

## Differences in Learning Outcomes of Students Taught With Problem Based Learning Model Assisted by iSpring Suite 10 Media and Powerpoint on Chemical Equilibrium Material

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**Abstract:** This research aims to determine whether there are differences in student learning outcomes taught with the Problem Based Learning model assisted by iSpring Suite 10 media and PowerPoint on chemical equilibrium material. This research method uses quantitative research methods. This research was conducted at SMA Negeri 4 Medan, where the population in this study were all students of class XI IPA. The samples used in this study were two classes determined by the purposive sampling technique. The samples in this study were XI IPA 5 class as the first experimental class taught with the Problem Based Learning model assisted by iSpring Suite 10 media and XI IPA 7 class as the second experimental class taught with the Problem Based Learning model assisted by PowerPoint media. This research was conducted by research stages: 1) Giving a pretest, 2) The learning process, and 3) Giving a posttest. This study uses test instruments in the form of multiple choice questions as many as 20 questions that have met the requirements. The results of the research data analysis obtained the average student learning outcomes in experimental class I pretest value (44,16) and posttest value (82,08) with an average increase in learning outcomes of 69,47%, and the average student learning outcomes in experimental class II pretest value (43,88) and posttest value (76,81) with an average increase in learning outcomes of 61,28%. The average difference in student learning outcomes (posttest scores) of the two experimental classes was obtained by 5,278. Hypothesis testing was carried out with a two-party t-test and obtained sig. (0,04) <  $\alpha$  (0,05) so that the results show that  $H_a$  is accepted and  $H_0$  is rejected, which means that there is a difference in the average learning outcomes of students taught with iSpring Suite 10 media and PowerPoint on chemical equilibrium material. Based on the results and discussion of this study, it can be concluded that the use of learning media can have an impact on student learning outcomes. The use of iSpring Suite 10 learning media is better than PowerPoint.

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## Introduction

Education is a conscious and planned effort to create a learning atmosphere and learning process for students to actively improve their innate potential both physically and spiritually to obtain religious spiritual strength, self-control, personality, intelligence, noble character and skills needed to succeed in national development, because education is expected to produce

quality human resources (HR). Education is carried out through learning and teaching activities in schools as formal educational institutions (Darmadi, 2019). Slameto in (Usinawati, 2020) explains that learning is a change in behavior through experiences experienced by each individual. Then Komalasari in (Faizah, 2017) explains that learning is a process that is systematically planned, implemented and evaluated so that teachers and students can achieve more optimal learning objectives. The implementation of learning that is currently carried out is in accordance with the 2013 curriculum. In research (Jannah, 2018) explains that the 2013 curriculum has three aspects of assessment, namely aspects of knowledge, skills and attitudes and behavior. Through various interactions and learning experiences, the 2013 curriculum aims to improve students' skills, activities, and creativity. Furthermore (Sufairoh, 2017) learning models that are prioritized in the 2013 curriculum are inquiry-based learning models, discovery learning models, project-based learning models and problem-based learning models. Curriculum 2013 learning supports the use of ICT-based learning media (Technology and Communication Sciences) as a learning tool. To understand the concepts in chemistry, students need in-depth knowledge. According to Subagia in (Budiariawan, 2019) chemistry is one of the subjects that most students dislike.

Chemistry is a complex subject that requires students not only to have numeracy skills, but also to master concepts. Understanding the concept of chemical equilibrium is needed to be able to understand advanced materials such as acid-base, salt hydrolysis, buffer solution, solubility and solubility product. In (Atika et al., 2018) chemistry lessons at school become difficult for students to understand due to chemical material factors and lack of student involvement in learning activities, resulting in less than optimal cognitive, affective, and psychomotor results. One of the chemistry materials that has high abstractness and concept linkage in class XI is chemical equilibrium. In (Indriani, 2017) explained that students' difficulties in understanding chemical equilibrium material because students still have difficulty describing dynamic equilibrium and students still do not understand the writing and calculation of  $K_c$  values. Students assume that in an equilibrium state the reaction that occurs has stopped, the concentration of the product and the concentration of the reactant are the same without looking at the  $K_c$  value and students still write the equilibrium constant equation without involving the reaction coefficient.

This is in accordance with the problems experienced by students at SMA Negeri 4 Medan. The results of interviews with one of the chemistry teachers can be concluded that the lack of variety of learning models and media used by chemistry teachers causes students to be less motivated to take part in the learning process, so that the average daily test scores and learning outcomes obtained are still low. This can also be influenced by internal factors and external factors. Internal factors consist of motivation, attention, interest, talent, intelligence, and learning methods, while external factors consist of family, school, and community environments (Hemayanti, 2020). In accordance with the above problems, a variety of learning models and media used by chemistry teachers during the learning process is needed. One of the learning models and media that can be used according to the 2013 curriculum is the problem-based learning model (Problem Based Learning) and iSpring Suite media. From the results of research (Valdez & Bungihan, 2019) problem-based learning approaches are effective in improving students' problem-solving skills and problem-based learning is more effective than non-problem-based learning. This is also in accordance with Hasni's research in (Sholihah et al., 2019) problem-based learning models have a significant influence in improving student learning outcomes regarding the concept of reaction rates. Furthermore, it is strengthened by (Watoni & Savalas, 2021) that the problem-based learning model has a

significant effect on the learning outcomes of students in class XI IPA SMAN 4 Praya on reaction rate material.

Then the learning process will run better if accompanied by learning media that is in accordance with the needs of the material. iSpring Suite media in (Ariyanti et al., 2020) is an android application-based media that utilizes digital technology and is integrated with Microsoft PowerPoint and can be packaged in the form of games and animations so that it can facilitate the learning process of students independently. The use of ICT-based learning media (Technology and Communication Sciences) plays an important role as a facility used during the learning process. This is in line with research from (Sastrakusumah et al., 2018) iSpring is able to package learning in an interesting way, and can improve students' critical thinking skills. From research (Dasmo et al., 2020) there is a significant effect of using interactive learning media based on iSpring Suite 9 on the physics learning outcomes of class X students of SMA Negeri 1 Babakan Madang, Bogor.

Furthermore, strengthened by research (Aritonang & Zubir, 2020) there is a significant difference in the learning motivation of students who are taught using the Problem Based Learning model and conventional learning using iSpring media on reaction rate material. The use of a problem-based learning model (Problem Based Learning) with iSpring Suite 10 media can be a solution in improving student learning outcomes on chemical equilibrium material. This is in accordance with research from (Maulana et al., 2021) learning using Problem Based Learning with a variety of digital platforms used can make students more interested in participating in the learning process. Therefore, to improve student learning outcomes, learning is carried out with the Problem Based Learning learning model and iSpring Suite 10 media. Then Wijayanto in (Nuraini et al., 2019) said that the use of interactive multimedia with iSpring Software can be used as a variety of learning aids to increase student motivation and creativity. The purpose of this study is to determine the differences in student learning outcomes taught with the Problem Based Learning learning model assisted by iSpring Suite 10 media and PowerPoint on chemical equilibrium material.

## Research Method

This research method uses quantitative research methods. This research uses the type of research Quasi Experiment (pseudo experiment). The form of research design used was pretest-posttest group design. The population in this study were all students of class XI IPA at SMA Negeri 4 Medan in the 2022/2023 school year. The sample in this study was taken through Purposive Sampling technique. The sample consisted of two classes, namely XI IPA 5 class as experimental class I and XI IPA 7 as experimental class II. The research was conducted in stages: 1) Giving pretest at the beginning to determine the initial ability of both classes, 2) The learning process in both classes with varied learning media, 3) Giving posttest at the end of learning to determine student learning outcomes.

**Table 1.** Research Design

Class	Pretest	Treatment	Posttest
Experiment I	T <sub>1</sub>	X	U <sub>1</sub>
Experiment II	T <sub>2</sub>	Y	U <sub>2</sub>

Description:

T<sub>1</sub> : Experimental class I pretest data

T<sub>2</sub> : Pretest data of experimental class II

X : Problem Based Learning learning treatment assisted by iSpring Suite media

Y : Problem Based Learning learning treatment assisted by PowerPoint media

U1 : Posttest data of experimental class I

U2 : Posttest data of experimental class II

The test instrument used in the study was in the form of multiple choice questions with 5 answer choices (A, B, C, D, and E) as many as 20 questions that had met the requirements (validity, difficulty level, differentiating power, distractors and reliability of questions) using the Microsoft Excel program. Data collection techniques used in this study were interviews, learning outcomes tests and documentation. Data analysis in this study, using statistics with SPSS version 26. As a requirement for research data to be used for parametric testing, the normality test and homogeneity test were first carried out using posttest data, then hypothesis testing was carried out with a two-party t test approach, then the N-Gain test was carried out to determine the increase in student learning outcomes.

## Result and Discussion

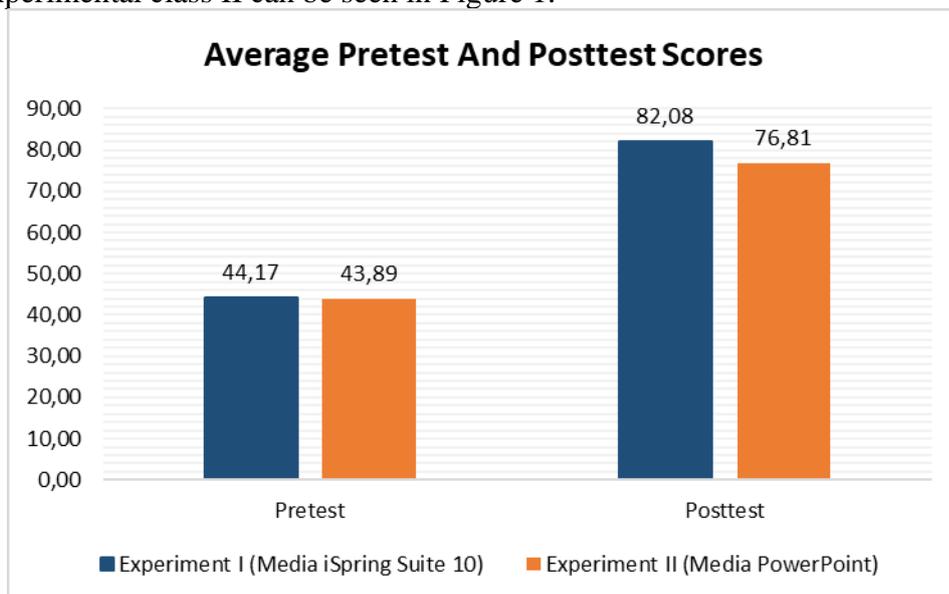
### Result

Research data on student learning outcomes were obtained from 2 research classes, namely experimental class I and experimental class II. This study took data from the initial test (pretest) given before learning and the final test (posttest) given after learning in both classes. The table of average learning outcomes (pretest and posttest) of students in both classes, namely:

**Table 2.** Average Student Learning Outcomes

Class Experiment I		Class Experiment II	
Pretest	Posttest	Pretest	Posttest
$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$
44,16	82,08	43,88	76,81

The difference in the average value of student learning outcomes from experimental class I and experimental class II can be seen in Figure 1.



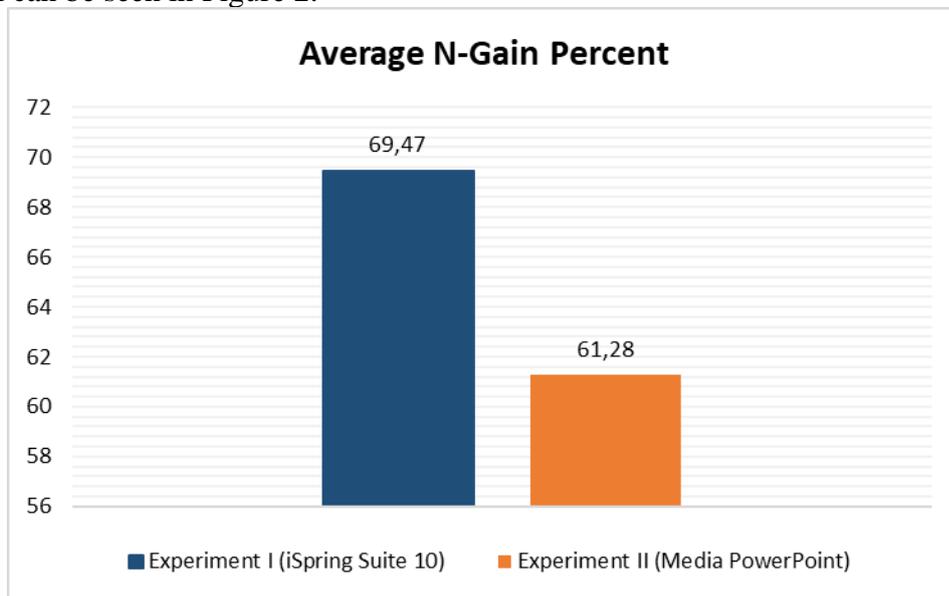
**Figure 1.** Average Pretest and Posttest Values

Furthermore, the average increase in student learning outcomes can be seen from the N-Gain test table, namely:

**Table 3. N-Gain Test Results**

Class	N	Mean		Percentage Gain	Description
		Pretest	Posttest		
Experiment I	36	44,167	82,08	69,47	Sedang
Experiment II		43,889	76,81	61,28	Sedang

The difference in the average N-Gain percent value of the experimental class I and experiment II can be seen in Figure 2.



**Figure 2. Average N-Gain Percent Value**

Data analysis of student learning outcomes in experimental classes I and II shows normally distributed and homogeneous data. The table of normality test results, namely:

**Table 3. Normality Test Results**

Learning Media	Class	Data Source	Shapiro-Wilk Sig.	Description
Learning Outcomes	Experiment I	Pretest	0,688	Normal
		Posttest	0,101	Normal
	Experiment II	Pretest	0,758	Normal
		Posttest	0,108	Normal

Furthermore, data analysis of student learning outcomes in experimental class I and experimental class II showed homogeneous data. The table of homogeneity test results, namely:

**Table 4.** Homogeneity Test Results

	Learning Media	Data Source	Class	Shapiro-Wilk Sig.	Description
Learning Outcomes	iSpring Suite 10	Pretest	Experiment I	0,872	Homogen
			Experiment II		
Learning Outcomes	PowerPoint	Posttest	Experiment I	0,070	Homogen
			Experiment II		

Furthermore, the results of the hypothesis and the difference in the average value of student learning outcomes in the two classes. The table of Hypothesis Test results, namely:

**Tabel 5.** Hypothesis Test Results

t-test for Equality of Means						
		T	df	Sig. (2-tailed)	Mean Difference	Description
Learning Outcomes	Equal variances assumed	2,098	70	0,04	5,278	H <sub>a</sub> Accepted

## Discussion

This study begins by giving an initial test (pretest) to both classes, where the pretest questions tested were 20 questions that had met the requirements of the validity test, difficulty level, differentiating power, distractors, and reliability. The use of pretests is to determine the initial ability of students as a benchmark for improving student learning outcomes after treatment. Based on pretest data, both sample groups are normally distributed and homogeneous with an average pretest value of experimental class I of 44.16 with a minimum value of 10 and a maximum value of 80, while in experimental class II it is 43.88 with a minimum value of 10 and a maximum value of 80. The pretest data shows that experimental class I has a higher initial ability than experimental class II. After all the learning processes were completed in experimental classes I and II, then a final test (posttest) was conducted to determine student learning outcomes. Based on the posttest data, the average student learning outcomes of experimental class I were 82.08 with a minimum value of 65 and a maximum value of 100 while in experimental class II with an average student learning outcome of 76.81 with a minimum value of 55 and a maximum value of 95. The learning outcomes obtained in experimental class I were higher than the learning outcomes obtained in experimental class II. This is in accordance with the results of research conducted by (Mawarni & Syafriani, 2022) that students with high initial abilities have better average learning outcomes than students with initial abilities.

In addition, the average N-Gain percent value in experimental class I was obtained at 69.47%, based on the table of categories of interpretation of the effectiveness of the N-Gain percent value, it can be concluded that the use of iSpring Suite 10 media is effective in improving student learning outcomes. Meanwhile, the experimental class II obtained an average N-Gain percent value of 61.28%, based on the table of categories of interpretation of the effectiveness of the N-Gain percent value, it can be concluded that the use of PowerPoint media is quite effective in improving student learning outcomes.

In research (Tani, 2017) the iSpring Suite application has a number of features that can be used to create interactive conversation simulations, quizzes, surveys, presentations, and learner worksheets (LKPD). In addition, this application can also be used for online and offline education. Although in the study obtained data on student learning outcomes taught with iSpring Suite 10 learning media higher than PowerPoint learning media, but in its implementation both learning media have been able to improve student learning outcomes on chemical equilibrium material. The difference in the effectiveness of the two methods is meaningful (significant) or not, namely by interpreting the second output table of the Independent Sample Test. Based on the output table, it is known that the sig value. Levene's Test for Equality of Variances is  $0.242 > 0.05$ , which means that the variance of the N-Gain percent data of the two classes is homogeneous. Furthermore, the Independent t test for N-Gain percent is guided by the sig value. (2-tailed) in the Equal Variances Assumed table of  $0.003 < \alpha (0.05)$ , so it can be concluded that there is a significant difference in the effectiveness of the two methods on chemical equilibrium material.

This is shown in the statistical results of the normality test with the Shapiro-Wilk approach obtained a significance value of 0.101 in experimental class I and 0.108 in experimental class II. Furthermore, the homogeneity test of pretest and posttest data with the Levene Statistic approach obtained a significance of 0.872 and 0.070 which means greater than the significance level ( $\alpha = 0.05$ ) so that the data is declared homogeneous.

The results of hypothesis testing obtained the price sig. (2-tailed)  $0.04 < \alpha (0.05)$  so that for the third problem formulation ( $H_a$  is accepted and  $H_0$  is rejected), which means there is a difference in the average value of student learning outcomes taught with the Problem Based Learning learning model assisted by iSpring Suite 10 media and PowerPoint on chemical equilibrium material. The difference in the average value of student learning outcomes in both classes is 5.278 where the average value of student learning outcomes with iSpring Suite 10 media is higher than that of PowerPoint.

Based on the results of the research and discussion that has been done, it can be seen that the use of iSpring Suite 10 learning media is better than PowerPoint. According to researchers, this is influenced by the advantages and disadvantages of the media used and the obstacles found during the learning process. The results of this study support research conducted by (Dalimunthe & Roza, 2021) where student learning outcomes taught with the iSpring-based Problem Based Learning learning model are higher than ordinary PowerPoint (89% and 85.6%). The teacher's ability to provide an interesting learning media will make students more interested in paying attention to learning so that student learning outcomes are better, one of the learning media that can be used is iSpring Suite 10 which has been integrated into a learning application.

The use of appropriate learning media is essential in the learning process. It has several advantages, namely it makes abstract and complex principles clear, simple and planned (Nurfajriani & Chairani, 2023). The use of learning media as teaching materials in learning can provide new experiences that are more meaningful, in addition, Android-based learning media can be studied anywhere and anytime, which can provide convenience for students (Ariani, Fatirul, & Atiqoh, 2023).

## Conclusion

Based on the data analysis of the research results and the discussion that has been carried out, the researchers obtained the following conclusions: 1) The learning outcomes of students taught with the Problem Based Learning learning model assisted by iSpring Suite 10 media obtained an average pretest score of 44.16 and a posttest of 82.08. And obtained an average N-Gain percent value of 69.47% including the medium category on chemical equilibrium material. 2) The learning outcomes of students taught with the Problem Based Learning learning model assisted by PowerPoint media obtained an average pretest score of 43.88 and a posttest of 76.81. And obtained an average N-Gain percent value of 61.28% including the medium category on chemical equilibrium material. and 3) There is a difference in the average learning outcomes of students taught with the Problem Based Learning learning model assisted by iSpring Suite 10 and PowerPoint media on chemical equilibrium material with a sig value.  $0,04 < 0,05$ . The difference in the average value of student learning outcomes in both classes is 5.278 where the average value of student learning outcomes with the Problem Based Learning learning model assisted by iSpring Suite 10 media is higher than that assisted by PowerPoint media.

## Recommendation

Based on the results of the research, discussion and conclusions, the suggestions that researchers can give are as follows: 1) For teachers and prospective teachers in teaching learning materials such as chemical equilibrium material, they should use a learning model such as the Problem Based Learning learning model assisted by learning media such as iSpring Suite 10 media to improve better student learning outcomes. 2) For further researchers to also conduct research by applying other variables such as the use of different learning models with the help of iSpring Suite 10 media or other learning media in an effort to improve student learning outcomes, especially in chemistry subjects.

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