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Investigate Students' Perception of Learning Environment Through Socioscientific Inquiry-Based Learning (SSIBL) Viewed from School Origin and University Entrance

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ABSTRACT

The quality of a good learning environment will affect the effectiveness of a learning model in achieving several competencies in science learning. This research aimed to investigate students' perceptions of the learning environment towards the implementation of the Socioscientific Inquiry-Based Learning (SSIBL) model on chemical kinetics material. The sample in this study involved 36 students who took Basic Chemistry I course. The data were collected by administering the WIHIC Questionnaire (What is Happening in This Classroom?) consisting of 50 questions. In the WIHIC questionnaire that has been distributed, there are 7 indicators that will determine the quality of the learning environment created, including student closeness, lecturer support, involvement, investigation, task orientation, collaboration, and student equality. The questionnaire data were analyzed using the SPPS program by inferring the mean and standard deviation that had been distributed to 69 respondents. The results of the analysis showed that overall the indicators measured were in the very good category. The results of the One way ANOVA analysis state that there is no significant differences in the learning environment of students based on their school origin or university entrance route. This shows that the SSIBL model is a learning alternative that can created a good quality learning environment for all levels of student ability based on school origin and university line.

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1. INTRODUCTION

An enjoyable learning experience will have a positive effect on improving students' abilities in the learning process. One effort to present a good learning experience is to improve the learning environment. The learning environment has a close relationship with learning effectiveness, influencing student confidence in the learning process, student attitudes, and achievement (Maison et al. 2022; Rahayu et al. 2019). The learning environment includes 4 types of environment, namely the physical, psychosocial, psychological, and psychological environment. In the implementation of learning, the interactions that

are made between lecturers and students have an important role in overcoming the gap between students. This is in line with Ogbuanya et al. (2017) that the aspect that most influences the success of learning is the psychosocial aspect which includes the relationship between students, students and lecturers, as well as students and their environment.

The research conducted by Bahrudi & Eka (2021) about the learning environment in learning found that there are still gaps between students in the learning process in class. One of them was in the process of completing assignments when some students completed their assignments on time, but the others still looked unenthusiastic and chose not to follow the lecturer's instructions. This is one clear proof that the learning environment made is still not in the good category. One possible cause of the low learning environment is the learning model which is still teacher-centered. This is supported by the results of research conducted by Gonzales et al. (2021) that teacher-centred learning presents a less interesting learning experience and has a negative effect on students' academic abilities. Teacher-centered learning did not involve students because students got used to accepted concepts in a raw way and will have difficulty if other more complicated issues are presented.

In light of these issues, we need a teaching model that can provide students with a pleasurable learning experience in order to have an impact on their skills. Active and collaborative learning methods have an influence on enhancing student participation, according to Rochana (2021). Boosting student participation in the classroom is an effective strategy for improving learning outcomes. One way to evaluate the quality of the classroom is by how actively students participate. It is common knowledge that in the modern world, pupils need a wide variety of skills to succeed. Individuals' involvement in the process of finding solutions to global issues is one of them. One simple step towards this goal is encouraging greater student engagement in class (Maison et al. 2022; Ogbuanya et al. 2017; Wang et al. 2019).

In this study, an active and collaborative learning model was implemented, namely Socioscientific Inquiry Based Learning (SSIBL). The SSIBL model was first tested on 89 pre-service teachers in Germany, which had a significant impact on the learning process (Levinson, 2018). The SSIBL model consists of 3 main steps, namely Ask, Find Out, and Act. Most of the learning duration is spent on discussions and dialogues which can train students' ability to express opinions and increase active participation in learning. One of the pillars of the SSIBL model is citizenship education, namely, student equality as part of citizens is taught in this model (Levinson, 2018). Students are free to express arguments about the issues discussed as a form of active participation as a citizen in responding to problems in their country. This learning essentially does not look at students based on certain characteristics, but looks at the equality of students' rights in expressing opinions to resolve issues. In line with the characteristics of the solutions received in SSIBL learning, including aspects of agreeing and disagreeing, formal and informal arguments, as well as consideration of uncertainty and risk. Several studies state that there are gaps between downtown and regional students, such as differences in independence, problem-solving abilities, and knowledge (Tagela et al. 2021; Gunur et al. 2018; Amar et al. 2021). So, in this study, the researcher intends to see to what extent the SSIBL model can accommodate student learning environments based on differences in school origin and university entrance.

The lack of contextualised presentation of learning diminishes the efficacy of its execution. Bahrudi & Eka (2021) conducted an investigation on the learning environment and found that there are disparities among students in terms of completing tasks during the learning process. The observations suggest that the learning environment, particularly the psychosocial aspect, has not been adequately addressed thus far. Rubini et al. (2019) showed that the adoption of Problem-Based Learning Socioscientific Issues (PBL-SSI) led to an enhancement in scientific literacy. However, the study did not include an assessment of the learning environment. Aldresti et al. (2019) did a study investigating the impact of POGIL-SSI on the learning settings of students. The implementation of POGIL-SSI has a substantial impact on the student learning environment, particularly in terms of teacher support, equity, involvement, and investigation. However, prior research has not conducted measurements of the SSIBL model and the demographic factors that are used.

2. METHODS

This research was an experimental research with a non-equivalend pretest posttest control group that aimed to see how the learning environment was created after using SSIBL model. The research was conducted in October-November 2022 in the chemistry education study program. The population in this study were students of Faculty Teacher Training and Education Universitas Riau who took basic chemistry courses. The research sample was determined using a purposive sampling technique, namely according to the research objectives. The sample in this study was 69 students.

Measurement of the quality of the student learning environment in SSIBL learning has been done in the Chemistry Education study program, Universitas Riau, through the distribution of the WIHIC questionnaire. The sample involved is 36 first year students who had participated in SSIBL learning. The WIHIC questionnaire which is the instrument in the study was valid and reliable using a Likert scale (1-5) which includes 7 indicators: (1) student closeness; (2) lecturer support; (3) involvement; (4) investigation; (5) task orientation; (6) cooperation; and (7) student equality.

The questionnaire used in this study was the What is the Happening in This Classroom (WIHIC) questionnaire consisted of 50 questions. In looking at the improvement of learning environment, there were many relevant questionnaires including the School Level Environment Questionnaire (SLEQ) (Akram et al. 2018); Computer Classroom Environment Inventory (CCEI) (Maor & Fraser, 1996); Individualized Classroom Environment Questionnaire (ICEQ) , and Learning Environment Inventory, and also WIHIC (Fisher, 2001). Of the several types of questionnaires that were generally used to view the learning environment in the learning process this study used the WIHIC Questionnaire adapted from Fisher et al. (2001). The WIHIC questionnaire combines several other aspects of questionnaires that have been developed to produce a questionnaire that addresses contemporary educational issues. The WIHIC questionnaire writed in Bahasa Indonesia.

Before being implemented on 69 respondents, a trial was carried out on 20 respondents to see the validity and reliability of the questionnaire used. The WIHIC questionnaire items have a Cronbach alfa value = 0,962 with a very high category (0,81<R<1,00). Overall the total Cronbach alpha value of WIHIC questionnaire is presented in Table 1 and Table 2.

Table 1. Reliability of Each item of questionnaire

Variable	Item	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Student Cohesiveness	P1	0,487	0,961
	P2	0,421	0,961
	P3	0,528	0,961
	P4	0,721	0,960
	P5	0,635	0,961
	P6	0,453	0,961
	P7	0,500	0,961
Teacher Support	P8	0,624	0,961
	P9	0,606	0,961
	P10	0,530	0,961
	P11	0,570	0,961
	P12	0,511	0,961
	P13	0,602	0,961
Involvement	P14	0,826	0,960
	P15	0,761	0,960
	P16	0,344	0,962
	P17	0,455	0,962
	P18	0,499	0,961
	P19	0,742	0,960
	P20	0,668	0,961
	P21	0,521	0,961

Investigation	P22	0,778	0,960
	P23	0,561	0,961
	P24	0,651	0,960
	P25	0,456	0,961
	P26	0,428	0,961
	P27	0,581	0,961
	P28	0,515	0,961
	P29	0366	0,962
Task Orientation	P30	0,364	0,962
	P31	0,458	0,961
	P32	0,605	0,961
	P33	0,761	0,960
	P34	0,573	0,961
	P35	0,616	0,961
	P36	0,384	0,961
	P37	0,746	0,960
Cooperation	P38	0,674	0,960
	P39	0,611	0,961
	P40	0,812	0,960
	P41	0,716	0,961
	P42	0,588	0,961
	P43	0,473	0,961
Equity	P44	0,625	0,961
	P45	0,628	0,961
	P46	0,642	0,961
	P47	0,410	0,961
	P48	0,610	0,961
	P49	0,421	0,961
	P50	0,781	0,960

Each item of learning environments indicator questions has a Cronbach alfa value between 0,960 and 0,961. The item correlation values is more than 0,3 which means that item is accepted and reliable.

Table 2. Reliability of WIHIC Questionnaire

Instrument	N	Alfa Cronbach
Questionnaire WIHIC	50	0,962

Questionnaires were given to respondents after applying the SSIBL model. The SSIBL model is applied on basic chemistry courses on chemical kinetics material. The researcher applied the model for two meetings. The questionnaire was given at the third meeting to see the achievement of the SSIBL model. After the probing questions were given to the students, they were then collected and continued to analyze the instrument data using the SPSS version 20 program. In filling the data program in the data program, numbering/coding was carried out, compiling and recording each data from the questionnaire that was filled by the respondent, if an error occurs, the instrument can be re-examined. The proceeded with translating the data into a schedule and analyzing it using the SPSS program. Analyzing of the data was made based on a study problem that wanted to obtain data related learning environment. The data analysis step will be followed the data according to the respondents' profile category. For data obtained through probing questions, the reviewer makes the respondents' answers in the form of scoring. Score interpretation is carried out based on the categorization proposed by Arikunto (2019) listed in Table 3.

Table 3. Interpretation of score questionnaires

Percentage	Category
3,68 – 5,00	High
2,34 – 3,67	Moderate
1,00 – 2,33	Low

In this study, demographics are used based on school origins and university entrance line. The distribution of demographic data for the study sample is presented in Table 4.

Table 4. Research Demographic Profile

Demography	Number	Percentage
School origin		
• City	7	19,4%
• Out of city	29	80,5%
Line of entrance university		
• National Selection to Enter State Universities (*Seleksi Nasional Masuk Perguruan Tinggi Negeri*)	11	30,6%
• Joint Selection to Enter Public Universities (*Seleksi Bersama Masuk Perguruan Tinggi Negeri*)	16	44,4%
• Selection of Regional Superior Candidate (*Pemilihan Bibit Unggul Daerah/PBUD*)	5	13,9%
• Non-test	4	11,1%

Based on Table 2 for the category of school origin, 7 people (19.4%) derived from schools in the City and 29 people (80.5%) derived from schools outside the City. Furthermore, based on the university entrance line, 11 people (30.6%) passed through the SNMPTN line, 16 people (44.4%) goes through the SBMPTN line, 5 people (13.9%) goes through the PBUD line, and 4 people (11.1%) passed through the Non-test line. %) through the Mandiri line. The research framework shows by the Figure 1 as follows:

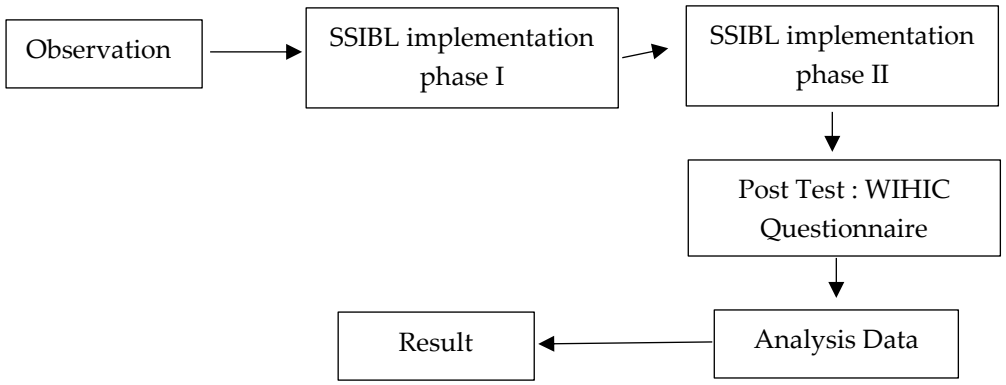

Figure 1. Research Framework

3. FINDINGS AND DISCUSSION

The learning environment data obtained based on the results of the posttest given to students. These results were anlyzed descriptively using the mean and standard deviation. The results of follow-up studies were also analyzed based on predetermined demographic aspects using one way ANOVA

to see an overview of the aspects of school origin and university entrance. Demographic review was needed to see wether the SSIBL model can improved the learning environment of students evenly based on differences in university entrance and school origins. Analyzing of mean and standard deviation shown in Table 5 as follows:

Table 5. Category of Learning Environment

No	Indikator Learning Environment	$\bar{x}$	Category
1.	Student Cohesiveness	4,24	High
2.	Teacher Support	4,23	High
3.	Involvement	3,94	High
4.	Investigation	3,89	High
5.	Task Orietation	4,59	High
6.	Cooperation	4,36	High
7.	Equity	4,46	High

The results of the study illustrated that the implementation of the SSIBL model can created a good learning environment. In implementing the learning model, students are actively involved in the decision-making process. The dialogue and discussion syntax provides free space for students to express opinions related to the issues being discussed. This is in line with the advantages of presenting socio-scientific issues-based learning put forward by Chen & Xiao (2021) that one of the characteristics of SSI implementation is the presentation of dilemmatic problems that require students to link issues with scientific knowledge which ultimately involves a process of thinking and discussion. before making a decision.

Students do not seem rigid in expressing opinions during discussions because at the beginning of the implementation, the lecturer said that there were no right or wrong opinions. Each individual has the right to express his opinion in the implementation of learning. This finding is in line with the opinion categories in Socioscientific Issues (SSIs) learning, there are two types of arguments that can be put forward, namely arguments with formal and informal reasons (Levinson, 2018). When students provide a personal perspective based on experience on the issues raised, the reasons are informal used in case. However, when students put forward reasons based on scientific knowledge to justify an argument it is said that students have used formal reasons.

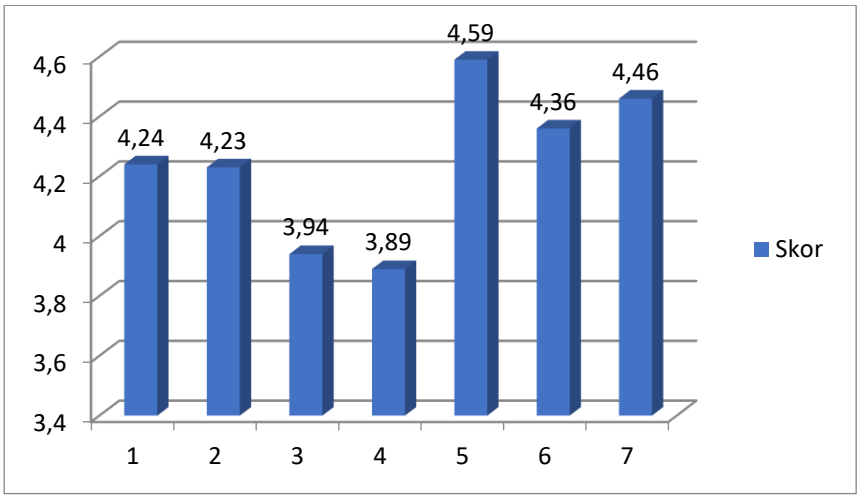

Figure 1. Profile of Learning Environment

Explanation:

1. Students Cohesiveness
2. Lecturer support
3. Engagement
4. Investigation
5. Task Orientation
6. Cooperation
7. Equality

The student closeness indicator has an average score of 4.24 in the high category (3.68<x<5.00). This indicator measures whether students help each other in the discovery process or work individually. Each step of the SSIBL model provides broad opportunities for students to search for information and find evidence in groups. The closeness between students will decrease gaps so that there is a balanced transfer of knowledge. This is in line with Fisher et al. (2001) that acceptance by partners studying will have a positive influence on the learning environment. Students with low abilities can participate in the process of discovering new knowledge. This will be different if the closeness of students is in the low category. Students will have certain groups in the learning process, there is a very large distance between students with high abilities and students with low abilities**.**

The SSIBL model positions the lecturer as a facilitator. Teacher support can be seen in the process of discussion and dialogue. Students are given the freedom to find a solution that feels most appropriate and effective. Based on the study results, the Teacher Support indicator has an average score of 4.23 by category high (3.68<x<5.00). By providing input and suggestions that seem not to intimidate students' opinions, the lecturer is seen as providing support rather than threatening the assignments given. In line with the case study conducted by Mulenburg & Burge (2005) that adolescents tend to need other people to increase their motivation. The close physical and psychological distance between lecturers and students will create a sense of student trust in the learning process. The social context is an aspect that influences student interest.

Conventional learning approaches employed by lecturers lack a clear task orientation. This engenders a sense of complacency among students, leading them to forgo the need to seek out instructional resources beforehand, as they hold the belief that the lecturer would provide comprehensive explanations during class. Providing task orientation is essential for enhancing students' initial knowledge and preparedness prior to commencing their learning. It is crucial to consider this aspect in order to instill a sense of accountability in students when it comes to fulfilling prearranged tasks (Ozudugru, 2020).

Student involvement in the learning process is necesary to improve. The higher the involvement of students, the better their understanding of the material being taught (Tun et al. 2020). In this study, the student involvement indicator has an average score of 3.94 and was categorized in the high category (3.68<x<5.00). This involvement is influenced by the existence of a learning model that demands the activeness and active role of a learner. The SSIBL model provides great opportunities for communication opportunities between students in finding solutions to problems. Most of the learning duration is spent in the process of discussion and dialogue. According to Rochana (2021) one of the factors that can increase student involvement is the presentation of active and collaborative learning. One of the characteristics of active and collaborative learning is the demands of students to be involved in projects, communicate with other students, and participate in projects. The SSIBL model presents involvement in the process of finding solutions to the problems presented.

In the process of finding solutions, students are required to be active in the process of searching for relevant literature. In this study, the investigative indicator get the lowest score compared to the other scores but is still in the high category. The average score of the investigative indicator is 3.89 and was categorized in the high category (3.68<x<5.00). The investigative process in the SSIBL model emphasizes searching for relevant articles and literature. Of the 8 statement items regarding investigations in learning, the statement with the lowest score is "*I explore issues to answer questions that interest me",* in this case, it appears that students were looking for problem-solving because they were only oriented towards the lecturer's assignment. This research was apart from growing students' interest in the material presented. This answer was in stark contrast to the question item with the highest score, namely, "*the lecturer asked me to think about evidence that supports conclusions in a chemistry issue".*

From the above analysis it can be found that the role of the lecturer as a facilitator and the orientation of the tasks given will affect students' tendencies in finding task completion. The SSIBL model was a model that provided clarity on the orientation of the tasks assigned. First, students were

given hot issues related to personal, local, and global phenomena. After that students are asked to come up with solutions to the problems given. The clarity of task orientation in this model is in line with research results, which describe the average score for the Task Orientation indicator is the highest score of 4.59 and was categorized in the high category (3.68<x<5.00).

Some aspects that have been described support a good learning environment. Indirectly it can be seen that in the process of implementing the SSIBL model it provides opportunities for students to work together and not be individualists. The Cooperation indicator in the WIHIC questionnaire that has been given gets an average score of 4.36 in the high category (3.68<x<5.00). Students are formed in small groups to facilitate the search for solutions and unification of opinions. It aims to organize students in the process of respecting the opinions of colleagues. According to Wang et al. (2017), a cooperative atmosphere will decrease the sense of competition between individuals so that it can indirectly improve student cognitive. Equity or equality indicators are considered achieved if the lecturer gives equal treatment to all students. The same treatment affects the psychological condition of students and results in motivation and academic achievement. The Cooperation indicator in the WIHIC questionnaire has been given an average score of 4.46 and was categorized in the high category (3.68<x<5.00). Overall, the learning environment for students with SSIBL learning is in the high category.

3.1 Learning Environment Categorical based on School of Origin

The Independent Sample t-test was conducted to examine the impact of perceptions influenced by variations in school background. The variables were tested using a t-test, which included two categories: 1) students who attend school in the city, and 2) students who attend school in the regency. The test results are displayed in Table 5.

Table 6. t-Test Learning Environment Test

Dependent variable	Factor	F	Sig
Learning Environment	School origin	0.066	0.789

Based on the results of the t-test, the value of F (0.066) = 0.798 (p > 0.05) means that there is no difference in the learning environment of students based on school origin. From the results of the analysis it appears that the SSIBL model can improve a good learning environment for all students equally. The SSIBL syntax, which demands completion through searching for issues and reducing information, provides equal opportunities for every student. The absence of right and wrong judgments gives each student confidence and self-confidence in the process of presenting arguments in order to find a solution that feels appropriate and useful.

3.2 Learning Environment Categorical based on University Entrance Pathway

To see the effect of perceptions based on differences in school origin, the One Way Anova test is done. The variables were analyzed by Anova include: 1) National Selection to Enter State Universities; 2) Joint Selection to Enter Public Universities; 3) Selection of Regional Superior Seed; and 4) Non-test. The output of the test results is presented in Table 3.

Table 7. Anova Learning Environment Test

Dependent variable	Factor	F	Sig
Learning Environment	Line of entrance university	0.779	0.515

Based on the results of the ANOVA test, the value of F (0.779) = 0.515 (p > 0.05) means that there is no difference in the learning environment of students based on the university entrance line. From the results of the analysis it appears that the SSIBL model can improve a good learning environment without any differences based on university entrance line. This also provides a clarification that every

entrance selection held by the Universitas Riau is in accordance with the proportions and conditions.Universitas Riau has 4 types of student selection to be accepted as new students, namely the test line which includes (Joint Selection to Enter Public Universities) SBMPTN and also non-test (Mandiri) and the non-test line through National Selection to Enter State Universities (SNMPTN) and Selection of Regional Superior Candidate (PBUD). Each entry line has its own criteria in the process of determining it.

According to the analysis, the learning environment indicator profile was classified as excellent. These findings demonstrate that the SSIBL model has a significant impact on every measure of the student learning environment. A study conducted by Aldresti et al. (2018) demonstrated that learning within the framework of scientific topics offers students the chance to develop, discuss, and reach conclusions regarding the issues given during the learning experience. The subjects discussed are occasionally unfamiliar to the students, which sparks their curiosity. This curiosity can enhance student motivation. To foster their learning, kids should be motivated to explore the topic by conducting research on relevant articles or books. According to Fisher's (2019) research, millennial children have a preference for immersive and active learning. They have a preference for active participation in the learning process, necessitating adaptable classroom arrangements and environment. The establishment of an optimal learning environment will impact the efficiency of learning and enhance students' confidence in the learning process (Maison et al., 2012).

4. CONCLUSION

The Socioscientific Inquiry-Based Learning (SSIBL) paradigm is an educational framework that requires students to actively and collaboratively engage in the learning process. Active and collaborative learning significantly impacts the created learning environment. The SSIBL model demonstrates a commendable learning environment category, encompassing the evaluation of eight factors. An advantage of the SSIBL model is its ability to enhance the atmosphere and learning conditions for all students in an equitable manner. The effectiveness of an implemented model can be determined by maximising the result of the learning environment. This study focuses solely on examining the characteristics of the learning environment when implementing the SSIBL model. It suggests that future researchers should explore other models to assess the learning environment, which can serve as a valuable resource for teachers, lecturers, and other researchers seeking effective models. All characteristics of the learning environment were classified as high category based on the assessed data from the WIHIC questionnaire.

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