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Development of a Socio-Scientific-Based Language Learning Model to Improve Argumentative Writing Skills in Senior High School

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ABSTRACT
This study is motivated by the low ability of students in writing argumentation in its elements. This can be seen from the assignment given that there is still a lack of connection between the substance and reality, making the content of the argumentation conveyed ambiguous to the reader. The goal is to develop a theoretical model of socio-scientific-based language learning. The issues or problems used are adjusted to the concept or theory of language in use, such as the issue of hate speech in forensic linguistics, the issue of cultural immersion in anthropolinguistics, and so on. This type of research is development research, which develops research products and is tested on a test class. This research was conducted at SMA Negeri 2 Medan City, which contained a research sample of 35 students. The products tested were SCC-based language learning model books, teachers' books, and students' books. The research instruments used consisted of a/questionnaire, an interview guide, and an observation guide. Data analysis was done qualitatively and quantitatively according to the type of data obtained. The results of this study indicate that the research products tested in both limited and large classes achieved an expert validation percentage of 89.42% and a practicality value of 81.95%. Furthermore, the effectiveness of the model is evident from the increase in student learning activities.

Keywords : Language Learning, Socio-Scientific, Problem Solving

INTRODUCTION

One of the goals of language learning is to guide students' language development sustainably through the process of listening, speaking, reading, and writing. Students are directed to be able to speak as a means to improve their intellectual, emotional, communication, and creative expression of ideas. For this reason, language teachers are expected to develop learning models or strategies that are appropriate and meet students' needs. The strategies in question are learning strategies, communication strategies, and social strategies (Asshabis et al, 2023). Learning strategies are related to students' mental activities, while communication strategies are related to communication issues. Social strategies are the same as affective strategies, namely, strategies to develop social interactions. This is due to technological developments that spur students to master the 4C (communication, collaborative, critical thinking, problem solving, and creativity & innovation) skills contained in the subject matter

(Healuddin et al, 2023). The learning process is not only oriented towards mastering the material, but also equipping students with life skills (Aryana et al., 2022).

Language learning at the secondary school level should emphasize two key areas of knowledge: linguistic knowledge and non-linguistic knowledge (Aslamiah et al., 2021). Linguistic knowledge includes linguistic aspects (sound system, word system, sentence system, and language meaning). This non-linguistic knowledge is often overlooked by language teachers, namely, social knowledge that is integrated into language learning. Integrating non-linguistic knowledge can improve learners' ability to solve problems from social issues (moral, scientific, economic, and cultural) that are incorporated into the subject matter (Carlian & Dina, 2023). The issues or problems used are adjusted to the concept or theory of language in use, such as the issue of hate speech in forensic linguistics, the issue of cultural immersion in anthropolinguistics, and so on.

This is a problem in language learning: the lack of integration of learning materials with non-linguistic knowledge, such as local culture identification (local wisdom), social stratification, and current issues that can support the achievement of learning objectives. In other words, language teachers still emphasize systemic knowledge (linguistic knowledge). As a result, high school graduates tend to succeed in linguistic knowledge, but do not succeed in implementing it in real life.

Based on observations made by researchers in several high schools in Medan City, it shows that language learning tends to emphasize linguistic knowledge, which includes vocabulary learning, language meaning learning, and grammatical learning (grammar language). The materials presented by teachers are still factual, not contextualized and integrated with scientific issues or problems. In addition, language teachers still tend to ignore social knowledge, which results in learners not being skilled at problem-solving.

In connection with the above problems, language learning in high school should be able to balance linguistic knowledge with non-linguistic knowledge. This requires an approach that can balance linguistic knowledge with non-linguistic knowledge, with a socio-scientific issue approach that emphasizes the presentation of issues/problems in everyday life in language learning. The socio-scientific issue framework utilizes informal discussions, formal debates, and argumentative thinking as an important part of preparing learners to use information in relevant individual contexts (Genisa et al, 2020). Social scientific issues can be conceptual, procedural, or technology-related to science (Geovany et al, 2021).

The SSI used varies in learning, such as high-order thinking skills, inquiry, argumentation, multiple regressions, environmental literacy, scientific literacy, critical thinking, and so on. This means that researchers have widely studied the Socio-Scientific Issue (SSI) approach by linking different disciplines. The results of research conducted by Bayram (2019) on learning in the context of SSI, which has been carried out on an international and national scale, show that SSI contributes positively to improving students' skills, such as critical thinking skills, argumentation, and decision making.

In line with the results of Cayci's research (2020) states that the socio-scientific issue-based learning process opens up space for discussion on topics that focus on discovery, knowledge construction, critical thinking skills, environmental literacy, scientific thinking, self-efficacy, and attitude domains. Students are more creative as shown by the variety of student creations

in writing. If it is related to Cayci's research, of course this research is also in line with the development of students' creations in writing argumentation for high school students.

METHODS

This study is a research and development type by developing a socio-scientific issue-based language learning model assisted by problem solving which aims to improve students' critical thinking skills. The development model used in this research is Plomp's (2013) development model which consists of the initial investigation, prototype design, realization, testing, and evaluation & revision stages (Thalhah et al, 2022). The first step, preliminary investigation, was carried out by observing the needs and characteristics of students, reviewing literature according to the research topic, and developing a conceptual framework.

The second step, designing the research product, which is a socio-scientific issue-based language learning model classified as three product books (model book, teacher book, and student book). The third step involves evaluating and revising research products following their testing in the experimental class. Evaluation of prototypes and revised according to input and suggestions obtained from students and observers. Evaluation is conducted through summative evaluation, which includes practicality and effectiveness tests. The sample selection in this study employed a random sampling technique, resulting in 35 students from class XII at SMA Negeri 2, Medan City. Then, the researcher conducted hypothesis testing to determine the significance of the model developed.

Before testing the product, the research instruments were first prepared and validated by experts in the scientific field in the questionnaire. The aspects assessed are content, language, presentation, and graphics. The experts in their respective fields must adjust each aspect. The main instrument used in this research is a questionnaire, which is a list of structured questions used to measure respondents' perceptions and facts related to respondents, as well as circumstances known to respondents. Filling in the questionnaire by respondents was accompanied by research staff members to interpret the questionnaire questions correctly. In addition to the questionnaire, the researcher also used a structured interview guideline instrument to qualitatively obtain respondents' statements about the facts known by the respondents.

The research procedure consists of (1) developing a language learning model based on socio-scientific issues according to the philosophical concepts and cycles of the model, (2) conducting validity testing is intended to test an instrument (indicator) measuring the construct as expected by the researcher, so a construct validity approach is used through discriminant validity testing (Fadly et al, 2023). A measuring instrument is not only able to reveal data precisely, but also provide a complete picture of the data obtained. That is, describing the most minor difference between one subject and another. For more details, the following stages of the Plomp development model can be seen.

Table 1. Stages of the Plomp Development Model

No	Development Stage	Research Activity	Activity Description
1	Preliminary research stage	a. Needs analysis b. Curriculum	Initial investigation of the need for an SSC-based

		analysis c. Analysis of teacher characteristics	language learning model for Indonesian language teachers.
			Analyze the purpose and content of SSC-based language learning model.
		Literature review	Analyze theories and concepts related to SSC-based language learning models.
2	Tahap prototipe	Designing a prototype	Designing SSC-based language learning models.
		Formative evaluation	Conduct an expert validity test of the prototype.
		Revised	Revise the prototype based on the results of the formative evaluation.
3	Assessment stage	Summative evaluation	Conduct practicality and effectiveness tests on the prototype.

Modified from Plomp (2013) according to research needs

Untuk lebih jelasnya, instrumen yang digunakan dalam penelitian ini dikemukakan pada tabel berikut ini.

Table 2. Research instruments

No	Stage/Phase	Data Type	Instrument
(1)	(2)	(3)	(4)
1	Preliminary stage	The assessment conditions used by teachers in learning so far.	Interview guidelines, teacher needs analysis sheet, and concept analysis sheet.
2	Validity	• Feasibility of content, language, and construct of the model • Teacher response to the model.	• Model validation sheet. • Teacher response questionnaire.

3	Practicality Effectiveness	• Practicality of the model. • Teacher activity while using the model. • Improved assessment results while using the model.	• Model practicality questionnaire. • Teacher activity practicality questionnaire. • Teacher effectiveness questionnaire • Student effectiveness questionnaire

The data analysis techniques carried out in this study are (1) data analysis of the validity of the literary authentic assessment model, (2) data analysis of the practicality of the SSC-based language learning model, and (3) data analysis of the effectiveness of the SSC-based language learning model. First, the validity test uses descriptive techniques to describe the data from the prototype validation results by experts. Second, the practicality test of the SSC-based language learning model is obtained from the results of the observation sheet and teacher response questionnaire. Third, to test the effectiveness of the literary authentic assessment model, a quasi-experiment was conducted through a static-group comparison design with pretest and postest. The collected data were then tabulated. The tabulation results were searched for the percentage with the formula:

$$P = \frac{\sum skor\ per\ item}{skor\ maksimum} x\ 100$$

To see the validity category, the following table is used.

Percentage	Category
0-20	Invalid
21-40	Less Valid
41-60	Moderately Valid
61-80	Valid
81-100	Highly Valid

Source: Riduwan (2009)

RESULTS

The research process began with Focus Group Discussion (FGD) activities at SMA Negeri 2 Medan City with 6 Indonesian language teachers. The results were used to design research products in the form of model books, student books, and teacher books. These three products were designed according to the needs of grade XII students and the curriculum used by the school. After the three products were designed, the next step was for the research team to validate them with experts, who would assess their validity and feasibility. The assessed aspects of the model consisted of aspects of content, presentation, language, and graphics. Validation involves more than just filling out the questionnaire; the expert's suggestions and

input are crucial for improving the three products. For more details, the recapitulation of the value of the expert validation results can be seen in Table 1 below.

Table 3. Model Validation Results

No	Aspects Assessed	Validation Result (%)	Category
1	Content	Highly Valid	Highly Valid
2	Language	Highly Valid	Highly Valid
3	Presentation	Highly Valid	Highly Valid
4	Graphics	Highly Valid	Highly Valid
Jumlah		357,7	Highly Valid
Nilai Rata-rata		89,42	Highly Valid

Based on the table above, the validation results from experts show that the average value is 89.42% with a very valid category from the assessed aspects (content, language, presentation, and graphics). The experts who validated the product consisted of Dr. Yaredi Waruwu, M.S. (content field validator), Dr. Fitriani, M.Pd. (presentation and language validator), Dr. Ahmad Gurning, M.Pd. (graphical validator). These three experts validated the three research product books on substance and other aspects.

In addition to the model validation aspect, the next step was for the research team to test the three products in the limited trial class and large-scale trial. The research team was assisted by two observers as observers in the testing process. After the product testing was completed, the research team gave a questionnaire to each student to fill in according to what they felt. The results of the practicality of the three models can be accumulated as follows.

Table 4. Results of Model Practicality by Students

No	Statement	Percentage (%)	Category
1	The SSC-based language learning model book is very easy to understand.	95	Very Practical
2	The SSC-based language model book can increase my interest in learning.	94.5	Very Practical
3	The explanation of the material in the model book greatly helps me understand quickly.	89.75	Very Practical
4	Learning indicators in the model book are in accordance with the learning objectives.	91.15	Practical
5	The model book is equipped with technical usage to facilitate students.	95.25	Very Practical
6	The SSC-based language model book can be studied independently by students.	90.25	Very Practical
7	The language model book encourages students to discover new things.	89.91	Very Practical

8	The content of the SSC-based language model book can enhance students' creativity.	90.85	Practical
	Total	655.66	Very Practical
	Average	81.95	Very Practical

Based on the table above, it shows that SSC-based language learning is very practical with an average of 81.95%. This means that the product trials on grade XI students were very easy to understand the steps of learning with the SSC-based language learning. Furthermore, the research team gave questionnaires to students to assess the effectiveness of the tested model. The results of the effectiveness of the SSC-based language learning model were obtained from student learning activities and student learning outcomes after the learning process was completed. During the trial, the research team was observed by two teachers as observers to see the objectivity of the model being tested. The results of the effectiveness of the model are described in table 3 below.

Table 5. Model Effectiveness

No	**Observer**	**Assessed Aspects**		
		Purpose	Audience	Logic
1	Observer 1	93.25	94.25	93.25
2	Observer 2	95.34	93.73	92.50
Total		188.59	187.98	185.75
Average		94.29	93.99	91.37
Category		Very Effective	Very Effective	Very Effective

Based on the results of the effectiveness of the model above, it can be determined that the socio-scientific issue-based language learning model is effectively used by students. On the other hand, Indonesian language teachers at SMA Negeri 2 Medan are more innovative in the writing process by applying the model. Teachers can follow the general guidelines and specific guidelines in the model. The material presented in the model is easy to understand by teachers and students.

The results of the effectiveness of this literary authentic assessment model were empirically tested using analysis of variance (ANOVA) with the help of the SPSS version 22 program. In this analysis, the variables differentiated were the results of the assessment in the cognitive, affective and psychomotor domains in the experimental group with the results of the assessment in these domains in the control group. To analyze with ANOVA, the assumptions must first be tested, namely normality and homogeneity of covariance tests. The normality test was conducted using the Kolmogorov-Smirnov Test of Normality.

The assumptions tested are in the form of statements as follows.

H0: the experimental class variable is normally distributed.

H1: the experimental class variable is not normally distributed.

The results of the normality test for the experimental class were obtained with the help of SPSS version 22 as follows.

Table 6. Normality Test Results of Experimental Class

One-Sample Kolmogorov-Smirnov Test

		Kelas_Eksprimen	Kelas_Kontrol
N		32	32
Normal Parameters[a,b]	Mean	80,63	76,25
	Std. Deviation	6,927	8,799
Most Extreme Differences	Absolute	,152	,196
	Positive	,139	,105
	Negative	-,152	-,196
Test Statistic		,152	,196
Asymp. Sig. (2-tailed)		,060[c]	,003[c]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.

Based on the provisions if sig < α (0.05), then H0 is rejected, H1 is accepted and if sig > α (0.05), then H0 is accepted, H1 is rejected. The Kolmogorov Smirnov value is 0.152, and the Asymp Sig value = 0.60. If the Asymp Sig value is greater than 0.05, then H0 is accepted, and H1 is rejected. This means that the experimental class variable values are normally distributed. Control class H1 is accepted, H0 is rejected. That is, the control class is not normally distributed.

Table 7. Saphiro Wilk Normality Test Experimental Class

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	Df	Sig.
Kelas_Eksprimen	,152	32	,060	,929	32	,036

a. Lilliefors Significance Correction

Based on the Saphiro Wilk test greater than 0.05, then H0 is accepted, H1 is rejected. With the conclusion that the experimental class scores are normally distributed. After the normality test, the next step is to conduct a homogeneity test.

Table 8. Homogeneity Test Results for Experimental Classes

Test Results

Box's M		1,661
F	Approx.	,385
	df1	4
	df2	1053,004
	Sig.	,819

Tests null hypothesis of equal population covariance matrices.

The decision criteria are if the calculation results show the Sig. (p) > 0.05, then H0 is accepted, H1 is rejected, on the other hand, if the Sig. (p) <0.05, then H0 is rejected and H1 is accepted. Box's M value obtained 1.661 with a Sig value of 0.819 greater than 0.05, then H0 is accepted, H1 is rejected. This means that the experimental class data population is homogeneous.

After the normality test and homogeneity test were carried out on the experimental class, then the researchers conducted a pretest-posttest test on the learning outcomes obtained by students with a two-mean difference test. The results can be obtained as follows.

Table 9. Pretest and Posttest Paired Sample T-test

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pretes & Postes	32	,249	,170

Paired Samples Test

		Paired Differences					T	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretes – Postes	5,313	10,075	1,781	1,680	8,945	2,983	31	,006

Based on the table above, the Paired Samples Correlation shows a correlation value of 0.249, a t value of 2.983 with a two-party test Sig value of 0.006. Therefore, the conclusion is that

the value of 0.006 is smaller than 0.05, then H0 is rejected, H1 is accepted. That is, the SSC-based language learning model can improve student learning outcomes.
Furthermore, the hypothesis testing above can be seen from the Mann Whitney test results with the help of SPSS 22 below.

Table 10. Hypothesis Testing Results

Ranks

	Kelompok	N	Mean Rank	Sum of Ranks
Hasil_Isian_Siswa	1	32	46,27	1480,50
	2	32	18,73	599,50
	Total	64		

Test Statistics[a]

	Hasil_Isian_Siswa
Mann-Whitney U	71,500
Wilcoxon W	599,500
Z	-6,019
Asymp. Sig. (2-tailed)	,000

a. Grouping Variable: Kelompok

Based on the Mann Whitney test results above, the basis for decision making can be done as follows.

1. If the value of Asymp. Sig (2-tailed) <0.05, then there is a significant difference.
2. If the Asymp. Sig (2-tailed) > 0.05, then there is no significant difference.

In relation to the basis for decision making, the Asymp value of the test results is 0.000 <0.05, it can be concluded that there is a difference in student learning outcomes on the effectiveness of the SSC-based language learning model.

DISCUSSION

Based on the research results above, it is found that the socio-scientific issue-based language learning model is valid, effective, and practical in the learning process of writing argumentative texts. The utilization of the socio-scientific issue-based language learning model shows that students experience increased stimulation, guidance, and the ability to think critically, analytically, and systematically to find solutions independently to various problems faced (Carlucy et al., 2018). From this research, students can hone their intellectual abilities and other skills, such as the ability to ask questions and find solutions independently. In practice, this inquiry learning model can be applied through several methods such as confirmatory inquiry, structured inquiry, guided inquiry, and open inquiry. The application of

the model in the learning process must be adjusted to the characteristics and needs of each student.

As the expression states, students with a positive attitude are more likely to achieve success in the learning process. They will more quickly adjust to the inquiry learning method applied by the teacher (Safitri et al., 2021). However, it is important to note that this inquiry learning serves to improve students' ability to ask questions to the teacher during language classes. In contrast to students who are only passive during learning, which ultimately makes the teacher unaware of the extent of their abilities. Especially, in terms of speaking skills, the teacher will have difficulty in giving assessments to these students.

The explanation of the development of socio-scientific issue-based language learning models above suggests that these models can evaluate learning outcomes, especially in the aspects of knowledge, attitudes, and skills. This model also motivates students to be active in evaluating themselves using self-assessment instruments. Students will have more freedom to think critically, analytically, and creatively when completing authentic tasks. This is in line with Gower's (2002) view that socio-scientific issue-based language learning encourages students to think logically, learn from experience, and helps them in the inductive and deductive thinking process.

The findings of this study showed that the application of the inquiry learning model in Indonesian language teaching proved to be very effective based on the observation level of the consistency of teachers' assessment from one meeting to another (Kamaruddin et al, 2023). In addition, the effectiveness of this model is also demonstrated by the questionnaire results, which show that the approach is very successful. The effectiveness of this socio-scientific issue-based language learning model is assessed through the aspects of validity, reliability, and practicality, yielding excellent results on average, as indicated by the teachers' assessments. This finding corroborates some previous research results, for example, research by Suprianti et al (2021) who successfully applied the inquiry learning model in developing reading skills.

The improvement of students' learning outcomes was seen after the application of the socio-scientific issue-based language learning model by the class teacher. About this research, the application of the socio-scientific issue-based language learning model has improved student learning outcomes. This integrated process in learning successfully encourages collaboration between teachers and students to improve and increase the effectiveness of learning. Improving the quality of learning can be achieved through developing teachers' ability to provide positive, immediate, detailed, and constructive feedback regularly. In this case, tasks based on the socio-scientific issue-based language learning model proved to be more effective in improving teachers' problem-solving skills compared to traditional learning and classroom tasks.

The following finding comes from Ching and Fernandez's (2020) research on the effect of socio-scientific issue-based language learning models on teachers' problem-solving skills. The results of the study revealed that the socio-scientific issue-based language learning model had a positive influence on teachers' views on their ability to overcome problems and acquire problem-solving skills in the educational context. The impact of socio-scientific issue-based language learning models on teachers' problem-solving skills has been studied in various

courses for prospective teachers from different fields of education. The socio-scientific issue-based language learning model also showed a positive influence on prospective teachers' views on problem-solving skills, while conventional learning did not show a significant effect.

CONCLUSION

Referring to the data and results of this study, several conclusions can be expressed. First, the socio-scientific issue-based language learning model in the process of learning to write texts received very high validation from the experts. This shows that the model reflects a harmonious relationship between the material taught and the characteristics and needs of students at the senior high school level. The model consists of a straightforward syntax, which can be followed by teachers as facilitators and students as implementers in the learning process. Second, the socio-scientific issue-based language learning model in text writing can be easily applied in Indonesian language teaching at SMA Negeri 2 Medan. The practicality of this model is evident in the teachers' ability to immediately understand and apply it by the instructions contained in the model that has been developed. Thirdly, the effectiveness of the model is evident in the improvement of students' learning outcomes, particularly in text writing, where they can easily produce argumentation texts that adhere to the rules and key elements.

REFERENCES

Alcaraz, Dominguez, S. & Brajas, M. (2021). Conseptualization of socioscientific issues in Educational Practice from a Review of Research in Science Education. *International Journal of Information and Education Technology*, 11(6), 297-302, http://doi.10.18178/ijiet.2021.11.6.1526.

Anam, A., K., Rumiati, A.T., & Ratnasari, V. (2020). Klasterisasi SMA di Indonesia dan analisis pola hubungan antar standar nasional pendidikan pada masing-masing klaster menggunakan SEM-PLS. *Jurnal Sains dan Seni ITS*, 9(2), D2118-2215.

Asshabis., Rashtchim., & Siyyarim. (2023). The Development of reflective language model: a structural equation modeling approach. *Journal of Language and Education*, 9(4), 11-30, http://doi.org/10.17323/jle.2023.13187.

Aryana, S., Subyantoro, S., & Pristiwati, R. (2022). Tuntutan kompetensi guru profesional bahasa Indonesia dalam menghadapi abad 21. *Semantik*, 11(1), 71-86, http://doi.org/10.22460/semantik.v11i1.p71-86.

Aslamiah, Ersis Warmansyah Abbas, Mutiani. (2021). 21st Century Skills and Social Studies Education. *The Innovation of Social Studies Journal*, Vol 2, (2), pp 82-92, http://doi.org/10.20527/.

Bayram, Jacobs. (2019). Science teacher’s pedagogical content knowledge development during enactment of socioscientific curriculum materials. *Journal of Research in Science Teaching,* vol 56, no 9, pp 1207-1233.

Carlian & Dina. (2023). Speaking skills analysis of 4 th grade student in Indonesia language subject. *Journal of Islamic Primary Education*, 6(1), pp 57-71, http://journal.uinsgd.ac.id/index.php/al-aulad.

Cayci, B. (2020). A Study on the effectiveness of a teaching based on sosio-scientific issue in the training of pre-service eachers. *Cypriot Journal of Educational Science*, 15(2), pp 220-231.

Erida, M. (2021). Uji validitas dan uji reliabilitas instrumen motivasi pengidap HIV/AIDS. *Jurnal Ilmiah Bina Edukasi*, 1(1), 10-21, http://doi.org/10.37753/bina%20edukasi.v1i1.156.

Fadly, Rahmat, et al. (2023). Validitas dan reliabilitas pada penelitian motivasi belajar pendidikan agama islam menggunakan product moment. *Jurnal Ilmiah Ilmu Pendidikan (JIIP)*, vol 6, no 3, pp1734-1739.

Fauth, B., Decristan, J. Decker, A.T., Buttner, G., Hardy, I., Klieme, E., & Kunter, M. (2019). The effect of teacher competence on student in elementary science education: the mediating role of teaching quality. *Teaching and Teacher Education*, 86,102882, http://doi.org/10.1016/j.tate.2019.102882.

Genisa U.M.,Subali, B., Djukri, Agussalim, A.,& Habibi, H. (2020). Socio-scientific issue implementation as science learning material. *International Journal of Education and Research in Education (IJERE),* Vol 9, No 2, pp 311-317, http://doi:1011591/ijere.v9i2.20530.

Geovany, I.O., Hernawati, D., & Meylani, V. (2021). The Relationship between of scientific issue and nature of science in ecosystem material in high school student. *Biosfer,* 14(1); 65-74.

Healuddin., Mannahali., Purwati., Alamsyah., & Wijaya. (2023). An investigation into the effect of problem based learning on learners' writing perfomance, critical and creative thingking skills. *Journal of Language and Education*, 9(2), 101-117. http://doi.org/10.17323/jle.2023.14704.

Lin, H., M., Lee, M.H., Liang, J., C., Chang, H., Y., Huang, P., & Tsai, C.C. (2019). A review of using partial least square structural modeling in e-learning research. *British Journal of Educational Technology*, 090), 1-19. http://doi.org/10.1111/bjet.12890.

Hakim, R., R. (2022). Perilaku harian dan profil demografi mempengaruhi kenaikan tagihan listrik selama covid 19 di Indonesia: pendekatan SEM-PLS. AKUA: *Jurnal Akunatsi dan Keuangan*, 1(10, 68-76, http://journal.yp3a.org/index.php/akua/article/view/217.

Surucu, L. & Maslakci, A. (2020) Validity and reliability in quantitative research. Business and Management Studies: International Journal. 8(3): 2694-2726, http://dx.doi.org/10.15295/bmij.v8i3.1540.