

Developing Assessment Instrument In Critical Thinking Ability For Fifth Grade Of Elementary School In Thematic Learning

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Abstract

The background of this study is about the availability of the test assessment instrument to measure the critical thinking ability of fifth grade elementary school students which is limited. Therefore, it needs to be developed. This development research used the Borg & Gall development method. The purpose of this study was to develop an assessment instrument in essay. The assessment instrument was validated by 5 Experts Judgment by using the Aiken'V formula. The results of trials using the construct validity of the Confirmatory Factor Analysis (CFA), interater reliability used Two Ways Anova proved by the Ebel formula and internal consistent reliability with the Alpha Cronbach formula. The result of expert judgment validation showed that ≥ 0.8 which mean that 10 items were in valid category, construct validity results from large-scale test analysis by using LISREL 8.8 namely Confirmatory Factor fulfilled the testing of goodness of fit GFI value 0,93, CFI=0,97 and NFI=0,91. The three assessment criteria have value $> 0,90$. It can be concluded that the construct validity is met. The construct validity is also evidenced by the loading factor of 10 items. All of which have a price of $> 0,3$. The interrater reliability assessment instruments based on Expert Judgment coefficient value was 0,62. The expert agreement indicated that the rating given by each rater is reliable or consistent between one another and internal consistency of small scale test results of coefficient value of alpha 0,861, large scale 0.813. Practicality of assessment instruments based on expert judgment had mean 37.2 and included in practical category. The profile of critical thinking skills of fifth grade elementary school students category "Medium". The Conclusions was the assessment instruments in critical thinking skills of fifth grade students on thematic learning were tested in validity, reliability and suitable to be used.

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INTRODUCTION

The ability to think critically is an important thing in education so it needs to be developed in students. Critical thinking skills are an essential requirement for all aspects of life. Educators recognize the importance of critical thinking skills as one of the outputs of the learning process. Noviani, *et al.* (2017, p.148) distinguishing the ability to think of each person is his thinking patterns. Alrfooh (2012) Student thinking patterns will direct students in critical and creative thinking to solve problems. Ennis (2014, p.180) critical thinking is rational and reflective thinking that is focused on deciding what to believe or do. Ruggiero argues that critical thinking is often discussed in relation to other cognitive skills such as logical reasoning, analyzing arguments, testing hypotheses, making decisions, estimating possibilities, and creative thinking (Szabo and Schwartz, 2011, p.79-94).

The opinions of the experts presented about the position of critical thinking is very important for students because one of them supports in the innovation process. Saavedra *et al.*, (2012) critical thinking skills should be empowered through learning in schools, especially science learning, because of in the 21st century, the students must have critical thinking skill. Zubaidah et al, (2015, p.200) critical thinking has become one of the competencies, goals, and objectives to be achieved in education.

Minister of Education and Culture Regulation No. 64 in 2013 has stated that learners in the 21st century must be able to develop competitive skills that focus on developing higher order thinking skills, one of them is critical thinking. The learning process implemented by teachers is designed to develop students' thinking Skill. Setyorini et al., (2011, p.52-56) in the research results showed that the application of PBL methods can improve students' critical thinking skills in mathematics learning. In line with Silva's research study (2012, pp.177-80) which showed that the abilities in critical thinking skill in elementary school students can be done by creating

classrooms that encourage students to think critically. Kartono, et al (2015, pp.1-7) stated that CORE learning helps work effectively in achieving problem solving abilities and student confidence.

Determining the success of learning that applies critical thinking skills certainly requires an accurate evaluation tool in the assessment to determine the student achievement in developing critical thinking skills. Rusilowati (2014, p.1) states that assessing interpreted as a systematic process for collecting, analyzing, interpreting information, and determining the level of success of students towards success towards learning objectives. Rahayu, et al., (2016, p.1598) the quality of learning outcomes the assessment instrument has a direct effect on the accuracy of status student learning outcomes.

Critical thinking skills in learning in schools have not yet been fully empowered, as in SMAN Batu, in the research of Rosyida, et al (2016, p.209-214). The researcher conducted observations at SDN Banyubiru 05, Semarang Regency. The data obtained was the teacher's difficulty in making evaluation instruments to measure students' critical thinking skills. Assessment by the teacher was only to measure the level of rote knowledge not to the ability to think critically. The availability of assessment instruments to measure critical thinking skills of fifth-grade elementary school students is still limited to being one of the obstacles of teachers in making assessment instruments. The researcher was very interested in conducting research on the development of critical thinking skills assessment instruments for fifth grade elementary school students on the thematic learning of theme 1 "Animal and Human Motion Organs", sub-theme 1 "Animal Motion Organs". The product of the research results was in the form of an assessment instrument to measure the thinking abilities of fifth grade elementary school students who had been tested for validity, reliability and practicality.

METHOD

This research used the development research design proposed by the Borg & Gall where there were 10 steps of product development. The eight revised steps namely (1) Research and information collecting (Preliminary Study), (2) Planning, (3) Develop preliminary form of product, (4) Preliminary field testing (Initial product trial), (5) Main product revision (Initial product improvement), (6) Main field testing, (7) Operational product revision (Product improvement of the result of field trial), (8) Final product revision. The respondents in this study were 33 students 'small scale test and 84 students' large scale test in the elementary school at Banyubiru, Semarang regency in 2019.

Data collecting of the study used qualitative and quantitative research. Qualitative data collection techniques include observation, interviews and document studies, while quantitative data collection techniques are done by questionnaire teacher responses and validation sheets. The instruments used included interview guidelines, voice recorders, cameras (camcorders) and observation sheets.

The validity of the instrument consists of two parts namely content validity and construct validity. Content validity is perfecting the product based on

the the Expert Judgments, the researcher uses 5 Expert Judgments, the results of the assessment are analyzed using the Aiken's formula with valid criteria ≥ 0.87 . The construct validity was analyzed using confirmatory factor analysis (CFA) assisted by the application of LISREL 8.8 With the results, at least three categories of model matches by looking at the criteria for each category. Absolute fit presents three types of indexes, namely chi-square > 0.05 , Root Mean Square Error Approximation (RMSEA) < 0.08 and Goodness Fit Index (GFI) > 0.90 . Incremental fit presents four types of index namely Adjusted Good of Fit (AGFI) > 0.90 , Comparative Fit Index (CFI) > 0.90 , Tucker Lewis Index (TLI) > 0.90 , and Normed Fit Index (NFI) > 0.90 .

The reliability of the instrument used interrater reliability using the *Two Ways Anova* then proven through the analysis of the Ebel formula. Internal consistency reliability of items was analyzed by using alpha Cronbach formula. Item analysis resulted from small and large scale using different power tests and the level of difficulty of the items. The practicality of the instrument was obtained through a questionnaire assessment containing 11 statements on a scale of 1-4 which by 5 raters was then dialed by finding the mean value, the success criteria presented in Table 1.

Table 1. Success Criteria

Mean Score	Criteria
$35 \leq x \leq 44$	Very Practice
$27 \leq x \leq 34$	Practice
$19 \leq x \leq 26$	Less Practice
$11 \leq x \leq 18$	Not Practice

FINDING AND DISCUSSION

The Design of Assessment Instrument for Critical Thinking Ability

The specification form of the instrument for critical thinking skills assessment which was developed in terms of internal tests included the essay tests, the number of 10 item questions, item criteria

and assessment procedures. The development of thematic items was about Sciences (IPA) and Indonesian Language, in accordance with the syllabus of the State Elementary School.

The internal attributes of the items arranged by took more attention to the suitability of the test with material oriented to the critical thinking ability. The test material was adjusted to the 2013 thematic-based

curriculum syllabus, each item was adjusted to aspects of critical thinking skills, namely elementary clarification, basic support, inference, advanced clarification and strategy and tactics. Item indicators were developed in line with the research of Pradana, et al., (2017, pp.51-61), namely the development of an instrument for testing critical thinking skills in optical geometry

The Validity of Assessment Instrument for Critical Thinking Ability

The content validity of instrument was based on 5 experts including; 3 evaluation experts, namely

professors at Semarang State University and 2 practitioner experts, namely the teachers of fifth grade in elementary school. Azwar (2015: 8) states that to find out whether a scale is able to produce accurate data in accordance with its measurement objectives, a validity testing process is needed.

In this study, content validation was analyzed by using formula Aiken's V, the valid items with provisions ≥ 0.87 . The results of the expert judgment are as follows. Result *Expert Judgment* presented in the table 2.

Tebal 2. Coefficient of Expert Agreement

No. Item	Indeks Aiken's V	Criteria	Conclusion
4, 6 dan 7	0,9	Valid	Proper
1, 2, 3, 5, 8, 9 dan 10	0,87	Valid	Proper
11, 12	0,8	Valid enough	Need revision
13	0,73	Not valid	Need revision

The results of data analysis presented in Table 2 finding the construct form of the variable that was can be obtained information about the level of validity of developed into an essay test item to measure critical the items based on the formula Aiken's V (Aiken, L, R .., thinking skills, using the help of LISREL 8.8.

1985 p.131-142). The total of 13 items that were said to Conceptually, the essay test items to measure the be valid with the Aiken's V index 0.9 and 0.87 is 10 critical thinking ability of thematic material were items. 3 items were declared not valid enough and developed by constructing from 5 indicators namely needed some revisions. Fika & Susilaningsih (2014, elementary clarification, Basic support, Inference, pp.1380-1389) Validity is stated as good with the validity Advanced clarification and Strategy and tactics. The coefficient category between valid to very valid. number of questions consisted of 10 items of critical

The construct validity of the instrument was thinking skills. The syntax used for data input in LISREL carried out to find the Confirmatory Factor Analysis in 8.8 out of 10 items presented in the table 3.

Tabel 3. Kode Sintaks

No. Item	Sintaks	No. Item	Sintaks	No. Item	Sintaks	No. item	Sintaks
1	EC_1	4	AC_4	7	BS_7	10	ST_10
2	BS_2	5	ST_5	8	IN_8		
3	IN_3	6	EC_6	9	AC_9		

The analysis of the validity of compatibility construct and the level of acceptance, presented in the table 4.

Tabel 4. Model Match Index and Acceptance Level

Name of Kategori	Index		Level of acceptance
Absolute fit	Chisquare	0,11	$P > 0,05$
	RMSEA	0,067	$RMSEA < 0,08$
	GFI	0,92	$GFI > 0,90$
Incremental fit	AGFI	0,83	$AGFI > 0,90$
	CFI	0,97	$CFI > 0,90$
	TLI		$TLI > 0,90$
	NFI	0,91	$NFI > 0,90$
Parsimonious fit	Chisq/df		$Chisq/df < 3,0$

(Mohamad, W., Bin, A., & Afthanorhan, W. 2013, p. 198-205).

Based on Table 4 it can be seen that the construct used to form a research model, in the confirmatory factor analysis process had the established *goodness of fit* criteria. *Goodness of fit probability* testing showed the value of GFI 0.93 (> 0.90), CFI 0.97 (> 0.90) and NFI value 0.91 (> 0.90). Two of the three match test categories had fulfilled the good-fit test or according to the data. Garson (2006) in Rusilowati (2014, p. 134) stated that support for model compatibility developed by

empirical data is at least seen from three match sizes that represent three different categories of model fit test. If two of the three categories are significant, the model developed is suitable or in accordance with the data.

In Figure 1, Path Diagram showed that the suitability of the measurement model was fulfilled. It was evidenced by looking at the factor loading value of each item > 0.3 which indicated that the variable had good validity to the construct.

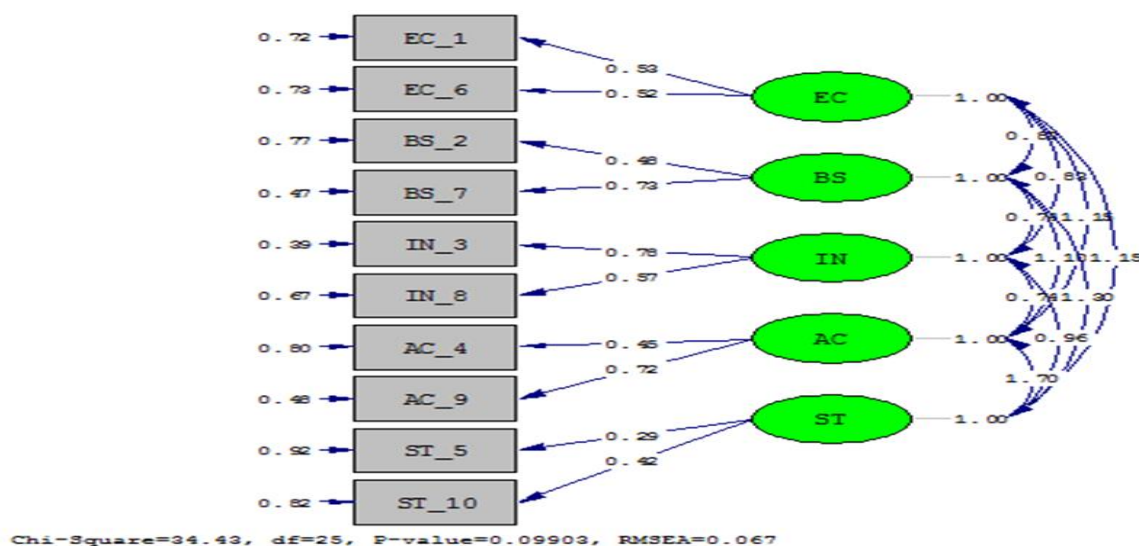


Figure 1. Path diagram of Instrument for critical thinking item.

The Reliability of Assessment Instrument for Critical Thinking Ability

The reliability test of the critical thinking ability assessment instrument was the *Interrater* reliability test and the internal consistency reliability test. *Two Ways Anova* is a comparative test, discusses the differences between several

samples of more than 2 samples (Sukestiyarno, 2016, p132). *Interrater* reliability test which was analyzed by using a different test through *Two Ways Anova* and subsequently proven through the *Ebel* Formula analysis by calculating the value of the reliability coefficient, the results were calculated by using the *Two Ways Anova* difference

test. *Two Ways Anova* test results were presented in Table 5.

Tabel 5. Hasil Two Ways Anova

Source	Mean Square
Rater	0,708
Item	0,133
Rater * Item	0,274

The results of the *Two Ways Anova* test analysis were then calculated using the Ebel formula with the average of the five raters was $r_{xxi} = \frac{MK_S - MK_{IS}}{MK_S} = \frac{0.708 - 0.274}{0.708} = 0.62$. The analysis results calculated using the Ebel formula showed that the value of the reliability coefficient was 0.62. The critical thinking ability assessment instrument was categorized as reliable and consistent if the

coefficient is ≥ 0.6 (Rusilowati & Sujarwanto, 2015, pp. 780-787).

Internal consistent reliability test for essay questions to measure students' critical thinking skills developed using the Cronbach Alpha formula with the help of the SPSS v.16 program. The results of the reliability testing analysis of the results of small and large scale trial results obtained the reliability coefficient presented in the table 6.

Tabel 6. Reliability analysis data

Uji	Cronbach's Alpha	N of Items
Skala Kecil	0,861	13
Skala Besar	0,813	10

Table 6 shows that the reliability of small scale test was 0.861 or greater than 0.8 so that the essay test instrument was reliable. Large-scale test results showed a reliability coefficient of 0.813 or greater than 0.8 so that the critical thinking ability test instrument essay was reliably tested. Rusilowati (2014, p.29), argues that the criteria for essay instruments with a coefficient of $0.8 \leq \alpha < 1.0$ are high, while according to Khumaedi the reliability coefficient of ≥ 0.50 is sufficient to be accepted as good reliability (Khumaedi, 2012, p.29).

Practicality Test of Assessment Instruments for Critical Thinking Ability

Practicality of assessment instruments for critical thinking skills of fifth grade students of elementary schools on thematic learning, obtained through practicality analysis of 5 assessors, namely 1 educational evaluation experts in Semarang State University and 4 teachers in fifth grade of Elementary Schools located in Banyubiru, Semarang regency, as an instrument user.

The recapitulation results of the practicality assessment of the 5 raters namely as the user of the instrument, assessment using the Likert scale 1-4,

obtained a mean score of 37.2, then the instrument of critical thinking ability assessment of fifth grade Elementary School students on thematic learning, lies in the "Very Practical" criteria. Research was conducted (Hidayat et al., 2017 p.36) that the practicality of the instrument is the ease and practicality of the instrument when used by instrument users.

The Profile of students' critical thinking skills

The results of the analysis in students' critical thinking skills used the essay test assessment instrument to measure the critical thinking skills of fifth grade elementary school students on thematic learning obtained from large-scale trial results. About 13 instrument items were used in the small scale test after the analysis of items with different power and difficulty levels so the researchers omitted 3 items, so the large scale trial used 10 items With 84 student respondents. Profile of critical thinking skills of fifth-grade elementary school students each indicator of critical thinking ability.

Profile of critical thinking skill of fifth grade students in aspects Elementary *clarification*, 44 students obtained a high category with a

percentage of 52%, 36 students in the moderate category with a percentage of 43% and 4 students in the low category with a percentage of 5%.

Profile aspects of critical thinking skill *Elementary clarification* presented in Figure 2.

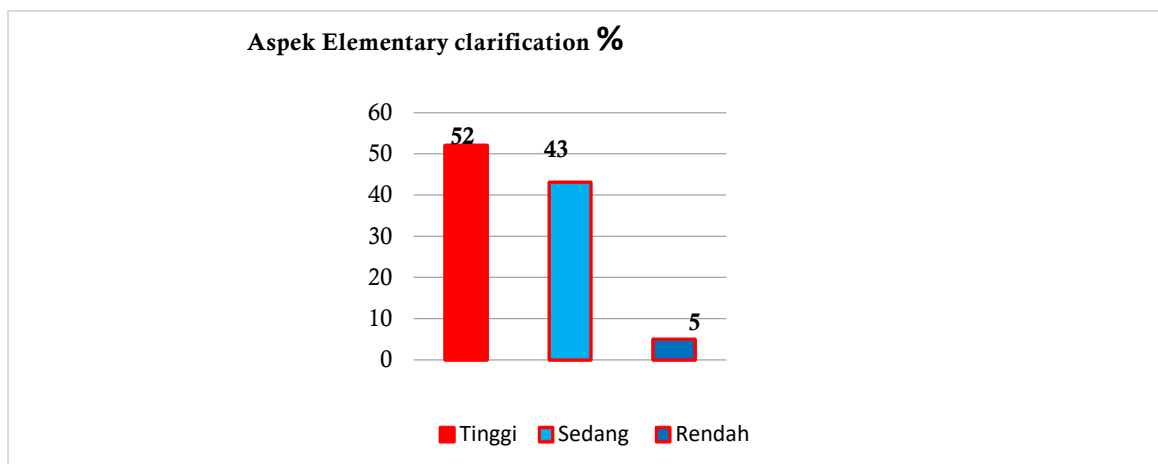


Figure 2. Critical Thinking Profile Elementary aspects of clarification

The results of the critical thinking ability profile of fifth grade students on the *Basic Support* aspects Obtained 45 students the high category percentage 54%, 32 students the moderate category

38% percentage and 7 students the low category percentage 3%. Profile of critical thinking skills on the aspect of *Basic Support* can be seen in Figure 3.

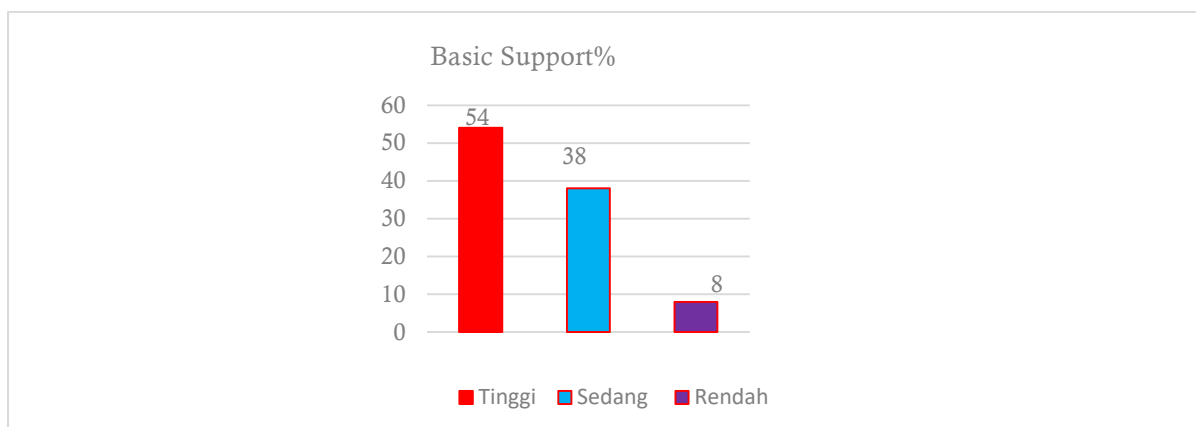


Figure 3. Profile of Critical Thinking Aspects of Basic Support

Profile of critical thinking skills of fifth grade students of elementary school in aspects of *Inference* 45 students gained high category percentage 45%, 39 students moderate category percentage 46% and

7 students low category percentage 8%. Profile of critical thinking skills in the aspect of *Inference* can be seen in Figure 4.

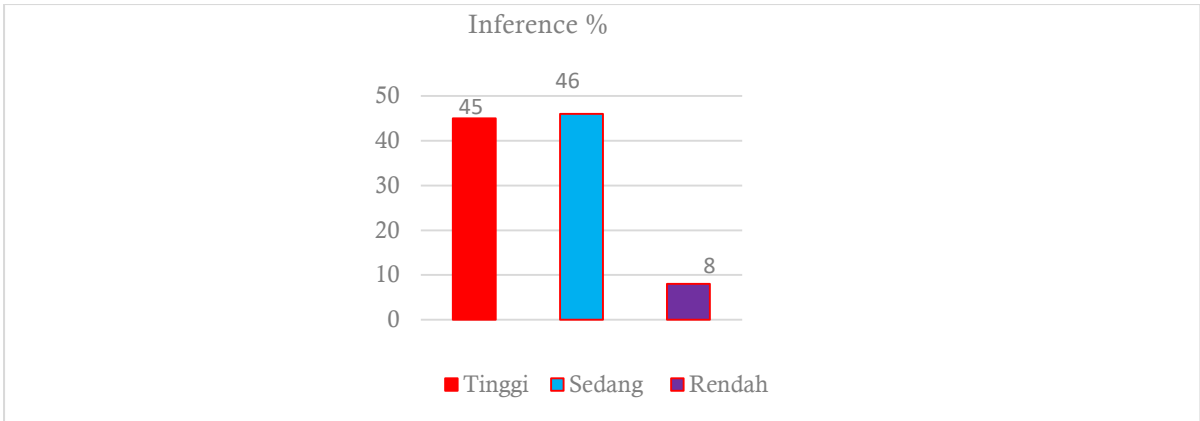


Figure 4. Profile of Critical Thinking Aspects of Inference

The profile of critical thinking skills of students in fifth grade of Elementary School aspects of *Advanced Clarification* there were 33 students in the high category with a 39% percentage, 45 students in the medium category

with a 54% percentage and 6 in the low category with a 7% percentage. The profile of critical thinking skills in the advanced clarification aspect can be seen in Figure 5.

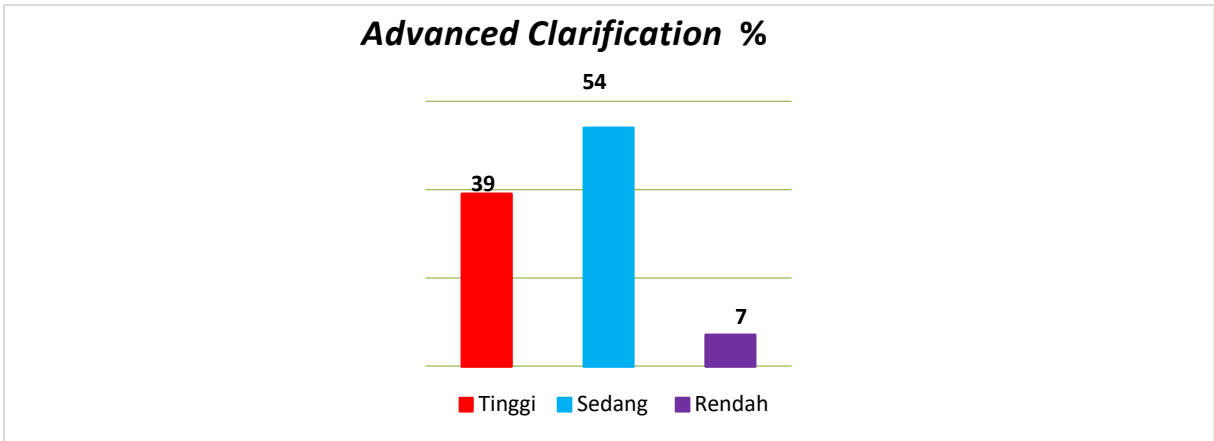


Figure 5. Profile of Critical Thinking in Advanced Clarification Aspect

The profile of critical thinking skills of fifth grade students of elementary school in the aspects of *Strategy and Tactics* (compiling strategies and techniques) there were 23 students in the high category with a percentage of 27%, 52 students in

the medium category with a percentage of 62% and 9 students in the low category with a percentage of 11%. The profile of critical thinking skills in the aspects of *Strategy and Tactics* can be seen in Figure 6.

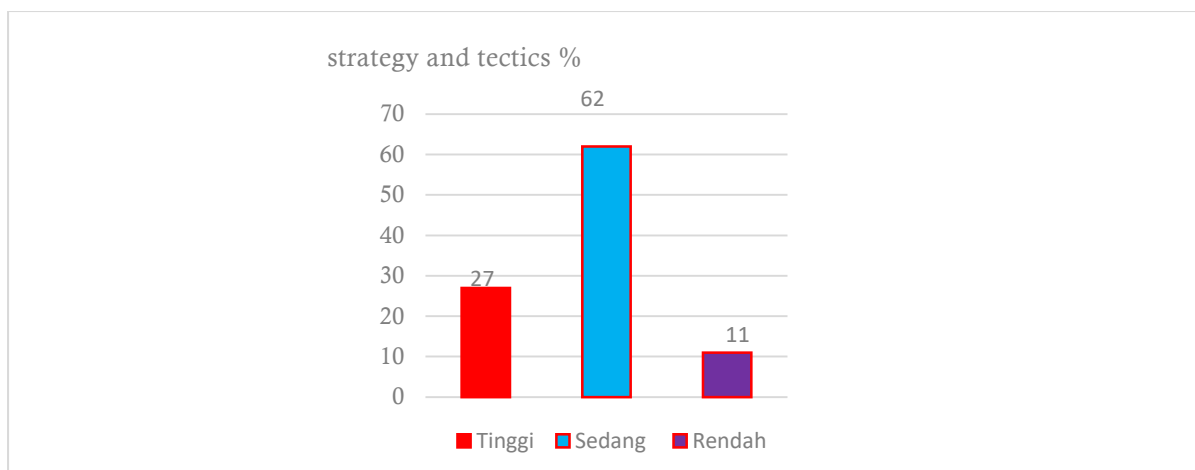


Figure 6. The profile of Critical Thinking in the Aspects of strategy and tactics

The ability in critical thinking in aspects of *Strategy and Tactics* was dominated by the medium category with a value of 62%, the items on the *Strategy and Tactics* aspects shows the criteria is a very difficult.

CONCLUSION

The instrument result had been tested starting from the instrument preparation stage, instrument validation to experts (content validity), construct validity test, testing the characteristics of the trial results, small-scale and large-scale reliability, testing the instrument's initiation and testing the profile of high-level thinking ability in fifth grade of elementary school students. Forms of critical thinking skills assessment produced in the form of grids, scoring guide rubrics, item test sheets and assessment sheet recapitulation assessment of critical thinking skills of elementary school students in thematic material.

The results of the assessment of experts that all items of the critical thinking ability assessment instrument are declared valid in content as evidenced by obtaining agreement (Aiken's v) which is in the range of 0.8 to 0.9. The validity of the constructs of essay test items to measure the ability to think critically following the developed model is evidenced by looking at the loading factor of each item > 0.3 .

The reliability of the critical thinking ability assessment instrument was stated to be reliable/consistent based on the inter rater reliability test with a coefficient value of 0.61 and internal consistency reliability of items with a small

scale score of $0.861 > 0.8$ and large scale $0.813 > 0.8$.

The instrument of critical thinking ability assessment of Grade V students can be used easily by users, namely Grade V teachers, proven by practicality test with a mean value of 37.2 with a very practical category used. The profile of students' critical thinking skills based on each indicator that with high criteria that is in the aspects of elementary clarification and Basic Support 45 students obtained with a percentage of 54%.

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