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The Influence of the Teachers Personality Competency on the Students Moral Attitude in Vocational School

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ABSTRAK

Kompetensi seorang guru merupakan gabungan dari kompetensi kepribadian, ilmu pengetahuan, teknologi, sosial, dan agama yang secara umum merupakan kompetensi seorang guru yang meliputi pengelolaan materi, pemahaman siswa, pembelajaran pedagogik, pengembangan pribadi, dan pengembangan profesional. Kompetensi guru merupakan faktor yang dapat mempengaruhi kualitas output pembelajaran. Penelitian ini bertujuan untuk menganalisis pengaruh kompetensi kepribadian guru terhadap sikap moral siswa kelas XI SMK. Jenis penelitian ini menggunakan penelitian korelasional yang menggunakan metode penelitian deskriptif kuantitatif sehingga analisis data dilakukan dengan menggunakan teknik statistik untuk menguji hipotesis. Pengumpulan data menggunakan angket, observasi dan dokumentasi. Hasil dari penelitian ini menunjukkan bahwa sikap moral siswa XI memberikan dampak sebesar 15,21% terhadap kompetensi kepribadian guru. Hal ini dibuktikan dengan rhitung lebih dari rtabel atau 0,39 lebih dari 0,304 sehingga koefisien korelasi variabel X dan Y signifikan, dimana rtabel n = 42 dengan tingkat kesalahan 50,304. Hasil penelitian uji t memberikan nilai t sebesar 2,441 dan t tabel sebesar 2,021 pada taraf signifikansi 5 derajat kebebasan (dk) = n-2 (42 -2 = 40) yaitu .H. t-hitung lebih dari t-tabel (2.441 lebih dari 2.021). Hal ini menunjukkan bahwa hipotesis alternatif dapat diterima, yaitu kompetensi kepribadian guru berpengaruh terhadap sikap moral siswa kelas XI SMK.

ABSTRACT

The competence of a teacher is a combination of personal, scientific, technological, social, and religious competencies which in general are the competencies of a teacher which includes material management, student understanding, pedagogic learning, personal development, and professional development. Teacher competence is a factor that can affect the quality of learning output. This study aims to analyze the effect of teacher personality competence on the moral attitudes of grade XI students. This type of research uses correlational research using quantitative descriptive research methods so that data analysis is carried out using statistical techniques to test hypotheses. Data collection using questionnaires, observation and documentation. The results of this study indicate that the moral attitude of grade XI students has an impact of 15.21% on the teacher's personality competence. This is evidenced by rcount more than rtable or 0.39 more than 0.304 so that the correlation coefficient of the X and Y variables is significant, where rtable n = 42 with an error rate of 50.304. The results of the t test study gave a t value of 2.441 and a t table of 2.021 at a significance level of 5 degrees of freedom (dk) = n-2 (42 -2 = 40), namely .H. t-count is more than t-table (2,441 more than 2,021). This shows that the alternative hypothesis can be accepted, namely the teacher's personality competence influences the moral attitude of grade XI students.

1. INTRODUCTION

Developed country is determined by human resources and natural resources. When all of that is available, the quality of the land will increase. Competence means mastery of knowledge, skills, values and attitudes that are reflected in the way of thinking and acting when carrying out tasks (Caswita, 2020; Nurtanto et al., 2020). The combination of knowledge, skills, attitudes, attributes, understanding, appreciation and expectations characterizes individuals who do work that meets actual work quality

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standards (Arifa & Prayitno, 2019; Fitriansyah et al., 2020; Lotter et al., 2018). These competencies can be implemented and applied in work if obtained through training. Competence refers to reasonable performance to meet certain requirements while performing training tasks (Cattaneo et al., 2022; Hermawan et al., 2020; Johannes, 2018). It is called rational because it has directions and goals that shape and develop the better character of each individual. Education and competence have a correlation, where competence can be built through education. Article 8 of Law Number 14 of 2005 concerning Teachers and Teachers states that teachers must have academic qualifications, qualifications, training, mental and physical health and the ability to organize national training. Law No. 14 of 2005 According to Article 10(1), qualifications teachers include pedagogic qualifications, personal qualifications, social qualifications, and professional qualifications (Arifa & Prayitno, 2019; Tanjung et al., 2022).The four competencies mentioned above do not stand alone from each other, but are interrelated and influence each other.Teacher skills must really be used in teaching in the classroom to guide students towards teachers play a very strategic role in forming the character and personality of students (Lawrence et al., 2019; Sabaniah et al., 2021; Scheopner Torres et al., 2018). With different teacher competencies, it is hoped that better changes will occur in students from a cognitive, affective and psychomotor perspective. Teacher qualifications play an role is important in learning, especially helping students to have an attitude that is positive for learning, increases curiosity, increases independence and intellectual-logical accuracy, and creates conditions for successful learning (Moosa & Shareefa, 2019; Tanjung et al., 2022). Teachers play an important role in the teaching and learning process by encouraging students to actively participate in learning activities, guiding them and providing learning opportunities to achieve learning goals.

Basically a good teacher greatly influences the moral development of students in his class, while a bad teacher loses his authority and is even humiliated by his students. In this case, the discipline of the teacher who always comes to class on time seems to indirectly affect the enthusiasm for student learning and emulates teacher discipline (Baharun, 2017; Singh, 2019; Stukalova, 2017). However, when the teacher does many things that are not in accordance with school rules and is often late, students also easily imitate the teacher's bad behavior. The ability of a teacher to shape a child's personality is very high, because in the end students see the teacher as a good role model in this life, because the teacher's behavior has a big influence on their students (Rindawan et al., 2020; Sokip et al., 2019). The different aspects are interconnected and influence each other. Lack of learning activities, many teachers teach for years, but in fact their work does not bring much positive into the lives of students. On the other hand, there are also teachers who are relatively new but concretely support the progress and positive changes of students. Teachers who know how to teach their students can be confident in their abilities as professional teachers. Based on the researchers' observations, one of the PPKn at SMKN 1 Sibolga, namely SMKN 1 Sibolga, started personal training during observations and interviews with Horas Lubis, but alternately. Observation or direct observation of researchers shows that the significant changes observed in students are very clear. Students who are too lazy to go to school, don't dress neatly, are late and don't even show up. This is because students are so used to online school that after the announcement they forget that they came to school. This surprised the researchers and they took a closer look at the problem.

Today everything is limited by distance. All these well thought out plans will not work for you. Everything has to be done online. Places of work, shopping, meetings and training that should be face-to-face have shifted to online learning (Mali, 2020; Qekaj-Thaqi & Thaqi, 2021). Technological developments encourage more innovation in learning. The current limitations of online learning have a major impact on instilling good morals in students (Akhwani, 2021; Najmuddin & Aprilianty, 2020). When the researcher observed that some of the native teachers in the class did not understand the moral attitudes of the students. Students are generally at a disadvantage when it comes to teaching and learning. This is due to the teacher's ignorance of the teacher's personality skills which should be a role model for building students' moral attitudes during learning. Because the researcher was still involved in online learning during the observation, he saw that the teacher's in-depth understanding of students' moral attitudes was very limited. Because it is limited by the display of electronic devices. The formation of students' moral attitudes occurs during learning (Fadzilah et al., 2020; Karimi et al., 2017). Some of the obstacles that the researchers found in their observations at the research site were the lack of student interest, inadequate electronic devices, very limited connectivity and some teachers who did not understand how to use electronic devices, so they only gave assignments to students (Adnan & Anwar, 2020; Ismaili, 2020). From the study of these problems it can be concluded that personality teachers PPC indicated that students were generally dissatisfied with the teaching in class. Also because it is still designed for classrooms. In addition, it can be said that the moral attitude of students outside the classroom is quite good. However, when online learning begins, students do not follow and see the tools when the teacher explains, this is due to the weak character of the teacher leading the class, namely the teacher does not show the firm

attitude that many students experience, the teacher hates and sometimes acts randomly and does not reflect habits. Meanwhile, in online learning, it can be seen that the attitude of students who do not respect each other is an obstacle for both the teacher and his friends which greatly interferes with the teacher's ability to concentrate and influences learning and learning. Base on those problem the researcher are interested to conducting the study with aims to analyse the effect of teacher personality competence on the moral attitudes of grade XI students.

2. METHOD

The type of research used in this research is correlational research (using two variables) using quantitative calculations. Quantitative research using instruments (data collection tools) that produce numerical data (numbers) in which data analysis is carried out using simple statistical techniques to reduce and classify data. This approach gives more meaning in relation to the interpretation of numbers so that the results are more accurate. Quantitative descriptive research method is used as a research method. The type of data used in this research is primary data through questionnaires and to complement the research materials also types of accompanying materials through observation and documentation (secondary data). The two data above were collected based on filling out questionnaires and observing respondents, especially class XI students of SMKN 1 Sibolga. The survey points and ratings given to the respondents are show in Table 1.

Tabel 1. Score Assessment Questionnaire answers

No.	Questionnaire Choice Answers	Score
1	Always	4
2	Sometimes	3
3	Seldom	2
4	Never	1

In this study, The subject of this research involving class XI students of SMKN 1 Sibolga. This research intends to influence the teacher's personality qualifications on the moral attitudes. In this study the data taken consisted of two types of variables, namely effect of teacher personality competence (variable x) and student moral attitudes (variable y). The total number of respondents was 42 students, namely class XI, who were randomly assigned. Number of respondents based on gender is show in Table 2.

Table 2. Number of Respondents Based on Gender

No	Gender	Amount
1	Man	20 people
2	Woman	22 People
Total		42 People

Data analysis for the discussion in this chapter is to obtain data from 42 respondents as a sample representing the entire population in this study. The results of the survey answers that were distributed to respondents were different about the effect of community teacher personality competence on the moral attitudes of class XI students.

3. RESULT AND DISCUSSION

Result

Calculation results the coefficient between variable x and variable y shows the value of r count of 0.39. When the sum of these values is compared with the rcount value with a significant value of n-42, the tcount meets the requirements if the tcount value is greater than the rcount value (rcount > rtable), or 0.39 > 0.304, it can be concluded that class XI students of SMKN 1 Sibolga students' moral attitudes are influenced by the social studies teacher's personality skills. The detail result is show in Table 3.

Table 3. Coefficient Influence of Teacher's Personality Competence on the Moral Attitudes

No	x	y	x^2	y^2	xy
1	76	72	5776	5184	5472
2	70	65	4900	4225	4550

No	x	y	x^2	y^2	xy
4	70	69	4761	4830	4828
5	61	66	4900	3721	4356
6	4026	60	68	3600	5929
5929	4080	4624	68	7	3
77	71	5929	5041	4624	_
8	77	74	5929	5476	5698
9	77	74	5929	5476	5698
11	72	73	5184	5329	5256
12	75	75	5625	5625	4392
70	5184	3721	5625	10	4900
13	4270	61	61	3721	72
–	–	–	–	–	–
–	–	–	–	–	–
_	_	70	4761	4900	4830
17	69	57	4761	3249	3933
19	71	68	4624	3136	4761
20	69	56	3864	4828	68
69	74	4761	5476	5106	5
4629	77	18	21	5041	_
–	–	–	–	–	–
–	–	–	–	–	–
_	_	_	_	5929	5698
25	71	46	5041	2116	3266
27	77	71	5625	5929	4489
28	73	68	5159	5329	72
75	5625	5850	4624	4964	6084
29	78	5325	75	30	26
67	5041	_	_	_	_
–	–	–	–	–	–
_	_	_	_	_	_
33	75	65	5625	4225	4875
34	69	69	5929	5313	3933
36	78	79	6084	6241	6162
37	38	63	5929	77	4761
77	75	5929	5775	3249	4761
57	35	77	_	_	_
–	–	–	–	–	–
–	–	_	_	_	_
_	_	71	5625	5041	5325
42	70	7 0	4900	4900	4900
Total	**3056**	**2889**	**223062**	**200631**	**210664**

Base on Table 1, show the calculation of the correlation coefficient between variable X (the influence of teacher pedagogic competence) and variable Y (student character) shows that the calculation is 0.39. If this correlation is interpreted to be a correlation value, it can be classified as low correlation. So it can be seen that the comparison between variable X and variable Y using the product moment correlation formula is known to be 0.39. Then for correlation interpretations nuber is show in Table 4.

Table 4. Interpretation of Correlation Numbers (r value)

Interval Koefisien	Relationship Level
0,00-0,199	Very low
0,20-0,399	**Low**
0,40-0,599	Currently
0,60-0,79	Strong
0,80-1,000	Very strong

Base on Table 4, calculating the coefficient between variables x and variable y shows t count of 0.39. Compare this value with the rcount value with significant value n-42, if the tcount value is greater than the tcount value (rcount > rtable) or 0.39 > 0.304, then the tcount value is the same as the prescription. Then you can decide. PPK Teachers with Personality Competence Influence the Moral Attitudes of Class XI Students of SMKN 1 Sibolga. Then, using the coefficient of determination equation it is clear in the field that the influence of the personality abilities of a Civics teacher on the moral attitudes of class XI students at SMKN 1 Sibolga in the 2021/2022 academic year is 15, 21%. On the other hand, 84.79% is influenced by other factors which are not fully discussed in this study. To test whether the successful correlation is significant, use the 't' test formula. Exploratory analysis results using the "t" test. Knowing how to influence social studies teachers' personality competencies on the moral attitudes of class XI students. affect class. Look at the class of SMKN 1 Sibolga for the 2021/2022 academic year, tcount = 2.441 with a price table = 2.021. Because tcount is bigger than ttable (2.441>2.021|)| At the 5 degree of freedom level (dk) = n-2, then dk = 42-2 = 40. In other words, the alternative hypothesis is that the national teacher's personality competence influences the moral attitude of class XI students. Students of SMKN 1 Sibolga for the 2021/2022 academic year will be accepted.

Discussion

The purpose of this study was to find out whether the personality competence of Civics teachers had an effect on the moral attitudes of class XI students. class of SMKN 1 Sibolga. Basically the teacher is a profession whose main role is to educate, teach, guide, train, assess and evaluate students' formal and informal education. As a vocational school teacher, various competencies are needed to support the learning process, namely pedagogic, personal, technical and social competencies (Ana et al., 2020; Made Sudana et al., 2019). The National Education Standards explain in Article 28(3)(a) that personality abilities refer to the ability to be stable, stable, mature, wise and authoritative, to be role models for students and to have noble character (Estriyanto et al., 2017; Nurtanto et al., 2020). Professional teachers do not only focus on imparting knowledge to their students, but spread their wings as mentors and role models through good character that reflects the values and standards that are at the heart of the school. The good character of a teacher consciously or unconsciously influences his students. This is because a teacher is a role model for his students (Andayani et al., 2020; Hermino & Arifin, 2020; Sultoni et al., 2020). Product-moment correlation analysis shows that social studies teacher's personality competence has little effect on the moral attitudes of class XI students of SMKN 1 Sibolga. This shows that tcount is larger than rtable by (rcount>rtable), eg. H. 0.39 > 0.304, so the correlation coefficient of the X and Y variables is significant. Where r-table at n = 42 with an error level of 5 0.304 accepts the truth of the formulated hypothesis (Ha) namely "Teacher's personality competence in society influences the morale of class XI students of SMKN 1 Sybolga". The results of the study between X and y when learning in class, students must be able to see teachers who are patient in the teaching and learning process, in this study it was found that teachers were always patient in the teaching and learning process. This was evidenced by 42 respondents, that as many as 38 people (90.4%) said always, 4 people (9.6%) said sometimes, 0 said rarely and 0 said never. Supporting the strengths possessed by students, judging from the results of this study it can be said that it is good to see from the results of the questionnaire which showed 42 respondents, 36 people (85.7%) said always, 6 people (14.3%) said sometimes, 0 said rarely and 0 for never.

From the results of processing the research variable x. personality competence of a social studies teacher, it can be concluded that the teacher shows personality in the classroom and outside the classroom. The personal competence of a teacher above all is a noble character (Dewi & Alam, 2020; Marini et al., 2019). First, teacher does this by participating in religious activities at school, speaking polite and courteous words, being patient with students in class, easily forgiving students, and being able to control their anger so they can bring out their talents (Laeheem, 2020; Lu & Wu, 2020). Second, aspect of skilled and wise teacher in this case teachers do things like provide services without favoritism, teachers are aware of diversity, are open to accepting student differences, show enthusiasm in teaching and learning to reduce boredom in class, and guide everyone. Through the duties and responsibilities of a responsible teacher (Baharuddin et al., 2019; Yulius, 2020). Third, the teacher gives an example. In this case the teacher always tries to set an example to his students by applying good discipline in class on time, then the teacher shows how to dress politely and not excessively. The moral attitude referred to in this study is first, following one's conscience. In its application students have done it in a form when making a decision based on careful consideration using conscience, then students are able to issue various opinions based on their conscience (Cebollero-Salinas et al., 2022; Hasanah, 2020). Second, students have an attitude of self-confidence. The form of self-confidence shown by students is being able and daring to express their opinions in front of the class, conducting debriefing with the teacher when they do not

understand the teacher's statement, and doing good relations among class members (Diniyah et al., 2018; Hong et al., 2021). Third, show empathy. Base on previous study the empathy shown by students is by being sensitive to the surrounding circumstances, caring for friends who are experiencing difficulties and difficulties (Altavilla et al., 2021). Fourth, a moral attitude in the form of love of goodness. The form of kindness shown by students is mutual agreement. Previous study state one implementation is when there is a dispute caused by differences in opinion between class members and showing mutual support between class members (Septikasari & Frasandy, 2018). Fifth, namely self-control. The form of self-control carried out by students is being able to make the right decisions without being hasty, meaning that they have maturity in thinking and are able to think clearly without being intervened by others. Sixth, namely humility. The form of humility in question is when in the class there are students who are smart and not smart enough, then the smart ones are able to humbly help various learning difficulties experienced by students who are not smart enough (Arif, 2017; Church & Samuelson, 2017). The implications of this study provide an overview related to the influence of the teachers' personality competency on the students' moral attitude in vocational school. It is important to know how teachers' personality competency has an impact on moral attitude so that it can be used as a reference or guideline to support learning outcomes, especially character learning by students. This research has many limitations. One of the limitations of this research lies in the limited research subjects, where this research only involved one class in one school institution. Therefore, it is hoped that future research will be able to further deepen and broaden the scope of research related to teacher competency and students' moral attitude.

4. CONCLUSION

The conclusion of this study is that the social studies teacher's personality competence has a significant effect on the moral attitudes of class XI students. The results of the correlation coefficient concluded that between variable (x) and variable (y) obtained it can be concluded that the national teacher's personality competence influences the moral attitude of class XI students. According to the alternative hypothesis, the social studies teacher's personality competence influences the moral attitudes of class XI students of SMKN 1 Sibolga is accepted and the null hypothesis (Ho) is rejected.

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User-Friendly Level Differences in Learning Mathematics Using Braille Books with Talking Books for the Student with Visual Impairment

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ABSTRAK

Media pembelajaran bagi siswa tunanetra berpengaruh terhadap kecepatan dan proses pemahaman dalam pembelajaran. Penggunaan buku Braille dan buku berbicara memiliki kelebihan dan kekurangan masing-masing. Penelitian ini bertujuan untuk menguji perbedaan tingkat user friendly siswa tunanetra yang belajar matematika menggunakan buku Braille dan talking book. Pendekatan penelitian ini menggunakan kuantitatif dengan desain yang digunakan dalam penelitian ini adalah quasi-experimental-posttest-only Control design. Subyek dalam penelitian ini adalah 38 siswa yang terdiri dari 8 SLB di 6 provinsi di Indonesia. Teknik pengumpulan data menggunakan angket dan tes. Validitas instrumen menggunakan validitas isi dan uji reliabilitas menggunakan teknik interpreter. Teknik analisis data yang digunakan dalam penelitian eksperimen ini adalah analisis data t-test atau uji-t. Hasil penelitian menunjukkan bahwa penggunaan buku braille memiliki perbedaan yang signifikan dengan buku berbicara. Perbedaan tersebut ditunjukkan dengan nilai t hitung sebesar -4,955 dengan sig 0,00 yang berarti terdapat perbedaan yang signifikan antara penggunaan buku Braille dan talking book dalam memperoleh kemudahan belajar.

ABSTRACT

Learning media for students with visual impairment affects the speed and process of understanding in learning. The use of Braille books and talking books have advantages and disadvantages of each. This study aims to examine the difference in user-friendly levels of students with visual impairment learning mathematics using Braille books and talking books. This research approach uses a quantitative with the design used in this study being a quasi-experimental-posttest-only Control design. The subjects in this study were 38 students consisting of 8 special schools in 6 provinces in Indonesia. Data collection techniques used questionnaires and tests. The validity of the instrument uses content validity and the reliability test using the interpreter technique. The data analysis technique used in this experimental research is t-test or t-test data analysis. The results show that the use of braille books has a significant difference from talking books. The difference is shown by the t count of -4.955 with sig 0.00 which means that there is a significant difference between the use of Braille books and speaking books in gaining ease of learning.

1. INTRODUCTION

All children have the right to learn at all stages of their development and can use appropriate methods with easy access. Data compiled by World Statistics shows that less than 2% of children with disabilities have the opportunity to attend school (Dardzińska-Głębocka & Zdrodowska, 2021; Fansury et al., 2019). One type of child with special needs is blind. Students with visual impairment have big problems in obtaining educational or learning opportunities because of discrimination in education based on gender, race, or disability (Putri, 2020; Rahimi et al., 2019). This affects the learning process of students with visual impairment. Children with visual impairment of the total blind categories in obtaining information utilize the sense of hearing and the sense of touch. Meanwhile, children with low vision categories are still able to use the sense of sight to obtain information, but they must use visual aids. For students with visually impaired this manner of receiving information is a challenge (Hashim et al.,

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2021; Toenders et al., 2017). The most difficult challenge for blind children in learning among subjects at school is mathematics. Besides being abstract, the material is presented in the form of symbols, graphs, tables, pictures, and various forms of equations.

Learning mathematics is an important part of learning for all students because mathematics is a subject that is widely applied in real life. The impact of vision loss on learning mathematics is that direction, quantity, form, and logical attributes are at the heart of mathematics. Teaching/Learning and understanding mathematical concepts are quite hard for primary and secondary education of blind people, which subsequently hinders their career choices and career growth (Nahar et al., 2022; Vandana & Singla, 2022). The difficulties in math accessibility encountered by students with visual impairment often lead to those individuals having more problems with science than sighted people (Buhagiar & Tanti, 2011; Spinczyk et al., 2019). Research conducted by previous study found that blind and visually impaired students in Bangladesh face difficulties in the first step due to their limitations in writing and reading mathematical notation (Nahar et al., 2022). Students with visual impairmenttheirmselvcan can access any document more easily if they are prepared in braille. Mathematics contains a large number of symbols, and the braille notation for all these symbols has made the braille system long and sometimes complicated to understand and remember (McDermott-Wells, 2016; Wongkia et al., 2012). This can be caused by the lack of facilities in the form of professional experts or qualified teachers coupled with poorly made braille materials which can make long braille systems very difficult to learn (Kway et al., 2010; Wongkia et al., 2012). The use of unique Braille mathematical symbols has its difficulties for stud students with visual impairment. The provision of mathematics Braille books requires special skills such as expertise in mathematical concepts and Braille codes. This lack of competence is the reason for the limited number of Braille Mathematics books. The Braille code of mathematics varies from country to country (Fischer-Baum & Englebretson, 2016; Wongkia et al., 2012). Learning mathematics with Braille books for students with visual impairment takes quite a long time compared to students aware and able to read printed letters. According to previous study the readers absorb written information through visual fixation (eye gaze), where the perceptual field of each eye gaze includes at least 15 letters (Hollins, 2021). In terms of reading Braille, tactile fixation (fingertip palpation) is not comparable to visual fixation, because tactile reading involves coordinating finger, hand, and arm movements. The speed of reading Braille cannot be compared with the speed of reading printed letters by alert learners. This is caused by different modalities, but there is a relationship between cognitive capacity and Braille reading speed (Martiniello & Wittich, 2022; Veispak et al., 2013). One way to overcome this problem is to use audio fixation in learning, which comes with mathematics audio books equipped with tactual fixation through tactual mathematics supplements. This is the concept of digital development that advances the realm of education, with the development of audio fixation, which can foster student skills in competing in the digital world (Ivashova et al., 2019; Wongkia et al., 2012).

Although a lot of educational software has been introduced for blind children, very little educational software is available to students sent with visual impairment. Audio-book production in Indonesia, such as the Mitranetra Foundation, the Ministry of Education and Culture's BPMR, the Indonesian Braille Printing Center tend to produce audio-books that are text-based and not numeric-based or math and statistics books, which are accompanied by tactual supplements. In addition to the unavailability of materials, mathematics learning equipment for visually impaired students is very expensive and most rarely on found in developing countries (McDermott-Wells, 2016; Ry-Kottoh et al., 2022). However, current there’re is the development of a an audio-book recorder students with visual impairment with the name math+T. The main purpose of audio-books is to help students with visual impairment and further developments now audio-books are enjoyed by many people with vision because by having audiobooks, people can read books without having to read. They can do it by listening through car tape, at home, or on the go. It is explained by previous study that 3D audiobooks are effective as a learning supplement for class discussion (Bertulfo et al., 2017). The respondents were amazed at the 3D Audiobook and its whole concept whilst there were so those who strongly suggested that the voice selection be reconsidered. Additionally, the materials (sound effects avoiceoversers) were commendable they majorly contributed to the overall quality of the 3D Audiobook. Furthermore, the teachers explained that they had used the add audiobooks as a supplement to the lesson and it was effective. Mathematics audio student books for visually impaired students can be developed with analog (cassette) and digital recordings. Digital audio student books can be developed with MP3, MP4, and DAISY (Digital Accessible Information System) applications. The production steps between analog and digital recordings are the same, the difference is the equipment and technology used in production and storage media. DAISY is designed to be a complete audio replacement for printed materials and is specifically designed for use by people with visual impairments including blind, low vision, and dyslexic students. DAISY multimedia can be a book, magazine, newspaper, journal, computerized text, or presentation of synchronized text and

audio (Kerscher, 2001; Nattaya Wongrukmitr, 2021). It provides up to six embedded "navigation levels" for content, including embedded objects such as images, graphics, and MathML (Kerscher, 2001; Rattanaphinyowanich & Nunta, 2021). The results of the research by previous study in Thailand showed that: (1) the efficiency of the DAISY format audiobook in reading comprehension for blind students reached the standard criteria of 70/70 at 80.00/75.80; (2) The DAISY audio book effectiveness index on reading comprehension is at 0.70; (3 and higher reading comprehension learning outcomes after using DAISY audiobooksTheuse of different media, of course, affects the level of user-friendliness in utilizing existing developments (Nattaya Wongrukmitr, 2021).

Based on this case, it encourages researchers to test the user-friendliness of ststudentsith visual impairment learning by using Braille books and mathematic talking books. User-friendly media or friendly to users, in this case, students with visual impairment who will use talking books means thatalkingig book can be used by the visually impaired because it is easy to learn, and e, unand derstand so it is hoped that the problems of the blind in obtaining complete information through textbooks, especially in mathematics, can be completed and learning objectives can be achieved. The aims of this study is to examine the difference in user-friendly levels of students with visual impairment learning mathematics using Braille books and talking books.

2. METHOD

The research uses a quantitative research approach. The research design used in this research is the "Nonequivalent Control Group Design" research, namely the Posttest-only Control Group Design. Subjects were determined by purposive sampling, namely 38 children with visual impairment in class VII consisting of 8 special schools from 6 provinces in Indonesia. The determination of the control group and the experimental group was done randomly. Each group consisted of 19 children with visual impairment. The control group was taught by using a mathematics Braille book, while the experimental group was given learning using a mathematics audiobook. At the end of the lesson, a post-testest is given.

Data collection techniques with tests. Instrument validity uses content validity. Content validity ty a validity that focuses on what elements are in the measure, so rational analysis is the main process carried out in content validity analysis (Azwar, 2017; Coaley, 2010). The validity of this study uses expert judgment, namely 2 linguists, 2 construct arts, and 2 substance experts. In this case, after the instrument is constructed about the aspects to be measured based on a certain theory, then it is then consulted with the competent one or through the Reliability expert judgment using the interrater technique through Kappa coefficient analysis from Cohen and Intraclass Correlation Coefficients (ICC). To find out the difference in userfriendly level between the experimental group and the control group, the t-test data analysis technique was used.

3. RESULT AND DISCUSSION

Result

The difference in the effect of user-friendly between the use of Braille Mathematics books and talking books were tested for the difference in the difference in data between the two groups, in this case, conducted with an independent sample t-test. The results of the user-friendly independent sample t-test in learning mathematics using Braille books and talking-book can be seen in Table 1.

Table 1. T-Test Results

		F	Sig.	t	Df	sig. (2-tailed)	Mean Difference	Std Error Difference	95% Confidence interval of the Difference	
									lower	Upper
VAR0001	Equal variance assumed	2.267	0.141	-4.955	36	0.000	-8.526	1.72073	-12.016	-5.036
	Equal variance not assumed			-4.955	32.739	0.000	-8.526	1.72073	-12.016	-5.024

Base Table 1, it is known that the value of F = 2.267 with probability (sig) 0.141. The decision-making provisions using the Ho rule as a user-friendly variance between Braille books and booking books have no significant differences, and user-friendly friendly variance with Braille math books and books

have significant differences. The rules used are a) if the probability (sig) > 0.05, then Ho is accepted; b) if the probability (sig) <0.05, then Ho is scored. Then, Table 1 shows that the calculated F value = 2.267 with a sig of 0.141, then Ho is accepted. The conclusion is that there is no difference in variance in Braille and talking book data, so the data is called homogeneous. To test the difference in user-friendly level between learning to use Braille books and talking books using the provision that Ho as the variance there is no significant difference in the level of user friendly between learning with Braille books and talking books, while H1 as a variant there is a significant difference in the effect on the user-friendly level between learning with Braille books with talking book. The rule used is Ho is accepted if the probability value (sig) > 0.05 and Ho are rejected if the probability value (sig) < 0.05. Table 2 shows that the t count is -4.955 with sig 0.00 which means Ho is rejected, which means that there is a significant difference between the use of Braille books and talking book in gaining ease in learning. Differences in means between groups is show in Table 2.

Table 2. Differences in Means Between Groups

VAR00002		N	Mean	Std. Deviation	Std. Error Mean
VAR00001	1.00	19	28.1579	4.38765	1.00660
	2.00	19	36.6842	6.08324	1.39559

Referring to Table 2, using a 95% confidence level tolerance, the mean range of differences between the use of Braille books and talking books is -12,016 to -5,036. The ease between learning with Braille books and talking books has a different mean value with a difference of 8,527 (36,684-28,157) which means that the use of Braille math books with audio is user-friendly in learning to choose a significantly different mean.

Discussion

Graphs, charts, diagrams, pictures, and drawings are used as mathematical tools to communicate large amounts of data or relationships between variables in a simplified and concise manner. The material for pictures, graphs, and graph is visual, and therefore many students with visual impairment face considerable challenges in their reading. That difficulty can be done by making tactile graphics. Tactile graphics are created using elevated lines and textures to convey images and graphics with touch. They are often used by blind and visually impaired people because tactile modalities are the best for understanding their graphic images (Övez, Filiz, Tuba, Dikkartin & Akar, 2018; Quero et al., 2021). The provision of friendly teaching materials is needed to fulfill their rights in learning like other students. The use of assistive devices for children with visual impairment has been increasing, and several electronic aid devices have been introduced over the past few years, called electronic travel aids, which can replace with existing aid apparatus, such as white canes. Combining different types of sensors, cameras, or feedback channels can work with different implementation approaches and improve mobility for the visually impaired. Assistive systems based on computer vision or machine learning methods have been emerging, and assistive technology has been expanded according to technological advancement (Bagon et al., 2018; Hwang et al., 2020).

Braille's reading speed is difficult to increase through technology because it is related to the strength of finger touch. Another great power is hearing. The research results of previous study concluded that optimal spatial auditory sensitivity has no prerequisites in visual abilities, even a lack of vision leads to a general improvement of auditory-spatial skills (Battal et al., 2020). As technology advances, the demand for literacy increases very rapidly. As the volume of reading requested increases, a student with visual impairment is encouraged or taught to supplement their reading of Braille text with digital books, talking books/ other digital recordings (Kway et al., 2010; Melfi et al., 2020). With talking book is considered a necessary tool to improve access to information not only to compensate for slow reading rates but also because Braille printed material is not always available when needed.

It was explained that there were significant differences in the results of studies related to the user-friendliness of Braille books and audiobook media. From the results, it can be seen that the use of talking book media is more user-friendly than the use of braille books. The use of talking books with Braille books has a significant *difference*. This shows that the user-friendly use of math books for visually impaired students in Class VII with talking books equipped is significantly better than using Braille books. Research conducted by previous study using cellular tactile audio media is suitable for introducing learning environments and evaluating systems by comparing three interaction methods with tactile graphics: Tactile graphics coupled with (1) documents with key index information in Braille, (2) digital documents with key index information and (3) the iPad system, an audio-tactile solution that meets

specific needs in a school context (Melfi et al., 2020). Added by other researcher who developed a platform that shared graphical mathematical content (graphs, geometric numbers, etc.) in audio-tactile form for visually impaired students, preliminary research on test groups showed better assimilation of mathematical knowledge and improvement of participants' positive sentiments and their cognitive abilities (Maćkowski et al., 2020). Testing several types of charts and obtaining evidence that visual augmentation can offer clear advantages for the exploration of tactile charts, even participants with small residual vision can complete tasks with visual augmentation more quickly and accurately (Götzelmann, 2018; Martiniello & Wittich, 2022).

Many studies have identified a positive relationship between self-efficacy to use technologies and online learning performance. However, some studies show that the use of technology in certain areas does not benefit students (Hoskin et al., 2022; Sumuer, 2018). This is by the results of this study that the use of talking books in mathematics subjects students' understanding is lower when compared to using Braille mathematics books. After the talking book mathematics supplement was added to tactual/Braille (talking book+) supplements, the comprehension score was higher than the use of talking book mathematics without tactual/Braille supplements. In addition, the use of tactile audio books contributes to the students with visual impairment in inclusive schools in bonding activities during learning. Children can release their emotions and fantasies and show that each child experiences an exchange with themselves and the world (Edirisinghe et al., 2018; Tederixe et al., 2021).The use of mathematical Braille is believed to create new difficulties for the student with visual impairment, so the use of talking books or audio math can help students understand the use of formulas in mathematical concepts. In terms of user-friendliness, visually impaired students prefer to use audiobooks to capture existing material. Talking book technology presents new ways to communicate and reach users who may be limited by print or want other convenient ways to consume content while multitasking (Hashim et al., 2021; Ry-Kottoh et al., 2022). The implication of this research is to encourage other researchers to develop assistive technology for visual impairment students that is more friendly as a form of friendly service for learning mathematics. The limitation of the results of this study is that the subject is relatively small, and does not represent the representation of visual impairment students in Indonesia. This is due to the small number of clients with visual impairment in special schools. The results of the research can at least be used as inspiration for similar research with a wider scope and more detail.

4. CONCLUSION

Friendly mathematics teaching materials are needed by blind students. This is not only to provide access to blind students in learning mathematics, but this is a right that must be fulfilled by education providers. The use of talking book learning media gives more freedom to blind students in mathematics subjects than using Braille books. The convenience in question is speed and understanding in learning mathematics. User-friendly includes ease and comfort in learning mathematics.

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UTBK-Based Higher Order Thinking Skills (HOTS) Test Instruments on Reaction Rate Topic

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ABSTRAK

Kemampuan berpikir tingkat tinggi merupakan salah satu keterampilan yang diperlukan di abad ke-21. Penelitian ini bertujuan untuk mengembangkan instrumen tes pilihan ganda dan essay untuk mengukur Higher Order Thinking Skills (HOTS) peserta didik pada materi laju reaksi. Penelitian ini menggunakan metode Research and Development (R & D) dengan model pengembangan ADDIE (Analysis, Design, Development, Implementation, dan Evaluation). Responden dalam penelitian merupakan 150 siswa kelas XII MIPA yang telah mendapatkan pembelajaran materi laju reaksi. Hasil validitas isi produk menunjukkan instrumen soal 92,01% valid dengan kategori sangat baik. Hasil validitas empirik menunjukkan bahwa sebanyak 20 butir soal pilihan ganda dan 8 butir soal essay valid dan memiliki reliabilitas yang tinggi dengan nilai Cronbach Alpha soal pilihan ganda 0,723 dan soal essay 0,736. Daya beda butir soal dari kedua tipe soal dikategorikan sangat baik dengan 20 butir soal pilihan ganda dikategorikan sedang, sedangkan pada soal essay 1 butir soal dikategorikan mudah dan 7 soal dikategorikan sedang. Selanjutnya instrumen soal yang telah dikembangkan dapat digunakan untuk mengukur HOTS peserta didik.

ABSTRACT

One of the efforts that can be support students in developing 21st century skills is to implement learning based on 21st century skills. In addition, another alternative that can be taken is to create, direct, and provide HOTS-based test instruments as an evaluation of learning. This study aims to develop multiple choice test instruments and essays to measure learners' Higher Order Thinking Skills (HOTS) on reaction rate materials. This research uses the Research and Development (R & D) method with the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) development model. The respondents in the study were 150 students of class XII MIPA one of the high schools who had received learning material on reaction rate. The results of the validity of the product contents show that the question instrument is 92.01% valid with an excellent category. The results of empirical validity show that as many as 20 items of multiple-choice questions and 8 items of essay questions are valid and have high reliability with Cronbach Alpha scores of multiple-choice questions of 0.723 and essay questions of 0.736. The difference between the question items from the two types of questions is categorized very well with 20 items of multiple-choice questions categorized as moderate, while in essay questions, 1 question is categorized as easy and 7 questions are categorized as moderate. Furthermore, the question instruments that have been developed can be used to measure the HOTS of students.

1. INTRODUCTION

21st century skills are an invaluable soft skills asset and these skills are a must-have for everyone, especially in 21st century learners who will face stiff competition in 2045 when demographic bonuses occur. Assessment and Teaching of 21st Century Skills (ATC21S) organizes 21st century skills into four categories, namely ways of thinking, ways of working, tools for working and skills for living in the world. Assessment and Teaching of 21st Century Skills (ATC21S) organizes 21st century skills into four categories, namely ways of thinking, ways of working, tools for working and skills for living in the world. One of the

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skills that are indispensable in the 21st century by these learners is the Ways of thinking skills which include critical, creative, and high order thinking skills (Aslamiah et al., 2021; Sulaiman & Ismail, 2020). Furthermore, previous study explained that there are five important components in 21st century skills, including critical thinking, creative thinking, cooperation, motivation, and metacognitive (Lai & Viering, 2012). Critical, creative, and high order thinking are essential to be trained and developed in students in 21st century learning. However, current conditions show that the 21st century skills possessed by students in Indonesia are still low (Amran et al., 2019; Dinni, 2018). This is supported by data from the Programme for International Student Assessment (PISA) in 2018 which shows that the results of the science literacy assessment of students in Indonesia are ranked 74th out of 79 country participants (Chamisah, 2017; Fadillah & Ni'mah, 2019). Therefore, learning innovations are needed that can facilitate learners to develop 21st century skills. One of the efforts that can be support students in developing 21st century skills is to implement learning based on 21st century skills. In addition, another alternative that can be taken is to create, direct, and provide HOTS-based test instruments as an evaluation of learning (Heong et al., 2012; Ichsan et al., 2020). This information supported by research who explained that the formation of HOTS-based questions as a method for training teacher competencies and measuring the level of high-level thinking ability of students (Kusuma et al., 2017). Teachers are required to be able to have good competence in terms of compiling HOTS questions that are relevant to problems in everyday life. But in reality, there are still many teachers who do not integrate life phenomena in the evaluation questions so that they cannot facilitate students to develop their cognitive skills (Klosterman & Sadler, 2010; Sepriyanti et al., 2022).

HOTS is one of the ultimate goals to be achieved by the national education system which is described in the 2013 curriculum. In general, cognitive processes are divided into two levels, namely Lower Order Thinking Skills (LOTS) and Higher Order Thinking Sklls (HOTS). HOTS focuses on developing students' ability to analyze evaluating, drawing conclusions, and synthesizing new information (Brookhart, 2010; Kamin et al., 2015). HOTS is the ability to think that does not just remember (recall), restate (restate), or refer without processing. Based on Bloom's taxonomy that explains that HOTS generally measures the ability of the realm to analyze (analyzing/ C4), evaluate (evaluating/C5), and creating/(C6) (Anderson et al., 2001; Susiaty & Oktaviana, 2019). C6 is the highest cognitive level of the HOTS question instrument because it requires students to be able to think creatively in finding solutions to a problem (Chalkiadaki, 2018; Damaianti et al., 2020). In general, the hope of the Higher Education Entrance Test Institute (LTMPT) to hold a Computer-Based Written Examination (UTBK) can be a prediction related to the ability of prospective students to be able to complete their studies on time in college well. Recently was found that participants in the Computer-Based Writing Examination (UTBK) complained about the difficulty of chemistry subjects, especially in reaction rate materials because the level of difficulty of the questions increased and applied Higher Order Thinking Skills (HOTS) (Harta et al., 2020; Sarah et al., 2021). This difficulty can be caused by students who are not familiar with doing chemistry questions based on HOTS (Mahanal, 2019; Narayanan & Adithan, 2015). Therefore, it is necessary to have an assessment instrument that focuses on assessing Higher Order Thinking Skills (HOTS) on chemistry questions applied to students. The application of the HOTS assessment instrument is an alternative for teachers in training and measuring the level of students' high-level thinking ability (Damaianti et al., 2020; Nugraha et al., 2020).

The implementation of high-level thinking in chemistry subjects that contain macroscopic, microscopic, and symbolic levels can be done by applying chemistry questions that are often done by students at school, one of which is in reaction rate material that is closely related to daily life. In general, students' understanding at the submicroscopic level of reaction rate material is still low when compared to the level of understanding of other chemical representations (Handayanti et al., 2015; Reza et al., 2021). It can be interpreted that the understanding of reaction rate matter at the submicroscopic level involves atoms, ions, and molecules that cannot be observed with the naked eye so that critical thinking skills are needed to understand them. Previou stsudy state reaction rate has four submaterials which include the concept of reaction rate, collision theory, factors affecting the reaction rate, order and reaction rate equation (Hakimah et al., 2021). The characteristic of reaction rate topic is focuses on understanding concepts, calculations, and is applicative. Furthermore, reaction rate is also one of the chemical concepts that are abstract and difficult for students to understand so that it often causes misconceptions (Jusniar et al., 2020; Yan & Subramaniam, 2018). Previous relevant research on the development of HOTS question instruments in chemistry learning has been carried out on thermochemistry topic (Novatania & Kamaludin, 2021). Then there are also researcher who develop HOTS questions in electrolyte and non-electrolyte solution topic (Afriani et al., 2018). Moreover there are also develop HOTS questions on solubility topic (Sarah et al., 2021). However, other topics of chemical material are still not further developed especially in reaction rate topic. Furthermore, in studying the reaction rate material,

prerequisite materials are needed, namely chemical equilibrium, chemical reaction alignment, and the concept of mole so that it can be categorized as a complex chemical topic.

Facts on the ground show that HOTS assessment test instruments are still rarely implemented in learning assessments. Preliminary studies conducted at several senior high schools in Malang City showed that the test questions used in learning evaluation tend to measure students' thinking ability in the cognitive level of memorization and remembering so it cannot stimulate students to think at a high level. Through HOTS, learners will be able to give ideas clearly, argue well, be able to solve problems, construct explanations, hypothesize, and understand complex things to be clearer and more comprehensive. HOTS has an important role to play in supporting educational success and making learners more accustomed to creative and innovative thinking (Dinni, 2018; Lee & Choi, 2017). In addition, HOTS is also one of the main skills needed by students to deal with all problems and challenges in the 21st century. This is what underlies researchers to develop HOTS questions based on UTBK questions based on taxonomy bloom on reaction rate topic. This study aims to develop UTBK-based higher order thinking skills in multiple-choice and essays question on reaction rate topic that are valid and reliable. The results of the HOTS assessment that have been developed are expected to be an evaluation in learning to train and improve students' HOTS abilities.

2. METHOD

The approach used in this research is research and development (Research & Development). Research and development methods are research methods used to produce and test the effectiveness of products (Creswell, 2013). The product developed in this study is a UTBK-based Higher Order Thinking Skills chemistry question on the reaction rate material of 20 question items in multiple choice form and 8 essay items. In this study, the stages in design and development used the ADDIE framework (Analysis, Design, Development, Implementation, and Evaluation) (Aldoobie, 2015). The analysis stage is carried out with the aim of identifying and collecting information about the problems and needs of the assessment instrument product to be developed. The design stage is the preparation of the concept and framework of the question instrument which includes indicators of competency achievement, indicators of question items, and assessment rubrics. Furthermore, the development stage is carried out to test the validity of the content and the empirical validity of the question item. However, in this study only to the stage of development because it is only limited to measuring the level of validity and reliability of the questions developed. The trial sample in this study was as many as 150 students of class XII from one of the senior high schools in Malang City with the criteria of having received reaction rate material topic. Research instruments used to obtain data include content validation sheets and student answer sheets as empirical validation data. Content validation is carried out to test the quality of the feasibility of the questions reviewed from the aspects of content, construction, and language. Construct validation is performed to test the validity, reliability, differentiability, and difficulty level of the question item by using the help of the *SPSS 24.0 for Windows program.* Product content validation data is obtained from content assessment conducted by validator experts who are two senior high school teachers. Score percentages are categorized based on Table 1.

Table 1. Product Validity Criteria

Percentage (%)	Category
80 < x < 100	Very good
60 < x < 80	Good
40 < x < 60	Enough
20 < x < 40	Not good
0 < x < 20	Not very good

The question items that are categorized are very good and good, then an empirical validity test is carried out. Empirical validity includes the validity of the question item, reliability, differentiability, and degree of difficulty (Arikunto & Suharsimi, 2009). Data obtained through the results of student answer sheets. The data analysis technique of the percentage of validity of the content of the HOTS question instrument. The validity test shows the level of accuracy of the question instrument to measure what should be measured. The validity test is carried out with the help of the spss 24.0 for Windows program. The test results were compared with the r_{table} value of product-moment (0.159) at a 95% confidence level with n = 150. If the $r_{count} \geq r_{table}$ then the question item can be declared valid, while the $r_{count} \leq r_{table}$ then the question item can be declared invalid. Assessment instruments can be said to be reliable if they are able

to be used repeatedly to measure the same object and produce the same data (Sugiyono, 2017). Reliability test analysis is if the cronbach alpha value > 0.60 the assessment instrument has high reliability, while if the cronbach alpha value < 0.60 the assessment instrument has low reliability (Arikunto & Suharsimi, 2009). The interpretation of the reliability data of the question can be seen in Table 2.

Tabel 2. Reliability Criteria

***Cronbach Alpha* (r)**	**Category**
0,80 < r < 1,00	Very good
0,60 < r < 0,80	Good
0,40 < r < 0,60	Enough
0,20 < r < 0,40	Not good
0,00 < r < 0,20	Not very good

The differentiability shows the level of ability of the question instrument in distinguishing highly capable learners from low-ability learners. The number that shows the magnitude of the differentiation is called the discrimination index (D). The interpretation of the differential power of the question can be presented as in Table 3.

Table 3. Differential Power Criteria

Score	**Category**
D < 0,00 (negative)	Very low
0,00 < D < 0,20	Low
0,21 < D < 0,40	Moderate
0,41 < D < 0,70	High
0,71 < D < 1,00	Very high

Difficulty level is a number index that shows the easy level and difficulty of a question can be answered correctly by students (Sugiyono, 2017). The interpretation of the difficulty level data of the question item can be presented as in Table 4.

Table 4. Criteria for The Level of Difficulty

Score	**Category**
0,00 < P < 0,30	Difficult
0,31 < P < 0,70	Moderate
0,71 < P < 1,00	Easy

3. RESULT AND DISCUSSION

Result

The product developed by the researcher is in the form of an instrument about HOTS on reaction rate material consisting of four submaterials, namely the concept of reaction rate, collision theory, factors affecting the reaction rate, order and equation of reaction rate. The question instruments developed are multiple choice and essay. The development of this question instrument was strengthened by the results of needs analysis and surveys in schools that showed information that students rarely do HOTS-based chemistry questions so that the questions used to measure student learning outcomes still use Low Order Thinking Skills (LOTS) questions. In addition, references to HOTS in high school are also still limited and research that develops HOTS-based questions on chemistry topics is still small. A description of the developed HOTS indicators can be seen in Table 5 and Table 6.

Table 5. Description of HOTS Multiple Choice Item Indicator

No	**Submaterial**	**Indicator**	**Cognitive Level**
1	Concept of reaction rate	Analyze phenomena according to the type of reaction	C4 (Analyze)
2	Concept of reaction rate	Analyze research variables to measure reaction rate	C4 (Analyze)
3	Concept of reaction rate	Analyze the reaction rate based on	C4 (Analyze)

No	Submaterial	Indicator	Cognitive Level
		submicroscopic representations	
4	Collision theory	Analyze the exact collision theory based on a phenomenon	C4 (Analyze)
5	Collision theory	Analyze treatments that can improve effective collisions	C4 (Analyze)
6	Collision theory	Summing up the exact statement based on experimental data	C5 (Evaluate)
7	Factors that affect the reaction rate	Analyze the factors affecting the reaction rate	C4 (Analyze)
8	Factors that affect the reaction rate	Analyze the factors affecting the reaction rate with collision theory	C4 (Analyze)
9	Factors that affect the reaction rate	Analyze control variables in the experiment of factors affecting the reaction rate	C4 (Analyze)
10	Factors that affect the reaction rate	Analyze the role of catalysts in a chemical reaction	C4 (Analyze)
11	Factors that affect the reaction rate	Analyze appropriate treatment based on specified conditions and variables	C4 (Analyze)
12	Factors that affect the reaction rate	Design an experimental procedure of factors affecting the reaction rate	C6 (Create)
13	Factors that affect the reaction rate	Summing up the exact statement based on experimental data	C5 (Evaluate)
14	Factors that affect the reaction rate	Identify the tools and materials needed in designing the experiment	C6 (Create)
15	Factors that affect the reaction rate	Analyze the factors affecting the reaction rate	C5 (Evaluate)
16	Factors that affect the reaction rate	Analyze the factors affecting the reaction rate from the experimental data	C4 (Analyze)
17	Factors that affect the reaction rate	Analyze the graph of a reaction with catalysts and without catalysts	C4 (Analyze)
18	Order and equation of reaction rate	Analyze the order and equations of reaction rates	C4 (Analyze)
19	Order and equation of reaction rate	Determine the order of the reaction based on experimental data	C4 (Analyze)
20	Order and equation of reaction rate	Analyze the reaction rate due to temperature changes	C4 (Analyze)
21	Order and equation of reaction rate	Determine the rate of formation of a compound	C4 (Analyze)
22	Order and equation of reaction rate	Analyze the reaction rate equation based on experimental data	C4 (Analyze)
23	Order and equation of reaction rate	Analyze the reaction rate equation based on experimental data	C4 (Analyze)
24	Order and equation of reaction rate	Determine the order of the reaction based on experimental data	C4 (Analyze)

Table 5. Description of Hots Essay Item Indicator

No	Submaterial	Indicator	Cognitive Level
1	Reaction rate concept	Analyze the phenomenon of chemical reactions to determine the meaning of the concept of reaction rate	C4 (Analyze)
2	Reaction rate concept	Analyze the comparison of the rate of chemical reactions in life phenomena	C4 (Analyze)
3	Factors affecting the reaction rate	Design experiments on factors affecting the reaction rate	C6 (Create)
4	Factors affecting the reaction rate	Analyze the factors affecting the reaction rate of a phenomenon	C4 (Analyze)
5	Factors affecting the reaction rate	Analyze the factors affecting the reaction rate by using collision theory	C4 (Analyze)

No	Submaterial	Indicator	Cognitive Level
6	Factors affecting the reaction rate	Analyze the influence of surface area on reaction rate	C4 (Analyze)
7	Factors affecting the reaction rate	Formulate a hypothesis against the rapid slow rate of chemical reactions	C6 (Create)
8	Order and equation of reaction rate	Analyze the order of the reaction and predicting the time of occurrence of the reaction	C4 (Analyze)
9	Order and equation of reaction rate	Analyze reaction equations and graphs of a chemical reaction	C4 (Analyze)
10	Order and equation of reaction rate	Analyze the rate of combustion reactions under certain conditions	C4 (Analyze)
11	Order and equation of reaction rate	Design an experiment to measure the reaction rate	C6 (Create)

Base on Table 4 and Table 5 show a total of 24 multiple-choice questions and 11 essay questions were successfully developed according to the indicators. The question instrument that has been developed is validated by two validators who are high school teachers using a likert scale questionnaire. The results of the validator assessment showed that the average percentage score of 92.05% which was categorized as very good which could then be tested on students who met the predetermined criteria, namely having learned on the reaction rate material.

Empirical validity data obtained from learners' answers. In multiple-choice type questions, the correct answer will be given a score of 1 and the wrong answer will be given a score of 0. In essay type questions, a score of 2 is given on a complete and clear answer accompanied by evidence and strong reasons, a score of 1 if the answer is accurate but the reason is unclear or incomplete, and a score of 0 if the answer does not show a logical conclusion. The empiric validity test is performed with the help of the SPSS 24 for Windows program. r_{count} from the calculation of each question item compared to r_{table}. The r_{table} value based on the number of samples is 0.159. Based on the results of the analysis of multiple choice type questions, 20 points of valid questions were obtained and 4 points of invalid questions were obtained. The results of the validity of the question items can be seen in Table 6.

Table 6. Empirical Validity Results

Validity Index	Type Question	Question Number	Number of Question	Percentage (%)
$r_{count} > r_{table}$ (valid)	Multiple choice	2,3, 4. 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 22, 23, 24	20	84,3%
	Essay	1, 2, 3, 4, 5, 6, 7, 10	8	72,7%
$r_{count} > r_{table}$ (invalid)	Multiple choice	1, 15, 16, 21	4	16,6%
	Essay	8, 9, 11	3	27,3%

Based on the data in Table 6, it can be interpreted that there are 20 multiple-choice questions and 8 essays that are declared valid. This is supported by the value of the r_{count} of the question grain which is higher than the value of the r_{table} ($r_{count} \geq r_{table}$) with a r_{count} range of 0.243-0.685. Meanwhile, 4 multiple choice type questions and 3 essay questions were declared invalid ($r_{count} \leq r_{table}$) so it was not feasible to do a reliability test. Valid question in multiple choice show that there are 16 items C4 question, 2 items C5 question, and 2 items C6 question. Then, valid question in essay show that there are 6 items C4 question and 2 items C6 question. Based on this result, the example of C4, C5, and C6 question can be seen in Table 7.

Table 7. Example Question of HOTS (C4, C5, and C6)

Question Level	Question Indicator	Question
C4 (Analyzing)	Presented some important information regarding the experiment of factors affecting	Carbon dioxide (CO_2) is a non-colored gas. At low concentration, this gas is odorless. Whereas, at high concentrations it smells sour and sharp. Carbon dioxide is widely as an inert gas in fire machines, a supercritical solvent in the manufacture of low-caffeine coffe, an ingredient for making carbonates beverages, and as a refrigerant. The main sources of carbon dioxide gas are the processes of

Question Level	Question Indicator	Question
	the reaction rate, students can analyse the appropriate control variables	combustion, respiration of organism, fermentation and the addition of acids to limestone. The reaction equation between limestone and hydrochloric acid is as follow. $CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$ A group of children will conduct an experiment on the effect of surface area on the reaction rate of $CaCO_3$ and HCl. If the experiment is carried out at a constant pressure, which variables should be controlled? a. $CaCO_3$ mass b. H_2O and CO_2 volume c. Volume CO_2 d. Volume H_2O e. $CaCO_3$ size
C5 (Evaluating)	Presented a description of phenomenon related to collision theory, students are asked to determine the experimental step according to phenomenon	Cantika and her practicum group wanted to prove the collision theory which states that "the wider the the surface area of the touch plane of the reagent particle, then the effective collision that occurs will be more so that the reaction rate will be faster". Here's which is the most appropriate test step to investigate the event? a. Put 100 mL of vinegar acid into beaker A and 150 mL into beaker B; prepare two tablets of ulcer drugs containing $Mg(OH)_2$ with different masses and brands; put one tablet of the drug each into beakers A and B; turn on the stopwatch; record the time it takes for the tablets to finish reacting with vinegar acid on each glass. b. Put 100 mL of vinegar acid into beaker A and 100 mL into beaker B; prepare two tablets of ulcer drugs containing $Mg(OH)_2$ with the same mass; grind one tablet of the drug until it becomes powder; insert one tablet of ulcer medicine in keeping form into beaker A and one tablet in powder form into chemical B simultaneously; turn on the stopwatch; record the time it takes for the tablets to finish reacting with vinegar acid on each glass. c. Put 100 mL of vinegar acid into each of the beakers A and B; prepare two tablets of ulcer medicine containing $Mg(OH)_2$ with different brands; put one tablet of the drug into beaker A and one tablet with another brand into beaker B simultaneously; turn on the stopwatch; record the time it takes for the tablets to finish reacting with vinegar acid on each glass d. Put 100 mL of vinegar acid into beaker A and 150 mL into beaker B; prepare two tablets of ulcer drugs containing $Mg(OH)_2$ with the same mass; put each tablet of the drug in beakers A and B; turn on the stopwatch; stir on beaker A only; record the time it takes for the tablets to finish reacting with vinegar acid on each glass e. Put 100 mL of vinegar acid into chemical class A and 150 mL into beaker B; prepare two tablets of ulcer drugs containing $Mg(OH)_2$ with the same mass; put one tablet of the drug each into beakers A and B; turn on the stopwatch; record the time it takes for the tablets to finish reacting with vinegar acid on each glass
C6 (Planning)	Presented with the tools and materials of an experiment, students can design an experiment from the tools and materials provided	One day Bintan helped mom make a cake and accidentally dropped baking soda into the water containing vinegar and gas bubbles popped into the mixture. Bintan was very curious about what happened, then he tried it again twice. Both experiments showed different reaction times, unfortunately Bintan forgot to record it. Bintan also intends to retry the experiment. Assist Bintan in designing the experiment! a. What materials will you choose for the experiment to be carried out? and determine the amount! b. If the following tools are provided:

Question Level	Question Indicator	Question
		- Plastic cups - Drip pipette - Test tubes - Knife - Measuring cups - Stopwatch - Tablespoons - Label - Teaspoon - Glove - Test tube racks What tools would you choose for the experiment to be carried out? Also determine the amount! c. Design the experimental procedure that you will do!

The question reliability test is only carried out on valid questions so that as many as 20 multiple-choice questions and 8 essay questions are carried out reliability. *The reliability test of HOTS questions on each question type is carried out with the help of the SPSS 24 for Windows program.* The results of the analysis showed that the Cronbach alpha value of multiple-choice type questions was 0.723 and essay-type questions were 0.736 so that they were categorized as having good reliability. The differentiation of the question items is determined based on the discriminant index formula which is then categorized according to the criteria. The power test of the difference in question items is carried out with the help of the Microsoft Excel program. The results of the analysis showed that as many as 20 points of multiple-choice questions and 8 items of essay questions had differentiation power with excellent categories. Therefore, these two types of questions can be used to distinguish highly capable learners from low-ability learners. The difficulty level of the question item is determined based on the difficulty level index formula which is then categorized based on the criteria. The difficulty test of the question items is carried out with the help of the Microsoft Excel program. The results of the analysis showed that as many as 20 points of multiple-choice questions had a medium level of difficulty. While in the essay questions there is 1 question item that is categorized as easy and 7 question items that are categorized as medium.

Discussion

The study implements three stages of the ADDIE development model. The first stage is analysis which is a form of observation to identify and explore information about problems that arise. Based on the results of observations, information was obtained that teachers rarely implement HOTS-based questions as an evaluation in chemistry learning, especially in reaction rate topic. The questions given as learning evaluations are only limited to low cognitive levels (Low Order Thinking Skills) C1-C3. Furthermore, students also experience difficulties in solving the problems given by the teacher. This is due to the unfamiliarity of students to practice doing HOTS-based questions. In addition, the learning resources used are less facilitating learners to think at a high level. Therefore, the development of HOTS-based assessment instruments can be an alternative in solving these problems.

The second stage is a design that is an activity to design and compile indicators of competency achievement and indicators of question items based on basic competencies (KD). The indicators that have been prepared are consulted to expert lecturers which are then developed into HOTS-based assessment questions. The third stage is development which is the core stage of the preparation of the question instrument. The question instrument that has been developed is then validated by two chemistry teachers at one of the senior high schools in Malang City who have more than 10 years of teaching experience. Several revisions were made to the question item after getting advice from validators. The next process is carried out empirical validation aimed at students of class XII who have obtained reaction rate topic. The data obtained from the answers of students are then analyzed to test validity, reliability, difference, and the level of difficulty. A good assessment instrument must fullfill five important aspects, namely validity, reliability, objectivity, practical, and economical (Arikunto, 2015; Laliyo et al., 2019). The HOTS-based assessment instrument that has been developed meets these five aspects. The validity of the question item shows that 20 questions are declared valid that the r_{count} value ≥ r_{table} so that it can be used to measure what is to be measured. This is in line with previous research which shows that questions that can be used as an instrument for assessment and collection of research data, one of which is to meet valid categories (Rintayati et al., 2020; Hairida, 2017). In this study, only valid questions can be tested for reliability. The reliability of the questions is categorized as high with a cronbach alpha value above 0.60 in both types of questions so that it has good consistency to obtain data with the same results. This is in accordance with the results of previous studies which show that reliable assessment instruments can be used to collect research data continuously (Danczak et al., 2020). Based on this information, it can be interpreted that validity and reliability are basic aspects that must be met in developing an assessment instrument that can

be used to measure research variables. The differentiability of the question item shows the level of ability of the question instrument in distinguishing highly capable learners from low-ability learners (Sugiyono, 2017; Widyaningsih et al., 2021). Based on the results of data processing, all multiple-choice questions and essays have a very high differentiation power so that they can function properly as a measurement instrument. The difficulty level of the question items interprets that each question item has a level of difficulty or ease for students to answer.

The results of data processing showed that 20 questions (100%) of multiple choice questions had a moderate level of difficulty, while in essay questions, 1 question item (12.5%) was categorized as easy and 7 question items (87.5%) were categorized as medium. HOTS-based assessment instruments in the form of essays developed also have advantages that can stimulate students to think more comprehensively and deeply. Based on the results of the HOTS-based assessment instrument that has been developed, it can be interpreted to meet the categories of content validity and empirical validity in accordance with the existing theoretical framework. Assessment instruments are very important in learning because they can be used as a benchmark for learning outcomes. In learning activities, question instruments are important things needed by teachers to measure the extent of students' ability to understand chemistry learning topic. So far, conditions on the ground show that the majority of learning evaluations conducted by teachers rarely integrate HOTS. Almost all question instruments used to evaluate LOTS-based learning (Ghani et al., 2017; Widiyawati et al., 2019). Therefore, learners cannot hone critical and creative thinking skills as an important aspect of 21st century skills to solve problems (Afandi et al., 2018; Ramdani et al., 2019; Redhana, 2019). The implication of this study is produce the question instruments developed can be used as evaluations in learning and research to measure the HOTS ability of students, especially in reaction rate topic. Students who are used to getting HOTS-based learning will be better prepared to face global challenges. HOTS is an important need as the focus of this 21st century learning. The HOTS question instrument that has been developed by researchers is expected to be applied to measure the HOTS ability of students, especially in the evaluation of chemistry learning of reaction rate topic. Furthermore, the HOTS-based assessment instrument that has been developed is expected to train students to be accustomed to critical and creative thinking in solving problems and preparing themselves for computer-based national exams. This research has limitations, one of which is this study only to the stage of development because it is only limited to measuring the level of validity and reliability of the questions developed. It is hoped that future research will be able to deepen development research related to higher order thinking skills (hots) test instruments.

4. CONCLUSION

Based on the results and research and discussion, it can be concluded that the question instruments developed meet the validity of the content and empirics. Content validation carried out by two expert validators informs that the question instrument has excellent quality with very good categories. The validity test results showed that 20 items of multiple choice questions and 8 items of essay questions were declared valid. Valid question instruments have high reliability with a moderate degree of difficulty and excellent differentiation in both multiple choice and essay questions. However, the development of this question instrument has limitations, namely that it is only implemented until the third stage of the ADDIE development model (development) so that the last two stages (implementation and evaluation) have not been applied.

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The Effect of Reciprocal Teaching Learning Model and Self-Concept on Reading Comprehension Ability

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ABSTRAK

Kemampuan membaca siswa di lapangan masih sangat memprihatinkan. Hal ini diperkuat dengan rendahnya kemampuan siswa dalam memahami materi atau soal yang membutuhkan keterampilan berpikir tingkat tinggi. Rendahnya kemampuan membaca pemahaman dapat dilihat dari rendahnya kemampuan literasi siswa berdasarkan pemeringkatan PISA. Penelitian ini bertujuan untuk menganalisis keefektifan model reciprocal teaching terhadap keterampilan membaca pemahaman siswa ditinjau dari tingkat konsep diri siswa. Pendekatan yang digunakan dalam penelitian ini adalah kuantitatif dengan metode eksperimen semu. Partisipan penelitian ini adalah 100 siswa sekolah dasar yang dibagi menjadi dua kelompok yang masing-masing terdiri dari 50 siswa dalam kelompok eksperimen dan kontrol. Data dikumpulkan melalui tes pemahaman bacaan dan observasi. Analisis data dilakukan dengan ANOVA dua arah. Hasil penelitian menunjukkan bahwa model Reciprocal Teaching memberikan kontribusi yang lebih signifikan terhadap keterampilan membaca pemahaman siswa dibandingkan dengan metode konvensional, terutama bagi siswa yang memiliki konsep diri rendah. Berdasarkan temuan di atas, disimpulkan bahwa model pembelajaran Reciprocal Teaching berpengaruh terhadap keterampilan membaca pemahaman siswa. Baik model pembelajaran resiprokal maupun konvensional memiliki pengaruh yang sama terhadap siswa yang memiliki konsep diri tinggi. Implikasi dari penelitian ini adalah guru harus memilih model pembelajaran yang dapat mengakomodir semua siswa, tidak hanya siswa dengan kemampuan akademik tinggi, tetapi juga siswa dengan kemampuan akademik rendah.

ABSTRACT

The reading ability of students in the field is still very worrying. This is reinforced by the low ability of students to understand material or questions that require higher-order thinking skills. The low reading comprehension ability can be seen from the low literacy ability of students based on PISA rankings. This study aims to analyze the effectiveness of the reciprocal teaching model on students' reading comprehension skills in terms of students' self-concept levels. The approach used in this research is quantitative with a quasi-experimental method. The participants of this study were 100 elementary school students who were divided into two groups of 50 students each in the experimental and control groups. Data was collected through reading comprehension tests and observations. Data analysis was performed by two-way ANOVA. The results showed that the Reciprocal Teaching model gave a more significant contribution to students' reading comprehension skills compared to conventional methods, especially for students who had low self-concept. Based on the findings above, it is concluded that the Reciprocal Teaching learning model has an effect on students' reading comprehension skills. Both reciprocal and conventional learning models have the same effect on students who have high self-concept. The implication of this research is that teachers must choose a learning model that can accommodate all students, not only students with high academic abilities, but also students with low academic abilities.

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1. INTRODUCTION

One aspect of language skills that is the main foundation of students in accessing information is reading ability. The reading ability of our students in the field is still very worrying. This is reinforced by the low ability of students to understand material or questions that require higher-order thinking skills. The questions and texts contained in PISA require high reading comprehension skills (Lin et al., 2021; Yousuf et al., 2021). The difficulty in obtaining this implied information is seen when students take the midterm and school exams. This phenomenon proves that students' reading comprehension skills are still low. Based on this phenomenon, reading comprehension skills are very important to be improved through various teaching models. Through the ability to read, students can access other academic abilities. Reading has a very strategic value in self-development (Bezerra et al., 2022; Samiei & Ebadi, 2021). By reading, we can expand our knowledge of the world. It was further revealed that reading will broaden horizons, enrich perspectives, sharpen thoughts and feelings, and gain provisions to navigate real life. Reading comprehension skills are very important because through reading comprehension skills students are able to understand questions that are at a high level. In addition, through reading comprehension, students can access a variety of information that requires higher-order thinking skills (Gottardo et al., 2018; D. Hadianto et al., 2021b). The basic competence is finding the main idea in the reading text. This means that students must be able to understand various written discourses through reading activities. However, in reality this cannot be implemented optimally. Based on the importance of understanding reading content in learning, various efforts have been made by the government. Efforts made by the government so far are through curriculum improvements. Indonesia's reading interest is lowest in Southeast Asia (Froiland & Davison, 2020; Wagner et al., 2021). The lack of students' understanding of the contents of the reading has an impact on the failure to take the national exam for Indonesian subjects. Failure to take the national exam in the Indonesian language field can be caused by several other factors that are chain in nature. So that there are still many students who have difficulty in understanding a reading text, so this is a problem that needs to be solved. The low reading ability of these students is reinforced by the literacy rating of the State of Indonesia which is still below. The low PISA literacy rating in Indonesia is the low reading comprehension ability of students because the majority of students fail to understand the instructions or questions given through PISA questions (D. Hadianto et al., 2021a; Young et al., 2019). This indicates that the reading teaching model used by the school is not optimal. Therefore, an appropriate teaching model is needed so that students' reading comprehension skills are optimally encouraged.

One of the teaching models that can be used to improve students' reading comprehension skills is the reciprocal teaching model. The reciprocal teaching model is one of the teaching models that emphasize reading comprehension. The reciprocal teaching model refers to learning activities that occur in the form of dialogue between teachers and students regarding reading texts (Wulfemeyer, 2019; Zhao et al., 2022). This reciprocal teaching model also provides opportunities for students to convey information to other students related to the summary they have made. This dual role is useful because it allows students to gain understanding, both from their role as recipients of information and as people who convey information. There are four stages involved in the reciprocal teaching model, namely summarizing, asking, predicting, and clarifying. The stages in the reciprocal teaching model are expected to be able to improve students' ability to understand reading content. The reciprocal teaching model emphasizes students to work in groups that are formed in such a way that each member can communicate comfortably in expressing opinions or asking questions in order to exchange experiences of learning success with each other (Hiebert & Daniel, 2019; Soto et al., 2019).

The reciprocal teaching model not only helps to understand reading but also provides opportunities for students to monitor their own learning and thinking processes. The purpose of the reciprocal teaching model is to make it easier for students to communicate and help each other in their respective groups in understanding the text or reading given by the teacher. The structure of dialogue and interaction between groups in the learning process requires the participation of all students in fostering healthy competitive relationships so that they can help create a conducive learning atmosphere. Student participation in learning can include: (1) commenting on other students' summaries, (2) asking questions that have been made to other students, (3) providing comments on other students' answers, (4) asking for clarification of material that is not understood, 5) helps resolve misunderstandings. The reciprocal teaching model is a teaching procedure or approach designed to teach students about cognitive strategies and to help students understand reading well (Muijselaar et al., 2017; Ozturk, 2017; Taşçı & Turan, 2021). Academic self-concept is a factor that affects the learning process (learning model) and has an impact on student learning outcomes. Self-concept is the image that a person has of himself. Self-concept includes physical self-image and psychological self-image (Gubbels et al., 2020; Ha, 2021). A person's physical image is usually formed first and is related to physical appearance, attractiveness, suitability and incompatibility with gender. Psychological self-image is based on thoughts, feelings, and emotions. Self-

image consists of qualities and abilities that affect life adjustments. These traits include courage, honesty, independence, discipline, and trust (Ricchiardi & Emanuel, 2018; Shaari et al., 2019). Therefore, students' academic self-concept is considered to have an important role in learning reading comprehension. Starting from the description above, it is necessary to try the application of the reciprocal teaching learning model. This study is very important to determine the characteristics of the learning model that is able to accommodate low and high academic abilities. Basically, the learning model must not only be able to accommodate high academic abilities, but also must be able to accommodate low academic abilities.

Several previous studies that raised the ability to read comprehension include the role of metacognition in reading comprehension. This metacognition instruction is able to optimize students' understanding of the reading content because it is guided by questions that reveal the content of the text (Wulfemeyer, 2019). Another study that tested the cooperative script method to improve reading comprehension skills was proven to be effective in improving reading comprehension skills (Tarchi, 2017; Zhao et al., 2022). In addition, another study that used the PQRST (Preview, Question, Read, Summarize) method to improve reading comprehension skills was proven to have a significant contribution to students' reading skills. Improved reading skills through this method because students are given the opportunity to elaborate on the content of the text through the stages of preview, questioning, independent reading, and summarizing (Hayashi et al., 2018; Susantini et al., 2021). These various models have proven to be effective in improving reading comprehension skills. However, the previous research has not accommodated the characteristics of students who have diverse academic abilities.

The difference between this study and previous research is to test the effectiveness of the reciprocal teaching model in improving reading comprehension skills in terms of students' self-concept skills. So, the difference lies not only in the model used but also in the student's academic self-concept variable which will be very useful to see the role of the reciprocal teaching model in involving students with low and high academic self-concept abilities. The purpose of this study was to examine the reciprocal teaching model in terms of students' academic self-concepts. Through this research it is seen whether this model is able to accommodate students with low and high academic abilities or not. The purpose of this research is to study the effect of reciprocal teaching model and academic self-concept on students' reading comprehension skills.

2. METHOD

This study uses a quantitative approach with a quasi-experimental design. The sample of this study was students in grades 5-6 at the elementary school level, totaling 100 students with 50 experimental groups and 50 control groups respectively. Class samples were taken randomly. This study aims to determine the effect of the reciprocal teaching learning model on reading comprehension by manipulating the independent variables, namely the reciprocal teaching learning model and students' self-concept, while the dependent variable is students' reading comprehension ability. The quasi-experimental design used in this study was the Non-Equivalent Post Test Control Group Design. Hypothesis testing was carried out using a two-way ANOVA test.

The instruments used in this study were reading comprehension tests, and reciprocal teaching assessment observations to determine self-concept skills. The validity and reliability of the instrument used empirical tests and expert judgment. Based on the test results, the instrument meets the criteria for use. Students who have a high self-concept have signs, including: (1) he believes in his ability to solve problems, (2) he feels equal to others, (3) he realizes that everyone has feelings, desires, and behaviors that are different from others, and (4) he is able to improve himself and try to change it. The reading comprehension test is carried out through multiple choice questions using a cognitive level that is in the higher-order thinking area. Assessment of self-concept researchers used a Likert scale with points (1-5) and observation to see their own ability to measure their own abilities. The results of this self-concept observation will be used to confirm the results of their reading comprehension abilities whether they are in line or contradictory.

Students are instructed to understand the reading through cognitive strategies. Students are asked to read a discourse, during which they learn and practice four comprehension strategies, namely: summarizing, formulating questions, explaining difficult words or discourse content, predicting, and clarifying. Through summarizing students gain a learning experience to identify important information, themes, and ideas in reading texts and integrate them into concise statements. At the question stage, students learn to make questions based on the summary they made. Next, the third phase is prediction in which students combine previous knowledge with new knowledge they gain from reading texts to answer questions made and teacher questions. The last stage, students conduct discussions to clarify the material that has not been understood and present their work in front of the class. Data analysis was carried out by

confirming the results of the self-concept assessment with the results of the reading comprehension test. Students who have good self-concept are separated and compared with the reading ability test. Then, data analysis was carried out through a two-way ANOVA test to see the effect of the reciprocal teaching model on reading comprehension ability and how it relates to students' self-concept.

3. RESULT AND DISCUSSION

Result

Based on the results of the calculation of central tendency includes: mean, median, and calculation of dispersion, namely the standard deviation for the six data groups. It can be presented in Table 1.

Table 1. ANOVA Test Results for Reading Comprehension Levels, Self-Concept, and Learning Models

	Reciprocal Teaching	Conventional	High self-concept X Reciprocal Teaching	Low self-concept X Reciprocal Teaching	High self concept X Conventional	Low self concept X Conventional
Average	65.53	60.45	69.56	65.45	61.32	56.56
Median	67.35	61.23	73	63.53	60.22	56.45
Standard deviation	11.64	12.14	14.23	9.55	7.78	9.35
Variance	98.765	76.145	181.13	83.64	55.35	62.64
Maximum score	82.04	84.61	86.14	81.34	73.45	76.22
Minimum score	42.12	42.65	41.23	54.52	53.45	41.45

Base on Table 1, the results of the calculation of the two-way analysis of variance regarding the differences in students' reading comprehension who followed the reciprocal teaching learning model with the conventional learning model resulted in F = 6.465 ($p < 0.05$). Thus, the null hypothesis is rejected. In other words, the alternative hypothesis which reads "there is a difference in reading comprehension between students who follow the reciprocal teaching learning model and students who follow the conventional learning model" is accepted at a significance level of 5%. When explored further, the reading comprehension of students who took reciprocal teaching (experimental class) was on average 65.53 with a standard deviation of 11.64 better than students who took conventional learning with an average of 60.45 with a standard deviation of 9 ,35. To find out the difference in reading comprehension of students who have high academic self-concepts who follow the reciprocal teaching learning model and students who have high self-concepts who follow conventional learning models, it is tested with the F-test. Fcount = 1.576, the significance is greater than 0.05. This means that for the group of students who have high self-concept, their reading comprehension is not significantly different either following the reciprocal teaching learning model or the conventional model at a significance level of 5%. However, when explored further based on the mean (mean) and standard deviation (SD), it turns out that the group of students who have high self-concept who follow the reciprocal teaching learning model averages 69.56 with a standard deviation of 12.14 which is better than the group of students who following the conventional learning model with an average of 61.32 with a standard deviation of 7.78.

The results of the F test resulted in Fcount = 4.643, in fact the significance was smaller than 0.05. This means that for groups of students who have low self-concept, their reading comprehension is significantly different between those who follow the reciprocal teaching learning model and those who follow the conventional model at a significance level of 5%. If further traced based on the average (mean) and standard deviation (SD), it turns out that the group of students who have low academic self-concepts who follow the reciprocal teaching learning model have an average of 65.45 with a standard deviation of 9.55, which is better than the group of students. It follows the conventional learning model with an average of 56.56 with a standard deviation of 9.35. From the results of the two-way ANOVA calculation, F = 0.132 ($p > 0.05$) for a significance level of 0.05. Because the results of the analysis show that the significance is 0.865 > 0.05, it means that the null hypothesis is accepted. In other words, the alternative hypothesis which reads that there is an interaction between the learning model and the academic self-concept on reading comprehension is rejected. That is, the reciprocal teaching learning model is suitable for both high self-concept and low self-concept. Based on the results of data analysis, it has been proven that there are differences in reading comprehension of students who follow the reciprocal teaching learning model and those who follow the conventional learning model. This is indicated by the results of

ANOVA with an FA value of 6.476 ($p<0.05$), which was significant. From the application of the two models, different results were obtained at a significance level of 5%. The average reading comprehension score of students who follow the reciprocal teaching learning model is 65.53 with a standard deviation of 11.64, which is better than students who take conventional learning with an average reading comprehension score of 60.45 with 10.14 degrees of freedom. Through the application of the reciprocal teaching learning model, students are invited to understand reading through cognitive strategies. Students are asked to read a discourse, during that reading they learn and practice four comprehension strategies, namely: summarizing, formulating questions, explaining difficult words or discourse content, predicting, and clarifying. Through summarizing students gain learning experiences to identify important information, themes, and ideas in reading texts and integrate them into concise statements. In the question phase, students learn to make questions based on the summary they made. Next, the third phase is prediction in which students combine their prior knowledge with new knowledge they gain from the reading text to answer the questions made and the teacher's questions. The last phase, students conduct discussions to clarify the material that has not been understood and present their work in front of the class.

The results of the hypothesis test turned out to be Ho which reads "there is no difference in reading comprehension, students who have high academic self-concepts who follow the reciprocal teaching learning model and the conventional learning model" are accepted. This is indicated by the ANOVA results obtained by the value of $F = 1.587$ ($p>0.05$), which means it is not significant at the 5% significance level. Thus, it can be said that there is no difference in reading comprehension of students who have high academic self-concepts who follow the reciprocal teaching learning model and the conventional learning model. These results indicate that for the group of students who have high academic self-concept, students' reading comprehension is not significantly different at the 5% significance level for the two learning models. That is, for groups of students with high self-concept, both the reciprocal teaching learning model and the conventional learning model are both suitable to be applied.

The result of Ho's hypothesis test which reads "there is no difference in reading comprehension of students who have low academic self-concepts who follow the reciprocal teaching learning model and the conventional learning model" is rejected. These results are indicated by the ANOVA results obtained by the value of $F = 5.464$ ($p <0.05$) which means it is significant at the 5% significance level. Thus, it can be said that there are differences in reading comprehension of students who have low academic self-concepts who follow the reciprocal teaching learning model and the conventional learning model. These results indicate that for the group of students who have low academic self-concept, students' reading comprehension differs significantly at the 5% significance level for the two learning models. That is, for groups of students with low academic self-concept, the reciprocal teaching learning model is better than the conventional learning model. This can be seen from the average reading comprehension of students who study with the reciprocal teaching learning model of 65.45, which is greater than the group of students who study with the conventional learning model, which is 56.56.

Thus, if this model is applied to students who have low self-concept, of course over time they will be able to improve their self-concept. By increasing their self-concept, this will increase the suitability of the learning model with the students' self-concept so that their learning achievement including reading comprehension will be improved. From the hypothesis test 4 of this study, it turns out that there is no interaction between the learning model and students' self-concept on reading comprehension. This is evidenced by the results of ANOVA with an F value of 0.211 ($p>0.05$), which was not significant. The results also showed that the average reading comprehension of students for high self-concept was 69.56 who studied with the reciprocal teaching learning model (experimental class) was higher than students who studied with the conventional model (control class) which was 60.45. Likewise for the group of students with low self-concept, it turns out that the groups of students who study with the reciprocal teaching learning model have an average reading comprehension of 65.45 which is also higher than the average reading comprehension of students who study with the conventional learning model, which is 56.56.

Discussion

Based on the research results, it is clear that the reciprocal teaching learning model provides more opportunities for students to actively participate and practice their cognitive strategies in reading comprehension compared to the conventional model. This is in accordance with the opinion that the reciprocal teaching learning model is quite effective in helping students understand reading (Wulfemeyer, 2019; Zhao et al., 2022). The reciprocal teaching learning model has a dual role, namely as a recipient and a giver of information so as to enable students to get a better reading comprehension. Thus, it is natural that the results of this study indicate that the reading comprehension of students who take reciprocal

learning is better than students who take conventional learning. Through hypothesis testing there was no significant difference in students' reading comprehension taught by the reciprocal teaching learning model and the conventional learning model, judging from the average reading comprehension of students, it was found that the average reading comprehension of students taught by the reciprocal teaching learning model was higher compared to those who study with conventional learning models. This finding strengthens previous research that the reciprocal teaching model is able to improve the reading comprehension skills of low and high level students (Gubbels et al., 2020; Pacello, 2014; Silverman et al., 2015). This shows that the reciprocal teaching learning model is able to accommodate both students who have low and high academic self-concepts.

Students who have a low self-concept have characteristics including (1) he is very intolerant of the criticism he receives, he is easily angry. For this person correction is often seen as an attempt to bring him down, (2) he tends to avoid dialogue with various justifications or wrong logic, (3) he is very responsive to praise, for these people all complements that uphold his dignity always be the center of his attention, and (4) he will be pessimistic about competition and think he will be powerless to face competition. Students who have low self-concept tend to feel less confident in their abilities and pessimistic in doing a task, and students tend to be reluctant to express their ideas (Kane et al., 2014; LaRusso et al., 2016; Lyster et al., 2016). Although the group of students who have low academic self-concept has these characteristics, by applying the reciprocal teaching learning model it turns out that the reading comprehension results are better for the group of students with low academic self-concept compared to conventional learning models. This is in accordance with the theory that reading comprehension skills can be increased by a learning model that encourages active participation and encourages students' critical thinking skills (Meijer et al., 2013; Muijselaar et al., 2017; Ozturk, 2017).

Another finding in this study is that students who have low self-concept have relatively lower reading comprehension who study with the conventional model compared to the reciprocal teaching learning model (Froiland & Davison, 2020). From these findings, besides having advantages in improving students' reading comprehension skills, this model can help students develop self-confidence, so that students who have low self-concept will be able to improve their self-concept. This is because the reciprocal teaching learning model is a constructivism-based learning model. With this model, students learn to find their own knowledge and understanding, learn to construct knowledge and understanding, and learn to ask questions, express opinions with logical arguments, and be able to connect the understanding they have obtained with previous knowledge. In this learning model, learning is not only to know (learning to know), but also learning to find one's identity (learning to be). The findings of this study reinforce previous studies that a learning model that encourages students to be actively involved in the learning process will increase students' self-confidence (Gottardo et al., 2018; Justice et al., 2018). The findings on students who have high academic self-concept are students of this type can accept input and criticism which they consider logical and scientific. Based on the characteristics of these students, the learning model that is suitable for these students is a guided learning model that expects students' previous ideas, which are then linked to the experience gained in the learning process in accordance with the stages of reciprocal teaching, and later students are expected to find answers to questions through the same procedure clearly planned (Banks, 2012; Connor et al., 2018). Through the application of the reciprocal teaching learning model, students are required to be responsible for the learning process they undergo, and are directed not to always depend on the teacher. The reciprocal teaching learning model forms independent students who can continue the learning process in their life and career, so that there will be an increase in learning achievement, including an increase in reading comprehension. The characteristics of students who have a high self-concept as described previously are a necessary requirement in the application of the reciprocal teaching learning model, so that the demands in the application of the learning model are more easily carried out by students who have high self-esteem concepts, both reciprocal teaching learning models and conventional learning models.

Students with low academic self-concept abilities who study with the reciprocal teaching learning model are also superior in their reading comprehension compared to the group of students who study with the conventional model. Students who have low self-concept tend to feel less confident in their abilities and pessimistic in doing a task, and students tend to be reluctant to express their ideas. Based on the characteristics possessed by these students, the learning model that is more suitable for students who have low self-concept is the reciprocal teaching learning model because the reciprocal teaching learning model has more detailed stages, namely summarizing, asking questions, predicting, and clarifying (Daris Hadianto et al., 2022; Hiebert & Daniel, 2019; Soto et al., 2019). Compared to conventional learning, the stages are direct reading then followed by answering critical questions. Students who have low self-concept tend to follow what is given by the teacher without wanting to develop their ideas. Thus, it is natural that students' academic self-concept is low, reading comprehension is also lower for conventional

learning compared to reciprocal teaching. The results of this study are supported by research that most elementary school students have serious problems in reading (Foorman et al., 2020; Taşçı & Turan, 2021; Young et al., 2019). Furthermore, he said, after applying the reciprocal teaching model with small group work students can help students to develop students' metacognitive abilities, namely thinking about what students think such as reading and processing information.

The implications of this research provide an overview of the reciprocal teaching learning model that can be more effectively applied in improving students' reading comprehension, both for groups of students with high and low academic self-concept. From the presentation of the findings above, it can be concluded that the reciprocal teaching learning model is suitable for both groups, both students who have high self-concept and students who have low self-concept in improving students' reading comprehension. However, this research still has limitations. Therefore, it is hoped that future research will be able to further deepen and broaden the scope of research related to reciprocal teaching learning model and self-concept.

4. CONCLUSION

Based on the results of hypothesis testing as described above, it can be concluded that the learning model has an effect on reading comprehension. There are differences in reading comprehension between students who follow the reciprocal teaching learning model compared to those who follow the conventional learning model at elementary school level students. Reciprocal teaching learning can improve reading comprehension skills and help students develop comprehension monitoring skills. In this model, students and teachers exchange roles in working with reading texts, namely making questions, clarifying information, making predictions, and making conclusions.

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Knowledge and Thinking Skills in Li-Pro-GP Model of Instruction

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ABSTRAK

Survei dari beberapa penelitian tentang kemampuan literasi siswa Indonesia menunjukkan ketidaksesuaian dengan angka literasi Indonesia. Oleh karena itu, dapat dikatakan bahwa sebagian besar masyarakat Indonesia sudah melek huruf dalam hal pendidikan. Meskipun demikian, kemampuan literasi mereka secara umum masih lemah. Selain itu, kemampuan literasi siswa yang rendah dianggap sebagai akibat rendahnya minat membaca. Sejumlah masalah dalam keterampilan membaca terkait erat dengan pengalaman dan praktik membaca yang terbatas. Penelitian ini bertujuan untuk mendeskripsikan pengetahuan dan keterampilan berpikir siswa dalam pembelajaran model Li-Pro-GP. Sintaks model pembelajaran ini adalah pembelajaran berbasis proyek yang terintegrasi dengan program Gerakan Literasi Sekolah (GLS) dan Penguatan Pendidikan Karakter (PPK). Penelitian ini termasuk dalam model penelitian deskriptif. Subyek penelitian, siswa kelas tujuh mengikuti pembelajaran IPA. Data penelitian dianalisis secara deskriptif yang menunjukkan adanya peningkatan pengetahuan dan keterampilan berpikir di kalangan siswa. Selain itu, tingkat penggunaan bahasa tertinggi ditemukan pada tes untuk Aspek C2, C4, C5, dan C6, sedangkan tingkat kebenaran konseptual tertinggi ditunjukkan pada Aspek C3. Sebaliknya, tingkat pemberian argumentasi yang paling rendah tampak pada semua aspek. Singkatnya, tingkat keterampilan tertinggi ditunjukkan oleh penggunaan bahasa, sedangkan yang terendah pada kepercayaan diri siswa dalam memberikan argumentasi.

ABSTRACT

Surveys from some research on Indonesian student's literacy skills showed irregularity with Indonesia's literacy rate. Therefore, it can be said that most of Indonesians have already been literate, in terms of education. Nonetheless, their literacy skills in common still remains weak. Moreover, student's low literacy skills are deemed as the result of low interest at reading. A number of problems in reading skill is closely associated with limited reading experiences and practices. The current research aims to describe student's knowledge and thinking skills in a Li-Pro-GP model of instruction. The syntax of this learning model is project-based learning that is integrated with the School Literacy Movement (SLM) and Character Education Reinforcement (CER) programs. The research fell into a descriptive research model. Research subjects, seventh graders attending IPA instructions. Data of the research were analyzed descriptively, which indicated improvement in terms of knowledge and thinking skills amidst students. In addition, the highest level of language use was found at the test for Aspect C2, C4, C5, and C6, whilst the highest level of conceptual truth was indicated at Aspect C3. On the other hand, the lowest level of giving argumentation appeared at all aspects. In sum, the highest level of skills was indicated by the language use, while the lowest at the student's confidence in giving argumentation.

1. INTRODUCTION

Massive changes and transformation have remarked life in the 21st Century, going from agrarian to industrial societies. It, furthermore, continues and drives the societies well-knowledgeable, with high

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demands of good and outstanding skills in some crucial life aspects, i.e., problem-solving, critical-thinking, teamworking, and adaptability to new things (Pantiwati et al., 2020; Tuan Soh et al., 2010). One of key successes to facing challenges in the current century is science literacy. Those equipped with science literacy are able to use any scientific information they obtain in order to solve problems of life and to create a number of meaningful scientific products (Junika et al., 2020; Nofiana & Julianto, 2017). According to a study from *Program for International Student Assessment* (PISA) 2018 released on Tuesday, December 3 2019, it was shown that Indonesia's position downgraded in comparison to that of in 2015. The country was ranked 74 in terms of literacy, and 71 for science category out of 79 countries involved (Chamisah, 2017; Hewi & Shaleh, 2020). It is certain that education of a nation cannot be fully determined by an international test only. In fact, reality shows different cases in which many of students still cannot adequately meet the international criteria (Hartini et al., 2018; Mevarech & Fan, 2018). This fact corresponds to a notion declared by the Minister of Education, Nadiem Anwar Makarim, who considers PISA's assessment results as meaningful inputs to evaluate and improve the education quality in Indonesia, which actually becomes one of the National Plans for the five coming years, with strong emphasis on improving the quality in response to any challenges in the 21st Century.

Literacy is not only all about reading and writing, but also about how to obtain information from what is being read and how it ends up as a good summary. This kind of literacy applies to schools whose priority is to make students well-knowledgeable. Moreover, science literacy requires students to make use of scientific information, to identify questions, and to provide scientific evidences based upon conclusion so that the information remains understandable and can help formulate good summary about the nature and its changes due to human activities (Nofiana & Julianto, 2017; Wibayanti et al., 2020). According to previous study there are some factors causing low student's science mastery as a way of investigating, namely that: students rarely do experimental activities; students cannot understand specific terms when investigating things (i.e., independent and dependent variables); and students tend to spend more times to study science by repetitive method (Suryani et al., 2016). Surveys from some research on Indonesian student's literacy skills showed irregularity with Indonesia's literacy rate (Megawati & Sutarto, 2021; Samrin, 2016). Therefore, it can be said that most of Indonesians have already been literate, in terms of education. Nonetheless, their literacy skills in common still remains weak. Talking about solutions for reading ability problems, the Ministry of Education and Culture of Indonesia designs a School Literacy program (SLM) in order to improve student's literacy level (Munawaroh et al., 2018; Srirahayu et al., 2021). In addition to possessing literacy skills, one of several curriculum demands is designing the 21st Century model of instructions with the core on knowledge skill. In general, knowledge is referred to information owned by one in specific areas. Meanwhile, knowledge skill is commonly associated with cognition, which is mostly intertwined with ways how one is thinking when dealing with problems or trying to find solutions for them. In fact, cognitive skill is also set as a parameter to identify student's learning outcomes, especially by means of tests (Nabilah et al., 2020; E. Y. Wijaya et al., 2016). Basically, ones will be considered genius once they are able to perceive particular phenomena from different perspectives. Not only does knowledge define the individuals' cognitive skill, but their ways of communicating their opinions also matter. One of the most common obstacles that frequently appears in the 2013 Curriculum instructions is that students are less active at expressing their ideas (Khalamah, 2017; Maunah, 2016; Rohendi, 2010). Some factors are assumed to be causes of this occurrence, such as shyness, anxiety when interacting with other people, low confidence level, low degree of understandability about materials, and low student's participation during the instructions (Idrus, 2009; Syarifudin & Sulistyaningrum, 2015).

One of possible solutions in response to the abovementioned issue is to find out and implement a suitable model of instruction. An eloquent model of instruction will not only be useful for students, but also teachers in the creation of class culture that leads to tendency, sensitivity, and capability to take further and more flexible actions (Agustin & Cahyono, 2017; M. H. Hidayat et al., 2018; Insyasiska et al., 2015). Li-Pro-GP learning model stands for project-based model integrated with SLM and CER. In other words, such a model adopts the core syntax of project-based learning (Pantiwati et al., 2020; T. N. I. Sari et al., 2021). The model Li-Pro-GP, moreover, is also designed based upon project-based learning method through an integration with SLM activities in three main sections, i.e., habituation, development, and learning. The integration is carried out based on the key components of CER, manifested as the character reinforcement on five-character values, including nationalism, independency, collaboration, integrity, and religiousness. Meanwhile, topics to discuss can cover health, natural resources, environmental quality, natural disasters, and technological science. Referring to the policy that applies today, teachers are strongly required to be beyond creative. Thus, schools are prepared with the policy to rule this kind of model, and are set to form a Literacy Task-Force Furthermore, some studies have demonstrated that one of several models of instructions considered effective to meet the 21st Century instructional requirements

is Project-Based Learning (PjBL). Using the model, students are allowed to have more chances to express their creativities in making use of existing sources and revising how they are supposed to work, which is so uncommonly found in models other than this (Batubara & Ariani, 2018; Mutakinati et al., 2018). Project-Based Learning model constitutes one of numerous approaches that provide students with supportive learning atmosphere that can help them acquire knowledge and other personal skills (Redhana, 2019; Wahyuni, 2021). Two of several must-have skills for humans were integrity and communication Use of project-based learning in Li-Pro-GP model is expected to improve instructional quality that leads to student's further cognitive development through student's involvement at complex problems (Hartono & Asiyah, 2018; Insyasiska et al., 2015). In addition to cognitive area, this kind of model is also expected to be able to enhance student's communicative competence, especially in a way of expressing ideas. Meanwhile, character education is set to be a basis to actualize quality future generation, not only intelligent and literate but also focused on moral building of the nation (Dalyono & Lestariningsih, 2020; Hartono & Asiyah, 2018; Insyasiska et al., 2015). After all, this Li-Pro-GP model is deemed to be effective in making students excellent in knowledge and enhancing their skills of expressing ideas and cherishing moral values.

CER designed by the Ministry of Education and Culture of the Republic of Indonesia in 2017 attempted to identify five core values that were integrated one with another in the construction of value networks, with some priorities in need of development, including: religiousness, independency, collaboration, and integrity (Khalamah, 2017; Komara, 2018). In addition, reinforcing character education becomes a basis to construct fundamental quality of a nation without neglecting any social values, like tolerance, collaboration, and respect. CER, furthermore, is an education movement to enhance personality through a series of processes, i.e., formation, transformation, transmission, and student's potential development by synchronized spirits (ethical and spiritual concerns), affection (aesthetics), thinking (literacy and numeracy), and physical education (kinesthetics) based upon the life philosophy of Pancasila. For those reasons, collaboration among schools, local communities, and families is highly needed as a fundamental basis to carry out National Mental Revolution Movement (NMRM). In respect to aforesaid points, this research aims needed to investigate knowledge and thinking skills in the Li-Pro-GP model of instruction (Project-Based Literacy Integrated with School Literacy Program).

2. METHOD

The current research was designed using descriptive-qualitative research model conducted in SMP Al Ma'arif Singosari, Malang Regency in academic year of 2020/2021. The instructions were focused on two basic competences on analyzing environmental pollution and its impacts to the ecosystem and the skill domain. Each of the competences was completed with indicators based on related aspects and levels, whilst the instructions were designed using a model of Li-Pro-GP syntax. Population of the research consisted of students in VII A class of SMP Al Ma'arif Singosari. Meanwhile, sample comprised 20 students who attended Scienceinstruction. Sampling technique purposive sampling was used to determine the research sample. Basically, the technique constitutes a specific technique with particular considerations. In this case, it was considered that students in VII A class were those who still needed literacy management following their thinking skill, academic achievements, and character considered low in level.

The data collection technique used to collect cognitive ability data uses essay questions according to Bloom's taxonomy starting from the ability to understand (C2), apply (C3), analyze (C4), evaluate (C5) and create (C6). Meanwhile, students' thinking skills are given through retelling tasks recorded on video. Furthermore, the video recordings were analyzed with reference to indicator, to name: giving response, accent, vocabulary, fluency, bravery, ethics, and linkage of ideas measured by means of rubrics once students were working on the pre- and post-tests. Object of the current research was set on the student's knowledge and thinking skills. In practice, pre-test was a procedure of assessment before implementing the Li-Pro-GP model, while the post-test after the model was applied in the instruction. Data of assessment results on the student's knowledge and thinking skills were analyzed using a descriptive method through interpretation and elaboration. Further, data analysis technique used for a qualitative analysis procedure included four main phases, i.e., data collection, data reduction, data display, and conclusion or verification.

3. RESULT AND DISCUSSION

Result

Sorted from the highest to lowest achievement indicators, students' answers were indicated by following aspects, i.e., language use skill, good flow of thinking, answer specification, conceptual truth, answer linkage, and argumentation skill Figure 1.

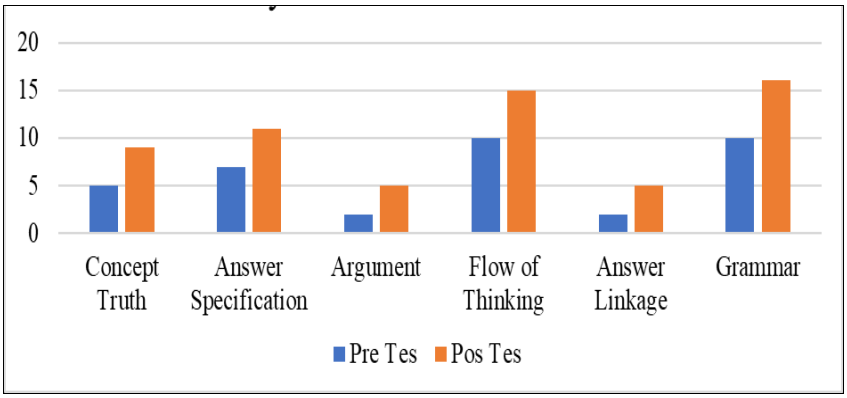

Figure 1. Graph of Matching Answers to Criterion One

Base on Figure 1, those indicators improved before and after the implementation of the Li-Pro-GP model. Criteria of thinking flow were associated with how students thinking process were, encompassing their intellectual skills that covered remembering, understanding, and processing information once they attended the instructions. In addition, student's thinking skill varied based on student's cognitive state. The results of the study on students' knowledge abilities were measured using essay questions at the cognitive level of C2 or understanding *as show in* Table 1.

Table 1. Results of Analysis of Answers to Characteristic One Questions

Aspect	Question Criteria	Answer Characteristics
C2. Understand	Requires students to understand concepts that are measured by providing explanations based on theories or concepts correctly about maintaining water quality	No. All concepts are correct, quite clear, but not yet specific, no. All descriptions of answers are correct, not yet supported by strong reasons so that the arguments have not been explained. The flow of thinking is good, not all concepts are related, not yet integrated, Grammar is quite good and correct, not all aspects are visible, the evidence is quite good and not balanced

As show in Table 1, it showed that the characteristics of students' answers were not all of the concepts written by students were correct but the concepts written were quite clear. However, the concepts written are not yet specific to the topic in question and the concepts written do not have any connection with other concepts. So that the written concepts do not yet have a coherence with other concepts. Figure 2 demonstrated the result of students' answers for the question of Aspect C3 (implementing).

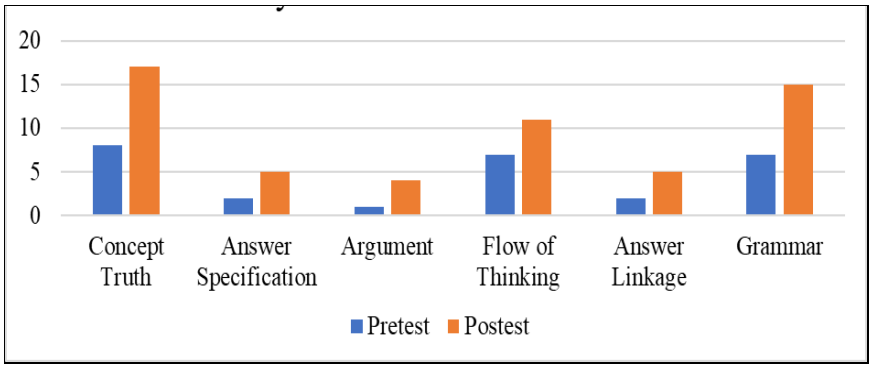

Figure 2. Graph of Matching Answers to Criterion Two

This sort of question also fell into a cognitive test, which involved use of procedural knowledge. Using this question, students would be more directed to their sensitivity in implementing or using a certain procedure for a certain situation. It was indicated by the question in which students were requiredto be able to find the best solution for environmental pollution issues in the real life. Students' answers for the question on Aspect C3 show in Table 2.

Table 2. Results of Analysis of Answers to Characteristic Two Questions

Aspect	Question Criteria	Answer Characteristics
C3. Applay	Requires students to understand the concept and be able to solve a pollution problem and be able to apply it in daily life	All concepts are correct, clear, but not yet specific. All descriptions of answers are correct, but have not been supported by strong reasons. The argument has not been explained, the flow of thinking is good, all concepts are interrelated, but not yet integrated. Grammar is quite good and correct, but not all aspects are visible, the evidence is quite good and not balanced

Based on Table 2, the order from highest to lowest, students' answers for the question on Aspect C3 encompassed conceptual truth, language use, thinking flow, answer specification, and argumentation. With reference to the scores, students appeared to improve, in terms of knowledge, before and after the Li-Pro-GP instruction was applied. To be more specific, conceptual truth referred to a state in which students had been able to communicate a concept based on the convention that applied, mainly about environmental pollution. In addition, the lowest criterion happened to the argumentation skill, which was closely interlinked to ways students were expressing opinions. Figure 3 indicated the students' answers on Question for Aspect C4.

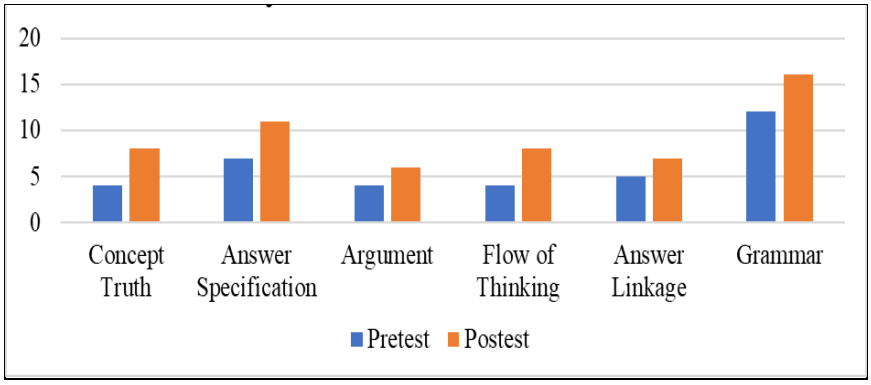

Figure 3. Graph of Matching Answers to Criterion Three

Base on Figure 3, the highest score was found at the student's ability to use proper language, while the lowest at argumentation. This finding was relatively similar with those indicating Aspect C2, C3, C4, C5, and C6. Second rank was linked to answer specification, followed by conceptual truth at third, thinking flow at fourth, and answer linkage at fifth. Basically, student's skills for those six indicators improved after the Li-Pro-GP was applied. Question for Aspect C4 (analyzing) was categorized as a cognitive test as well, which included student's analysis skill as show in Table 3.

Table 1. Results of the Analysis of Answers to the Three Characteristics Questions

Aspect	Question Criteria	Answer Characteristics
C4 Analyze	Students are required to analyze waste management problems by providing descriptions and studies and solutions to waste problems	No. All concepts are correct, not yet clear, not yet specific. All descriptions of answers are correct, have not been supported by strong reasons, correct, the arguments have not been explained. The flow of thinking is good, all concepts are interrelated, not yet integrated, Grammar is quite good and correct, not all aspects are visible, the evidence is quite good and not balanced

Base on Table 3, this sort of question was associated with elaborating certain problems and interaction among their constructive and primary elements. In this case, students were required to analyze a specific problem in relation to waste while finding out the best solution for the problem. Ones with inability to analyze problems would not be able to solve the problems really well, let alone to find solutions for them. Figure 4 shows students' answers to the ability to analyze or C4.

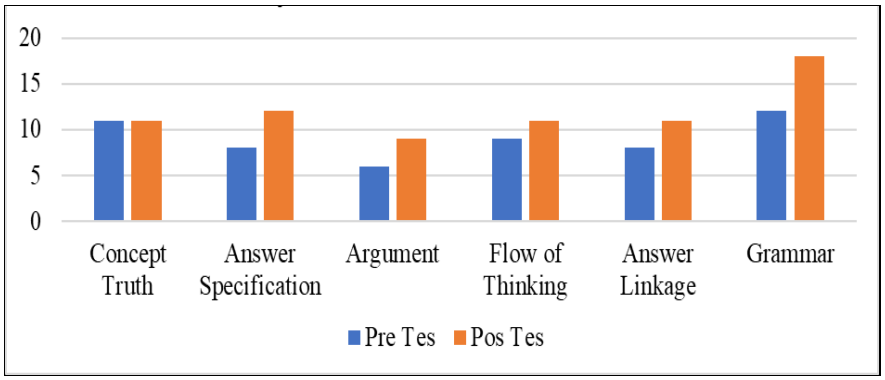

Figure 4. Graph of Matching Answers to Criterion Four

Base on Figure 4 show the results of the analysis showed that the highest score was found in students' ability to use appropriate language, while the lowest was in argumentation or students' ability to present their opinions on the answer sheet. The second rank is associated with the specification of answers, followed by conceptual correctness in the third place, the flow of thinking in the fourth, and the relevance of the answers in the fifth. The ability to assess the level of knowledge is also measured using essay questions at the cognitive level of C5 or assessing is show in Table 4.

Table 2. Results of Analysis of Answers to Characteristics Questions Four

Aspect	Question Criteria	Answer Characteristics
C5 Evaluation	Students are required to be able to make an assessment of the practicum that has been done about water pollution	All concepts are correct, clear, but not yet specific, All descriptions of answers are correct, not supported by strong reasons, correct, arguments have not been explained, The flow of thinking is quite good, not all concepts are interrelated, not integrated, Grammar is quite good and correct, not yet All aspects are visible, the evidence is quite good and not balanced

Base on Table 4, it was found that the concept written by the student was correct but the student had not written down the strong reasons for what was described on the answer sheet. Some students are able to write the relationship between concepts, but some students still write the relationship between concepts. However, the use of students' grammar in writing answers is quite good even though there are some concepts that have not been integrated. Then the analysis of student's answers shown in Figure 5.

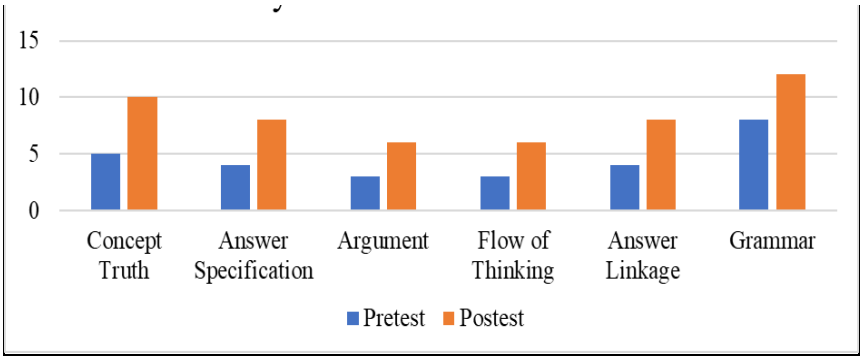

Figure 5. Graph of Matching Answers to Criterion Five

Base on Figure 5 show the highest score was found at language use skill, followed by conceptual truth at the second, answer specification third, answer linkage fourth, thinking flow fifth, and argumentation the lowest. In sum, after using the Li-pro-GP model, student's knowledge skill improved, especially in terms of creative skills. It was found that Question C6 constituted the highest type of cognitive test, which required students to have extra understanding when doing it. Cognitive ability to create (C6) is the highest level in the realm of knowledge as show in Table 5.

Table 3. The Results of the Analysis of Answers to the Five Characteristics Questions

Aspect	Question Criteria	Answer Characteristics
C6 Creative Skill	Students are required to be able to come up with ideas to help overcome environmental pollution problems based on the conditions of the environment around them	No. All concepts are correct, not yet clear, not yet specific, All descriptions of answers are not correct, not yet supported by strong reasons, correct, arguments have not been explained, Flow of thinking is quite good, not all concepts are interrelated, not yet integrated, Grammar is quite good and correct, Not all aspects are visible, the evidence is quite good and not balanced

Base on Table 5, in research students are required to be able to make ideas in overcoming problems of environmental pollution based on the conditions of the environment around them. The results show that students write for ideas in solving problems in the surrounding environment, but the opinions expressed by students are not yet all concepts are interrelated and integrated. Basically, thinking skill could be acquired by students through observation once they were involved at the Li-Pro-GP model of instruction. Further, there were a number of indicators in expressing ideas with reference, including (1) response selection, (2) accent, (3) vocabulary, (4) fluency, (5) bravery, (6) ethics in expressing ideas, and (7) linkage of ideas with the substances of discussion. Results of data processing and observation from the activities were presented in Figure 6.

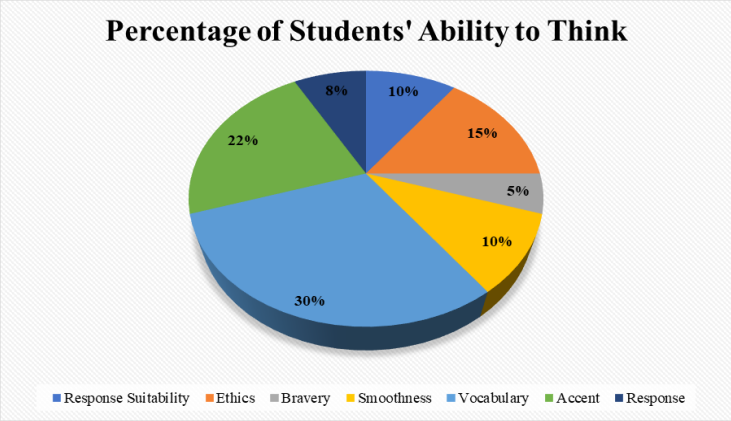

Figure 6. Student's Thinking Skill Diagram

Base on Figure 6 it know that when expressing argument, students critically evaluated, but were still less competent in selecting information. Students, further, were also not able yet to use information accurately, but still creative due to detailed elaboration they made based on their own thinking.

Discussion

CRH *Li-Pro-GP Model integrated*

Li-Pro-GP instructional model is a kind of project-based learning design that is associated with Science Literacy Movement (SLM) and Character Education Reinforcement (CER) Programs. This kind of model adopts the key syntax of Project-Based Learning Method (PjBL). Practically, the Li-Pro-GP model of instruction was integrated with character education and science literacy at schools (Pantiwati et al., 2020; T. N. I. Sari et al., 2021). Project-based learning is believed to be effective at provoking students to acquire new knowledge based on real and live experiences. By using this sort of model, students try to explore materials through various ways meaningful to them, and make some experimental activities collaboratively. Project-based learning model constitutes an in-depth investigation over a certain topic of real life, which is seen priceless for student's attention and attempts (Fatmah, 2021; Wahyuni, 2021). It is designed by following syntax of heterogeneous learning grouping and collaborative learning in the accomplishment of a project or discussion. One of the greatest expectations from such a model of learning is to make students excellent, not only in terms of cognition but also personal character. In addition to having good character, the model also pinpoints habituation upon literacy. It is because literacy has become one of a number of requirements students are supposed to possess in response to the 21st Century instructional model (Fajar et al., 2019; Suraya et al., 2019; Yusnaeni et al., 2016).

Student's Knowledge Skill

Question for Aspect C2 (understanding) was a cognitive test, which included student's understanding on conceptual context (Iskandar & Senam, 2015; Rosnawati, 2009). Question in this type was closely related to student's skill in constructing a concept of a certain topic, including spoken, written, and illustrated objects from teachers. In addition, the question also required students to understand a concept by giving explanation based on relevant theories about how to keep the water good in quality. Explanation should be consistent with the theories, which indicated that students, in this case, were strongly required to construct a new concept they had understood in advance. Moreover, students were supposed to be able to integrate new information into a scheme that existed in their mind (Effendi, 2017; Giani et al., 2015; Minarto, 2020). Without good understanding, one would be hard to construct a concept well The cognitive ability aspect of C3 in the research requires students to be able to understand the concept and be able to solve a pollution problem that is presented. Problem-solving, students were required to select which method or procedure was the most appropriate to be applied in solving environmental pollution issues. The issues were solved well only if the method or procedure applied was proper. In fact, most of students could not solve problems due to inappropriateness of method or procedure they chose (Barus & Hakim, 2020; D. W. Hidayat & Pujiastuti, 2019). This can be seen through argumentation skills in expressing ideas in essay tests on pollution problems. Argumentation basically comprises scientific foundation that serves to be an important evidence to communicate the information (Fatmawati et al., 2018; Ubaque Casallas & Pinilla Castellanos, 2016). Aspects of cognitive abilities C4 is the ability used to break down material into its constituent parts and determine the relationships between those parts and the relationship to the overall structure. The results showed that the student's C4 answer criteria, on the criteria for using language, got a high percentage. It focused on how Indonesian language was used correctly. Previous study state good language use made everything easy to be understood, especially in spoken and written forms (Faisal, 2008). In this research, student's language use was indicated based on how students could formulate their answers for the essay test, both before and after the Li-Pro-GP model was applied.

Next, Question for Aspect C5 was also a cognitive test as it involved skills of evaluating, assessing, giving argumentation, and recommending among students. The cognitive question C5 was associated with student's ability to make decision based on conventional criteria or standards (Erfan et al., 2020; P. A. Wijaya et al., 2019). In Question C5, students were required to give assessment on the practicum they had followed. In fact, student's assessment was in the form of responses to the practicum, either in terms of advantages or knowledge. In this case, students were fully allowed to assess the practicum based on their own perceptions. Previous study declared that Question C6 was a cognitive test that included creative skills (Himmah, 2019). In fact, Question C6 constituted the highest type of cognitive test, including three cognitive processes, i.e., formulating, planning, and producing. Formulating means making hypothesis. In the question, students were required to formulate an idea about how to solve environmental pollution, which was adapted from real life situation where they lived at. Question C6 was also closely associated with student's ability to integrate constructive elements and to create a new product (Giani et al., 2015; Yunita et al., 2017).

Holistically, the research indicated improvement in terms of knowledge, both before and after the implementation of Li-Pro-GP model. This was consistent with previous study, teaching upon this science literacy perspective, saying that the key component was seen relevant, and the relevant model for science teaching was based on relevance according to two perspectives (Holbrook & Rannikmae, 2009). Relevance from both perspectives was very much geared to the view that science literacy was best taught following a principle of 'education through science' instead of 'science through education. The average improvement was based on the five questions given, which was set to measure student's knowledge skill. Each of the questions was used to indicate conceptual truth, answer specification, argumentation, thinking flow, answer linkage, and language use. The Li-Pro-GP model of instruction was able to give different conceptual understanding of students before and after the instructions. It was because the model occupied the core syntax of project-based learning method (Pantiwati et al., 2022; T. N. I. Sari et al., 2021). Project-based learning, in essence, constitutes an instructional model that highlights autonomy, process as the key, and independent learning, and allows students to train their thinking skills (Jagantara et al., 2014; Rusminiati et al., 2015). Furthermore, according to previous study it is denoted that literacy can be seen as dependence on instruction so as to make the instructional quality a key to its success (Snow, 2006). This perception pinpoints developmental nature of literacy. A discussion on children with successive stages of literacy; at each of which reading and writing tasks are qualitatively changeable. Science literacy in student's knowledge skill contributed to student's ability to make use of scientific information, identify questions, and make conclusions based upon scientific evidences in the completion of questions given. Those series of stages were meant to measure student's conceptual understanding. In addition, the

concept of student's science literacy should be understandable, which allowed students to make decisions in relation to natural phenomena and changes based on real-life humans' activities (Nofiana & Julianto, 2017; Yuliati, 2017). In addition to science literacy, integration of SLM into this sort of instructional model appeared to influence student's knowledge skill. SLM had a set of regular activities, one of which was 15-minute reading session per day (Widayoko et al., 2018; Yunianika & Suratinah, 2019). Further, SLM also covered thinking skills based upon literacy stages and components, processing skills, and informational understanding during reading and writing.

Language use skill was shown to get the highest scores for Question C2, C4, C5, and C6. In fact, it became an elementary skill of communication and interaction that led to understanding on contents or materials students were learning. Previous study claims that constructing vocabulary mastery raises cognition and promotes knowledge of the world (Ipatenco, 2017). In contrast to it, argumentation got the lowest scores over all aspects. As a consequence, students were in need of intensive guidance to make them braver and more confident in giving argumentation. Finding on argumentation skill also confirmed that bravery became a problematic aspect. In addition, findings from other studies also revealed that argumentation outlining and peer assessment could promote learners' awareness and ability to engage in argumentation processes.

Student's Thinking Skill

Ones who could give opinion well were supposed to be able to give an impression that they knew much about what they were talking. In addition to giving opinion, they had to be able to speak clearly and accurately. The Li-Pro-GP model of instruction required students to always be active at every instructional session, while teachers were only to facilitate. This was in line with the core syntax of the model that pinpointed the spirit of project-based learning (Pantiwati et al., 2022, 2020; T. N. I. Sari et al., 2021). Project-based learning, in addition, influenced student's ability to speak up more. In such a mode, students were directly involved at a certain project more intensively so as to make them more informed and able to enhance their speaking skill, especially when giving opinions. Low student's ability to process effective words, develop and analyse certain problems, and logically and critically think could resist students to be active in sharing opinions at class (Regita et al., 2019; L. I. Sari et al., 2015). Previous study explained that low student's thinking skill could turn worse if it remained neglected and did not receive immediate responses (Syarifudin & Sulistyaningrum, 2015). It affected student's social interaction, at the end. For example, students could probably get hard in using good and well-structured language once they were to express their ideas in front of public. The implications of this study provide an overview related to the implementation of the Li-Pro-GP instruction model of Instruction Knowledge and Thinking Skills. The results of the research can at least be used as inspiration for similar research with a wider scope and more detail. However, this research has limitations, especially on research subjects which only involve students in class VII at one of the junior high schools, namely, SMP Al Ma'arif Singosari. Therefore, it is hoped that future research will be able to further deepen and broaden the scope of research related to the Li-Pro-GP instruction model.

4. CONCLUSION

The Li-Pro-GP model is basically a specific model of instruction that adopts the core of project-based learning through the integration of SLM, and encompassed three main stages, i.e., habituation, development, and learning. The integration was conducted based on the components of CER, including character reinforcement on five key characters, i.e., Nationalism, Independency, Collaboration, Integrity, and Religiousness; all of which were packed as CER movement. Further, existence of this Li-Pro-GP model of instruction indicated skill improvement at some extents, comprising conceptual truth, answer specification, argumentation, thinking flow, answer linkage, and language use. It was indicated that language use got the highest score based on Question C2, C4, C5, and C6. Meanwhile, for Question C3, the highest skill level fell on the conceptual truth. In addition, the lowest skill level among others was argumentation. Vocabulary mastery was found to be the highest skill achieved, while bravery still became the problematic one as it was the lowest.

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