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The Effect of the SIRI Learning Model (Stimulation, Investigation, Review, and Inference) on Student Learning Activities in Excretory System Material

Pengaruh Model Pembelajaran SIRI (*Stimulation, Investigation, Review And Inference*) Terhadap Aktivitas Belajar Peserta Didik Materi Sistem Ekskresi

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Abstract

This study aims to determine the effect of the SIRI learning model (Stimulation, Investigation, Review, and Inference) on students' learning activities regarding the Excretory System material in grade XI at SMAN 1 Gowa. This research used a quasi-experimental design with a Nonequivalent Control Group Design. The population consisted of 361 students, while the sample included 72 students, divided into two classes: the model class and the control class. Data were analyzed using descriptive and inferential statistics with an independent sample t-test. The results showed that students' learning activities in the SIRI model class were categorized as very active at 86.11%, while the control class was categorized as active at 72.86%. The t-test in this study showed a significance value of 0.001 < 0.05, indicating that the SIRI model affects the learning process. The findings of this study suggest that the SIRI model can enhance students' learning activities.

Penelitian ini bertujuan untuk mengetahui pengaruh model pembelajaran SIRI (Stimulation, Investigation, Review, and Inference) terhadap aktivitas belajar peserta didik mengenai materi Sistem Ekskresi di kelas XI SMAN 1 Gowa. Penelitian ini menggunakan quasi eksperimen dengan Nonequivalent Control Group Design. Populasi terdiri dari 361 peserta didik, sedangkan sampelnya meliputi 72 peserta didik, dikategorikan menjadi dua kelas yaitu kelas model dan kelas kontrol. Data diperiksa menggunakan statistik deskriptif dan inferensial dengan independent sample t-test. Hasil penelitian menunjukkan bahwa aktivitas belajar peserta didik di kelas model SIRI dikategorikan sangat aktif sebesar 86,11%, sedangkan kelas kontrol digolongkan aktif sebesar 72,86%. Uji-t dalam penelitian ini menunjukkan nilai signifikansi 0,001 < 0,05, yang menunjukkan bahwa model SIRI memengaruhi proses pembelajaran. Temuan penelitian ini menunjukkan bahwa model SIRI mampu meningkatkan aktivitas belajar peserta didik.

Article Information

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Learning activity; SIRI; Stimulation; Investigation; Review; Inference

Kata kunci:
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A. INTRODUCTION

Learning requires activities in the form of actions and mental processes that cannot be separated, so that activities become an important principle in teaching and learning interactions. (Alonemarera & Kaliu, 2023). Facts in the field show that the learning process by teachers is still lacking in variety and innovation. As a result, there are still few teachers who are active in learning and student engagement (Adijaya et al., 2023). During classroom learning, students should be actively involved not only by listening, paying attention, and understanding the material from the teacher, but also through active participation such as asking and answering questions that encourage deeper involvement in learning (Tirka & Kusumawati, 2017). Students can engage in various activities at school. Paul B. Dierich classified learning activities into *visual activities, oral activities, listening activities, writing activities, drawing activities, motor activities, mental activities, and emotional activities* (Sardiman A.M, 2014). Therefore, in the learning process, teachers need to apply appropriate methods so that students can grasp and understand lessons more quickly. The level of understanding and activity of students will greatly affect their learning outcomes (Sudarsih, 2022).

Based on interviews with biology teachers at SMAN 1 Gowa, it was found that the biology learning process generally still uses the direct instruction model, in which teachers are more dominant and play an active role in delivering material. Students' views also support this, with around 62.9% stating that the dominant learning method used in class is lecturing. In addition, around 57.1% of students think that biology is difficult, especially the material on the excretory system, due to complex physiological processes and scientific language that is difficult to understand. This also reduces students' motivation to learn, which affects their activity in learning.

The findings indicate that there has been no implementation of learning models that combine various forms of learning activities with the local cultural context to increase student activity and understanding. Most previous studies have focused on increasing learning activities through Problem Based Learning models or cooperative models such as *Jigsaw* and STAD. (Lazuardi et al., 2022). However, there is still little research linking the learning process with regional cultural values as the basis for character building and student motivation.

As an alternative solution, the SIRI (*Stimulation, Investigation, Review, and Inference*) learning model was implemented. This model is oriented towards a constructivist approach that places students as the main subjects of learning (Astuti et al., 2024; Ulya, 2024). Conceptually, SIRI is unique compared to other *Problem-Based Learning* and cooperative models because it integrates local cultural values that reflect the spirit of learning, discipline, and self-confidence of participants (Jamaluddin et al., 2024). The value of *siri'* is used as a pedagogical principle that not only shapes critical thinking skills, but also positive character rooted in local culture.

The SIRI learning model is built through four main stages: *stimulation, investigation, review, and inference*, which encourage students to think reflectively, participate actively, and collaborate in groups (Jamaluddin et al., 2023). Research (Jamaluddin et al., 2024) shows that the application of SIRI can create a more interactive, collaborative, and contextual learning environment, thereby effectively increasing participation and learning outcomes. Thus, the SIRI model has the potential to become a new innovation in learning strategies, as it combines a scientific approach with local cultural wisdom to strengthen character while increasing student learning activity.

Based on this background, this study aims to determine the effect of student learning activities taught using the SIRI (*Stimulation, Investigation, Review, and Inference*) learning model on the Excretory System material in grade XI at SMAN 1 Gowa.

B. METHOD

This study used a quasi-experimental method with a nonequivalent control group design. The nonequivalent control group design can be seen in Table 1 below:

Table 1. Research Design

Group	*Pretest*	Treatment	*Posttest*
A	O1	X	O2
B	O3	-	O3

Note : A = Eksperimental Group, B = Control group, O1 = *Pretest* score of the experimental group, O2 = *Posttest* score of the experimental group, O3 = *Pretest* score of the control group, O4 = *Posttest* score of the control group, X = Treatment using the SIRI learning model

The research was conducted at SMAN 1 Gowa, Jl. Andi Mallombasang No. 1 A, Somba Opu District, Gowa Regency. The research population consisted of all 361 students in grade XI. From this number, two classes were selected as samples, namely class XI.7 as the experimental group taught using the SIRI model with 36 students and class XI.9 as the control group taught using the *direct instruction* model with 36 students, bringing the total sample to 72 students. The sample selection process was carried out using *purposive sampling*. The instruments used to collect data in this study were observation sheets to obtain data related to student learning activities in the classroom and character assessments based on siri' cultural values. The indicators of siri' cultural values can be seen in Table 2 below ;

Table 2 Bugis-Makassar Siri Cultural Values

Siri Values	Description
Tongeng	Sincerity
Tomatoa	An elder whose words are respected
Lempuk	Honesty
Abbulosibatang	Cooperating with each other
Sipakainge	Reminding each other
Sipakatau	Humanizing humans
Pesse	Loving
Sipatokkong	Helping each other and not putting each other down

The collected data were then analyzed using descriptive and inferential statistics, including normality tests, homogeneity tests, and hypothesis tests with independent sample t-tests, to examine the effect of the SIRI learning model on student engagement with the excretory system material in grade XI at SMAN 1 Gowa.

C. RESULTS AND DISCUSSION

This study was conducted at SMAN 1 Gowa with research subjects consisting of grade XI students. Class XI.9 was designated as the control group, while class XI.7 served as the experimental group. Data collection was carried out using non-test instruments in the form of observation sheets that were used both before (*pretest*) and after the treatment (*posttest*).

Table 3 Categories of Student Learning Activities

Value Range	Eksperimental Class				Control Class				Category
	Pretest		***Posttest***		***Pretest***		***Posttest***		
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	
81-100	0	0	33	91,7	0	0	1	2,8	Very Active
61-80	0	0	3	8,3	0	0	34	94,4	Active
41-60	35	97,2	0	0	35	97,2	1	2,8	Moderately Active
21-40	1	2,8	0	0	1	2,8	0	0	Less Active
0-20	0	0	0	0	0	0	0	0	Passive

Based on Table 3, it can be seen that before the learning process, both in the control class and the experimental class, most students were in the moderately active category, with only a few classified as less active. After the learning process, in the control class there was an increase in learning activity, with most students moving to the active category. Meanwhile, in the experimental class after the implementation of the SIRI learning model, most students showed an increase to the very active category, while a small number remained in the active category.

Before conducting a t-test to determine the difference between the two groups, a prerequisite analysis test was conducted, which included a normality test and a homogeneity test. The normality test was conducted to ensure that the pretest and posttest data for learning activities in this study were normally distributed. The following are the results of the normality test in this study.

Table 4 Normality Test of Student Learning Activities Using Shapiro Wilk

Variabel	Sig	α	Description
Eksperimental Class *Pretest*	0,088	0,05	Normal
Eksperimental Class *Posttest*	0,068	0,05	Normal
Control *Class Pretest*	0,089	0,05	Normal
***Posttest* Control Class**	0,082	0,05	Normal

Table 4 shows the results of the *Shapiro Wilk* test with a sig. value of >0.05, which means that the student learning activity data is normally distributed. Next, a homogeneity test was conducted to determine whether the samples studied came from populations with similar characteristics or not. In this study, homogeneity testing was performed using the *Levene* test, where the results were considered homogeneous if the significance value was >0.05. The results of the homogeneity test can be seen in Table 5 below.

Table 5. Homogeneity Test of Student Learning Activities

Variable	***Based on mean***	α	Description
	Sig.		
Learning Activity	0,074	0,05	Homogeneous

The homogeneity test analysis produced a *sig. Based on Mean* value of 0.074, while the α level was 0.05. The *sig. Based on Mean* value obtained from the mean > α (0.074 > 0.05), indicating that the samples were taken from a similar population.

After the data was declared normal and homogeneous, hypothesis testing was conducted. Hypothesis testing aims to ensure the validity of assumptions or estimates proposed in a study. This study used an *independent sample t-test*. The results of the hypothesis testing can be seen in Table 6 below.

Table 6 Hypothesis Testing

Variable		*Levene's Test for Equiality of Variances*		*t-test for Equality of Means*		
		F	**Sig.**	**t**	**df**	**Sig.(2-tailed)**
Learning Activity	*Equal variances assumed*	2,618	0,110	9,232	70	<,001
	Equal variamces not assumed			9,232	68,832	<,001

Based on the results of data analysis, the average posttest score for the control class was 72.86%, which falls into the active category, while the experimental class obtained an average of 86.11%, which falls into the very active category. The results of the *independent sample t-test* showed a significance value of < 0.001, which is much smaller than the significance level of 0.05. This value confirms that the difference in learning activity between the experimental class and the control class is statistically very significant, so it can be ascertained that the increase in student learning activity did not occur by chance.

Students taught using the SIRI learning model showed great interest in their learning. The SIRI model has clear and focused stages that progressively encourage student engagement in learning, thereby facilitating understanding of the material. In contrast, students taught using the direct instruction model appear to show less enthusiasm for the learning process because this model tends to be teacher-centered and limits interaction between students.

Observations during the learning process showed that in the experimental class, students were more active in asking questions, responding to their peers' opinions, and participating in group activities. These activities indicated an improvement in the visual, verbal, mental, and emotional aspects of the students during the learning process. In contrast, in the control class, most students received information rather than exploring ideas independently. This condition is in line with the characteristics of the direct instruction model, which focuses more on the delivery of material by the teacher.

The SIRI learning model can increase learning activities because learning is centered on the students. Thus, they are encouraged to play a more active role and interact with their friends during learning activities. These findings are in line with research (Jamaluddin et al., 2023) The SIRI learning model prioritizes students in the learning process. The application of this technique improves students' cognitive focus and sets clear goals. In addition to enhancing the learning experience, SIRI also contributes to the development of students' critical thinking skills. Not only that, this model has other positive impacts, such as helping to shape character and moral values in students (Jamaluddin et al., 2024).

In addition, the application of the SIRI learning model in the learning process will be linked to the Bugis Makassar siri culture, namely by providing reflection, advice, or

motivation to learn in accordance with the local wisdom culture of Bugis Makassar (pappaseng). (Jamaluddin et al., 2022) reveals that integrating Makassar-Bugis siri' into education can improve students' character. When students have good character, this will certainly also trigger an increase in their learning activities. Students who are given messages or advice before starting the learning process will have the awareness to remain focused and serious in following the learning process, and of course this will also have an influence on their learning activities. This was also stated by (Zamhari et al., 2023) in his research that when students are highly motivated by the material explained by the teacher, they tend to show enthusiasm and involvement in various learning activities that take place.

Conversely, the direct instruction learning model is less effective in increasing student engagement in learning activities due to a lack of motivation to seek information independently, as the learning process is largely determined by the delivery of material by the teacher. These findings are in line with (de Jong et al., 2023), that in direct instruction learning, students usually show lower engagement in acquiring new concepts independently; they rely on the teacher's explanations and the reading materials provided. In addition, (Amin & Sumendap, 2022) revealed that students tend to be less responsible for the subject matter because they assume that all material will be explained by the teacher.

The success of the SIRI learning model in improving student learning activities is also supported by its ability to provide a collaborative and challenging learning environment. Each phase of this strategy encourages critical thinking, discussion, and collaborative problem solving among students. These activities create active two-way communication, both among peers and with teachers, making the learning process more dynamic and meaningful.

The findings show that students in class XI.9 (control class) were taught without using the SIRI learning model. The researchers used the direct instruction learning model. This model prioritizes the direct delivery of material from educators to students. Direct instruction is used to deliver lessons verbally, so that students can clearly understand the information from the teacher's explanations (Sudarmanto et al., 2021). The application of the direct learning model in class XI.9 is said to increase student engagement in learning, in accordance with the statement made by (Burden.P.R & Byrd.D.M, 2003) that the direct instruction learning model can be used effectively in various types of learning because it follows the principles of behavioral learning. These principles include attracting students' attention, reinforcing correct answers, providing feedback and corrections if there are errors, and instructing students to apply the information obtained effectively.

The learning activities of students in class XI.9 (control class) increased from the moderately active category to the active category. The observation results showed that the application of the direct instruction learning model encouraged an increase in student engagement in discussions, asking questions, and articulating their points of view. However, some students still engaged in other activities, such as talking to their classmates or disturbing other classmates. According to (Alimuddin et al., 2021), the direct learning model usually involves one-way communication. In this method, students are directed to learn by listening to explanations, paying attention, and taking notes. However, because not all children have this ability, educators must continue to provide instruction and practice to ensure their proficiency.

The implementation of the SIRI learning model in class XI.7 (experimental) showed an increase in student activity, from the category of moderately active to very active. This increase in student activity was due to the stages of the SIRI learning model that facilitated active participation in the learning process. This increase was evident in various indicators of learning activity, such as in the *visual activities* indicator, which showed results from the category of moderately active to very active. This proves that the application of the SIRI model makes students pay more attention to the material during the learning process and read more of the lesson material. In addition, the *oral activities* indicator showed results from the moderately active category to the very active category. This also proves that the application of

the SIRI model makes students more active in discussing with their group mates and more active in expressing their opinions.

In the *listening activities* indicator, the results ranged from moderately active to very active. This proves that the application of the SIRI model made students listen more attentively to the explanations and instructions given by the teacher. In the *writing activities* indicator, the results ranged from moderately active to very active. This proves that the application of the SIRI model made students more active in writing and taking notes on important matters during the learning process. The *emotional activities* indicator showed results ranging from moderately active to very active. This proves that the application of the SIRI model makes students calmer in following lessons and more courageous in expressing their opinions. Then, the *mental activities* indicator showed results ranging from moderately active to very active. This proves that the application of the SIRI model makes students more active in responding and participating in group discussion analysis.

In addition, the application of the SIRI learning model in the learning process will be linked to the Bugis Makassar siri culture, which is to provide reflection, advice, or motivation to learn in accordance with the local wisdom culture of Bugis Makassar (pappaseng). (Jamaluddin et al., 2022) revealed that the integration of Makassar-Bugis siri in education can improve the character of students. When students have good character, this will certainly trigger an increase in their learning activities. Students who are given messages or advice before starting the learning process will have the awareness to remain focused and serious in following the learning, and of course this will also have an influence on their learning activities. This was also stated by (Zainudin, 2022) in his research that if students are highly motivated by the material presented by the teacher, they will show active participation and involvement in various activities during the learning process.

There are several Bugis Makassar local cultural values that need to be applied by students in the learning process, including tongeng (sincerity), lempuk (honesty, straightening out all intentions and actions), abbulosibatang (mutual cooperation), sipakainge (mutual reminders), sipatokkong (mutual assistance and not putting each other down), pesse (loving), sipakatau (humanizing humans), and tomatoa (respected elders who are listened to). By applying these cultural values, the educational process becomes more meaningful because it is not only oriented towards academic achievement, but also towards shaping the character and ethics of students. This is in line with (Wahyuni et al., 2022) that students who apply Bugis Makassar local cultural values in the learning process will certainly have good character, which will improve their learning activities. This statement shows that integrating local cultural values into education can be an effective approach to creating a comprehensive and continuously developing learning atmosphere.

D. CONCLUSION

This study shows that: 1) students who learn without using the SIRI (*Stimulation, Investigation, Review, and Inference*) learning model on the excretory system material in grade XI at SMAN 1 Gowa were in the active category, 2) students who learned using the SIRI model were in the very active category, and 3) the use of the SIRI learning model on the excretory system material had an effect on the learning activities of grade XI students at SMAN 1 Gowa.

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