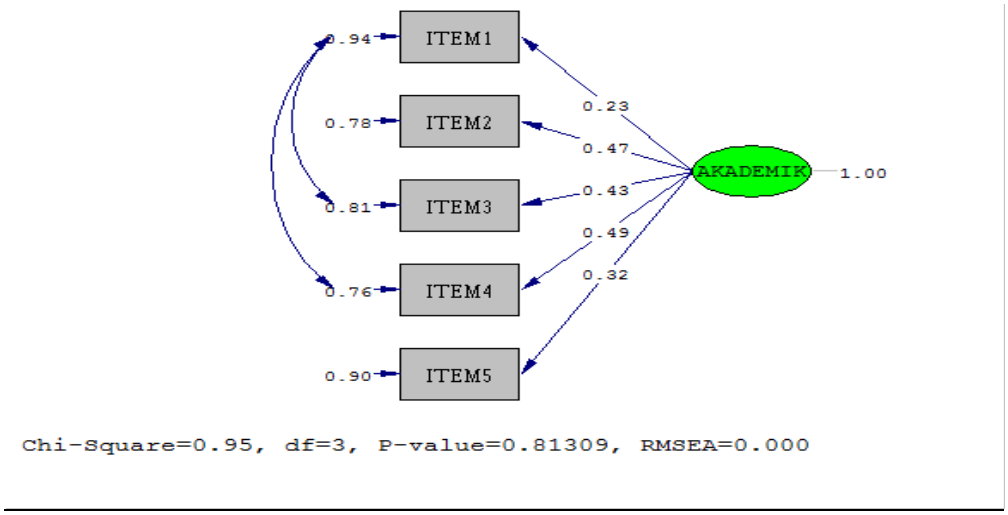


Table F.1 Load of Academic Factor Items

Item	Item Scale	Coefficient	Standard Error	t-score	Significant
1.	(6)	0.23	(0.12)	1.86	X
2.	(9)	0.47	(0.11)	4.20	V
3.	(29)	0.43	(0.11)	3.97	V
4.	(30)	0.49	(0.11)	4.29	V
5.	(36)	0.32	(0.10)	3.07	V

Description: V = significant (t> 1.96) ; X = not significant

Based on the table above, the Lambda coefficient is positive for all items. Meanwhile, the t-value for the factor loading coefficient of all items is qualified to be significant except for item no.1 (item no.6). All items except no.1 (item no. 6) can be used for further analysis; in other words, nothing needs to be dropped (no.1 (item no. 6) needs to be dropped) and is not included in the score calculation factor.

3.6 Religiosity, Self-Confidence & Hope

The author tested whether the 5 (five) items were unidimensional, meaning they only measured religiosity, confidence, & hope factors. From the results of the CFA analysis carried out with the one-factor model, a fit model was obtained with Chi-square = 4.34, df = 4, P-value = 0.36242, and RMSEA value = 0.021. P-value has resulted in a value > 0.05, so it can be stated that the model with one factor is acceptable. This means that all items in this factor are significant, measuring only one factor, namely the factor of religiosity, confidence, & hope.

Figure G.1 Path Diagram of the Factors of Religiosity, Confidence, & Hope

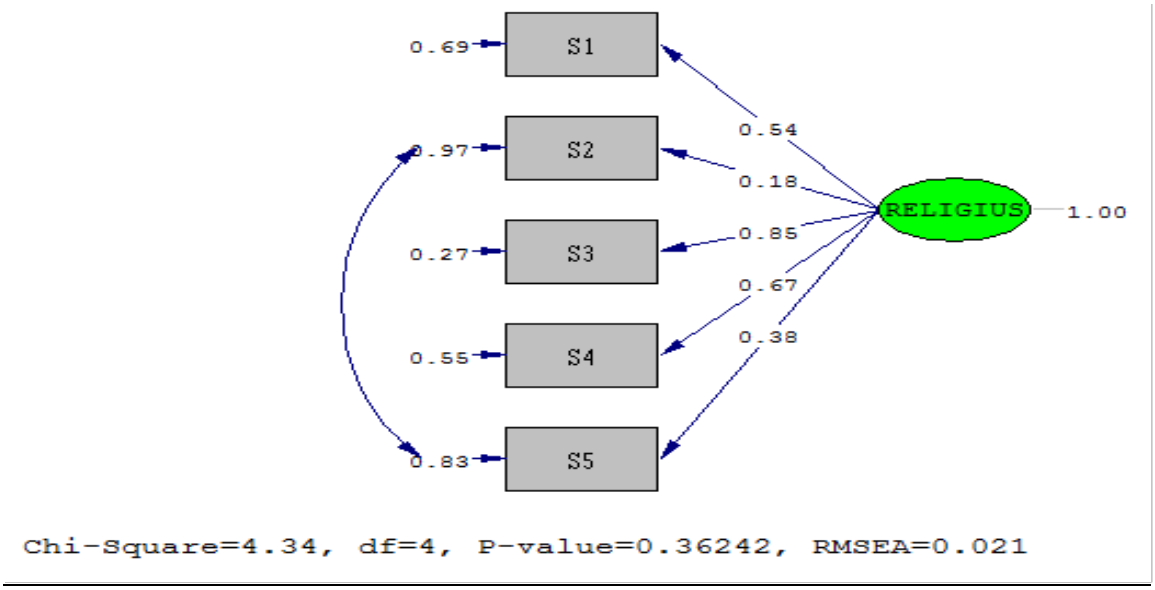


Table G.1 Load of Items Factors Factors of Religiosity, Confidence, & Hope

Item	Item Scale	Coefficient	Standard Error	t-score	Significant
1.	(19)	0.54	(0.08)	7.13	V
2.	(24)	0.18	(0.08)	2.30	V
3.	(27)	0.85	(0.08)	10.86	V
4.	(33)	0.67	(0.08)	8.78	V
5.	(34)	0.38	(0.08)	4.93	V

Description: V = significant (t> 1.96) ; X = not significant

Based on the table above, the Lambda coefficient is positive for all items. Meanwhile, the t-value for the factor loading coefficient of all items is qualified to be significant. All items can be used for further analysis; in other words, nothing needs to be dropped and included in the factor score calculation.

4. CONCLUSION

In general, the results of this study indicate that the items on the Academic Resilience Inventory (ARI) Samuels (2004) scale measure what they want to measure, namely only measuring themselves on the academic resilience factor. However, some items were found to be still correlated from one item to another . The adaptation and back translation processes have also gone through the correct procedure so that after processing such a long process [20], readers can easily understand the items distributed to respondents as the subject of testing the validity of the Academic Resilience Inventory (ARI) scale [24]. Furthermore, the results of testing the validity of this academic resilience measuring instrument can be used as a reference for readers to research if they want to use the same variables. From the explanation above, thus

the Academic Resilience Inventory (ARI) scale can be used as a reference in further research, especially for the world of education.

Based on the results of the validity test above, in general, the Academic Resilience Inventory (ARI) (2004) can be used for research. However, in the explanation of the validity test above, item no.8 on the intelligence factor, item no. Forty on temperamental factors, items no. 2, 14, 25, 26, and 28 on social relations factors, item no. Three on the factor of family relations, item no. 6 on academic factors declared invalid. So it is recommended for further research not to use these items in research or can also conduct a review of these items. In addition, it is hoped that the research that will be conducted will increase the number of respondents to achieve the expected goals.

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