The Effect of the Project-Based Learning Model on the 4C Skills (Critical Thinking, Creativity, Communication, and Collaboration) of Elementary School Students

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Abstract: This research aims to examine the effect of the project-based learning model on elementary school students' 4C skills. This research is a quasi-quantitative experimental research. The sampling technique used at the SD Negeri 2 Perm Way Kandis location was an arbitrary cluster technique. The research sample consisted of two groups: experimental class IV A, totaling 28 students, and control class IV B, totaling 30 students. Data collection techniques use tests and questionnaires. Data analysis techniques use normality tests, homogeneity tests, and hypothesis tests. The results of data analysis can be used to identify the impact of critical thinking skills and creativity. The average pretest score for the experimental class was 40.89 the posttest score was 81.07, the average pretest score for students in the control class was 44, and the posttest score was 80.16, higher in the experimental class than the control class. Based on the analysis of experimental class student questionnaire data, the questionnaire data was used as a measuring tool for students' level of skill achievement, communication, and collaboration in the experimental and control classes, and an average score of 82 was obtained. Furthermore, the average score for the control class was 79.5. The results of the t-test using the SPSS StatisticsV for Windows application obtained a value of Sig<0.05(5) on Sig(two-sided), namely 0.000<0.05(5) for 28 students. Based on this research, PJBL has a significant impact on improving students' 4C skills.

Abstrak: Tujuan penelitian ini adalah untuk menguji pengaruh model pembelajaran berbasis proyek terhadap keterampilan 4C siswa sekolah dasar. Penelitian ini merupakan penelitian eksperimen kuasi kuantitatif. Teknik pengambilan sampel yang digunakan di lokasi SD Negeri 2 Perm Way Kandis adalah teknik cluster sembarang irisan. Sampel penelitian terdiri dari dua kelompok yaitu kelas eksperimen IV A yang berjumlah 28 siswa dan kelas kontrol IV B yang berjumlah 30 siswa. Teknik pengumpulan data menggunakan tes dan angket. Teknik analisis data menggunakan uji normalitas, uji homogenitas, dan uji hipotesis. Hasil analisis data dapat digunakan untuk mengidentifikasi dampak keterampilan berpikir kritis dan kreativitas. Rata-rata nilai pretest kelas eksperimen sebesar 40,89 dan nilai posttest sebesar 81,07, serta rata-rata nilai pretest siswa pada kelas kontrol sebesar 44 dan nilai posttest sebesar 80,16, lebih tinggi pada kelas eksperimen dibandingkan dengan kelas kontrol. Berdasarkan hasil analisis data angket siswa kelas eksperimen, data angket sebagai alat ukur tingkat pencapaian keterampilan, komunikasi dan kolaborasi siswa pada kelas eksperimen dan kontrol diperoleh nilai rata-rata sebesar 82. Selanjutnya, hasil kelas kontrol rata-rata 79,5. Hasil uji t dengan menggunakan aplikasi SPSS Statistics V for Windows diperoleh nilai Sig <0,05(5) pada Sig (dua sisi) yaitu 0,000<0,05(5) yang berjumlah 28 siswa. Berdasarkan penelitian tersebut, PJBL memberikan dampak yang signifikan terhadap peningkatan keterampilan 4C siswa.

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A. Introduction

Teaching is an effort to increase, strengthen, and idealize every human capacity and ability. Residents also shape their character according to the quality and culture found in community activities (Roqib, 2017). Schooling is an educational effort that addresses honorable qualities that are valuable for social life so that these qualities can be channeled through the exchange of training in the areas of data (mental), perspective (feeling), and skills (psychomotor).

Education developments align with the demands of the times (Nurjaman, 2020). Education is necessary for every human being to equip themselves with knowledge, thinking skills, and other skills that can develop the ability to face developments in the era of scientific and technological progress (Dwiyanto & Kurniasih, 2024). Of course, education is necessary because, with education, students can face future developments, which will be more difficult (Malik & Chusni, 2018). Nowadays, students must have 4C skills, including creative thinking, communicating, creative thinking, and collaboration (Malik & Chusni, 2018). This skill will give students social intelligence, creativity in generating ideas, and the ability to combine theories with facts (Maulidah, 2021). Keterampilan ini akan membuat siswa memiliki kecerdasan dalam social, kreatif dalam memunculkan ide dan mampu untuk mengaikan terori dengan fakta-fakta (Muttaqin & Rizkiyah, 2022).

It is hoped that this will prepare skills for the 21st century. Skills preparation that is attempted early will get better results than skills preparation that primarily requires short education (Taja et al., 2019). Based on a study conducted by Delimiter Laser, shows that many students who move from middle school to high school need the ability to have some of the skills needed in the world of work. So, the organization must make huge expenditures to represent changes in events and preparations. These abilities include Oral and written correspondence, decisive reasoning and critical thinking, impressive skills and hard-working behavior, cooperation and joint efforts, working in different groups, and applying innovation, authority, and effort of executives (Lase, 2019).

Technically, providing skills training in education can be implemented through learning activities. The 2013 curriculum states that learning must be carried out by considering mastery of the 4C skills, namely Critical Thinking, Creativity, Collaboration and Communication. In line with this, the Partnership for 21st Century Skills identified that the skills needed for learning in the 21st century are critical thinking, communication skills, collaboration/team building, and creativity (Mudrikah et al., 2022). So, to achieve this goal, an appropriate learning model is needed so that students can master the required skills.

Education must be able to change society's goals to meet real needs, namely to make oneself an agent of change in the 21st century, making oneself useful to many people (Harahap et al., 2023). The aim of education at first was only to produce people to face simple situations; now, it is necessary to prepare students with thinking skills and brilliant ideas for the future in the world of work (Sukma et al., 2022). Education provides knowledge and skills to do many things in the world of work (Mustika, 2021). Of course, in the future, the

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challenges that students will face will be more complex. Therefore, skills and abilities must be instilled in students from school to solve the problems faced by their environment.

The ability to think critically (Critical Thinking) is an ability that is needed by students when facing problems, with the analytical ability to see problem points, respond, and convey ideas that can solve problems (Suharna & Hi Abdullah, 2020). Communication skills are very important when expressing opinions in the learning process and conveying ideas for their reactions to the material presented by the teacher (Fitriah et al., 2020).). Apart from that, the way students convey their ideas well, politely, and bravely (Fitriah et al., 2020).

Creative thinking skills (Creative Thinking) can birth ideas, from existing things to something new in solving problems (Malik et al., 2019). Creative thinking is a mental activity that generates original, aesthetic, constructive ideas that relate to mental images and emphasize rational and intuitive thinking (Dupri et al., 2021). Skills or the ability to work together (Collaboration) is an ability that can combine critical reasoning abilities, motivation, and the ability to connect theory with reality to solve problems that exist in society (Puspitasari et al., 2019). The scope of education can create superior human resources to answer all the challenges of contemporary developments (Rosad, 2019). However, the problem in reflecting education today is that it still uses old material-processing methods. Hence, the aims of education itself are not optimal due to errors in choosing media, methods, and learning models.

The existing learning model in schools still prefers conventional methods and makes the teacher the center of knowledge (Kurniawati, 2022). Therefore, in education, it is necessary to raise awareness of the importance of students' willingness and active learning abilities, not just based on the knowledge possessed by teachers (Nasution, 2018). To create a meaningful learning climate, choose a learning model that suits students' needs (Fitri, 2021).

Based on the results of the meeting held by Perum Way Kandis State Elementary School 2 with science subject teachers, it is known that the educational model used by teachers has utilized different educational models, namely Guidance and Education, which is oriented towards demonstration and context. Still, the student's experience matters in mastering the topic. During the learning process, this results in students' learning skills still not being active. Based on this, it can be concluded that in science learning it is necessary to use a learning model that can improve students' learning skills and meet the Minimum Completeness Criteria. Science subjects are 64.

However, it is known that for 28 students in class IV A, 12 people completed it, and 16 people did not; for class IV B classically, there were 30 students. Twelve students completed it, and 18 students did not. If the percentage of completeness of process skills in science subjects for students from both classes, namely class IV A, reaches 42.85% and class IV B 40%, then even half of the students in both classes have not reached the minimum completeness criteria. This indicates that the science process skills of class IV students at

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Perum Wa Kandis State Elementary School 2 are divided into two classes, namely class IV A and IV B, and are still low.

Based on the problems described above, a learning model is needed to enable students to work together. The way that can be implemented is by implementing a learning model (Project-Based Learning) (Sholekah, 2020). Using the Project Based Learning learning model allows students to form their knowledge based on their experiences (Elisabet et al., 2019). Project-based learning (PjBL) is project-based learning that encourages students to carry out concrete, core learning activities (Mayuni et al., 2019).

Project-based Learning (PjBL) is a type of learning that requires projects. This learning model is considered appropriate to current developments because it accustoms students to think critically and creatively and can solve problems (Dewi, 2021). Project-based Learning (PjBL) is a learning model based on assignments based on challenging problems, involving students in design matters, finding solutions, taking actions, or performing certain activities culminating in concrete product results or achievements. As for what can be done, Thomas formulated five ways to design project assignments in the learning process: 1) giving project assignments is the essence of learning, 2) assigned projects must have the capacity to encourage students to be able to seek and discover their knowledge, 3) assigned projects require investigative activities, 4) projects assigned to students are fully given responsibility to students, 5) the projects given must be contextual and meaningful (Pratiwi et al., 2018).

This task-based education model can also be applied at all levels of training from elementary school to high school (Christian, 2021). Next, in the learning experience, we are passionately instructed to make the learning experience more perfect by using growing experience. Using an educational model that is less accurate can cause students to face difficulties in solving natural science questions. Hence, an educator needs to choose the right educational model (Nisah et al., 2021), especially using a business-based education model.

This learning model also emphasizes students' activities in producing products by applying the skills of researching, analyzing, creating, and presenting products from concepts learned with real experience (Irman & Waskito, 2020). This learning allows students to explore and be directly involved in gaining knowledge (Surya et al., 2018). Therefore, this learning model is very suitable for use as a learning model that can improve student learning outcomes.

Based on several references related to the research described above, this research aims to see the effect of the project-based learning model on improving the 4C skills of elementary school students. This research is quantitative, and the type of experiment used is quasi-experimental. It is hoped that this research will become reference material that influences students' skills. Because theoretically, this learning model significantly influences student learning outcomes, this research needs to be carried out.

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B. Method

The examination method is a colorful list of methods for combining data, analyzing it, and providing definitions related to the examination object. The examination method used in this examination is a quantitative approach. Quantitative research is a method used to find the effect of certain treatments on others in controlled situations or the effect of certain variables on other variables in strictly controlled situations (Sugiyono, 2016). The location or place of this research was the State Elementary School 2 Perum Way Kandis.

This type of research is experimental research. The experiment was to apply a project-based learning model to measure its effect on improving the 4C skills of grade 4 students at Perumnas Way Kandis 2 Elementary School. During the learning process, researchers will make observations by filling out a questionnaire containing indicators of mastery of 4C skills. After the learning is complete, students will be given a questionnaire about the effectiveness of the learning model. The stages in this research are in the sketch, namely:

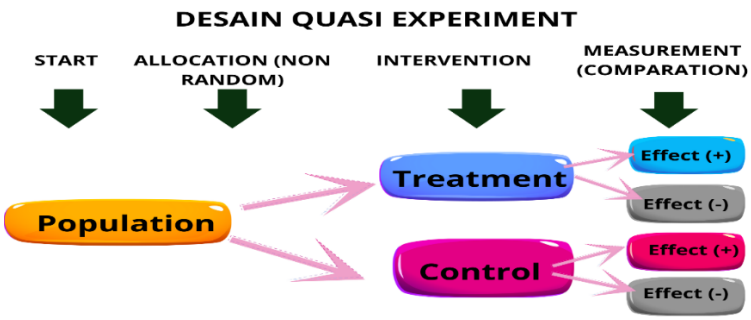

Figure 1. Quasi Experimental Design

The population in this research is all students in class IV at SDN 2 Perum Way Kandis.

Table 1. Research Population

No	Class	Gender		The Number of Students
		Man	Woman	
1.	IVA	14	14	28
2.	IVB	18	12	30
Amount		32	26	58

The example used in this determination is the saka rong genera kanthi sing padha example. One gender finds the polite gender, namely gender IV A, and the other gender, namely gender IV B. Class jurisdiction uses problem-based archetypes, and the polite gender uses task-based archetypes. The testing method used in this test is the Bunch Arbitrary Testing strategy. Irregular Bunch Checking is a testing procedure in which a scientist divides a population into cohorts. Several examples of these bunches were taken

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haphazardly (Sugiyono, 2018). Testing using a bundle of arbitrary inspecting is done according to the exam's objectives, especially to determine the extent to which students' 4C abilities have been further developed using the undertaking-based learning model.

The pattern collection technique used in this determination is Cluster Random Sampling. Cluster Random Sampling is a pattern-gathering effort in which a researcher divides a community into several remote communities called clusters. Several clusters take several patterns randomly (Sugiyono, 2018). Sampling using Cluster Random Sampling is by the research objective, namely wanting to know how students' 4C skills have improved using the project-based learning model. The information examination strategy, specifically this exploration, utilizes quantitative investigation. The insights utilized are the t-test. A few necessities should be met before the t-test is done. A few essential tests are as follows:

Normality Test

The normality test is used to determine whether or not the data taken comes from a normally distributed population. The normality test in this study used Kolmogorov Smirnov based on the magnitude of the significant value. Data is said to meet the normality assumption or is normally distributed if the Kolmogorov Smirnov sig value is > 0.05, whereas data that is not normally distributed has a sig value < 0.05. The data input and processing process uses the SPSS Statistics V 20 for Windows.

Homogeneity Test

After the normality test, a homogeneity test is carried out to find out whether the study population has the same variation or not. The homogeneity test used by researchers is the Levense statistical test based on the magnitude of the significance value. Data is said to meet the homogeneous assumption if the sig value is > 0.05, whereas data that is not homogeneous has a sig value.

Hypothesis Testing

Hypothesis testing is a procedure that contains rule conclusions that lead to a decision on whether to accept or reject the hypothesis. In this case, a test of equality of two averages is carried out. The similarity test of two averages is used to determine whether or not there is a difference (similarity) between two averages. The statistical analysis technique used to test the equality of two averages is the t-test.

The t-test is a statistical data analysis technique that compares two samples or groups that must be normally distributed. The t-test formula used to test the hypothesis is as follows:

$$T_{count} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left[\frac{Jn1 + 12}{(N_1 + N_2) - 2}\right]\left[\frac{1}{N_1} + \frac{1}{N_2}\right]}}$$

$T_{table} = t(a,n1 + n2 - 2)$

Note :

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X_1 = the average of the experimental sample
X_2 = control sample average
n1 = lots of experimental samples
n2 = many control samples
S1 = standard deviation of the experimental sample
S2 = standard deviation of the control sample
S = standard deviation

C. Result and Discussion

Result

This test was carried out at the State Elementary School 2 Perumas Way Kandis odd semester in June 2023. Before the test instrument was given, the questionnaire was first approved, and after that, it was tried in class IV MIN 7 Bandar Lampung by more than 30 students who got the scores. Class IV style material. This exploration aims to identify the results of the Undertaking Mastering Model on the Implementation of 4C Skills (Decisive Reasoning, Inventiveness, Correspondence, and Joint Effort) of Class IV Students at State Lower School 2 Perum Way Kandis.

Data analysis results in pretest and posttest results

The input results appear through the jungle of experimental machines, such as experimental measuring equipment connected to 20 things plus style lessons. The children are given hidden problems, namely the asking children and the chance children. For the search child, it is child IV A, then the child who asks is child IV B. For this reason, it is postulated that the reaction to checking the presence of the research child's ideal pretest presence is still low, namely an increase in the average number of 40.89. Meanwhile, the ideal posttest is present when the child investigates the present through improvement, with an ideal average of 81.07. Then, the child's pretest reaction was also low, namely 44, and the posttest reaction was also high namely 80.16.

Results of questionnaire data analysis for the experimental and control class

The researcher first conducted classroom learning using the Project-Based Learning model in the experimental class and then implemented the Problem-Based Learning learning model in the control class. Then, data was collected using questionnaires to achieve indicators of Communication and Collaboration skills.

Based on the data obtained from the student questionnaire scores, there is achievement of the Communication and Collaboration skill indicators in the style material presented in the diagram below:

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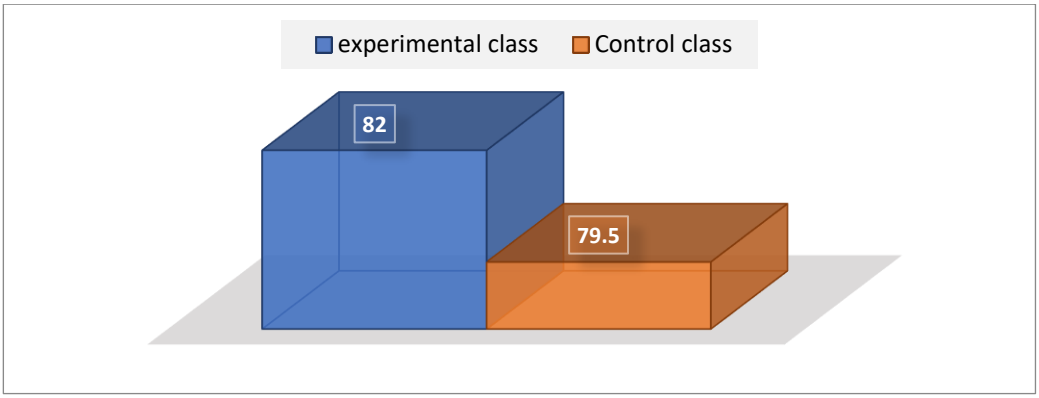

Figure 2. Class questionnaire Data Analysis Results Experiment and Control Class

The data results in the diagram above were obtained through questionnaire data to measure achievement per indicator of the skills, Communication, and Collaboration of experimental class and control class students. For this reason, based on the results of the questionnaire data analysis, students in the experimental class showed an average score of 82. Then for the control class, the results were 79.5.

Normality Test

Pretest and Posttest Normality Test for Experimental Class

The regularity test is used to determine whether the next data dies regularly. The next data fulfills the normal assumption if the Kolmogorov Smirnov sig fare value is 0.05; otherwise, data that is not expected to have a sig fair 0.05.

Table 2. Results of Pretest and Posttest Normality Test for Experimental Class

Class	Kolmogorov- Smirnov			Shapiro- Wilk		
	Statistic	df	Sig.	Statistic	Df	Sig.
Pretest Experimental	.134	28	.200	.941	28	.120
Posttest Eksperimental	.155	28	.084	.931	28	.066

Based on the information provided by the board in the Kolmogrov-Smirnov segment table above, it makes sense that the pretest and posttest effects of the trial class with sig. 0.200 with an importance level of α = 0.05, so in the exploratory pretest class, sig > α means that H0 is recognized. Meanwhile, in the exploratory posttest, the sign is 0.084, and the level of importance is α = 0.05, so in the trial posttest, the sign is > α, which means H0 is recognized. So, it can be assumed that the pretest and posttest of the H0 trial class are recognized, which means that students' Decisive Reasoning and innovation abilities are frequently circulated.

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Control Class Pretest and Posttest Normality Test

The normality test was carried out to determine whether the two research class samples were normally distributed. The following are the results of the pretest and posttest normality test of the control class learning results which can be seen below:

Table 3. Results of the Pretest and posttest normality Test for the control class

Class	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	Df	Sig.
Control Pretest	.149	30	.200	.936	30	.145
Control Posttest	.141	30	.200	.925	30	.087

Based on the calculations contained in the Kolmogrov-Smirnov section table above, it is known that the control class pretest and posttest data with sig. 0.200 with a significance level of α = 0.05 so that in the control pretest class, it is sig > α, which means H0 is accepted. Meanwhile, in the control posttest, the sig is 0.200, and the significance level is α = 0.05, so in the experimental posttest, it is sig > α, which means H0 is accepted. So, it can be concluded that the pretest and posttest of the control class H0 are accepted, which means that students' average Critical Thinking and Creativity skills are normally distributed.

Uji Homogenitas

The researcher conducted a homogeneity test to determine whether the two classes had the same or different characteristics. The following is a table of results from the homogeneity test for the experimental class and control class:

Table 4. Results of Homogeneity Test for Experimental Class and Control Class

Levene's Statistic	df1	df2	Sig.
2,390	3	58	.073

Based on the homogeneity test of research data using SPSS Statistics V 20 Windows, a Sig value > 0.05 (5%) was obtained, namely 0.073. So the research instrument is said to be homogeneous.

Hypothesis Testing

After doing the ordinariness and homogeneity tests, the scientist completed a speculation test. The speculation test was examined utilizing the T-test to see if the exploratory class research information and control affected understudies' 4C abilities (Decisive Reasoning, Imagination, Correspondence, and Coordinated effort). The aftereffects of the t-test are in the accompanying table:

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Table 5. Hypothesis Test Results

	Paired Differences					t	df	Sig.(2-tailed)
	Mean	Std Deviation	Std Error Mean	95 % Confidence interval of the Difference				
				lower	upper			
Uji-t	-40,000	10,541	1,992	-44,087	-35,913	-20,080	58	,000

In this examination, testing the information utilizing the t-test using the SPSS Measurements V 20 For Windows application got a Sig worth of <0.0 5 (5%). Si g (2-followed) got 0.000 < 0.05, so there is a critical impact on understudy learning results. So, the speculation H0 is dismissed, and H1 is acknowledged. This can likewise be seen from the information below:

Table 6. Pretest and Posttest Analysis Results

	N	Minimum	Maximum	Mean	Std. Deviation
Pretest Eksperimental	28	30	65	40,89	8, 653
Posttest Eksperimental	28	70	95	81,07	7, 382
Pretest Control	30	30	65	44	10,729
Posttest Control	30	70	95	80,16	7,459

In light of the information above, it tends to be seen that the distinction between the normal pretest score for the exploratory class is 40.89 and the posttest for the trial class, specifically 81.07, which is higher than the Decisive Reasoning and Imagination capacities of understudies in the exploratory class. Control class with a normal pretest score of 44 and a posttest score of 80. .16. The examination results likewise show that the T-Test involving the SPSS Measurements V For Windows application got a sig esteem < 0.05 (5%) in sig (2-followed) got 0.000 < 0.05 (5%) so it very well may be presumed that there is a Model Impact Undertaking Based Figuring out how to Work on 4C Abilities (Decisive Reasoning, Imagination, Correspondence and Coordinated effort) of Class IV Understudies at State Grade School 2 Perum Way Kandis.

Discussion

This quantitative exploration expects to uncover the impact of the PJBL learning model on working on the 4C abilities (Decisive Reasoning, Inventiveness, Correspondence, And Joint effort) of Class IV Understudies at State Grade School 2 Perum Way Kandis. With motorbike-based learning, understudies can boost the growing experience in class and work on the 4C. The upside of PBL is that understudies are engaged with learning exercises. Hence, their insight is very much retained; understudies are prepared to have the option to cooperate with different understudies, and understudies can acquire issue arrangements from different sources. So that understudies' 4C abilities can get to the next level.

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This increment should be visible from the aftereffects of the Correspondence and Joint effort Abilities Poll test in the control and trial classes. The exploratory class got 82%, while the control class got just 79.5. So, with these outcomes, one might say that PJBL can further develop understudy mastering results and abilities since understudies are exceptionally energetic about partaking in the educational experience. As per past exploration, PJBL can further develop understudy learning results because, during the time spent learning exercises, understudy members seem excited and dynamic in following the growing experience bit by bit (Siregar et al., 2023).

Ordinariness test results are utilized to decide whether the information conveyed is typical. Information is said to meet the presumption of ordinariness if the Kolmogorov-Smirnov sig esteem is > 0.05, through information that does not expect ordinariness has a sig esteem < 0.05. Concerning the aftereffects of the examination, it is realized that the control class pretest and posttest information with sig. 0.200 with an importance level of α = 0.05, so in the control pretest class, it is sig > α, implying that H0 is acknowledged. In the meantime, in the control posttest, the sig is 0.200, and the importance level is α = 0.05, so in the exploratory posttest, it is sig > α, which implies H0 is acknowledged. So, it tends to be reasoned that the pretest and posttest of the control class H0 are acknowledged, implying that understudies' typical Decisive Reasoning and Innovativeness abilities are ordinarily conveyed. There is past exploration that can uphold that PJBL impacts understudy learning results and, in the ordinariness test, brings about regularly appropriated understudy learning results (Nurhadiyati et al., 2021).

The consequences of the Homogeneity test in the two example classes show that the aftereffects of examination utilizing SPSS Measurements V 20 Windows got a Sig esteem > 0.05 (5%), specifically 0.073. So the exploration instrument is supposed to be homogeneous or can be supposed to be something similar. Then, the consequences of the speculation test are to decide if there is an impact on 4C abilities in understudies. It very well may be seen that the Sig esteem is <0.05 (5%) and the Sig (2-followed) esteem is 0.000 <0.05, so there is a critical impact on understudy learning results. So speculation H0 is dismissed and H1 is acknowledged, so in light of this information, one might say that there is an impact of the Task Learning Model to Work on the 4C Abilities (Decisive Reasoning, Imagination, Correspondence, And Coordinated effort) of Class IV Understudies at State Grade School 2 Perum Way Kandis. Other examinations likewise express that PJBL affects mastering results and further developing understudy abilities (Azzahra et al., 2023).

D. Conclusion

Based on the research results, it can be concluded that the Project Learning Model can improve the 4C skills (Critical Thinking, Creativity, Communication, and Collaboration) of Class IV Students at State Elementary School 2 Perum Way Kandis. Influence of Critical Thinking Skills, Creativity.

Then, the answer to this question must be seen from the formal pretest ethos of the demonstration species, 40.89 and the posttest ethos of 81.07, which is higher than using the

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subtest ethos of the superior species, which has a formal pretest value of 0.44 and posttest value of 80.16. In this way, using the antecedents of PBL tarbiah can enlarge the nature of subordinates, so PJBL is very appropriate to use as a resistance that enlarges the nature of subordinates.

Based on the results and exam process, there is an idea for Learning Teachers to utilize the PJBL Model in this exploration to have an impact on the 4C Abilities (Assertive Reasoning, Imagination, Correspondence and Coordinated Efforts) so that students' abilities increase so that they can be created by instructors persistently for various purposes. Material. The idea for advanced scientists in implementing the venture-based learning model is to complete a relative report between the PJBL learning model and different learning models to generate new information and increase information collection.

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