Development Study of Academic Resilience Scale for Gifted Young Scientists Education

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Abstract

Heretofore, there are still limitations of instruments to measure student academic resilience scale of senior high school, especially in Indonesia. Thus, there is a need of an excellent academic resilience scale instrument design. This article aims to evaluate construct validity and instrument reliability of an academic resilience scale instrument. It is designed to collect senior high school students' academic resilience levels. The developed academic resilience scale could be used by gifted young scientists. The conducted evaluation procedure is construct validity through Exploration Factor Analysis (EFA). The instrument was tested for 181 senior high school students. The analysis results were obtained from 22 of 24 question items which met requirements of academic resilience construct representations. self-efficacy, control, plan, low anxiety, and diligence. The reliability test was Split-Half Method with coefficient 0.723, meaning that the instrument is reliable. The academic resilience score could be used as data collection instrument or need assessment.

Keywords:

academic resilience scale, gifted young scientists, validity, reliability

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Introduction

We are now in 21st century which is in modern era. Adolescence living in this era really need tougher skill and higher order thinking skill to face current living condition which is full of rapid – dynamic growths (Nota, Soresi, & Zimmerman, 2004; Desmita, 2009; Abdurrahman et al, 2019). Curriculum and educational system also experience reformation in introducing education to prepare students in facing 21st century challenges so they could adapt with the dynamic changes (Mnguni, 2019; Walid et al, 2019; Sadiku & Sylaj, 2019). Reformations or changes frequently cause various problems for students, especially in academic matter. It also occurs in increasing of academic achievement at school. Parents' attitudes which seem to be too strict in internalizing excessive discipline to children with purpose to reach achievement, to avoid any failure, and to obtain good scores. Such demand and regulation in family influence to student academic achievement at school (Ilhan et al, 2019). It could trigger stress level moreover when the students are not ready to learn. The cause could be seen in excessive anxiety. In another hand, anxiety is needed but if it is too exaggerate, it will negatively influence students. As explained by Putranta (2019) anxiety is important to improve motivation in achieving certain purpose, however, when it is too high, it will negatively influence.

Such condition makes students must have life skill to make them capable of facing challenges and solving problems, especially academic problems, to make them not easily giving up, to have endurance or high resilience in facing the challenges, to avoid stress, depression, and negative attitude which could damage both personally and environmentally. Previous studies also explained that high resilience students would be more successful in academic field than those who were not (Somchit & Sriyaporn, 2004; Abolghasemi & Varaniyab, 2010; Hupfeld, 2010; Mwangi et. al 2015).

Resilience term has been used in physics but nowadays it has been adopted to psychological field. However, it is assumed important in human development study (Albuquerque et al, 2015). Resilience or endurance is interpreted by many people to describe personal attitude which allows an individual to be successful in life. Of course it is with consequence if those whom are not successful will personally have responsibility upon their problems (Luthar, 2003).

Reivich & Shatte (2002), stated that resilience is a skill to solve and to adapt with burdening occurrence or problem in life. Ginsburg (2006) defined resilience as an ability to raise up from difficult situation and to keep existing in imperfect situation. Individuals try to adapt with their stressful environment and try to escape such disadvantageous situation. Resilience is an ability of individual in adapting and surviving in risky situation to raise and keep existing from a certain pressure and to not give up as well as to be able in interpreting the benefit of what is happened.

Academic resilience has similar definition but it is more academic. In academic context, resilience refers to capability or capacity of students to effectively handle

academic regression, stress, seatback, challenge, adversity, and pressure in academic context (Martin & Marsh, 2003; 2006; Schoon, 2006; Cloete & Ballard, 2011; Satyaninrum, 2014).

In another hand Morales (2008) defined it as "process and result which are parts of individual life story which have been academically successful, although it has been facing various hindrances, but typical people experience failures". Furthermore Martin (2013) defined it as ability to solve acute/chronic problems seen as main threat for student educational development. Martin dan Marsh (2006) explained that students with academic resilience could be seen from five predictive factors: self-efficacy, plan, control, tranquility (low anxiety, and commitment or diligence.

Therefore, academic resilience could be defined as capacity and ability of students to effectively adapt in facing adversities to not surrender from academic failures and to regain success although he is pressured without giving up in facing the problems due to his self-efficacy, plan, control, tranquility, and commitment in facing demands, pressures, and academic problems.

Students with poor academic resilience is concerned to not be able in adapting to the changes, demands, and disappointments due to academic problems. High resilience individuals could adapt with negative feeling. They could change pressuring condition into positive matter so it could motivate them reaching high achievement and being able to solve life problem and preventing them from similar factors in the future (Sales & Perez, 2005; Steinhardt & Dolbier, 2008; Khalaf, 2014).

It strengthens the belief that academic resilience is an important thing to have by students moreover in facing developments and transition periods. Resilience is seen as important elements to keep and promote mental health of adolescences and as life support for any threat toward wellbeing as the time goes by and in its transition (Khanlou & Wray, 2014), Adolescences also prepare their future orientation which is influenced by high challenges or resilience as well as orientation of achieving their purposes which have important roles for student academic achievement (Seginer, 2008; Jowkar et al, 2014).

Resilience is seen as process occurring at individual level and it is not an attaching attitude. Resilience is not an individual's attitude but it is individual endurance realized into habitual pattern in his life (Luthar, 2003; Zolkoski & Bullock, 2012). Resilience is an ability and a skill obtained through experiences and individual interaction with his environment (Mayasari, 2014). It means that resilience is not only something emerging but it is a capacity owned by individual through learning process from his environments both family, school, and social environments.

In school environment, in developing or improving student academic resilience, it cannot be separated from the role of school members, such as teachers, students,

and other personnel. Teachers and schools, as well as the peers there, can assist youth person endurance to be more protective in the middle of academic stressful environment (Liebenberg et al., 2016; Wilks, 2008) and it has important role in guiding adolescence endurance which is fragile to face adversity (Liebenberg et al., 2016). At Senior High School level, the one directly involved in guiding the students is Counselor.

Importance of Academic Resiliency Scale for Education of Gifted Young Scientists

Current occurring problem deals with the limited - used instruments to measure academic resilience scale of senior high school students, especially in Indonesia. Thus, there is a need of an excellent academic resilience scale instrument design. Counselors in carrying out their tasks and functions need assessment before providing assistance or counseling. Besides counselors, gifted young scientist need to integrate need of assessment in implementing a certain research, especially dealing with educational field. Need of assessment is an important thing to differ interventions. It cannot be separated by counselors before providing interventions which are appropriate for students (Widyatmoko et al., 2019). Efforts which could be done by counselors or gifted young scientists to ease need of assessment process is by using various instruments. One of the instruments to use, dealing with student academic resilience problems, is academic resilience scale.

Gifted young scientists are those whom are expert or have lots of knowledge about a certain science in educational field. Indonesia has many young talents scientists whom need supports and better opportunities to innovate (Putra, 2017). One of the personal development of gifted young scientist in educational field could be done by further research by using sustainable academic resilience scale.

Academic resilience scale could be used to measure gifted young academic resilience levels. By the growth of intellectual concept, the concept of talent theory also changes, from unidimensional into multidimensional (Wandansari, 2011). By referring to three conceptions of giftedness theory as proposed by Renzulli (2005), characteristics of talents or giftedness are three, they are beyond average skills, commitments to tasks, and creativities. Renzuli asserts that from those characteristics, there is no single characteristic which creates giftedness or talent. Instead, those three are important to create creative-productive achievements and to emerge giftedness behaviors.

Intellectual giftedness brings various consequences which could hinder social relationship of those gifted ones to their peers (Wandansari, 2011). In an effort to minimize conflict between needs of friendship and needs to be excellent in their preferred expertise, the gifted children needs to have excellent academic resilience.

Gifted children but having low achievements are individuals whose low motivation, low motivation is one of the problems met in gifted students frequently (Tortop, 2015) and they need educational support (Kunt, K., & Tortop,

2017). They consistently do not want to show their efforts nor hard work , below their potencies (Wahab, 2005). Gifted children have less achievements, in another side, have higher other achievements. The problems does not concern on their skills but on their attitudes (Wahab, 2005). To avoid any failure in the future, gifted children with less achievements need excellent academic resilience.

Problem of Study

Based on the background that has been described, the problem of study is to evaluating validity and reliability of an academic resilience scale instrument. As for the study question stated as follows:

- Is the developed academic resilience scale valid and reliable?

Method

Research Model

A survey model was used to collect data or information about a large population by using relatively small sample size. Survey research designs are procedures in quantitative research in which investigators administer a survey to a sample or to the entire population of people to describe the attitudes, opinions, behaviors, or characteristics of the population (Creswell, 2012)

Participants

The participants consisted of Senior High School student of Malang Indonesia with 181 respondents representing three geographical areas. The areas were: Southern – East suburban (Industrial/trading area) with 80 respondents, midtown (the center of government) with 54 respondents, and suburban area of Northern – East (educational area) with 47 respondents.

Procedure

This research aimed to evaluate validity and reliability of academic resilience scale instrument construct. The validity and reliability tests were done by distributing the instrument to respondents. Before being distributed, the instrument was arranged in the form of question items based on five academic resilience aspects (Martin & Marsh, 2006). Then, the instrument was validated by three experts (using expert judgment) in guidance and counseling field.

From the validity result done by the experts, there were 24 question items determined based on the academic resilience scale. Each question consisted of answers based Likert scale (Very appropriate, appropriate, inappropriate, not appropriate at all). Then, the total of items on each academic resilience scale aspect were: (1) self – efficacy with six question items, (2) control aspects with four question items, (3) plan aspect with three question items, (4) low anxiety aspect with five question items, and (5) diligence aspect with six question items. The obtained data were analyzed by EFA and reliability test. The test was assisted by SPSS version 2.0.

Results and Discussion

This research aimed to test validity and reliability of academic resilience scale instrument construct. There were two things explained in this research.

Exploratory Factor Analysis of Academic Resilience Scale Instrument

Validity is accuracy of an instrument in measuring what is being measured. Therefore, there is a need an instrument validation to check it. The instrument validation used was exploratory factor analysis with principal components. It had purpose to figure out the valid question and reduce the invalid questions with loading criteria ≥ 0.5 toward the constructed aspects (Hair et al., 2014). Not only just empirical support of statistical value, the validity of question is also determined by theoretical assumption (Hair et al., 2014; Cronbach, 1990).

To obtain statistical value support, the first step was assessing the reliability of all questions by figuring out the Kaiser – Meyer – Olkin Measure of Sampling Adequacy (KMO-MSA) value. When the KMO – MSA ≥ 0.5 with p ≤ 0.05, then the analysis could be proceeded. From the calculation results obtained KMO-MSA value of 0.753 with Sig. 0,000. Thus, the analysis could be proceeded. The score of Anti Image Correlation of each question should be also considered. If it was ≥ 0.5 then the questions were worthy to analyze. However, when it was ≤ 0.5, the questions would be removed. The result of Anti Image Correlation score of each question is explained in a table.

Table 1.
Anti Image Correlation Score of Each Question

Item	Anti Image Correlation
Academic Resilience 1	0,790
Academic Resilience 2	0,778
Academic Resilience 3	0,858
Academic Resilience 4	0,819
Academic Resilience 5	0,817
Academic Resilience 6	0,748
Academic Resilience 7	0,541
Academic Resilience 8	0,505
Academic Resilience 9	0,769
Academic Resilience 10	0,699
Academic Resilience 11	0,783
Academic Resilience 12	0,803
Academic Resilience 13	0,694
Academic Resilience 14	0,849
Academic Resilience 15	0,612
Academic Resilience 16	0,516
Academic Resilience 17	0,703
Academic Resilience 18	0,793

Item	Anti Image Correlation
Academic Resilience 19	0,772
Academic Resilience 20	0,746
Academic Resilience 21	0,802
Academic Resilience 22	0,760
Academic Resilience 23	0,751
Academic Resilience 24	0,762

From the table, it could be seen the score of *Anti Image Correlation* of each question was ≥ 0.5. Therefore, all questions were worthy to process on next factorial analysis by factoring and rotating. The analysis obtained result of output factoring and rotation as follow.

Table 2.
Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
A R 1	5.066	21.108	21.108	5.066	21.108	21.108	3.033	12.639	12.639
A R 2	2.150	8.960	30.068	2.150	8.960	30.068	2.487	10.364	23.003
A R 3	1.725	7.187	37.255	1.725	7.187	37.255	2.125	8.854	31.857
A R 4	1.463	6.097	43.351	1.463	6.097	43.351	2.079	8.664	40.521
A R 5	1.266	5.276	48.627	1.266	5.276	48.627	1.946	8.107	48.627
A R 6	1.224	5.102	53.729						
A R 7	1.103	4.597	58.325						
A R 8	1.055	4.395	62.720						
A R 9	.925	3.855	66.576						
A R 10	.909	3.786	70.361						
A R 11	.800	3.333	73.695						
A R 12	.736	3.065	76.760						
A R 13	.652	2.717	79.477						
A R 14	.626	2.608	82.085						
A R 15	.575	2.396	84.481						
A R 16	.554	2.310	86.790						
A R 17	.533	2.222	89.012						
A R 18	.510	2.125	91.137						
A R 19	.450	1.874	93.011						
A R 20	.401	1.670	94.681						
A R 21	.378	1.577	96.258						
A R 22	.334	1.392	97.650						

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
A R 23	.309	1.287	98.936						
A R 24	.255	1.064	100.000						

Table 2 explains all questions are summarized into five factors based on eigenvalues. Eigenvalues show relative interest of each factor in calculating those 24 analyzed question variants. Then, the next step was loading factor rotation to determine question items into one of the factors based on five factors with criteria ≥ 0.5. From the analysis of factor loading rotation, it is obtained that:

Table 3.

Rotated Component Matrix

Item	Component				
	1	2	3	4	5
Academic Resilience 14	.709	-.042	.220	.115	-.006
Academic Resilience 21	.649	.116	.189	.179	-.072
Academic Resilience 20	.605	.047	.175	-.036	.361
Academic Resilience 24	.604	.139	.221	-.116	-.019
Academic Resilience 4	.544	.109	.108	-.005	.211
Academic Resilience 1	.509	.274	-.006	-.191	.143
Academic Resilience 22	.074	.762	.154	-.054	.098
Academic Resilience 23	.088	.642	.226	-.021	.032
Academic Resilience 5	.111	.584	.047	.080	.325
Academic Resilience 2	.483	.535	-.130	.042	.017
Academic Resilience 3	.217	.510	.284	-.141	-.028
Academic Resilience 12	.291	.180	.703	.007	.039
Academic Resilience 13	-.110	-.058	.607	-.187	.380
Academic Resilience 11	.269	.130	.593	-.085	.061
Academic Resilience 17	.293	.219	.537	.313	-.346
Academic Resilience 18	.249	.188	.462	-.010	.193
Academic Resilience 8	.110	.083	-.101	.709	.008
Academic Resilience 16	-.034	.142	-.009	.680	-.018
Academic Resilience 7	-.005	-.181	-.004	.637	.300
Academic Resilience 15	-.100	-.244	-.011	.587	.050
Academic Resilience 19	.381	.089	.047	-.098	.633
Academic Resilience 10	.009	.043	.174	.131	.563

Item	Component				
	1	2	3	4	5
Academic Resilience 9	.175	.173	.098	.256	.512
Academic Resilience 6	-.034	.435	-.087	.046	.498

From the table, it could be explained there are two questions items (Academic Resilience 18 & Academic Resilience 6) which do not meet the criterion ≤ 0.5. The analysis of loading factor rotation analysis could be shown the factor instilment in table as follows.

Table 4.
Item Identification based on Factors

Factor	Item	Anti Image Correlation	Rotated Component Matrix
Self-efficacy	14	0,849	.709
	21	0,802	.649
	20	0,746	.605
	24	0,762	.604
	4	0,819	.544
	1	0,790	.509
Control	22	0,760	.762
	23	0,751	.642
	5	0,817	.584
	2	0,778	.535
	3	0,858	.510
Plan	12	0,803	.703
	13	0,694	.607
	11	0,783	.593
	17	0,703	.537
Low Anxiety	8	0,505	.709
	16	0,516	.680
	7	0,541	.637
	15	0,612	.587
Diligence	19	0,772	.633
	10	0,699	.563
	9	0,769	.512

The name of the factors are determined by the explained - factor content by the factor to each variable. The first factor is the greatest variance factor in explaining the variable. It show that the main factor is general factor of academic resilience scale. Based on the question content, then it is named self-efficacy. Self-efficacy is a significant predictor of academic resilience and one of cognitive factors to

determine behavior and attitude of individuals in facing problems (Cassidy, 2015; Reivich, Karen & Andrew, 2002).

The second factors is control. To improve academic resilience is by improving self-control. Martin & Marsh (2006) explains that by showing how effort and strategy refinements to achieve purpose is a main method to improve self-control. While realizing that students could control their results of their decision and action. Then, at that time they realized that they had abilities to do what was needed to raise (Ginsburg, 2006).

The third factors in named plan because it is important to do. A success of something to achieve is strongly correlated to how an individual creates plan. Working in a self-control or regulation and in a setting of determined purpose would provide direction to improve plan and persistence. It is the second key of academic resilience (Martin & Marsh, 2006).

The fourth factor of academic resilience scale is low anxiety. The main relevant matter to anxiety is fear of failure and success. Fear of failure and success involves achievement and motivation factors (De Castella, K., Byrne, D., & Covington, 2013) This research suggests that to relieve students' fears of failures could be done by: (a) improving self-confidence, (b) demonstrating mistakes which means providing lesson about a mistake and how to deal with it, (c) loving positive - cooperative climate in each academic activity, and (d) fixing the mindset of success (Martin & Marsh, 2006).

The last factor fostered from academic resilience is persistence. Persistence is an individual characteristic in achieving resilience (Hendriani, 2018). Resilience is the main key of success indicated by the achievement of the determined purpose. It motivates students to implement excellent purposes and directs them to how they should effectively and efficiently cooperate. It is the most important matter in improving persistence, especially when students found challenging task or when they could not find immediate solution (Martin & Marsh, 2006).

Therefore, it could be concluded that academic resilience consists of 5 factors, such as self-efficacy, control, plan, less anxiety, and persistence. Generally, the developed academic resilience scale is valid.

Academic Resilience Scale Reliability Test

The reliability test was used to find out instrument consistency whether the used instrument could be relied and consistent if it would be used again. The test used Internal Consistency Reliability. The test was done by internal consistency by trying the instrument once. Then, the obtained data was analyzed by Split-Half Method (Sugiyono, 2012) The test was done for all valid items. The test results could be seen on table 5.

Table 5.
Reliability Statistics

Cronbach Alpha	Part 1	Value	.650
		N of Items	11[a]
	Part 2	Value	.632
		N of Items	11[b]
	Total N of Items		22
Correlation Between Forms			.567
Spearman-Brown Coefficient	Equal Length		.723
	Unequal Length		.723
Guttman Split-Half Coefficient			.723

Reliability criteria, according to Guilford (1956)are: 0.80 - 1.00 reliability is considered very high, 0.60 - 0.80 high, 0.40 - 0.60 moderate. The calculation result is obtained Guttman Split-Half Coefficient score 0.723, included to high reliability category.

Based on the results and discussion, it could be concluded that the academic resilience scale had met the criteria (based on Anti Image Correlation and Rotated Component Matrix ≥ 0.5). From 24 question items, there were 2 items did not meet the requirements. They were question number 6 and 18. The questions items which had met the requirements were also tested in term of their reliabilities by using Guttman Split-Half Coefficient, 0.723. It means this instrument could be accepted and is reliable. From 22 question items, they represented each component of academic resilience construct theory (self-efficacy, control, plan, low anxiety, and persistence).

Valid and reliable properties were considered by accuracy and carefulness levels of the measuring results (Azwar, 2018) Conclusion and decision which were standardized on the accurate data could be trusted. It was resulted by excellent measuring instruments which would facilitate counselors, gifted young scientists, and any concerning parties with the test results. Entailed by correct interpretation, the results of valid and reliable measurements would lead to accurate and useful diagnosis and decision.

Academic resilience scale is important to be developed since in Indonesia it is still limited, especially for Senior High School students' academic resilience level uses. Heretofore, other researchers have only adopting or adapting CD-RISC scale (Common Davidson - Resilience Scale) to measure resilience in general (Uyun, 2012; Dewi, 2014; Permata, 2015; Roellyana, 2016). Thus, through this development study, it could be used by gifted young scientists to see and measure students' academic resilience levels. The developed academic resilience scale consists of five aspects: self-efficacy, control, plan, low anxiety, and persistence.

Therefore, this scale could be used as instruments to collect data or as assessment. However, this scale is still limited due to the selected respondents -

whole senior high school students in Malang, Indonesia. Therefore, to generalize the result of this evaluation, for gifted young scientists could do further investigation by having larger numbers of students in different education environment.

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Appendix 1.
Academic Resilience Scale

1. Strongly Disagree   2. Disagree   3. Agree   4. Strongly Agree

No	Items	1	2	3	4
1	I remain focused on completing the assignments given by the teacher even though it is many				
2	I do not delay doing the assignment given the teacher				
3	I must be able to complete the assignments given the teacher on time				
4	I tried my best to become a class champion				
5	I sure get good grades				
6	I am sure I can do the assignments given the teacher				
7	I continued to study hard though it was difficult to understand				
8	I am optimistic to be able to understand the subject matter				
9	I can solve problems in learning				
10	I was able to answer the exam questions with my own abilities				
11	I understand every material delivered the teacher				
12	I consider learning time and leisure time professionally				
13	I complete school assignments for example like home work on a priority scale				
14	I make a daily study schedule in my daily activity				
15	I am not complaining despite the many assignments given the teacher				
16	I remain patient when there are friends who think my ability is low				
17	I do not stress when going to carry out exams				
18	I can control my emotions when I get low test scores				
19	I stay calm when I get an incomplete test score				
20	I can finish the assignment given by the teacher well				
21	I do positive things when I am getting bored in studying				
22	I am patient when I get bad test score				

* *There is no negative items*

Dimension 1: Self-efficacy; 1, 2, 3, 4, 5, 6 items
Dimension 2: Control; 7, 8, 9, 10, 11 items
Dimension 3: Plan; 12, 13, 14, 15 items
Dimension 4: Low Anxiety; 16, 17, 18, 19 items
Dimension 5: Diligence; 20, 21, 22 items