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Innovative Learning to Improve Learning Success with the SCL Method Based on Gamification at Sd 2 Lebih Gianyar

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Abstract
The curriculum currently implemented in Grade V of elementary school for mathematics includes whole numbers. The level of success in mathematics, especially in teaching positive and negative whole number operations, still does not meet the Minimum Learning Completion Standard (SKBM). On the other hand, student motivation and desire to learn are factors that influence student learning completion. Many primary school students, especially in Grade V, still lack understanding and have difficulty comprehending the concept of integer operations. Therefore, this study applied a learning method that is more interesting for primary school students, namely the application of the Gamification-based SCL (*student-centred learning)* method to improve learning success in Grade V of SD 2 Lebih, Gianyar. The objectives of this study were to obtain the percentage of learning success and the best model of the factors that determine learning success. The results of the learning outcome evaluation in cycle 1 were 73% and in cycle 2 were 76%. The learning success model was obtained as follows:

$$Y = -8.12 + 0.499\,X1 + 0.260\,X3 + 0.329\,X4$$

indicates that there are three independent variables that have a significant effect, namely X1, X3, and X4.
The p-value obtained is lower than the 5% significance level, indicating a linear relationship between the independent variables and student success, with an R-Sq value of 94.3%, meaning that the model is good with each variable being significant.

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1. Introduction

Learning success that does not meet expectations, but learning outcomes are often forced to be good. Through research from the Ministry of Education and Culture, Indonesia is still in the low literacy category, which is the cause of this lag (Bappenas, 2024) [3]. One of the things that needs to be done is to introduce new learning methods that are interesting and mostly involve student activity, independence, responsibility, and participation in every activity. The teaching and learning process in the classroom must be interesting, innovative, and not boring, so that students learn happily and well. Therefore, the researcher applied a more interesting and innovative learning methods for elementary school students through the Gamification-based SCL *(student-centred learning)* method. The SCL approach (Boiliu and Sinaga, 2021) [4] is a learning idea that supports teachers in connecting the material presented with the students' situations and encourages students to establish connections between their knowledge and its application in everyday life.

The SCL learning model aims to encourage student activity in learning and independence in the learning process, as well as responsibility. This provides tasks both verbally and in writing in a good and proper evaluation (Firmansyah, 2022) [5]. Research on the SCL (*student-centred learning)* method regarding learning success (Gusteti, 2022) [6] at the primary school level has yielded good results. In addition, students will develop creative abilities because they will actively participate in the learning process. Gamification is an innovative teaching method that utilises elements or features from *games* that can increase student motivation in the learning process (OECD, 2024) [7]. The Gamification method aims to make *non-game contexts (*e.g., in learning and teaching) more interesting by incorporating game elements (*game thinking, game design, and game mechanics)*. The application of Gamification in the learning process can have a positive impact on students' understanding of the material, while still paying attention to the characteristics of each student (OECD, 2023) [8]. Research on gamification has been conducted with good learning outcomes (Werdianto, *et al*., 2023). The SCL (*student-centred learning)* method based on gamification was used to improve learning success in Grade V at SD 2 Lebih, Gianyar. This learning method focuses on student engagement and prioritises individuals by providing a *game* in the teaching and learning process.

This learning also links physical activities with cognitive activities and utilises all five senses, which can have a significant impact on the learning process. As is well known, SD Negeri 2 Lebih has implemented the K-13 curriculum and the independent curriculum, with adequate learning facilities and infrastructure. However, the school does not simply adopt or implement these curricula; they must be aligned with the situation and characteristics of the students. Therefore, it is necessary to introduce new and interesting elements to the PMB process, namely learning and teaching. One of the things that can be done is to apply the Gamification-based SCL (*student-centred learning)* method to improve learning success in class V of SD 2 Lebih Gianyar. Thus, the objectives of this study are to obtain the percentage of improvement in student learning success from cycle I and cycle II with the application of the Gamification-based SCL (*student-centred learning)* based on gamification in class V of SD 2 Lebih, Gianyar, to obtain a model of learning success and to identify the factors that significantly influence the level of learning success with the application of the SCL (*student-centred learning)* method based on gamification in class V of SD 2 Lebih Gianyar.

2. Method

The method used to carry out this activity was to implement learning by applying the gamification-based SCL *(student-centred learning)* method. The complete stages of learning are as follows:

Introduction and discussion with students and class teachers, covering the problems faced and their solutions.

Meeting 1: Implementing PMB Cycle 1, which includes:

1. Implementing the teaching and learning process with material on integers using the Gamification-based SCL *(student-centred learning)* method.
2. During the learning process, several factors were observed, such as student activity, independence, responsibility, and participation in each activity.
3. Practice questions and their solutions were guided by the team.
4. At the end of the learning process, a test on integers was given.

Meeting 2: Implementing PMB Cycle II, which included:

1. Implementing the teaching and learning process with material on integers by applying the SCL *(student-centred learning)* method based on gamification.
2. During the PBM, the aspects of student activity, independence, responsibility, and participation in each activity are observed.
3. The team guided the students in practising and solving problems.
4. At the end of the learning process, a test on the material was administered integers.

Meeting 3: Conducting evaluation and discussion, which includes:

1. Assessment of learning outcomes in cycle I and cycle II were conducted to observe improvements in student learning success.
2. Analysing significant factors in the student learning success model.
3. Obtaining a model with a significant level of successful learning.

2.1. Problem formulation

Based on the circumstances at SD Negeri 2 Lebih, the problems that can be identified are *(first),* How to improve student learning success between cycle I and cycle II by applying the gamification-based SCL *(student-centred learning)* method to improve learning success in class V of SD 2 Lebih Gianyar? (*second),* What is the learning success model obtained from the factors that influence it by applying the Gamification-based SCL (*student-centred learning)* method to improve learning success in grade V at SD 2 Lebih Gianyar?

2.2. Literature search

Regarding the application of SCL and gamification in various fields, a number of studies have been conducted. One study was conducted by (Asih, etc., 2017), which focused on the learning process of two-dimensional and three-dimensional subjects in Grade V students at SD Negeri 5 Keramas, Blahbatu, Gianyar- Bali. The purpose of this study was to assess the effectiveness of the *auditory intellectually repetition* (AIR) learning model in improving students' academic achievement in two-dimensional and three-dimensional shapes. The results of this study indicate that the academic achievement of elementary school students in two-dimensional and three-dimensional shapes improved significantly after the application of the *auditory intellectually repetition* (AIR) learning model in three cycles of action research. This study emphasises that the effective application of the AIR learning model can improve student learning outcomes.

Furthermore, research by (Fredik, etc., 2021) examined the *student-centred learning* (SCL) approach. In the context of Christian Religious Education (PAK), students are trained to form positive, open, patient, and creative self-concepts and to process their experiences. The results of this study indicate that to achieve success in the PAK learning process, changes in the teaching model are necessary. If the PAK learning model in schools has been teacher-centred, it needs to be

transformed so that students become the main focus in the PAK learning process.

Research conducted by (Heni, 2016) used gamification to motivate students during the learning process and maximise *enjoyment* and *engagement*. The results of this study showed that gamification elicited positive reactions from students towards learning approaches that utilised social media. Their perceptions of social networking platforms indicated that the content was delivered effectively and usefully, and was very easy to use. This research emphasises that gamification is not just about creating a *game;* developing a special application to implement the concept of gamification would certainly be better. However, if resources are limited for developing a special application, gamification can use simple tools to implement the gamification process in classroom learning.

2.3. Evaluation data

The data for this study came from fifth-grade students at SD Negeri 2 Lebih, located in Gianyar, Bali, with the topic of integers. Data was collected through the learning process and concluded with a test. The test was conducted to assess students' understanding of the concept of integers. After the learning process, tests were conducted in cycle I and cycle II to assess students' understanding after participating in the learning process.

2.4. Data analysis and interpretation

Data was obtained from testing fifth-grade students using a gamification-based SCL approach. This data was analysed using multiple linear regression analysis techniques to process the data in order to understand the factors that influenced student learning success after implementing the gamification- based SCL method. The first stage obtained an average learning score for students in cycle I of 72.89 with a success rate of 73%, while in cycle II, the average learning score increased to

77.19 with a success rate of 77%. There was an increase in success of 4.3%, which shows that through multiple linear regression analysis, the use of the gamification-based SCL method has a positive effect on the understanding of integer material.

The initial regression model produced an R-sq of 95.9%, but there was multicollinearity in variables X4 and X5 with VIF>5, so the model did not fully meet the regression assumptions. Therefore, stepwise regression analysis was performed. In the stepwise regression analysis, the best model was obtained, namely:

$$Y = -8.12 + 0.499\,X1 + 0.260\,X3 + 0.329\,X4$$

With X1, namely activity, increasing learning success by 0.499; X3, namely responsibility, increasing learning success by 0.260; X4, namely participation, increasing learning success by 0.329, all variables were significant with a p-value < 0.5.

3. Results and Discussion

There were 36 student participants and two accompanying teachers. The learning process was carried out by applying the gamification-based SCL *(student-centred learning)* method at SD Negeri 2 Lebih, Gianyar, with material covering integers, including an introduction to integers, integer lines, the introduction of integers in everyday life, practice questions, and group discussions.

3.1. Student learning outcomes.

Table 1: Student learning outcomes in cycle I

No	Number of Students	Average score	Success rate >50%
1	36 people	72.8889	73

Table 1 shows that of the 36 students who participated in cycle I, the average test score was 72.8889, with a percentage of 72.89%.

Table 2: Student learning outcomes in cycle I

No	Number of Students	Average Score	Success percentage >50%
1	36 people	7277.14	77

Table 2 shows that of the 36 students who participated in cycle II, the average test score was 77.194, with a percentage of 77.19%.

Meanwhile, the measurement of variables during learning can be seen in the following diagram.

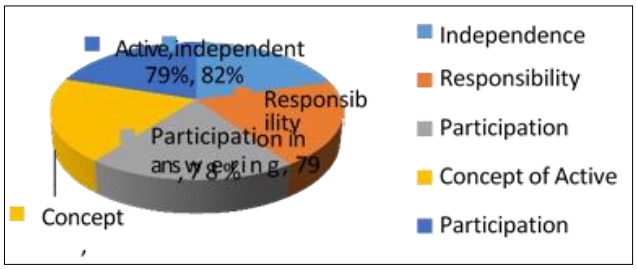

Fig 1: Pie chart of variable percentages

3.2. The best model for learning success.

Meanwhile, the results of the analysis of variables that influence learning success to obtain the best model are as follows. To determine the factors that affect learning success, student evaluation data was analysed using multiple linear regression analysis. The regression model and analysis results are as follows:

The regression equation is

$$Y = 3.56 + 0.256\,X1 + 0.132\,X3 + 0.211\,X4 + 0.106\,X2 + 0.252\,X5$$

with an R-Sq result of 95.9%, which indicates that the model is good with each variable being significant.

Table 3:

Predictor	Coefficient	SE Coeff	T-value	P-value	VIF
Constant	3.555	6.450	0.55	0.586	—
X1	0.2563	0.1109	2.31	0.028	3.794
X3	0.13176	0.06543	2.01	0.053	4.206
X4	0.21141	0.05808	3.64	0.001	4.658
X2	0.10557	0.09400	1.12	0.270	7.674
X5	0.2515	0.1011	2.49	0.019	12.883

S = 1.07834 R-Sq = 95.9% R-Sq(adj) = 95.2%

In regression models, several assumptions must be met, such as normality, homoscedasticity, autocorrelation, and multicollinearity. The following table summarises the results of these assumption tests.

Table 4: Normality Assumption Test

Assumption Test	Result	Decision
Normality	Kolmogorov-Smirnov test=0.133	Normal distribution
	P-value=0.106	

Table 5: Homoscedasticity Assumption Test

Assumption Test	Result	Decision
Homoscedasticity (p-value)	Bartlett's Test	Homoscedasticity Variance
	X1 = 0.502	
	X2 = 0.130	
	X3 = 0.144	
	X4 = 0.378	
	X5 = 0.332	

Table 6: Autocorrelation Assumption Test

Assumption Test	Result	Decision
Autocorrelation	Durbin-Watson statistic = 1.36126	Does not contain autocorrelation

Table 7: Multicollinearity Assumption Test

Assumption Test	Result	Decision
Multicollinearity	Uij VIF	
	X1 = 3.794	No
	X2 = 4.206	No
	X3 = 4.658	No
	X4 = 7,674	Yes
	X5 = 12,883	Yes

The partial test results show that X1, X3, and X4 significantly affect student success. It can also be seen that none of the VIF values are greater than 5, indicating that there is no multicollinearity.
The regression equation is

$$Y = -8.12 + 0.499\ X1 + 0.260\ X3 + 0.329\ X4$$

The regression model obtained from stepwise indicates that there are three significant independent variables, namely X1, X3, and X4. The simultaneous test results in the table below show a P-value smaller than the 5% significance level, indicating that there is a linear relationship between the independent variables and student success students.

Table 8:

Predictor	Coeff	SE Coeff	T	P	VIF
Constant	-8.124	5,689	-1.43	0.163	
X1	0.49947	0.09380	5.32	0.000	2.077
X3	0.26043	0.05740	4.54	0.000	2.476
X4	0.32859	0.05359	6.13	0.000	3.033

with an R-Sq result of 94.3%, which means that the model is good with each variable being significant. Based on the R-Sq(adj) value of 93.7%, it shows that the model can explain 93.7% of the diversity in student success, with only 6.3% unexplained or explained by other variables not included in the model.

Table 9:

Source	DF	SS	MS	F	P
Regression on	3	797.74	265.91	174.91	0.000
Error	32	48.65	1.52		
Total	35	846.39			

4. Discussion

The results of the study indicate that the application of the gamification-based SCL method has a positive impact on improving the learning success of fifth-grade students at SD Negeri 2 Lebih, Gianyar. This can be seen in the increase in average scores and the percentage of learning completeness from cycle I to cycle II. This improvement is in line with previous studies which state that the SCL approach can increase student activity, independence, and responsibility in the learning process. Gamification elements, such as interactive games, can increase students' intrinsic motivation, making them more enthusiastic about participating in mathematics lessons. Stepwise regression analysis shows that the three variables that most influence success are activity (X1), responsibility (X3), and participation (X4). These three variables are at the core of the SCL approach, encouraging students to become active subjects in learning rather than just recipients of information.

5. Conclusion

The conclusion explains that of the 36 students who participated in cycle I, the average class test score was 72.89%, and in cycle II, the average class test score was 77.19%, indicating an increase in student learning success. Meanwhile, the best model obtained with the factors that influence student learning success is X1, X3, and X4. Suggestions that can be given for the theme of education are to try other innovative, creative, and solution-oriented learning methods. Add variables to obtain the best model to identify the factors that support learning.

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