

COMPARISON OF INSIDE OUTSIDE CIRCLE (IOC) LEARNING MODEL WITH PEER LESSON LEARNING MODEL ON STUDENT LEARNING OUTCOMES IN RESPIRATORY SYSTEM MATERIAL IN CLASS XI SMAN 10 GOWA

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Abstract. This study aimed to compare the learning outcomes of students taught using the Inside-Outside Circle (IOC) and Peer Lesson learning models regarding the Respiratory System topic, and to examine the differences in learning outcomes between the two models among Grade XI students at SMAN 10 Gowa. The study employed a quasi-experimental method using a Nonequivalent Control Group Design. The sample consisted of 40 students divided into two classes: Class XI.4 (Inside-Outside Circle group) and Class XI.5 (Peer Lesson group). Data were collected via learning outcome tests and analyzed using descriptive statistics and the Independent Samples t-test. The results showed that the mean learning outcome score was 81.00 for the Inside-Outside Circle group and 83.35 for the Peer Lesson group; both groups fell into the high learning outcome category. The t-test results yielded a significance value of 0.001 ($p < 0.05$), indicating a significant difference in learning outcomes between the two models. Thus, the Peer Lesson model resulted in higher mean learning outcomes compared to the Inside-Outside Circle model for the Respiratory System topic.

Keywords: Inside-Outside Circle, Peer Teaching, Learning Outcomes, Respiratory System.

Abstrak. Penelitian ini bertujuan untuk membandingkan hasil belajar siswa yang diajar menggunakan model pembelajaran Inside Outside Circle (IOC) dan Peer Lesson pada materi Sistem Pernapasan serta menguji perbedaan hasil belajar antara kedua model tersebut pada siswa kelas XI SMAN 10 Gowa. Penelitian ini menggunakan metode kuasi-eksperimen dengan desain Nonequivalent Control Group Design. Sampel penelitian terdiri atas 40 siswa yang terbagi dalam dua kelas, yaitu kelas XI.4 sebagai kelompok Inside Outside Circle dan kelas XI.5 sebagai kelompok Peer Lesson. Data dikumpulkan menggunakan tes hasil belajar dan dianalisis dengan statistik deskriptif serta uji Independent Samples t-Test. Hasil penelitian menunjukkan bahwa rata-rata hasil belajar siswa pada kelompok Inside Outside Circle sebesar 81,00, sedangkan kelompok Peer Lesson sebesar 83,35. Kedua kelompok berada dalam kategori hasil belajar tinggi. Hasil uji t menunjukkan nilai signifikansi sebesar $0,001 < 0,05$, yang berarti terdapat perbedaan hasil belajar yang signifikan antara kedua model pembelajaran. Dengan demikian, model Peer Lesson menghasilkan rata-rata hasil belajar yang lebih tinggi dibandingkan model Inside Outside Circle pada materi Sistem Pernapasan.

Kata Kunci: Inside Outside Circle, Peer Lesson, hasil belajar, sistem pernapasan.

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INTRODUCTION

Education plays an important role in developing students' knowledge, skills, and character as essential components of human development and national progress (Asfar et al., 2020; Suparman, 2023). In the learning process, these goals cannot be achieved only through the transfer of knowledge, but also require active student involvement. Active learning provides opportunities for students to interact, communicate, collaborate, and construct their understanding, which can contribute to better learning outcomes than learning dominated by direct instruction (Dubinsky & Hamid, 2024). Therefore, the selection of an appropriate learning model is important, particularly for subjects that require students to understand concepts and communicate their ideas with others.

However, the learning process in Biology at SMAN 10 Gowa has not fully reflected these characteristics. Based on an interview with a Biology teacher on September 25, 2025, student learning outcomes were still suboptimal. Learning was predominantly teacher-centered, student interaction was limited, and only a small proportion of students were actively involved in discussing or communicating their understanding of the material. These conditions are particularly relevant to the respiratory system topic, which requires students to understand interconnected biological processes rather than merely memorize concepts. The limited interaction and participation may consequently restrict opportunities for students to clarify concepts, exchange ideas, and construct understanding collaboratively. Thus, a learning model that systematically increases interaction, peer communication, and active participation is needed to address these problems.

One model that has the potential to address these conditions is the *Inside Outside Circle* (IOC). The IOC model organizes students into two concentric circles, allowing them to exchange information with different peers through structured interactions. This mechanism provides students with repeated opportunities to explain, listen, ask questions, and communicate their understanding. Previous research by Amriani (2022) reported that the IOC model can support student interaction and contribute to improved learning outcomes. In addition, the *Peer Lesson* model emphasizes peer-to-peer learning, in which students take an active role in explaining learning materials to their classmates. Such activities can encourage student participation, motivation, communication, and collaborative learning (Jumriyanti & Thaha, 2025). These characteristics suggest that both models are relevant to the problems identified at the research site, although they employ different mechanisms for activating students during learning.

Previous studies have generally examined the IOC and *Peer Lesson* models separately and have reported positive contributions to student participation and learning outcomes. Nevertheless, these findings do not yet explain which of the two models provides better learning outcomes when applied to the same learning context and material. This distinction is important because IOC emphasizes structured interaction and exchange of information among students, whereas *Peer Lesson* places greater emphasis on students' roles as peer instructors. The differences in these learning mechanisms may produce different effects on students' understanding of Biology concepts. Moreover, research directly comparing the two models on the respiratory system material at the senior high school level, particularly in the context of SMAN 10 Gowa, remains limited.

The novelty of this study therefore does not merely lie in applying the IOC and *Peer Lesson* models, but in providing a direct empirical comparison of the two models within the same Biology learning context and material. This comparative approach enables the study to identify whether differences in the interaction and peer-learning mechanisms of the two models are associated with differences in student learning outcomes. The study consequently contributes comparative evidence that can help teachers select a learning model that is more appropriate for increasing student engagement and learning outcomes in respiratory system learning. Based on this rationale, this study aims to compare the learning outcomes of Grade XI students of SMAN 10 Gowa who are taught using the IOC learning model and those taught using the *Peer Lesson* learning model on the respiratory system material, and to determine whether a significant difference exists between the two learning models.

METHOD

This research uses a quantitative approach with a quasi-experiment method and a Non-Equivalent Control Group Design. The study was conducted at SMAN 10 Gowa, South Sulawesi. The research population was all 11th-grade students, totaling 166 students from five classes. The sample was selected using multistage random sampling and consisted of 40 students, namely class XI.4 as experimental group 1, which received the Inside Outside Circle (IOC) learning model, and class XI.5 as experimental group 2, which received the *Peer Lesson* learning model.

Table 1. Research design

Group	Pretest	Treatment	Posttest
Eksperimen 1	O ₁	X ₁ (<i>Inside Outside Circle</i>)	O ₂
Eksperimen 2	O ₃	X ₂ (<i>Peer Lesson</i>)	O ₄

Description:

O_1 = IOC group pretest

O_2 = IOC group posttest

O_3 = Peer Lesson group pretest

O_4 = Peer Lesson group posttest

X_1 = learning using the IOC model

X_2 = learning using the Peer Lesson model

The research instruments consisted of a learning outcomes test and an observation sheet. The learning outcomes test included 20 multiple-choice questions given as a pretest and posttest. Before being used, the instruments were validated by two expert validators and tested empirically. The validation results showed an Aiken's V value of 0.88 for the learning outcomes test, which falls into the high validity category. Out of the 30 items tested empirically, 25 items were declared valid. The instruments had very high reliability, with a Cronbach's Alpha of 0.921. The observation sheet was used to observe the implementation of learning in both groups. The research procedure was carried out in three stages: giving a pretest, conducting learning using the IOC model in experimental group 1 and the Peer Lesson model in experimental group 2, and then giving a posttest. The data were analyzed using descriptive and inferential statistics. Inferential analysis included Shapiro-Wilk normality test, Levene's homogeneity test, and Independent Samples t-Test. Hypothesis testing was done at a 5% significance level. ($\alpha = 0,05$).

RESULTS

Descriptive analysis results indicate an improvement in Biology learning outcomes for both groups following the intervention. In experimental group 1 (XI.4), which utilized the Inside-Outside Circle (IOC) model, the mean score rose from 50.25 on the pretest to 82.00 on the posttest. Meanwhile, experimental group 2 (XI.5), which employed the Peer Lesson model, saw an increase in the mean score from 47.70 to 83.75. A comparison of the learning outcomes for both groups is presented in Table 2.

Table 2. Descriptive statistics of pretest and posttest results

Group	N	Stage	Minimum	Maximum	Mean	SD
IOC	20	Pretest	35	60	50,25	7,46
IOC	20	Posttest	70	90	82,00	6,13
Peer Lesson	20	Pretest	35	65	47,70	9,87
Peer Lesson	20	Posttest	75	95	83,75	7,11

Based on Table 1, both groups demonstrated an improvement in learning outcomes following instruction. In the IOC group, the mean score increased by 31.75 points, whereas in the Peer Lesson group, it increased by 36.05 points. In addition to the rise in mean scores, the minimum and maximum scores in both groups also improved. Descriptively, the Peer Lesson group exhibited a greater increase in the mean score compared to the IOC group. Regarding learning outcome categories, the initial proficiency of both groups was predominantly in the low and very low categories. Following instruction, the majority of students in both groups fell into the high category. In the IOC group, 18 students were in the high category and 2 were in the medium category. Meanwhile, in the Peer Lesson group, 16 students were in the high category, 2 were in the very high category, and 2 were in the medium category. These findings indicate an improvement in learning achievement across both groups following the intervention.

Prior to hypothesis testing, the normality of the pretest and posttest data was assessed using the Shapiro-Wilk test. The results indicated that all data sets were normally distributed; significance values for the IOC group were 0.936 (pretest) and 0.910 (posttest), while for the Peer Lesson group, they were 0.929 (pretest) and 0.944 (posttest). As all significance values exceeded 0.05, the data met the assumption of normality, allowing for subsequent parametric analysis.

Table 3. Results of the normality test of learning outcomes

		<i>Shapiro Wilk</i>		
	<i>Statistic</i>	<i>df</i>	<i>Sig.</i>	Description
Experiment 1 Pretest	0,936	20	0,200	Normally Distributed
Experiment 1 Posttest	0,910	20	0.063	
Experiment 2 Pretest	0,929	20	0.145	
Experiment 2 Posttest	0,944	20	0,285	

Next, a homogeneity test was conducted to determine the similarity of variance between the two groups before testing the hypotheses. The results of the homogeneity test should be included in this section, along with their significance values. If the Sig. value is > 0.05 , the data can be considered to have homogeneous variance.

Table 4. Results of the homogeneity test of pretest learning outcomes

		<i>Levene Statistic</i>	<i>Df1</i>	<i>Df2</i>	<i>Sig.</i>
Learning outcomes	Based on Mean	1.204	1	38	0,279
	Based on Median	1.309	1	38	0,260
	Based on Median and with adjusted df	1.309	1	37.513	0,260
	Based on trimmed mean	1.211	1	38	0,278

Once all assumptions were met, hypothesis testing was conducted using an Independent Samples t-Test to determine the difference in learning outcomes between students taught using the Inside Outside Circle (IOC) model and those taught using the Peer Lesson model. The analysis yielded a t-value of -25.176 ($df = 39$) and a significance value (Sig. 2-tailed) of < 0.001 . Since the significance value was less than 0.05 , the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was accepted. Thus, there was a significant difference in learning outcomes between students taught using the IOC model and those taught using the Peer Lesson model regarding the Respiratory System topic for Grade XI students at SMAN 10 Gowa.

Descriptively, this difference is evident in the post-test means of the two groups. The group using the IOC model achieved a mean score of 82.00 , while the group using the Peer Lesson model achieved a mean score of 83.75 . Consequently, the mean learning outcome for the Peer Lesson group was 1.75 points higher than that of the IOC group. These findings indicate that, although both models resulted in improved learning outcomes, the outcomes for students taught via the Peer Lesson model differed significantly from those of the IOC group and showed a higher mean score. Meanwhile, the Paired Samples t-Test results indicated that both groups experienced significant improvement from pre-test to post-test. For the IOC group, the t-value was -18.077 ($p < 0.001$), while the Peer Lesson group yielded a t-value of -17.160 ($p < 0.001$). These results demonstrate that both the IOC and Peer Lesson models produced significant improvements in learning outcomes following instruction. However, when the two groups were compared based on post-test results, a significant difference was observed, with the Peer Lesson group achieving a higher mean score than the IOC group.

Table 14. Hypothesis test results for learning outcomes

Comparison	<i>t</i>	<i>df</i>	Sig. (2-tailed)	Decision
IOC <i>pretest–posttest</i>	$-18,077$	19	$< 0,001$	H_0 rejected
Peer Lesson <i>pretest–posttest</i>	$-17,160$	19	$< 0,001$	H_0 rejected
Posttest IOC–Peer Lesson	$-25,176$	39	$< 0,001$	H_0 rejected

DISCUSSION

Learning Outcomes of Class XI Students of SMAN 10 Gowa Who Were Taught Using the Inside Outside Circle (IOC) Learning Model

The implementation of the Inside-Outside Circle (IOC) model demonstrates that instruction involving student-to-student interaction can foster improved learning outcomes. Theoretically, this improvement is linked to the nature of the IOC model, which positions students as active participants in the process of information exchange. Through activities such

as sharing material, engaging in discussions, and rotating partners, students have the opportunity to reprocess information and convey it to their peers. The process of re-explaining material can reinforce understanding, as students do not merely receive information but also elaborate on the knowledge they have acquired (Zhu et al., 2024). These findings align with those of Agustin et al. (2025), indicating that the IOC model fosters a more communicative learning environment and encourages student engagement.

The improvement in learning outcomes observed in the IOC group can also be explained through the principles of active learning. Information exchange and discussion activities enable students to connect new knowledge with their existing understanding. Such engagement is crucial because active learning not only boosts participation but also helps students construct understanding by processing, applying, and discussing information (Jones & Sturrock, 2022). Thus, the study's findings demonstrate that the primary strength of the IOC model lies in its ability to generate student interaction and participation throughout the learning process.

Learning Outcomes of Class XI Students of SMAN 10 Gowa Who Were Taught Using the Peer Lesson Learning Model

Instruction using the Peer Lesson model also demonstrates improved learning outcomes. This finding can be understood through the key characteristic of Peer Lessons: assigning students the responsibility to study, explain, and discuss material with their peers. Acting as the presenter encourages students to comprehend the information before explaining it; consequently, the learning process extends beyond mere information reception to involve the elaboration and organization of knowledge. Research by Pi et al. (2025) indicates that the activity of explaining material to peers fosters deeper cognitive processes, while Tullis and Goldstone (2020) confirm that peer interaction supports student engagement and understanding.

These findings are further supported by Ribosa and Duran (2022), who demonstrate that peer teaching activities yield greater benefits for comprehension than simply receiving an explanation. In the context of this study, student involvement as peer tutors facilitates a two-way learning process: the student explaining the material gains the opportunity to organize and reinforce their knowledge, while the student receiving the explanation has the chance to grasp the material through language that resonates more closely with peer experiences. Therefore, the Peer Lesson model not only enhances learning outcomes but also fosters communication skills, self-confidence, and a sense of responsibility for one's own learning process.

Differences in Learning Outcomes of Class XI Students of SMAN 10 Gowa Taught Using the *Inside Outside Circle* (IOC) Learning Model and the *Peer Lesson Learning* Model

A comparison of the two groups reveals that the learning outcomes of students following the Peer Lesson model were higher than those of students following the IOC model. While both models successfully foster active learning, the Peer Lesson model offers students greater scope for deep engagement in the process of comprehending and explaining the material. In the IOC model, interaction occurs through information exchange and partner rotation within a set timeframe. Although this pattern effectively expands opportunities for student interaction, the relatively brief interaction periods may limit the depth of discussion. Conversely, the Peer Lesson model places greater responsibility on students to master the material and convey it to their peers, thereby facilitating a more intensive process of knowledge elaboration.

Theoretically, this difference can be attributed to the level of student cognitive engagement. When students are required to explain material to peers, they must select key information, structure their explanations, answer questions, and provide clarifications. This process reinforces understanding and knowledge retention. These findings align with research by Safitri et al. (2023), which indicates that peer-based learning supports students' communication skills, self-confidence, and comprehension. Thus, the superiority of the Peer Lesson model in this study stems not merely from the presence of student interaction, but rather from the depth of the students' roles in constructing and explaining knowledge.

These findings also reinforce prior research identifying active engagement as a crucial factor in successful learning. Knight and Brame (2018) explain that interactive learning provides students with opportunities to discuss ideas and build understanding through interaction. However, the present study offers a more specific insight: the form and depth of student engagement matter significantly. Interactions that entail the responsibility of explaining material to peers can yield higher learning outcomes than interactions primarily oriented toward information exchange. Nevertheless, these results do not imply that the IOC model is ineffective. The IOC model retains advantages in creating an active, communicative learning environment and offering students the chance to interact with a wider range of peers. The distinction lies in the nature of the interaction established. The IOC model places greater emphasis on the dynamic exchange of information, whereas the Peer Lesson model focuses more on students mastering the material and subsequently explaining it to others. Therefore, the choice of learning model should be aligned with the learning objectives. If the primary goal is to expand interaction and information exchange, IOC may be a suitable choice. However, if

the instruction aims to reinforce understanding through elaboration and the ability to explain the material, the Peer Lesson model may offer greater benefits.

CONCLUSION

The results of this study indicate that the application of the Inside Outside Circle (IOC) learning model improved the learning outcomes of class XI students at SMAN 10 Gowa on the Respiratory System material, with the average score increasing from 52.25 in the pretest to 82.00 in the posttest, which falls into the high category. Similarly, the application of the Peer Lesson learning model improved students' learning outcomes, with the average score increasing from 47.70 in the pretest to 83.75 in the posttest, also falling into the high category. The results of the Independent Samples *t*-test showed a significant difference in learning outcomes between students taught using the IOC model and those taught using the Peer Lesson model ($p < 0.001$). The Peer Lesson group obtained a higher posttest mean than the IOC group, indicating that the Peer Lesson model produced better learning outcomes in this study. Thus, both learning models were effective in improving students' learning outcomes, with Peer Lesson showing a greater improvement than IOC on the Respiratory System material.

RECOMMENDATION

Based on the findings of this study, biology teachers are encouraged to consider the Inside Outside Circle (IOC) and Peer Lesson learning models as alternative student-centered learning strategies, particularly for materials that require active interaction, discussion, communication, and knowledge sharing. The Peer Lesson model may be prioritized when deeper student involvement in explaining and discussing learning materials is desired. Further research is recommended to examine the application of both models to different learning materials, educational levels, and classroom contexts using larger samples and longer intervention periods. Future studies may also investigate their effects on other learning outcomes, such as student engagement, learning motivation, learning interest, communication skills, collaboration, and critical thinking, as well as their integration with digital learning media and technology.

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