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Rasch model for the need assessment instrument of academic guidance and counseling program in junior high school

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ABSTRACT

Developing an instrument for the need for academic guidance and counseling topics is a strategic step to support the needs assessment carried out by guidance and counseling teachers and counselors in schools. The development of this instrument had been carried out by Arfalah using exploratory factor analysis. This study aims to analyze the instrument using the Rasch model. The research procedure began with collecting data from two integrated online needs assessments of academic guidance and counseling instruments. The content validity test involved six experts, and the field test involved 111 students from three junior high schools in Yogyakarta. Data were analyzed using Winsteps version 3.73 according to Fisher's five criteria for a good instrument. The content validity test showed Aiken's coefficient of 0.71, considered in the high category. Meanwhile, the results of the Rasch test showed the item response model. The analysis also indicated high reliability on both instruments above 0.90 and Cronbach's alpha value of 0.98. Five items were decided to be maintained based on the misfit test explored. The accuracy and focus of the instruments in revealing the need for academic guidance and counseling topics for high school students indicated a number above 40% and a fairly good level of instrument contamination, which was below 10%.

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INTRODUCTION

Guidance and counseling programs in schools are an integral part of the education system. The program aims to facilitate students to independently develop their potential and be able to have a good self-understanding (Sahputra et al., 2016). Developing appropriate programs and guidance and counseling services for students requires a scheduled plan in a targeted manner. Therefore, the program is ideally designed every semester based on the students' needs. Program preparation begins with need assessments which are then analyzed before being formulated in a guidance and counseling program (Yudistira et al., 2018). The variety of issues gathered in the needs assessment will be a reference in preparing the most suitable and appropriate program for a school.

Measurement of needs is carried out at various educational levels, including junior high school. It aims to reveal the problems and needs of students specifically according to their level and age. Considering that need assessment is the main point in the development of the guidance and counseling program (Putri, 2018), various tools for measuring student needs have been developed, such as problem checklists, problem-solving tools, and developmental task inventory (Wahidah et al., 2019). Each of these instruments has a different measurement method, for example, a problem checklist that classifies problem topics into eleven problem

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areas consisting of 330 items. The contents of this instrument can then be analyzed and concluded in which areas students experience problems. Meanwhile, problem-solving tools and developmental task inventory also have different measurement methods. Instrument needs assessment that specifically categorizes student problems in the personal, social, learning and career fields is still in the process of being developed. The initial product of the instrument is referred to as an instrument for assessing academic guidance and counseling topic needs (*Instrumen Kebutuhan Bimbingan Belajar*-IKBB) for personal (Lubis, 2020), social (Pristanti, 2017), academic (Arfalah, 2018), and career (Putra, 2018). However, the instrument has not been used widely because it still needs to be tested for validity and reliability.

The study aims to analyze one of the instruments for measuring topic needs for guidance and counseling services in academic for junior high school students developed by Arfalah (2018) using the Rasch model. The Rasch model enables researchers to investigate more specifically at items that do not fit with the model; therefore, it can be revised and corrected. The Rasch model has been widely used by various studies to measure the level of validity and reliability of instruments in the field of guidance and counseling and mental health (Ardi, 2019; Latif et al., 2022; Marfu'i, 2019; Prasetya et al., 2020). Meanwhile, the validity and reliability measurement models carried out by the previous study used exploratory factor analysis (EFA) and Cronbach's alpha with a total sample of 90 students from one school. Meanwhile, this study enlarges the research sample and at the same time involve three schools in the city of Yogyakarta for more extensive evaluation.

The results of this study are expected to be the basis for the widespread use of this instrument in the assessment of needs in the field of study. The topic of learning guidance contained in this instrument is intended to support students to realize their obstacles and at the same time their potential in academic aspects. Besides, the academic guidance and counseling topics covered in this instrument are expected to help students understand various learning barriers, have positive attitudes and study habits, have high motivation to learn, have effective study skills, have skills in planning further education and have readiness facing exams (Ramli et al., 2017). By referring to the results of the needs assessment, the gap between the services provided and the needs of students can be narrowed (Astramovich, 2011; Hays, 2013; Scotia, 2007; Watkins et al., 2012), so that students will obtain adequate guidance and counseling services at school.

The field of learning development is a service area that helps students develop learning abilities in order to attend school education and study independently, as well as help students to grow and also develop good attitudes and study habits in mastering knowledge and skills in line with the development of science, technology and art as well as prepare students to continue their education to a higher level or to enter certain jobs (Syafaruddin et al., 2019). Therefore, the instrument that has been developed measures not only the level of need, but also the level of achievement in order to determine the priority of topics that need to be given to students. This instrument consists of nine indicators of tutoring material for junior high school students.

In general, this instrument consists of two parts, namely the part that measures the level of need and the second part that reveals the level of achievement of the academic guidance and counseling topics. In other words, there are 100 statements that students need to fill out with two different questions, namely how high the level of need is and how high the achievement of the topic is. To analyze the Rasch model, the researchers involved junior high school students in the Yogyakarta city area. Meanwhile, for the expert assessment, the researchers involved three guidance and counseling teachers and three guidance and counseling lecturers. Expert assessment aims to determine the suitability between items and indicators as well as suggestions given to improve item statements. It is hoped that with this research, the instrument for measuring student needs in this field of learning can be widely used in junior high schools.

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RESEARCH METHOD

This study uses the Rasch model to find how accurate the instrument for measuring the needs of guidance and counseling topics is valid and reliable (Bond & Fox, 2013; Sumintono, 2018). The use of Rasch model is suitable to the study because the study aims to find whether the instruments fit to the model. The analysis was conducted using Winsteps version 3.73.

The suitability between items, sub-indicators and indicators based on the theory referred to is assessed by teachers and lecturers of guidance and counseling. A total of three teachers and three lecturers of guidance and counseling in the city of Yogyakarta were asked to provide an assessment using a scale of 1-5 on each item. A value of 1 indicates that the relationship between items, sub-indicators and indicators is irrelevant and a value of 5 indicates that the relationship is highly relevant. The validators were also asked to provide suggestions for improvement on items deemed less relevant to the purpose of the instrument. This suggestion is used as a consideration for the refinement of items by the researchers.

The target users of this instrument are junior high school students. In the instrument trial, as many as 111 junior high school students in the city of Yogyakarta were recruited using a random sampling technique. Students were asked to fill out an online instrument which consists of two parts, namely (1) an instrument measuring the level of needs and (2) an instrument measuring the achievement of needs. The two instruments are a unit which has the same item but has two different measurements. Before filling out the instrument, students filled out an informed consent and this research has also received ethical clearance from Universitas Negeri Yogyakarta. The number of items in each instrument is 100 items. To complete each instrument, students required about 15-20 minutes so that overall, they needed an average of 30-40 minutes on the two instruments.

In the first instrument, students were asked to assess the level of need for the topic of guidance by giving an assessment on a scale of 0-3. A value of 0 means that the topic is considered unnecessary and a value of 3 indicates that it is very much needed. Meanwhile, on instrument 2, students were asked to assess the level of achievement of the topic by giving a score of 1-3 where a value of 1 means that it has not been achieved and a value of 3 means that it has been achieved. The final calculation of this instrument developed by the founder was done by adding up the values of the two instruments on the same item. The result of the sum is used to see how high the level of urgency of the need for providing guidance and counseling services is in accordance with the academic guidance and counseling topics stated in the item. The highest score indicates that the level of need for the topics of academic guidance and counseling is high and it is necessary to immediately get follow-up from the school.

In the Rasch model test on the two instruments, there are five criteria that were used as parameters for the fit of the instrument considered to the study from Fisher (see Table 1) (Fisher, 2007). The results also showed the reliability of the two instruments by looking at the results of person and item measurement reliability and Cronbach's Alpha score indicated. Meanwhile, the construct and content validity look at the validator's assessment and at the same time see whether the two instruments are able to measure the academic guidance and counseling topics in a pure and convergent manner, seen from the results of variance in data explained by measures and unexplained variance in contrast 1-5 of PCA of residuals. Measurements on person and item strata separated can also be employed as a basis to see the extent to which the instrument measured can accurately assess respondents' answers, in relation to the construct of fundamentalism. In addition, the item fit model mean-square range extremes were used to see if the item is in accordance with the Rasch model. Some items that do not fit in this test need to be reviewed. The determination of whether or not the item fits with the Rasch Model used a consideration to change the item while considering the suggestions from the validators.

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Table 1. Rating Scale Instrument Quality Criteria Fisher

Criterion	Poor	Fair	Good	Very Good	Excellent
1. Item model fit mean-square range extremes	<0.33->3.0	0.34-2.9	0.5-2.0	0.71-1.4	0.77-1.3
2. Person and item measurement reliability	<0.67	0.67-0.80	0.81-0.90	0.91-0.94	>0.94
3. Person and item strata separated	2 or less	2-3	3-4	4-5	>5
4. Variance in data explained by measures	<50%	50-60%	60-70%	70-80%	>80%
5. Unexplained variances in contrast 1-5 of PCA of residuals	>15%	10-15%	5-10%	3-5%	<3%

FINDINGS AND DISCUSSION

Findings

Content validation which was carried out before the large-scale field test involved six experts consisting of three lecturers and three guidance and counseling teachers. The expert validation was conducted using an instrument that measured the relevance of each item in the instrument with the predetermined indicators. The measurement results were then analyzed using the Aiken validation formula (Aiken, 1985; Fadilah & Mundilarto, 2019). The results showed that all items were in the category from medium to high with a range of 0.54-0.79. The instrument score was 0.71 which was included in the high category. However, compared to the initial research by Arfalah (0.83), the content validity result was 0.12 lower (Arfalah, 2018). Based on the results of the study, it can be concluded that the instrument can be considered valid to measure the need for academic guidance and counseling topics. In addition, the validation instrument also asked the experts about suggestions for item improvement. Suggestions given by the experts were regarding the improvements to clarify the word choices in item numbers including 1, 13, 41, 48, 61, 67, 73, and 99. Prior to testing the respondents, these items were revised and adjusted based on the suggestions.

The field test involved 111 students consisting of seventh, eighth and ninth grade students from three schools in Yogyakarta. Students were asked to fill out two online instruments via a google form that measured (1) the level of need and (2) the level of achievement of guidance and counseling topics. The proportion of students from each school was 18.8%, 29.7%, and 59.5%. There were 45 male and 66 female students with an age range of 12 years to 18 years. There are 73% included in early adolescence (12-14 years) and 27% included in late adolescence (15-18 years) according to the distribution of developmental stages according to encyclopedia of adolescence (Salmela-Aro, 2011). There are 37 students claimed to have attended the counseling services conducted at their school, while the rest conveyed they had never visited a counselor, which was 67%. Therefore, it can be seen that most students have never accessed the counseling services in their schools. The results of the field test from the two needs assessment instruments were then analyzed using the Aiken and Rasch model validity analysis. A summary of the results of the validity and reliability tests is presented in Table 2.

Table 2. Summary of Rasch Model Analysis based on Fisher's Criteria

	Instrument for Assessing Academic Guidance and Counseling Topic Needs			
	Instrument 1 Assessing the Level of Need		Instrument 2 Assessing the Level of Achievement	
	Coefficient	Category	Coefficient	Category
Content validity	0.71	High	0.71	High
Item strata separated	3.44	Good	4.35	Very good
Person strata separated	4.34	Very good	4.00	Very good
Item reliability	0.92	Very good	0.95	Excellent
Person reliability	0.95	Excellent	0.94	Very good
Cronbach's alpha	0.98	High internal consistency	0.98	High internal consistency

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Discussion

Based on the results, generally, the results of the content validity test with Aiken as described previously showed a good result with score a value at 0.71. Meanwhile, in the Rasch model, the quality of items and subjects can be seen from the results of the separation scores which were in the good and very good categories in both instruments with a score of 3.44 and 4.35 respectively. Considering the reliability test of the two instruments, the results showed very good results that reached 0.92 and 0.95 respectively. Likewise, the reliability shown by the subjects who participated in this study were both more than 0.9. This was in line with the results of the reliability test conducted in the previous study by Arfalah using SPSS, which was 0.94 on the needs level instrument and had not yet measured the level of achievement instrument (Arfalah, 2018). Furthermore, Cronbach's Alpha value indicated a very high value (α = 0.98), which meant the instrument had high internal consistency (Tavakol & Dennick, 2011). In general, the results of the validity and reliability tests show that the instrument had a good quality and is suitable for measuring the needs of academic guidance and counseling topics.

As instruments 1 and 2 had the same statement items even though the things measured were different, the misfit analysis results tended to be different. It can be seen in Table 3. The criteria used were based on Fisher where items with an MNSQ outfit value less than 0.34 and greater than 2.9 were considered very bad or recommended to be removed (Fisher, 2007). In summary, the misfit test results show that four items (81, 82, 85, 86) in instrument 1 and one item (96) in instrument 2 were included in the fair category, while all items from in-struments 1 and 2 except those previously listed were in the good category. Items in the fair category could be considered for replacement or removal. However, due to the importance of these items in providing students with a choice of topics, all items in this instrument were retained.

Table 3. Item Model Fit Mean-Square Results

	Item Number	INFIT		OUTFIT		PT. MEASURE	
		MNSQ	ZSTD	MNSQ	ZSTD	CORR.	EXP.
Instrument 1	81	2.11	6.0	2.21	6.2	0.36	0.56
	82	2.14	6.3	2.28	6.7	0.39	0.58
	85	1.61	4.3	2.10	6.4	0.47	0.65
	86	1.71	4.9	2.45	7.7	0.46	0.66
Instrument 2	96	0.55	-4.0	0.48	-3.0	0.68	0.53

In some references, the criteria used in determining the misfit analysis were if the items met criteria (1) the value of 0.5<MNSQ<1.5; (2) value -2.0<ZSTD<+2.0; and (3) the value of 0.4<PT-Measure Corr<0.85 (Boone et al., 2011, 2014). Meanwhile, when this study used the first criteria of Boone et al., 11 items (7; 11; 13; 37; 39; 81; 82; 83; 84; 85; 86) needed to be replaced or deleted. However, as this instrument seeks to measure all potential needs for guidance and counseling topic, it is relevant if the five items in the fair category are still maintained. Changes in trends in students from generation to generation are very likely to occur, so the currently less attractive topics can be of interest to the next generation. The decision to retain these items was also based on a content validation test which showed good and relevant results. The five items can be seen in Table 5. The items less fit were related to the topic of information on vocational high schools and boarding schools, and preservation in learning relevant to be maintained. Besides, the misfit results are predicted to be different if the number of respondents can be enlarged and varied as the study only recruited the respondent from three schools. The variation in student answers can be different and more representative of the population of junior high school students with the large respondents. Thus, further research is expected to examine how the level of need and achievement of academic guidance and counseling topics is; therefore, if improvements are needed based on larger data, the instrument can be refined to construct the most relevant version.

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Table 4. List of Items in Fair Category

Item Number	Statement
81	Receiving information about vocational high school
82	Having readiness to study in a vocational high school
85	Receiving information about boarding school
86	Having readiness to study in a boarding school
96	Developing persistence in learning

The further analysis of the Rasch model was to investigate how the instrument was able to measure correctly and focused on the topic of academic guidance and counseling that had been described in the indicators that constructed the instruments. In accordance with Fisher's criteria, a good instrument was expected to have a percentage of the variance in the data explained by measures more than 50% (Fisher, 2007). In other words, this test was often known as construct validity. The two instruments still indicated results below the established standard of 41% and 40.4% respectively, which could be seen in Table 4. However, the results of the unexplained variance in contrast 1-5 of PCA of residuals indicator showed good results below 10% meaning that the instrument had a good level of independence. Generally, it can be concluded that, about 40% of the instruments can measure the needs of academic guidance and counseling topics and less than 10% of the variance contamination that exists in the instrument. Based on other references of Bond and Fox, Mofreh et al., and Ng et al., the acceptable percentage of variance explained by measure in the Rasch model is more than 40% and the unexplained variance is less than 15% (Bond & Fox, 2013; Mofreh et al., 2014; Ng et al., 2018). Therefore, the instruments had already met the criteria of good instrument.

Table 5. The Results of Dimensional Analysis

	Variance in Data Explained by Measures (%)	Unexplained Variance in Contrast 1-5 of PCA of Residuals (%)
Instrument 1 Assessing the level of need	41	6.2
Instrument 2 Assessing the level of achievement	40.4	4.7

Ultimately, the results of the Rasch model analysis on the data collection both in the instrument 1 and 2 showed good results indicating a good instrument to assess the need of academic guidance and counseling topics for junior high school students. In terms of content validity, the results are considered high with an Aiken value of 0.71. In addition, the reliability of instruments 1 and 2 were both above 0.90 which is in the very good to excellent category range. The Cronbach's Alpha value of 0.98 also indicated that the internal consistency of this instrument was high. Furthermore, the construct validity that is seen from the separation value showed scores above 2 which meant the instrument was included in the good category on instrument 1 and very good on instrument 2. The instrument shows a value of more than 40% on variance explained by measure and less than 10% on the unexplained variance which indicated that the instruments were able to well measure the needs of guidance and counseling topics. Even though, according to Fisher, the variance explained by measure did not meet the 50% standard (Fisher, 2007). Moreover, judging from the misfit test, it turned out that there was a total of five items that fell into the fair category according to Fisher. These five items tend to be maintained because it is relevant and potential that there is a change in trend that can occur in the different generations. Therefore, the instrument needs for academic guidance and counseling topics can be considered as good and can be used to measure the needs and level of achievement of academic guidance and counseling topics for junior high school students.

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CONCLUSION

The development of an instrument for assessing the need for academic guidance and counseling topics is an important part to support guidance and counseling teachers or counselors in schools. Based on the results, instruments 1 and 2 showed a good reliability value above 0.9. The person reliability was 0.95 with a separation score of 4.34 on the level of need for academic and counseling topics and the person reliability at the level of topic achievement was 0.94 with a separation score of 4.00. Meanwhile, considering the item reliability, it obtained a score of 0.92 with a separation value of 3.44 on the level of need for tutoring topics and 0.95 with a separation value of 4.33 on the level of topic achievement. These results indicate that the instrument is considered to have reliability in the very good (0.91-0.94) and excellent (>0.94) categories. Furthermore, assessing the person and item strata separated, the instrument was classified as having a value in the good (3-4) and very good (4-5) categories. Cronbach's Alpha value also indicated that the level of internal consistency in the instrument was high with a score of 0.98. In addition, the content validity of Aiken value was 0.71 considered as having high validity.

However, in the misfit items, there were four items in instrument 1 and one item in instrument 2 which were in the fair category and the others were in the good category. By considering the importance of the topic of guidance and counseling on the five items in the fair category, all items were decided to be maintained. The value of accuracy in the measurement of the variable was still quite low and only about 40% did not yet reach the minimum standard of 50% based on Fisher criteria. Nevertheless, in general, the level of item contamination was still in the good category, which was below 10%. In conclusion, this instrument is considered to be feasible and valid to be used widely as it had met the criteria of good validity and reliability. Further research is recommended to measure the level of need for guidance and counseling topics using the instrument; therefore, if improvements are needed based on larger data, the instrument can be readjusted.

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