

**THE EFFECT OF INTEGRATED CHEMISTRY PRACTICE
LEARNING IMPLEMENTATION ON STUDENT LEARNING
OUTCOMES**

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Abstract

This research aims to determine the effect of integrated chemistry practice implementation on student learning outcomes. This research is a quasi-experimental and unbalanced control experiment design. The population for this research was students in class X for the academic year 2020/2021, totaling 165 students divided into six classes of 24-29 students each. A random sample of 58 pupils from the population was drawn and divided into two classes using a random sampling procedure. The test is included into the data collection procedure utilized in this investigation. Analyze the prerequisites using the normality and homogeneity tests. The descriptive statistical analysis and t-test were utilized to analyze the data for the one-party Separated variant model. The outcomes of the analysis are given a significance level of 5%. The findings reveal that, students who complete comprehensive exercises using integrated practicum approaches achieve higher basic chemistry learning values when compared to students who complete cooperative learning in chemistry (control classes). Integrated practice learning approaches, as demonstrated here, have a significant influence on the educational accomplishment of students at SMK PGRI 3 Malang.

Keywords: *Integrated Practice Learning, Cooperative Learning, Chemistry Learning*

1. INTRODUCTION

The 'Integration Continuum' curriculum outlined in the works (Vasquez et al., 2013) defines science integration as a continuum of stages of integration characterized by considerable interconnectedness and interdependence between disciplines. To clarify, development begins with a disciplinary approach in which students acquire concepts from several fields before integrating them into a common topic during a multidisciplinary stage. Following that, interdisciplinary learning is used to further develop knowledge and abilities in all areas. Finally, students can develop their skills and knowledge through project- or problem-based learning (PBL) in real-world application when using a transdisciplinary approach.

According to previous research, two elements contribute to the adoption of an integrated STEM teaching approach: teacher beliefs and student beliefs (Arshad, 2021; Dong et al., 2020; Vallera & Bodzin, 2020). Teachers' belief in their students' capacities to learn is critical for good science integration into teaching approaches and also impacts student accomplishment in schools (Edele et al., 2021; Margot & Kettler, 2019). According to Wang et al. (2011), teaching requires understanding of pedagogical subject as well as educational challenges, curriculum, and ways for bringing things to life for students. Each teacher possesses a unique set of abilities for developing the materials and pedagogical methods he intends to use in the classroom.

Becker & Park (2011) as well as Mustafa et al. (2016), conducted research on the effects of integrated science on student achievement. Becker & Park (2011) found a significant benefit of an integrative approach focused on subject integration on elementary, middle, and high school pupils. In other words, it was discovered that an integrative strategy has a significant effect on student achievement. The results indicated that integrating the four science disciplines had the largest effect size. Meanwhile, a study conducted by Mustafa et al. (2016) on effective strategies for integrated science education confirms that the project-based learning approach is the dominating strategy for science education implementation.

In educational activities, the learning process is an interactive one between students, teachers, and subject matter. Two activities occur concurrently and in the same location during the learning process: learning activities conducted by students and teaching activities conducted by teachers. Chemistry disciplines should be taught with a more specific aim in mind, namely to equip students with natural knowledge and the minimum amount of knowledge required to advance to higher levels and create science and technology. Additionally, chemistry is one of the more challenging disciplines for students to comprehend, as it comprises numerous abstract concepts and theories. Hence, chemical learning places a premium on delivering a direct learning experience through the application and development of process skills and scientific attitudes in order to maximize the achievement of chemical learning objectives.

According to Okmarisa et al. (2016), the practicum or experimental technique is one method that is suited for use in chemistry learning. Students obtain a stronger foundation in empirical chemistry through the practical technique. This is because chemistry learning should not be solely theoretical; it should also include practical experience to allow students to demonstrate various concepts and theories gained in class. Integrated Practicum is a type of instruction in which the learning process is supplemented by practical activities (Andromeda et al., 2018). The integrated practicum's objective is to develop students' understanding of and direct experience with the subject matter covered in class, in order for students to truly grasp the content covered in class and to improve students' ability to utilize chemistry laboratory equipment.

According to Duda et al. (2019) and Juhji & Nuangchalerm (2020), integrated science development can help students enhance their science process skills. Students' science process abilities include the ability to observe, ask questions, formulate hypotheses, process data, and present experimental results. Additionally, E-Module can help pupils develop their problem-solving and creative thinking talents (Astra et al., 2020; Cahyanti et al., 2021; Ibrahim & Alqahtani, 2018). Students' science process skills are critical for them to exercise innovation and produce new ideas while they are learning (Karacop & Diken, 2017).

According to the observations made, practicum is more likely to be implemented in schools separately from the subject matter; for example, the learning process may occur during study hours, while practicum occurs in the afternoon outside the room, during class hours, or the following week during class hours. This results in some students forgetting the subject content covered, preventing the practicum from running well. One of the chemistry subjects addressed in Vocation High School (SMK) on class X Chemistry semester 1 is reaction rate material, specifically the factors that impact reaction rate. Normally, teachers give material using their own practical technique, interfering with students' comprehension and making learning less effective and efficient. As an alternative technique of acquiring

content, integrated practicums must be capable of promoting a more effective and efficient learning process than individual practicums. Student achievement in chemistry learning is projected to improve as a result of this way of learning.

2. RESEARCH METHOD

This research used a quasi-experimental and unbalanced control experiment design. The population for this research was students in class X for the academic year 2020/2021, totaling 165 students divided into six classes of 24-29 students each. A random sample of 58 pupils from the population was drawn and divided into two classes using a random sampling procedure. The test is included into the data collection procedure utilized in this investigation. This research instrument will be validated using expert judgment and test questions. Analyze the prerequisites using the normality and homogeneity tests. The descriptive statistical analysis and t-test were utilized to analyze the data for the one-party Separated variant model. The outcomes of the analysis are given a significance level of 5%.

2.1. Research Hypothesis

Ha: the learning achievement of chemistry learning of the experimental class students who used integrated practical learning was higher than the chemistry learning achievement of the control class students who cooperative learning.

3. RESULT AND DISCUSSION

3.1. Research Result

3.1.1. Validity Test

Table 1 Validity Test Results

Items	Pearson Correlation	Sig	Description
1	0,401	0,035	Valid
2	0,566	0,002	Valid
3	0,283	0,009	Valid
4	0,622	0,000	Valid
5	0,416	0,028	Valid
6	0,489	0,008	Valid
7	0,482	0,009	Valid
8	0,576	0,001	Valid
9	0,407	0,032	Valid
10	0,441	0,019	Valid
11	0,428	0,023	Valid
12	0,525	0,004	Valid
13	0,510	0,006	Valid
14	0,589	0,001	Valid
15	0,620	0,000	Valid
16	0,407	0,032	Valid
17	0,418	0,027	Valid
18	0,456	0,015	Valid

19	0,402	0,034	Valid
20	0,453	0,021	Valid
21	0,450	0,016	Valid
22	0,343	0,008	Valid
23	0,493	0,008	Valid
24	0,515	0,035	Valid
25	0,401	0,035	Valid
26	0,448	0,017	Valid
28	0,396	0,037	Valid
29	0,439	0,019	Valid
30	0,521	0,004	Valid
31	0,422	0,025	Valid
32	0,533	0,003	Valid
33	0,254	0,192	Valid
34	0,556	0,002	Valid
35	0,400	0,035	Valid

It is possible to infer that all data items are valid and feasible for further testing based on the results of the validity test shown in Table 1.

Table 2 Reliability Test Results

Cronbach's Alpha	N of items
0,878	25

Based on the calculation of the SPSS tabulation above, it is known that the value of rII is 0.878. It means that all the items of the learning achievement instrument in this study have high reliability.

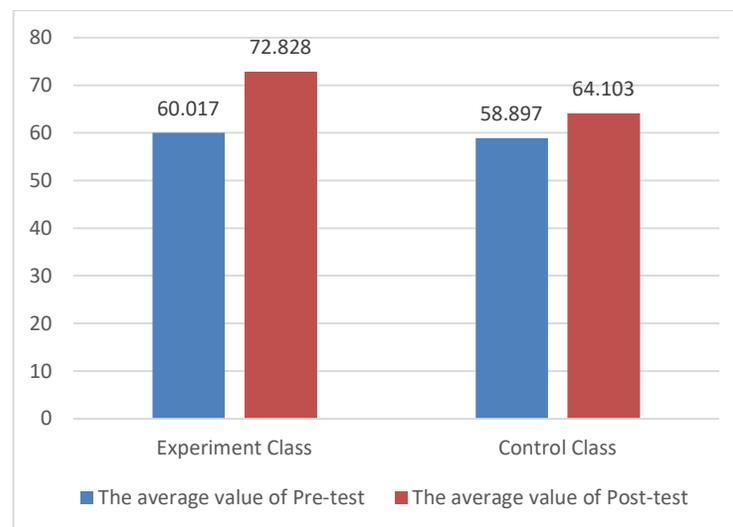


Figure 1 Histogram of the average value of the pretest and posttest on experimental class and control class

The average score on the posttest for the control class, which is class X Chemistry 2 SMK PGRI 3, is 64,103. The control class's average value is in the middle range. The average of the experimental class's posttest values, namely class X Chemistry I SMK PGRI 3, is 72,828. The experimental class's average value is in the upper range. The experimental class's posttest average was 72,828 while the control class's posttest average was 64,103. There is a difference of 7,725 or 4,952 % in the increase. This highlights the influence of integrated practice on academic outcomes.

- 1) Posttest data for control class and experimental class
 - a. Control Class

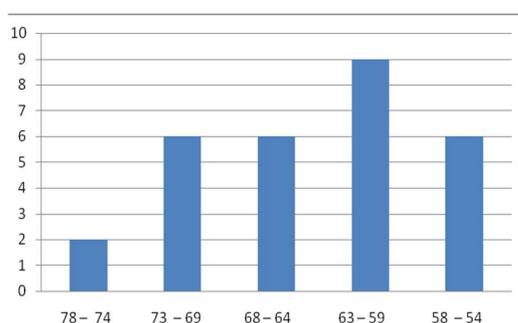


Figure 2 Histogram of Control Class Posttest Values

The average value in the posttest value of the control class, namely class X Chemistry SMK PGRI 3 is 64,103. The average value of the control class is in the medium range.

- b. Experiment Class

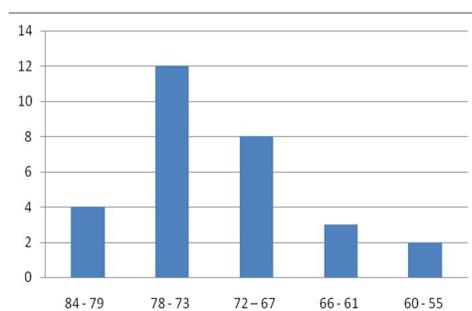


Figure 3 Histogram of Experiment Class Posttest Values

The average value in the posttest value of the experimental class, namely class X Chemistry at SMK PGRI 3 is 72,828. The average value of the experimental class is in the high range

3.1.2. Normality Test

Table 3 Summary of Data Distribution Normality Test Results

Treatment Group			Pretest	Posttest
Experimental Class	N		29	29
	Normal Parameters ^{a,b}	Mean	60.017	72.828
		Std. Deviation	7.7913	6.9079
	Most Extreme Differences	Absolute	.156	.187
		Positive	.156	.118
		Negative	-.087	-.187
	Kolmogorov-Smirnov Z		.840	1.006
	Asymp. Sig. (2-tailed)		.480	.264
Control Class	N		29	29
	Normal Parameters ^{a,b}	Mean	58.897	64.103
		Std. Deviation	7.0500	5.9603
	Most Extreme Differences	Absolute	.096	.099
		Positive	.096	.099
		Negative	-.079	-.080
	Kolmogorov-Smirnov Z		.516	.534
	Asymp. Sig. (2-tailed)		.953	.938

Based on the results of the normality test in table 3 above, it shows that the data is normally distributed

3.1.3. Hypothesis Test

Table 4 Results of t-test

Variable	Db	t-statistic	t-table
E1 – E2	56	5,149	1,673

Based on table 4 above, it can be seen that the t statistic results are 5,149 while the t table is 1,673, so that the t statistic > t table. Thus, it can be concluded that Ho is rejected and Ha is accepted.

3.2. Discussion

On the basis of the findings of this study, it can be concluded that integrated and practical learning approaches improve student learning outcomes. The average pre-treatment student learning score in the experimental class was 60.017, but the average post-treatment student learning score was 72.828. In the control class, which is similar to the control class, the average student performance score prior to the blended learning process is 59.897, whereas the average student achievement score following the blended learning process is 64.103.

The average score results indicate that there is no significant difference score of student achievement between the experimental and control classes prior to the learning process. However, after the learning process was completed, the average results for the experimental and control classes were significantly different. This can be seen as meaning that when students engage in both teaching and learning activities in the same way, their level of achievement is balanced and does not differ significantly between the experimental and

control classes. Nonetheless, if students engage in educational and learning activities in a variety of ways, the results will vary. The findings of this study reveal that students in class X chemistry 1 who complete integrated activities obtain a better level of learning than students in class X chemistry 2 who using **cooperative learning**. This can be accomplished through integrated practice, which involves including theory and practice into all sessions, distributing content to students until the subject is completed, and then practicing. It can take several months to teach all of the fundamentals of chemistry in one semester using this integrated learning strategy. As a consequence, this model contains flaws. This means that we must reiterate critical explanations provided by the teacher at the start of the practice.

Since the majority of students forget the content presented by the teacher at the beginning of the meeting, practice time is reduced, which is inefficient for strengthening students' psychomotor abilities. This is less than the greatest rise in student test scores that can be achieved. Integrated practice is a type of practice that occurs after the teacher has presented the topic in class but before any further material has been presented. Further, integrated practical skills adapt to the capabilities of the workplace. The objective of this integrated activity is to help students gain a better comprehension of the content covered in class and to reinforce the expectation that students truly understand the material covered. This form of learning paradigm is more efficient since it eliminates the need for students to repeat content in order to enhance their psychomotor abilities.

4. CONCLUSION

In conclusion, based on the findings of the data analysis, students who complete comprehensive exercises using integrated practicum approaches achieve higher basic chemistry learning values when compared to students who complete with cooperative learning exercises in chemistry (control classes). Integrated practice learning approaches, as demonstrated here, have a significant influence on the educational accomplishment of students at SMK PGRI 3 Malang.

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