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Scientific Argumentation Skills Through The Rasch Model on Analysis of Survey Data on The Importance of Aviation Vocational Education in Indonesia

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Abstract: This research aims to analyze the importance of scientific work skills in aviation vocational education in Indonesia using the Rasch Model. This research applies a mixed research methodology. The data collection tool in this study used reasoned test questions to uncover the argument skills of aviation vocational education cadets in Indonesia. The population taken in this study is aviation vocational education cadets in Indonesia. Sampling using purposive sampling techniques. The results of the analysis of reasoned question-answer analysis data entered with questionnaires are processed using the Winstep and Rasch Model applications. Analysis of cadet argumentation data is obtained at level 2 of 4 maximum levels. Argument skills at level 2 mean claiming with data. The results of deepening the scientific arguments of cadets obtained an alpha Cronbach value of 0.96 which belongs to a special category. The conclusion of Rasch model research applied to vocational education obtained cadet's argument skills on the plurality of claims with data.

Keywords: rasch models, scientific argumentation skills, vocational education

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INTRODUCTION

Scientific argumentation skills are basic thinking skills needed to provide scientific explanations supported by data and rebuttals (Archila et al., 2020; Hinton, 2021; & Castro, 2022). Level of the argument according to Pandžić (2022) there are four, namely level 1 when limited to being able to claim, level 2 can claim supported by data, level 3 can claim with data and one rebuttal, and level 4 claims with more than one rebuttal. Proof of something that requires support in the form of data. Sources of information are utilized when a person wants his scientific argument skills to develop. The rational reason is strengthened by claims to make the formation of a pattern of causation in proving a truth.

One of the indicators of the era of globalization is characterized by the emergence of free trade, and free goods in and out of the country (borderless). On the other hand, the era of globalization has led to increasingly fierce competition in terms of goods, services, capital, and labor/human resources. To be able to take part in this era requires Human Resources (HR) who have open competitiveness with other countries, are adaptive and anticipatory to various changes and new conditions, are open to change, able to learn how to learn (learn how to learn), have a variety of skills, easily retrained, and have a broad, strong, and fundamental ability base to develop in the future (Winangun, 2017). In the era of globalization, technological and industrial development 4.0 is expected to increase and develop human resources to meet these development needs. In this era, information technology has become the basis or basis of human life, including in the field of education in Indonesia, even in a world that is currently entering the era of industrial social revolution 5.0. This era will also disrupt various human activities, including the fields of science and technology (Science and Technology) (Risdianto, 2019).

To meet the needs of the world of work, it is necessary to develop a vocational education curriculum by looking at and considering it from the perspective of the past, present, and future. The quality of curriculum development is a factor that drives the qualifications of graduates relevant to the world of work (Mouzakitis, 2010). Vocational education, commonly referred to as diploma education, has the vision to make students ready with the ability of professional experts in applying, developing, and disseminating science and technology and seeking optimal use in society. The transportation cadet education system is vocational education, which is to prepare professionals in the transportation sector. They are not military, but military science, especially aspects of the discipline, assertiveness, and sportsmanship should be taught and applied in the lives of cadets on campus (Febiyanti et al., 2021). Vocational education institutions themselves must be able to contribute to economic competitiveness, by improving hard skills, and soft skills, and increasing the

use of technology. This is needed to strengthen vocational education graduates by providing skills-up in the form of training for fresh graduates to be better prepared to enter the workforce (Wardina et al., 2019). However, a synthesis of existing literature reveals a gaping hole between the dream of superior vocational education and the reality of lost opportunities and facilitated inequality, especially in students with poor socioeconomic backgrounds, weak social capital, and sparse social networks (Ozer & Perc, 2020).

Vocational education in Indonesia prepares graduates who are ready to work with soft skills and hard skills competencies in certain fields to the needs of the business world and industry, this is certainly accompanied by qualified facilities for student flexibility in accessing the implementation of practical learning in particular (Suharti & Faidin, 2021). During lectures and practices, until the teaching program is completed, it is expected that after they finish college, they will have a habit without having to be ordered, although in carrying out their duties, aircraft technicians must not memorize and must use the right equipment and use the right measuring instruments, must always carry a maintenance manual (Madjid, 2012). The benefits of vocational qualifications are highest when vocational education takes an important position in a country's education system, most evident in the form of a dual system in which schools and occupations are combined (Forster et al., 2016).

Vocational education in Indonesia starts in vocational high schools (SMK), academies, polytechnics, and universities that have vocational programs. Vocational education itself includes D-1 (Diploma 1) to applied doctoral level (Martono et al., 2021). However, the vocational education that will be studied in this study is devoted to the vocational education of the transportation human resources development agency. The development of regulations in the field of education to ensure the quality of implementation requires the Center for Human Resource Development of Air Transportation to better act as an aviation regulator. For this reason, the Air Transportation Human Resources Development Center will develop aviation regulations to ensure the quality of education implementation (Perhubungan, 2020).

Vocational education is needed as part of efforts to meet the needs of meeting human needs of the technology sector (Nouwen et al., 2022; Ye, 2021). Interest in vocational education is determined by the opportunity to get a job that suits the field and profile of graduates who have skills in mastering science and technology. The provision of experience in the form of activities analyzing learning resources in vocational education is obtained through content analysis (Brunello & Rocco, 2017; Calero et al., 2020). Analysis of various learning resources in vocational education forms a habit in students to dare to argue and refute an opinion from data obtained in scientific work activities. Lytvyn et al. (2020) students' scientific work in vocational education is pursued through activities in the laboratory and work practices.

There have been several previous studies on scientific argumentation skills, including research conducted by Frey et al. (2015) who developed a scientific argumentation test. The development was carried out with the background that the argumentation skill test is important because it is recognized as an important factor for student success in school and beyond. In their study, they stated that scientific argumentation is the main critical thinking skill that is emphasized in the national teaching standards and the Common Core. Scientific Argument Tests are also suitable for use in research and evaluation. Therefore, they developed a scientific argumentation test instrument and recommended it for use by classroom teachers, program evaluators, and researchers. Another research on scientific argumentation was conducted by Zhu et al. (2017). The study supports the assessment, and scientific feedback is written scientific arguments. Students' scientific arguments occur when they respond to structured argument requests. After submitting open responses, students receive scores generated by the grading engine and written feedback related to the scores in real-time. Using log data that recorded argumentation scores as well as proposed argument and revision activities, they answered three research questions. First, how students behave after receiving feedback; second, whether and how students improve their argumentation scores; and third, whether the difficulty of the item shifts with the availability of automatic feedback. The analysis of the shift to item difficulty in the study showed that written scientific arguments were easier after students used feedback. A similar study was also conducted by Ping et al. (2020). In their study, they teach scientific argumentation explicitly as an approach to developing argumentation skills, science process skills, and understanding of biology. In their study, they compared the Modified Argument-Driven Inquiry (MADI) approach, the Inquiry Without Argument (IWA) approach, and the conventional (CON) approach. Overall, the results of this study indicate that the MADI approach has a better effect on students' argumentation skills, science process skills, and conceptual understanding compared to the IWA and CON approaches. Several previous studies show the importance of scientific argumentation skills, many ways can be done to test the level of scientific argumentation skills, and also many cases can be used as material to test the level of scientific argumentation skills.

From the description above, the question arises whether vocational education in the field of aviation in Indonesia is important? Based on these problems, the researchers will analyze the importance of vocational education in the field of aviation in Indonesia. The purpose of this study is to find the level of scientific

argument skills through the use of Rasch models carried out specifically on the implementation of aviation vocational education in Indonesia. Argumentation skills are obtained from the question of analyzing survey data on the importance of vocational education in Indonesia for cadets.

METHODS

This research is part of R&D (Research and Development) research. The population taken in this study was all cadets who studied at vocational universities in aviation under the Ministry of Transportation in aviation English courses. Of the entire population, 75 people were then taken as samples. The data collection instrument provided is 10 reasoned multiple-choice test questions. Cadets are required to answer the question of multiple choices and provide relevant reasons related to the importance of Vocational Universities in the field of Aviation in Indonesia.

Sampling using purposive sampling techniques. Data collection techniques use non-test techniques in the form of filling out questionnaires. The instrument used in this study was a questionnaire sheet using a modified Likert scale with 4 answer options, namely Strongly Agree, Agree, Disagree, and Strongly Disagree. The questionnaire was tested using the Rasch model with the help of the Winstep app. For the Likert scale, the score interpretation model can be viewed in Table 1.

1. Likert Scale Interpretation

Percentage (%)	Groups
0% - 25%	Strongly Disagree
26% - 50%	Disagree
51% - 75%	Agree
76% - 100%	Strongly Agree

(Vital et al., 2015)

Data analysis is performed using the Rasch model and is assisted by the developed Winstep software (Linacre, 2011). The Rasch model can see interactions between respondents and items at once. In the Rasch model, values are not visible based on raw scores, but logic values that reflect the likelihood of selecting items in a group of respondents (Wibisono, 2016). Reliability values between students and items can be determined using Table 2.

Table2. Reliability Value

Number	Range	Groups
1	< 0,67	Weak
2	0.67 – 0.80	Enough
3	0.80 – 0.90	Good
4	0.91 – 0.94	That's great.
5	>0,94	Special

(Sultan & Tirtayasa, 2019)

RESULT AND DISCUSSION

The following are the results of the data analysis of cadets' argumentation from level 1 to 4 which can be seen in table 3.

Table 3. Cadets Argumentation Data Analysis

Argumentation Level	Component	Cadets Answer Result
Level 1	claim	13
Level 2	claim and evidence	47
Level 3	claim, evidence, and one rebuttal	9
Level 4	claims, evidence with more than one rebuttal	6
		75

Reliability is the extent to which measurement results can be trusted (Azwar, 2013). The reliability of the test instrument in this study is seen from the reliability of the real item because its value is more conservative than the item reliability model (Boone, 2016). From the results of the Winstep program analysis, the reliability value of real items is 0.98 which belongs to a special category. Through the high reliability of this item, it can be concluded that the test instrument developed already contains some more difficult items and some easier items and the consistency of this conclusion can be expected (Ramadhan et al., 2019). The reliability calculation of 33 Measured (Non-Extreme), People Data Summary can be seen in Table 4 and Figure can be 1.

Table 4. Summary Of 33 People Measured (Not Extreme)

	Entire Shoes	Count	Measure	Pola Herself	Infit		Clothes	
					MNSQ	ZSTD	MNSQ	ZSTD
MEAN	63	18	2.29	0.57	0.98	-0.17	1.12	-0.04
WITHOUT	1.1	0	0.28	0.03	0.09	0.31	0.15	0.34
P.SD	6	0	1.6	0.16	0.52	1.76	0.82	1.93
S.SD	6.1	0	1.63	0.17	0.53	1.79	0.83	1.96
MAX.	71	18	5.03	1.03	2.65	4.82	4.35	4.73
MIN.	46	18	-1.89	0.47	0.08	-4.02	0.07	-4.03

Real Rmse .63 True Sd 1.47 Separation 2.32 People Reliability .84 |
| Model Rmse .60 True Sd 1.49 Separation 2.50 People Reliability .86 |
| Se Person Mean = .28

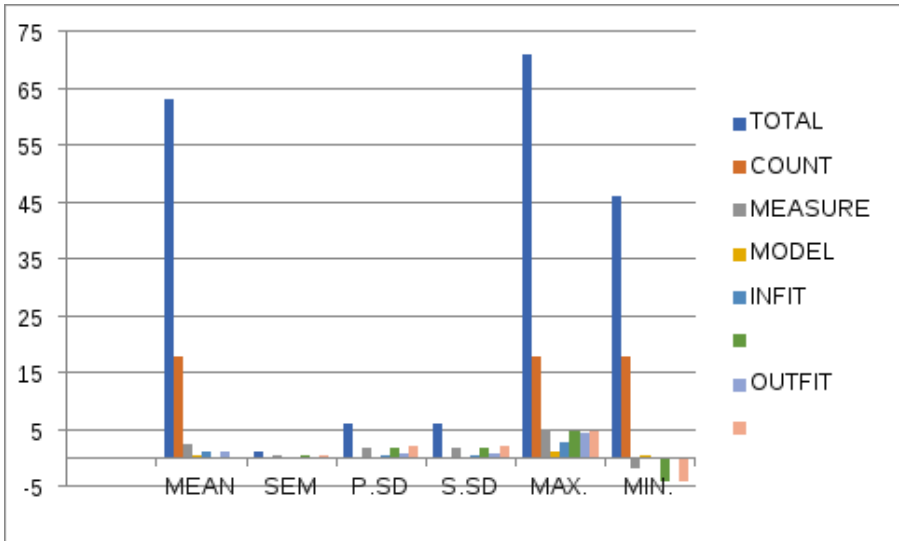

Figure 1. Summary Of Measured (Non-Extreme) 33-Person Graph

To find out the SUMMARY value of 18 MEASURABLE ITEMS (NON-EXTREME) can be seen in table 5 and figure 2.

Table 5. Summary Of 18 Measured Items (Non-Extreme)

	Entire Shoes	Count	Measure	Pola Herself	Infit		Clothes	
					MNSQ	ZSTD	MNSQ	ZSTD
MEAN	283.6	75	0	0.39	0.99	-0.09	1.12	0
WITHOUT	0.9	0	0.14	0.01	0.07	0.3	0.16	0.31
P.SD	3.8	0	0.59	0.02	0.3	1.23	0.66	1.3
S.SD	3.9	0	0.61	0.02	0.3	1.27	0.67	1.34
MAX.	291	75	1.11	0.45	1.73	2.39	3.23	2.62
MIN.	276	75	-1.24	0.37	0.56	-2.24	0.48	-1.86

Real Rmse .42 True Sd .42 Separation 1.01 Reliability Item .50 |
| Model Rmse .39 True Sd .44 Separation 1.12 Reliability Item .56 |
| Se Item Mean = .14

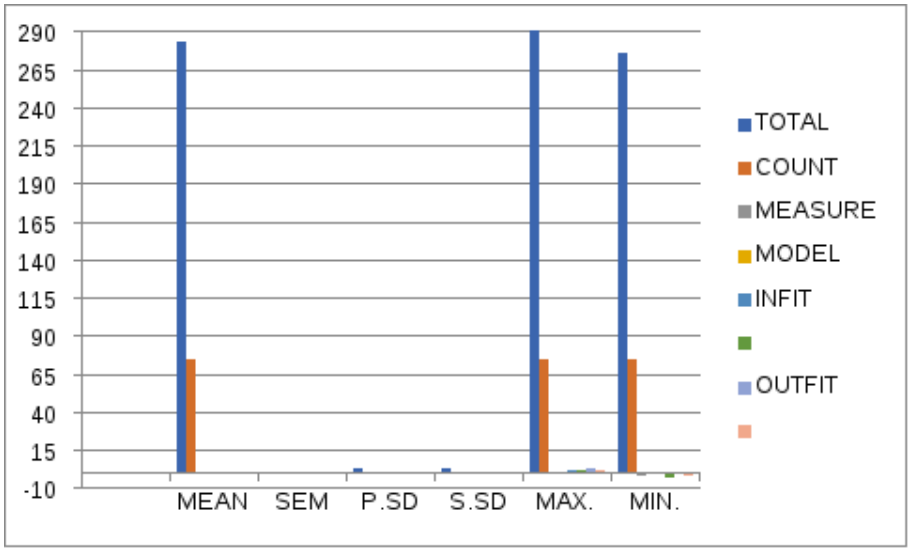

Figure2. Summary Of 18 Measured Items (Non-Extreme)

In Tables 4 and 5, reliability values for people and items are 0.84 and 0.50. The Cronbach Alpha value of 0.95, which represents the interaction between people and items, belongs to a special category because Cronbach's alpha values > 0.94. This categorization is based on Sumintono (2014) who consider values less than 0.6 to be included in the bad category, values in the range of 0.6 to 0.7 are in the medium category, values between 0.7 to 0.8 are in a good category and values greater than 0.8 are in the excellent category. To find out the value of Cronbach's alpha can be seen in table 6.

Table 6. Summary Of 75 People Measured (Extreme and Not Extreme)

	Entire Shoes	Count	Measure	Pola Herself	Infit		Clothes	
					MNSQ	ZSTD	MNSQ	ZSTD
MEAN	68.1	18	4.53	1.28				
WITHOUT	0.7	0	0.26	0.07				
P.SD	6	0	2.25	0.64				
S.SD	6	0	2.26	0.64				
MAX.	72	18	6.28	1.84				
MIN.	46	18	-1.89	0.47				
Real Rmse 1.44 True Sd 1.73 Separation 1.20 People Reliability .59 |								
| Model Rmse 1.43 True Sd 1.73 Separation 1.21 People Reliability .59 |								
| Se Person Mean = .26								
Korelasi Person Raw Score-To-Measure = .97								
Cronbach Alpha (Kr-20) Reliability "Test" People's Raw Score = 0.95 Sem = 1.31								
Standard Reliability (50 Items) = .80								

In addition, Table 6 can show the reliability and separation index of the person, that is, the reliability of the person is 0.59 and the separation item is 1.20. Based on Table 2, the reliability of item 0.59 is said to fall into the category of weak and acceptable but needs to be improved (Bond & Fox, 2007) while the separation item is 1.20 where according to (Linacre, 2011) a separation index exceeding 1 can be assumed to have a fairly good value. With a separation item index of 1.01, the value of strata items in the instrument (H) obtained is 1.68 based on the item strata formula (Sumintono, 2014), namely:

$$H = \frac{\left[\left(4 \times SEPARATION\right) + 1\right]}{3}$$

with a separation value of 1.01, then H = [(4 X 1.01) + 1] / 3 = 1.68 is rounded to 2, which means that there are three groups of items that can be interpreted as difficult, medium, and easy items.

This indicates that the items in the instrument can be divided into four levels of measurement based on the difficulty level. Meanwhile, the reliability of the respondents produced was 0.59 and the separation of respondents was 1.68. The results of the reliability test obtained also showed that the respondent had moderate reliability. If referring to Table 2. While the respondent separation index of 4.36 is said to be good because it has met the minimum requirements (> 2.0) where respondents can be divided into six large groups

based on the respondent's strata (H) value.

From the data obtained using Winstep Data Variable Maps (Wright map) the results can be seen in the image below:

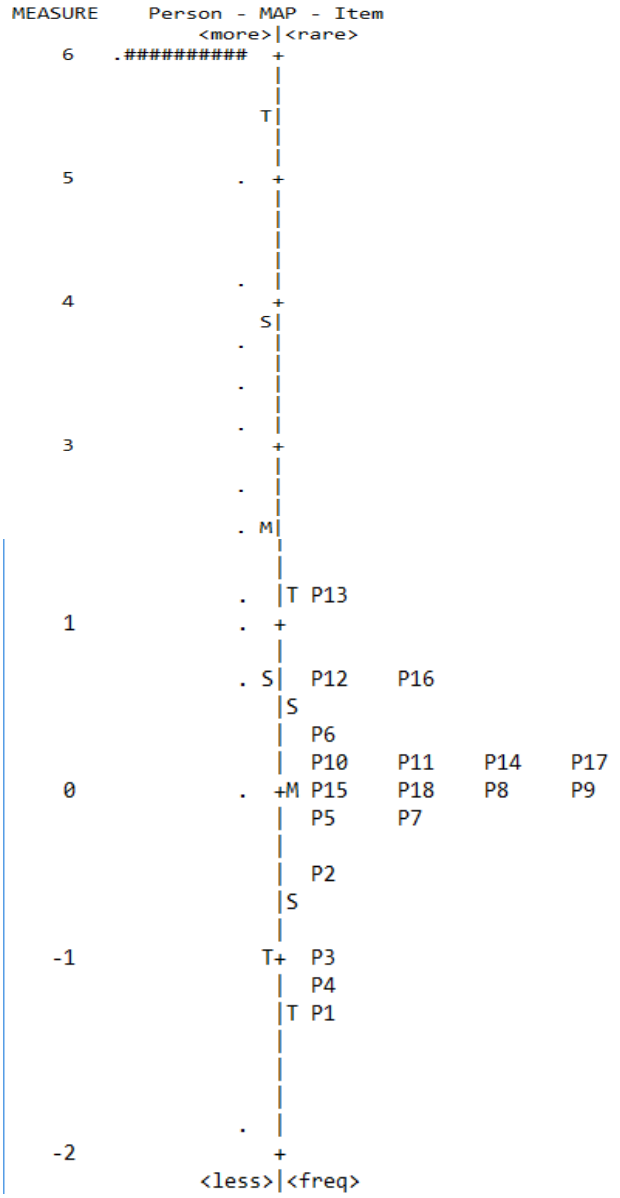

Figure 3. Variable map result (Item)

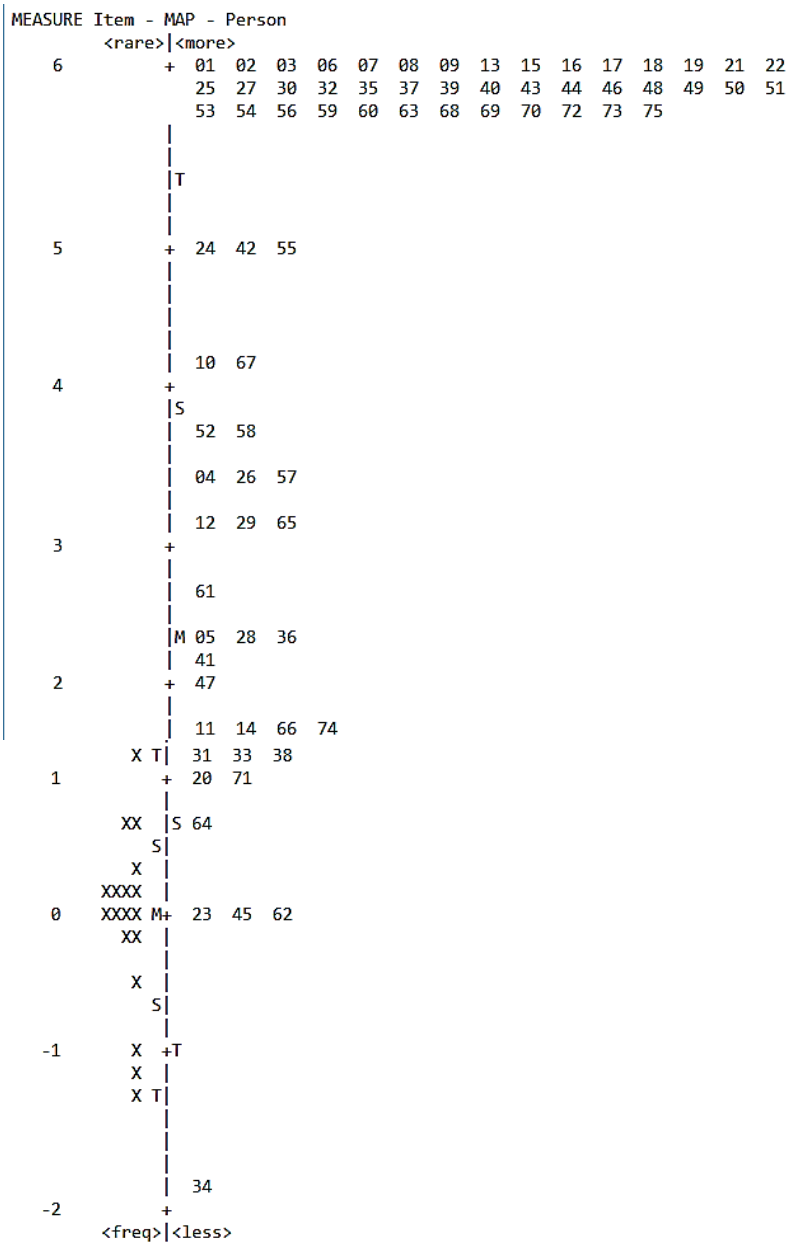

Figure 4. Variable map results (people)

Figures 3 and 4 show the distribution of respondents and questions (items). Based on the Item Map as shown in figure 3, we can see that the difficulty of the item level is spread in the range of 1 to 2 logs. A total of 18 items are positioned between -2SD and +2SD, while for items with the highest ability, the number P13 is above +1SD. The average level of respondents' abilities was above the standard difficulty level of the item. If you compare the average logic item with the logic person, it can be seen that this larger logic person (+2.20 logit) indicates that the overall ability is only slightly higher than the difficulty of the question (Untary et al., 2020). In this section, the validity of an item is measured by referring to the Point Measure Correlation (PTMEA CORR) which is the polarity value of the item (polarity of the item). To find out the validity value of the item can be seen in Table 7 which indicates that no items need to be discarded.

Table 7. Item Stats: Measure Orders

Entry Number	Entry Shoes	Entry Count	Measure	Pola S.E.	Infit MNSQ	Infit ZSTD	Outfit MNSQ	Outfit ZSTD	Ptmeasur-Al CORR.	Ptmeasur-Al EXP.|	Exact OBS%	Match EXP%|	Things
13	276	75	1.11	.37|	0.96	-.09	0.94	-.17	0.81	.81|	69.7	70.8|	P13
12	279	75	0.69	.38|	0.86	-.54	0.85	-.49	0.8	.78|	75.8	71.7|	P12
16	279	75	0.69	.38|	0.87	-.51	0.8	-.70	0.81	.78|	81.8	71.7|	P16
6	281	75	0.4	.38|	0.66	-1.61	0.61	-1.49	0.82	.76|	78.8	71.6|	P6
10	282	75	0.26	.38|	0.85	-.61	0.75	-.82	0.77	.74|	69.7	71.4|	P10
11	282	75	0.26	.38|	0.63	-1.79	0.56	-1.65	0.81	.74|	87.9	71.4|	P11
14	282	75	0.26	.38|	1	.07	0.89	-.27	0.74	.74|	75.8	71.4|	P14

17	282	75	0.26	.38|	1.27	1.16	1.11	.45	0.72	.74|	69.7	71.4|	P17
9	283	75	0.11	.39|	0.93	-.24	1.24	.80	0.73	.73|	78.8	71.9|	P9
15	283	75	0.11	.39|	0.92	-.27	0.77	-.70	0.75	.73|	72.7	71.9|	P15
8	284	75	-0.04	.39|	0.56	-2.24	0.48	-1.86	0.8	.72|	84.8	72.3|	P8
18	284	75	-0.04	.39|	1.4	1.62	1.26	.84	0.67	.72|	66.7	72.3|	P18
5	285	75	-0.2	.40|	1.35	1.44	1.98	2.29	0.62	.70|	63.6	72.6|	P5
7	285	75	-0.2	.40|	0.64	-1.72	0.52	-1.53	0.77	.70|	81.8	72.6|	P7
2	287	75	-0.52	.41|	1.14	.65	1.9	1.88	0.61	.67|	66.7	74.0|	P2
3	289	75	-0.86	.42|	1.12	.55	1.19	.54	0.59	.63|	66.7	75.8|	P3
4	290	75	-1.05	.44|	1.01	.14	1.03	.24	0.59	.61|	78.8	77.4|	P4
1	291	75	-1.24	.45|	1.73	2.39	3.23	2.62	0.42	.58|	78.8	79.3|	P1
MEAN	283.6	75	0	.39|	0.99	-0.1	1.12	.0|	|		74.9	72.9|	
P.SD	3.8	0	0.59	.02|	0.3	1.2	0.66	1.3|	|		6.8	2.3|	

Based on Table 7, it can be indicated that each item (1-18) has a positive PTMEA CORR value. Thus, no items in the instrument are discarded because they have met the minimum requirements (PTMEA CORR > 0). In addition, in Table 7 it can also be seen that the login item value (Measure) for item P13 is +1.11 which indicates the items that respondents find the most difficult to answer while item P1 is -1.24 which indicates the items that respondents most easily approved. The results showed that all items had a high PTMEA CORR value indicating that the items could distinguish the respondent's abilities.

To find out the aspects of response non-compliance with the ideal model as shown in the order of conformity of the table of 8 people, as shown in the table below:

Table 8. People Stats: Misfit Order

Entry Number	Entry Shoes	Entry Count	Measure	Pola S.E.	Infit MNSQ	Infit ZSTD	Outfit MNSQ	Outfit ZSTD	Ptmeasur-Al CORR.	Ptmeasur-Al EXP.|	Exact OBS%	Match EXP%|	Person
57	68	18	3.41	.58|	2.1	2.63	4.35	4.63|A	-0.68	.22|	83.3	77.8|	57
11	61	18	1.68	.47|	2.65	4.82|	2.66	4.73|B	0.15	.29|	27.8	63.3|	11
10	70	18	4.26	.76|	1.18	.48|	2.48	1.72|C	-0.43	.16|	88.9	88.9|	10
64	57	18	0.75	.49|	1.95	2.16|	1.97	2.13|D	0.77	.28|	38.9	72.6|	64
47	62	18	1.9	.47|	1.92	3.36|	1.87	3.16|E	0.05	.29|	44.4	60.9|	47
42	71	18	5.03	1.03|	1.08	.39|	1.88	1.00|F	-0.21	.12|	94.4	94.4|	42
55	71	18	5.03	1.03|	1.06	.36|	1.38	.67|G	-0.08	.12|	94.4	94.4|	55
66	61	18	1.68	.47|	1.34	1.33|	1.37	1.43|H	-0.51	.29|	38.9	63.3|	66
29	67	18	3.1	.54|	1.06	.30|	1.22	.70|I	0.05	.24|	77.8	72.5|	29
65	67	18	3.1	.54|	1.01	.13|	1.22	.71|J	0.1	.24|	77.8	72.5|	65
4	68	18	3.41	.58|	0.94	-.08|	1.07	.31|K	0.23	.22|	77.8	77.8|	4
61	65	18	2.58	.49|	0.94	-.22|	1.06	.31|L	0.24	.26|	77.8	64.0|	61
5	64	18	2.34	.48|	1.05	.31|	1.02	.15|M	0.13	.27|	55.6	60.4|	5
24	71	18	5.03	1.03|	1.03	.33|	1.03	.39|N	0.04	.12|	94.4	94.4|	24
34	46	18	-1.89	.47|	1	.09|	1.03	.19|O	0.71	.29|	66.7	59.7|	34
58	69	18	3.78	.64|	1.03	.22|	0.93	.05|P	0.16	.19|	83.3	83.4|	58
71	58	18	0.99	.49|	0.98	.05|	1	.12|Q	-0.3	.28|	72.2	70.1|	71
12	67	18	3.1	.54|	0.99	.04|	0.89	-.23|p	0.27	.24|	66.7	72.5|	12
28	64	18	2.34	.48|	0.96	-.13|	0.97	-.05|o	0.24	.27|	55.6	60.4|	28
26	68	18	3.41	.58|	0.91	-.16|	0.83	-.28|n	0.35	.22|	77.8	77.8|	26
36	64	18	2.34	.48|	0.82	-.86|	0.79	-.96|m	0.49	.27|	66.7	60.4|	36
52	69	18	3.78	.64|	0.82	-.32|	0.63	-.61|l	0.52	.19|	83.3	83.4|	52
67	70	18	4.26	.76|	0.81	-.16|	0.51	-.60|k	0.53	.16|	88.9	88.9|	67
41	63	18	2.12	.47|	0.78	-1.09	0.76	-1.16|j	0.53	.28|	72.2	60.1|	41
14	61	18	1.68	.47|	0.72	-1.22	0.7	-1.27|i	0.55	.29|	72.2	63.3|	14
20	58	18	0.99	.49|	0.61	-1.24	0.59	-1.28|h	0.42	.28|	72.2	70.1|	20
74	61	18	1.68	.47|	0.61	-1.80	0.59	-1.85|g	0.73	.29|	83.3	63.3|	74
23	54	18	0	.51|	0.57	-1.08	0.6	-.99|f	0.04	.27|	88.9	76.8|	23
33	59	18	1.23	.48|	0.49	-2.01	0.47	-2.05|e	0.77	.29|	83.3	67.7|	33
31	59	18	1.23	.48|	0.47	-2.10	0.45	-2.16|d	0.81	.29|	83.3	67.7|	31
38	59	18	1.23	.48|	0.47	-2.10	0.45	-2.16|c	0.81	.29|	83.3	67.7|	38
45	54	18	0	.51|	0.08	-4.02	0.07	-4.03|b	0	.27|	100	76.8|	45
62	54	18	0	.51|	0.08	-4.02	0.07	-4.03|a	0	.27|	100	76.8|	62
MEAN	68.1	18	4.53	1.28|	0.98	-0.2	1.12	.0|	|		74.9	72.9|	
P.SD	6	0	2.25	.64|	0.52	1.8	0.82	1.9|	|		17.6	10.6|	

Table 8 shows the abilities of respondents with the difficulty of each item at the item level. A respondent may be considered suitable if he meets at least 1 of the 3 criteria indicated in Table 8. The results of validity can be viewed and analyzed with the Winsteps program in the out fit order table to see the suitability of the questions that function in the normal category for use as a measurement of respondents' misunderstandings by paying attention to the criteria in the table 9.

Table 9. Item Validity Criteria

Reference	Limit Value
Clothing Means Square (MNSQ)	0,5 < MNSQ < 1,5
Z-Standard Outfi (ZSTD)	-2,0 < < ZSTD +2,0
Point Size Correlation (Pt Mean Corr)	0,4 < Pt Mean Corr < 0,85

(Untary et al., 2020)

To see more complete suitability can be seen in the following Guttmann matrix:

Table 10. Matriks Guttman

GUTTMAN SCALOGRAM RESPONSE:
| people Things
| 1 11111 111
|143257889501476263
|----------
1 +44444444444444444 01
2 +44444444444444444 02
3 +44444444444444444 03
6 +44444444444444444 06
7 +44444444444444444 07
8 +44444444444444444 08
9 +44444444444444444 09
13 +44444444444444444 13
15 +44444444444444444 15
16 +44444444444444444 16
17 +44444444444444444 17
18 +44444444444444444 18
19 +44444444444444444 19
21 +44444444444444444 21
22 +44444444444444444 22
25 +44444444444444444 25
27 +44444444444444444 27
30 +44444444444444444 30
32 +44444444444444444 32
35 +44444444444444444 35
37 +44444444444444444 37
39 +44444444444444444 39
40 +44444444444444444 40
43 +44444444444444444 43
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63 +44444444444444444 63
68 +44444444444444444 68
69 +44444444444444444 69
70 +44444444444444444 70
72 +44444444444444444 72
73 +44444444444444444 73
75 +44444444444444444 75

24 +444444443444444444 24
42 +444344444444444444 42
55 +444434444444444444 55
10 +344434444444444444 10
67 +444444444444444343 67
52 +444444444444344343 52
58 +444444434444433444 58
4 +443444443444444343 04
26 +444434444443443443 26
57 +243344444444444444 57
12 +444444434344334434 12
29 +434444334434444443 29
65 +434344444434444343 65
61 +433444444434443333 61
5 +444333444343334434 05
28 +443334444344344333 28
36 +444443343433443343 36
41 +444443343433343343 41
47 +443433424443324434 47
11 +434434434244224424 11
14 +444334343333443333 14
66 +333333344343443344 66
74 +444443343433333333 74
31 +444443333333333333 31
33 +444433343333333333 33
38 +444443333333333333 38
20 +344343333333343333 20
71 +333333333434433433 71
64 +444444342323333322 64
23 +333343323333333333 23
45 +333333333333333333 45
62 +333333333333333333 62
34 +433323323232322222 34

|------------------
| 1 11111 111
|143257889501476263

Table 10 shows the Guttman program or Guttman matrix. From the data above, we can find out the pattern of each answer given by respondents, there are similar answer patterns or there are unique answer patterns. Respondents with codes 31 and 38 had the same answer pattern, meaning that respondents deceived each other or were suspected of deceiving each other while conducting the test. This may be because at the time respondents lacked the motivation in responding to the scale. This low motivation causes them to give careless responses. The result is that their responses are varied and inconsistent, depending on their mood when responding to items. However, this does not affect the overall response results (Risdianto et al., 2020).

There are many ways to improve argument skills. Some develop e-modules to improve argumentation skills, develop argumentation test questions, develop e-worksheets, use partial argument negotiation learning models and total argument negotiation in learning activities, use argument-based learning models, and use science writing heuristics (SWE) strategies (Witri et al., 2020). Previous researchers such as (Vogel et al., 2016) in his research developed argumentation skills in mathematics through computer-powered collaborative learning (the role of transactivity). Then (Noroozi et al., 2020) conducted a systematic review of argumentation skills as an impact of game-based learning. In this study, a reasoned test was used to reveal the argument skills of aviation vocational education cadets in Indonesia. The results of the respondent analysis and questionnaire items showed that the majority of respondents agreed with all questionnaire items given. This shows that there is a positive response from respondents to the role of vocational education in the aviation sector.

CONCLUSION

From the analysis that has been carried out based on the analysis of questionnaire response items to the response data on the role of aviation vocational education in Indonesia, it can be concluded that the quality of the response questionnaire on the role of aviation vocational education is very good. So that it can be used to determine the response to the role of vocational education in aviation. From the data obtained, Cronbach alpha values and reliability level assumptions are also obtained. The proposed instrument has a Cronbach alpha value of 0.96, which belongs to a special category. And from the results of the respondent's analysis and questionnaire items, showed that the majority of respondents agreed with all the questionnaire items given, indicating that the response to the role of vocational education in the aviation sector agreed.

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