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ANALYSIS OF THE RELATIONSHIP OF INVENTIVE THINKING AND SCIENCE-RELATED ATTITUDE

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ABSTRACT

This study aims to analyze the relationship between inventive thinking (IT) and science-related attitude (SRA). This study is a quantitative study with a cross-sectional study design. Participants in this study were 109 chemistry education students, Sriwijaya University. The instruments used in this study were an adaptation of the inventive thinking measurement instrument and an adaptation of the science-related attitude (TOSRA) measurement instrument. Data analysis was carried out using Rasch Analysis to determine the validity and reliability of the instrument, as well as to measure inventive thinking and science-related attitude, which was then analyzed using Pearson correlation analysis. The results of the validity analysis showed that the MNSQ Outfit of both instruments (IT = 1.01 and SRA = 1) was in the range of 0.5-1.5 which was classified as valid or could measure what was to be measured well. The reliability of both instruments (IT = 0.98 and SRA = 0.99) was in the range> 0.94 which was classified as special. The results of the analysis of the relationship between inventive thinking and science-related attitude show that r = 0.273 is included in the low category. This shows that the relationship between science-related students and inventive thinking is low, or in other words there is no close relationship between inventive thinking ability and science-related students. The results of the Pearson correlation analysis also show a positive sign. This shows that the relationship between inventive thinking and science-related students is also positive, or not contradictory.

Keywords: *Inventive Thinking; Science related attitudes; Correlation*

ABSTRAK

Penelitian ini bertujuan untuk menganalisis hubungan antara inventive thinking (IT) dengan science-related attitude (SRA). Penelitian ini merupakan penelitian kuantitatif dengan desain cross-sectional study. Partisipan pada penelitian ini yaitu 109 mahasiswa pendidikan kimia, Universitas Sriwijaya. Instrumen yang digunakan pada penelitian ini yaitu adaptasi instrumen pengukuran inventive thinking dan adaptasi instrumen pengukuran science-related attitude (TOSRA). Analisis data dilakukan dengan Rasch Analysis untuk mengetahui validitas dan reliabilitas instrumen, serta mengukur inventive thinking dan science related attitude, yang selanjutnya analisis hubungan keduanya dilakukan dengan analisis pearson correlation. Hasil analisis validitas menunjukkan bahwa Oufit MNSQ kedua instrumen (IT= 1,01 dan SRA= 1) berada pada rentang 0,5-1,5 yang

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tergolong valid atau dapat mengukur apa yang hendak diukur dengan baik. Reliabilitas kedua instrumen (IT= 0,98 dan SRA= 0,99) berada pada rentang >0,94 yang tergolong spesial. Hasil analisis hubungan antara inventive thinking dan science related attitude menunjukkan bahwa r = 0,273 termasuk dalam kategori rendah. Hal ini menunjukkan bahwa hubungan antara science-related student dengan inventive thinking yaitu rendah, atau dengan kata lain tidak terdapat hubungan erat antara kemampuan inventive thinking dengan science-related student. Hasil analisis pearson correlation juga menunjukkan tanda positif. Hal ini menunjukkan bahwa hubungan antara inventive thinking dengan science-related student juga positif, atau tidak bertolak belakang.

Kata kunci: Inventive Thinking; Science related attitudes; korelasi

INTRODUCTION

What students know about science is not the only thing that matters, but their feelings about the subject are also important, the most important thing in learning about attitudes towards science is that students do not start school with likes or dislikes of science lessons in school, but they learn to like or dislike them in school (Akpinar et al., 2009). Thus, *science-related attitudes* are closely related to the concept of science and science activities that can provide positive reinforcement and develop students' abilities to grow creative, independent, and responsible abilities (Rahayuningsih, 2020). Educators in the field of science are responsible for the continuity of learning and teaching activities and measuring student *attitudes* (Astalini et al., 2019).

Science-related attitude is a person's desire to develop new knowledge and respond to a problem according to scientific thinking. So based on this, there should be a relationship between *scientific attitude* and thinking skills (Rubini et al., 2018). One of the thinking skills mandated as a 21st century skill is inventive thinking.

Inventive thinking is one of the main constructs in 21st century skills. It is a cognitive process that uses creative and critical thinking during problem solving to produce innovative or custom-designed solutions. It consists of six sub-constructs, namely flexibility, self-regulation, curiosity, creativity, risk-taking and higher-order thinking (Turiman et al., 2020). This shows the importance of thinking skills in producing a generation that thinks creatively, critically and innovatively, is able to solve complex problems, has a brilliant mind and thinks outside the box (Sahak et al., 2012).

To prove this, further research is needed to measure *science-related attitude* and *inventive* thinking, and regarding the relationship between the two. So this study aims to analyze the relationship between inventive thinking (IT) and science-related attitude (SRA) of students of the Chemistry Education study program, Faculty of Teacher Training and Education, Sriwijaya University

METHOD

Types of research

This study is a quantitative study with a cross-sectional study design. Where data is taken with an observational study that analyzes data from a population at a certain point in

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time (Maier et al., 2023). The study was conducted by measuring science related attitude and inventive thinking simultaneously at one time. Furthermore, the results were analyzed for the relationship between the two, namely the relationship between science related attitude and inventive thinking.

Participant

Participants in this study were 109 students of the chemistry education study program at Sriwijaya University , consisting of 3 classes as follows:

Table 1. Research Participants

Force	Amount
2021	31
2022	41
2023	37

1.1. Instrument

inventive thinking measurement instrument used in this study is an adaptation of the instrument developed by Turimen et al (Turiman et al., 2020), consists of 33 questions with 6 aspects *of inventive thinking* measured, namely 1) *Flexibility*, 2) *Self-regulation*, 3) *Curiosity*, 4) *Creativity*, 5) *Risk taking*, and 6) *Higher order thinking* .

science-related attitude instrument used in this study was *the TEST OF SCIENCE-RELATED ATTITUDES (TOSRA)* developed by Fraser (FRASER, 1981). There are 26 questions with 5 aspects in the TOSRA instrument, namely 1) *Attitude to Scientific Inquiry (I)*, 2) *Adoption of Scientific Attitudes (A)*, 3) *Enjoyment of Science Lessons (E)*, 4) *Leisure Interest in Science (L)*, and 5) *Career Interest in Science (C).*

Data analysis

Data analysis conducted in this study began by analyzing the validity and reliability of the questions according to Rasch Analysis. The validity of the questions can be seen from the outfit item mean square (MNSQ), where the range of values between 0.5 and 1.5 indicates suitability or validity (Boonee· et al., 2013). The reliability of the instrument can be seen from the item reliability, whose value is in the range of 0 to 1 (Maslahul et al., n.d.).

After the validity and reliability analysis is carried out, the next step is to measure inventive thinking and science related attitude by analyzing the Measure in Rasch analysis. The results of the Measure are then analyzed using Pearson correlation to determine the relationship between the two, namely the relationship between inventive thinking and science related attitude.

Table 2. Interpretation of Pearson Correlation Coefficient

Interval	Information
0.8 – 1	Very strong
0.6 – 0.79	Strong
0.4-0.59	Strong Enough
0.2-0.39	Weak
0 – 0.19	Very weak

(Cahyo et al., 2022)

RESULT AND DISCUSSION

The data obtained must be tested for validity and reliability first. Validity and reliability tests use Rasch analysis

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with the help of the winstep application. The validity and reliability of the instrument can be seen in the Table 3.

Table 3. Validity and reliability table

	Inventive thinking	Science related attitudes
Validity	1.01	1.00
Reliability	0.98	0.99

From the table 3, it can be seen that the validity of inventive thinking and science related attitude are respectively 1.01 and 1.00, where both are included in the range of 0.5-1.5. So it can be concluded that both instruments, namely inventive thinking and science related attitude, have been valid or can assess what should be assessed. Thus, the instrument has been productive for measuring.

The reliability results also show that both instruments are reliable, the value is close to 1, meaning that they have consistency in measuring. So both instruments are suitable for use to measure inventive thinking and science related attitude. Furthermore, an analysis of inventive thinking and science related attitude is carried out by looking at the "Measure" value based on the Rasch model analysis. The results of the analysis can be seen in the Table 4.

Measure value is a value in the form of "logits," which is short for " *log odds unit* ," the unit of measurement in Rasch measurement. Logit indicates the average value of the participant's ability. The average item has a default logit value of 0.0. Therefore, a negative value means that the respondent has a smaller than average person size (Bond et al., 2020; Boonee· et al., 2013)**.** After obtaining the measure value for each participant on inventive thinking and science related attitude, the next step is to conduct a Pearson correlation test to analyze the relationship between the two.

The analysis of the relationship between *science-related students* and *inventive thinking* was tested using Pearson correlation on 110 participant data. The 110 participants are the number that fits both types of data (*science-related students* and *inventive thinking*). The results of the Pearson correlation test are presented in the table 5.

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Table 4. Measure results of inventive thinking and science related attitude

	2021			2022			2023	
No	IT	SRA	No	IT	SRA	No	IT	SRA
1	4.49	0.49	32	3.56	0.4	73	2.91	0.23
2	1.56	-0.28	33	2.34	-0.02	74	1.56	-0.02
3	2.48	0.06	34	3.44	-0.71	75	1.56	-0.19
4	3.17	-0.11	35	5.87	0.74	76	2.19	-0.37
5	1.88	0.06	36	3.44	0.66	77	2.03	0.15
6	1.88	-0.02	37	1.56	-0.11	78	0.93	-0.88
7	2.19	0.15	38	2.19	1.18	79	2.63	0.49
8	4.35	-0.02	39	2.19	0.57	80	1.56	0.15
9	3.17	-0.54	40	1.56	-0.54	81	1.72	0.32
10	1.56	0.06	41	5.45	0.74	82	2.77	-0.02
11	2.48	0.15	42	1.88	1.35	83	1.24	0.66
12	2.91	-0.37	43	2.19	-0.03	84	2.19	-0.19
13	1.4	0.06	44	2.2	0.22	85	0.93	-0.19
14	0.93	-0.11	45	2.78	0.15	86	1.08	0.23
15	4.21	0.57	46	4.08	0.91	87	3.31	-0.11
16	4.08	0.83	47	1.24	-0.28	88	1.56	-0.11
17	3.56	0.23	48	1.88	-0.11	89	6.72	1
18	2.91	-0.88	49	1.72	0.15	90	1.72	0.4
19	1.4	0.15	50	3.17	0.15	91	2.48	-1.05
20	0.93	0.15	51	0.48	-0.79	92	2.19	-0.45
21	2.19	-0.71	52	2.03	-0.62	93	0.34	-0.28
22	1.4	0.15	53	2.91	1.44	94	1.4	-0.11
23	2.63	0.15	54	1.72	-0.62	95	1.72	0.06
24	2.77	-0.45	55	0.48	-0.02	96	2.48	0.66
25	1.24	-0.54	56	2.19	0.15	97	1.72	-0.19
26	2.91	0.32	57	2.03	-0.19	98	3.69	-0.62
27	2.34	0.06	58	1.4	-0.19	99	2.19	-0.97
28	1.72	1.09	59	1.24	-0.19	100	2.63	1.44
29	1.08	0.23	60	3.44	0.06	101	1.72	1.53
30	3.31	1.91	61	3.69	0.49	102	1.72	-0.62
31	1.56	-0.11	62	2.03	-0.19	103	1.88	-0.28
			63	3.69	-0.02	104	4.08	0.32
			64	2.19	0.23	105	1.88	1.44
			65	1.72	0.49	106	2.19	-0.02
			66	2.19	0.15	107	1.88	-0.19
			67	0.78	-0.37	108	1.88	0.4
			68	0.93	-0.28	109	1.88	1.09
			69	1.24	-0.02			
			70	1.56	0.32			
			71	1.72	0.06			
			72	2.34	0.15			

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Table 5. Pearson correlation table

r	Science related attitudes
Inventive thinking	**0.273**

Based on the interpretation of the data interval, 0.273 is included in **the low category**. This shows that the correlation between *science-related students* and *inventive thinking* is low, or in other words, there is no close relationship between *inventive thinking ability* and *science-related students* . If someone's inventive thinking ability is high, it does not necessarily mean that the person's *science-related student ability* is also high, and vice versa.

The results of the Pearson correlation analysis also showed a positive sign. This shows that the relationship between *inventive thinking* and *science-related students* also positive. If the ability of inventive thinking increases then it could be that *science-related students* can also increase. This means that the two things are not contradictory.

Other research results show that science related attitude has an influence on responsibility (Tanti et al., 2020). Other research also shows that science related attitude has a positive correlation with learning outcomes.(Hussain & Nawaz, 2023). *Science-related attitude* can be seen from how they respond to science lessons, in general attitudes towards science are divided into negative and positive attitudes, where students' positive attitudes in learning are characterized by being more diligent in studying so as to obtain satisfactory results and negative attitudes are attitudes that hinder students' learning activities because students become passive, do not like to think, and find it difficult to accept the material presented (Astalini et al., 2019).

CONCLUSION

Based on the results of the study, it can be concluded that the correlation between inventive thinking and science-related attitude is in the low category, or in other words, there is no close relationship between inventive thinking ability and science-related students. The results of the Pearson correlation analysis also showed a positive sign. This shows that the relationship between inventive thinking and science-related students is also positive, or not contradictory.

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REFERENCES

[1] Akpinar, E., Yildiz, E., Tatar, N., & Ergin, Ö. (2009). Students' attitudes toward science and technology: an investigation of gender, grade level, and academic achievement. *Procedia - Social and Behavioral Sciences* , *1* (1), 2804–2808.

https://doi.org/10.1016/j.sbspro.2009.01.498

[2] Astalini, A., Kurniawan, D.A., Kurniawan, N., & Anggraini, L. (2019). Evaluation of Student's Attitude Toward Science in Indonesia. *Open Journal for Educational Research* , *3* (1), 1–12. https://doi.org/10.32591/coas.ojer.0301.01001a

[3] Bond, T.G., Yan, Z., & Heene, M. (2020). Applying the Rasch model: Fundamental measurement in the human sciences. In *Applying the Rasch Model: Fundamental Measurement in the Human Sciences* . Taylor and Francis. https://doi.org/10.4324/9780429030499

[4] Boonee·, W.J., Staver, J.R., & Yale, M.S. (2013). *Rasch Analysis in the Human Sciences* . Springer.

[5] Cahyo, BD, Sasmita Setyowati, A., & Prabowo, A. (2022). *International Journal of Business, Economics and Social Development Pearson Correlation Between Education Level and Population Growth on Poverty in Central* . *3* (4), 174–180.

[6] Hussain, M., & Nawaz, M. H. (2023). To Explore the Relationship between Attitude toward Science and Achievement among Students in Tehsil Sarai Alamgir. *PAKISTAN LANGUAGES AND HUMANITIES REVIEW* , *7* (1). https://doi.org/10.47205/plhr.2023(7-i)21

[7] Maier, C., Thatcher, J. B., Grover, V., & Dwivedi, Y. K. (2023). Cross-sectional research: A critical perspective, use cases, and recommendations for IS research. In *International Journal of Information Management* (Vol. 70). Elsevier Ltd. https://doi.org/10.1016/j.ijinfomgt.2023.102625

[8] Adi, N.M.R., Amaruddin, H., Adi, H.M.M., & A'yun, I.L.Q. (2022). Validity and Reliability Analysis Using the Rasch Model to Measure the Quality of Mathematics Test Items of Vocational High Schools. *Journal of Educational Research and Evaluation (JERE)*, *11* (1), 2022–2103. http://journal.unnes.ac.id/sju/index.php/jere

[9] Rahayuningsih, S. (2020). Animation Media Of Animal Husbandry Thematic Science Learning To Stimulate Scientific Attitude In Early Childhood. *INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH* , *9* , 2. www.ijstr.org

[10] Rubini, B., Permanasari, A., & Yuningsih, W. (2018). Learning Multimedia Based on Science Literacy on the Lightning Theme. *Journal of Science Research and Learning* , *4* (2), 89.

https://doi.org/10.30870/jppi.v4i2.3926

[11] Sahak, S., Soh, T.M.T., & Osman, K. (2012). Comparison of Levels of Inventive Thinking among Science and Arts Students. *Procedia - Social and Behavioral Sciences* , *59* , 475–483. https://doi.org/10.1016/j.sbspro.2012.09.303

[12] Tanti, T., Kurniawan, DA, Wirman, RP, Fitriani, RS, Pratiwi, NIS, & Yuhanis, E. (2020). Relationship Attitude Natural Sciences To Responsibility In Junior High School. *Indonesian Journal of Science Education* , *8* (2), 306–318. https://doi.org/10.24815/jpsi.v8i2.17117

[13] FRASER, B. J. (1981). *TEST OF SCIENCE-RELATED ATTITUDES* . The Australian Council for Educational Research Limited.

[14] Turiman, P., Osman, K., & Wook, TSMT (2020). Inventive thinking 21st century skills among preparatory science course students. *Asia Pacific Journal of Educators and Education* , *35* (2), 145–170. https://doi.org/10.21315/APJEE2020.35.2.9