



# Gamification Learning integrated with Local Wisdom based on Character Education, is There an Effect on Problem Solving Ability?

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**Abstract:** The aim of this study was to determine the description of students' problem solving skills and the effect of gamification learning on students' problem solving ability. The population in this study consisted of 87 people. the research sample was selected based on purposive sampling technique so that the total sample in this study was 56 students who were divided into 2 classes, namely 28 people in the experimental class and 28 people in the control class. Students' problem solving ability was measured using a problem solving rubric developed by The Association of American Colleges and Universities (2017). Data analysis used descriptive and inferential data analysis. The results of descriptive data analysis showed that the average value of the experimental class problem solving ability was 80.36 higher than the control class which was 72.86. The results of inferential data analysis with independent sample t-test showed that the significance value of the data was 0.001 (<0.05). Based on the research data, it can be concluded that there is an effect of gamification learning integrated with local wisdom based on character education on students' problem solving ability.

**Keywords:** Character education; Gamification learning; Local wisdom; Problem solving ability

## Introduction

Generation Z is the generation born between 1995-2012. This generation was born in the midst of technological advancements. Their lives make technology and the internet an important element and something that must exist. The ease of accessing information, especially the internet, has become a global culture for them, which affects their values (Hastini et al., 2020). They are sometimes characterized as the "net generation, facebook generation, digital generation, or sometimes iGeneration" (Bencsik et al., 2016). The characteristics of generation Z are that they spend their free time using the internet, and prefer to stay in and play online rather than playing outdoors. They are multitasking individuals (blogging, listening to music, writing emails), quicker decision making, very good

device skills, and emotional incompetency (Csobanka, 2016; Zis et al., 2021). Generation Z is currently at school age, be it at the junior high school, high school level and even currently starting to enter college (Nasution, 2020). This generation has better intrinsic motivation than generations X and Y. Behind the positive impact of technology that affects the lives of generation Z, technology also has a negative impact on the morals of this generation. This generation tends to experience a decrease in the level of understanding, ownership, and application of human values in society, which has led to various non-normative behaviors that are not in accordance with the nation's cultural values (Tulak et al., 2022).

Generation Z is now one of the focuses of attention to achieve sustainable development goals (SDGs). In the implementation of the SDGs, the education sector is in

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the fourth goal, namely the creation of quality education that is equal, inclusive, and supports lifelong learning opportunities for all (Safitri et al., 2022). Generation Z is currently studying in the era of the industrial revolution 4.0. In this century, human resources are required to have high quality and be able to compete globally. Quality human resources are considered to come from an educational process that trains students to have the ability to solve problems, find alternative solutions in solving problems, and be able to think reflectively (Rizal et al., 2020). There are three main competencies that need to be developed in the 21st century, namely: 1) thinking competencies consisting of critical thinking, creative thinking, and problem solving. 2) action competencies consisting of communication, collaboration, digital literacy, and technological literacy, and 3) life competencies consisting of initiative, self-direction, global understanding, and social responsibility (Greenstein, 2012).

Problem solving and creativity are the top five skills in demand for 2025. These skills in terms of the new abilities students should be able to do surpass the basic skill and knowledge expectations of the past, especially when considering the implementation of new technologies (Guaman-Quintanilla et al., 2023). Problem solving ability is an ability that is considered important for prospective teachers in the 21st century (Amanda et al., 2021). Problem solving skills are also important for one's survival and success in the future (Mahanal et al., 2022). Problem solving ability in learners must be developed during learning because it can create superior human resources and be able to solve every challenge faced (Kim et al., 2018), making learners able to face various problems both individually and in groups to find solutions both individually and in groups (Widiastuti et al., 2021). It trains to determine actions to improve all conditions, control life or problems for the better, and train the ability to identify and find out problems carefully. Problem solving ability can be seen from the ability to define the problem, find strategies, write hypotheses, evaluate solutions, implement solutions, and evaluate the solution. Currently, the problem solving ability of learners is considered underdeveloped. This is because during the learning process, learners are not active in learning. They tend to be passive and less creative in responding to the teacher's explanation. They are only able to answer questions according to what is in the book. Teachers also sometimes use inappropriate learning models. The learning model used tends to be unable to increase student activity in learning (Permata et al., 2022).

Based on the description that has been presented, it can be said that lecturers as teaching at the university level are one of the subjects that play a role in improving

students' problem solving skills. This effort is part of providing provisions for students as generation Z to be able to compete globally. One of the efforts that can be made is to apply the right learning model and in accordance with the characteristics of Generation Z. Related to this, one type of learning that can be used is by implementing gamification learning.

Gamified learning is learning that uses games to motivate and build learners' sense of well-being. This learning model synthesizes more colorful and interesting learning patterns. Its application is not always by creating digital games but can be done with simple games that can build psychological engagement for learners (Jusuf, 2016). Learning with gamification will provide opportunities for students to compete, explore and excel in learning by integrating local wisdom based on character education will strengthen mentally in achieving quality learning objectives. This learning model can affect learning motivation (Marisa et al., 2022), performance and literacy skills (Romadhoni et al., 2021), learning productivity (Kusuma et al., 2021), and recognition of cognitive and affective values in learners (Mughtar et al., 2019).

The learning process should provide clear instructions to avoid misconceptions that can occur because small errors in learning can affect the course of the information acquisition process (Banihashem et al., 2022). Educators should strive to achieve the expected learning objectives. Learners' desire to know clearly all sources of knowledge is always reflected in how educators start by applying motivation at the beginning of learning (Paskevicius, 2022). In addition, the active involvement of learners will encourage them to use their mind and psychomotor in processing information both verbally and nonverbally (Singh, 2022). Therefore, gamified learning that starts the learning with a game can attract the attention and increase the motivation and activity of learners to learn.

No one type of existing learning can be considered ideal, all have their own advantages and disadvantages (Azzajjad et al., 2020). Marisa et al. (2022) outlines some of the advantages and disadvantages of gamification learning. The advantages of gamification learning include creating engagement (participation) that involves behavior, emotions, and cognitive learners, mistakes in gamification can be memorable for learners, benefits in the form of rewards that can spur motivation for learners, and improve communication capabilities and learner development for the better. Meanwhile, the disadvantages of gamification learning include: it can lead to misconceptions if learners think that rewards are the main thing without thinking about the process of acquiring knowledge in totality, and learners who are

not familiar with the rules will feel less familiar with the instructions.

Gamification learning in this research is integrated with local wisdom of Central Sulawesi region based on character education. As we all understand that currently cultural problems are a context that damages the nation's identity. The noble value of culture becomes the character of the embodiment of the struggle that has been rooted but over time, the cultural context is increasingly eroded by patterns of behavior that adopt various values that are outside the identity of the Indonesian nation. Local wisdom based on character education is a moral development of affective education that can guide the development of the copyrights, tastes and senses of learners towards noble character education values in accordance with national goals (Wahyudiati et al., 2021). The integration of gamification learning with local wisdom based on character education is expected to be one of the efforts made to minimize the negative impact of technology on the morals of generation Z who often behave non-normatively and are not in accordance with the nation's cultural values. The framework of gamification learning integrated with local wisdom based on character education can be seen in Figure 1.

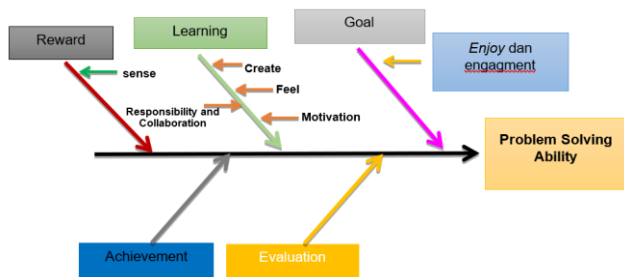


Figure 1. Framework gamification learning

Based on the figure, it can be explained that the provision of rewards in learning can nurture learners' sense of responsibility and collaboration. Furthermore, the learning materials will form learners who have creativity, taste and motivation because the learning process creates a feeling of enjoyment and engagement. Such learning conditions will make it easier for learners to achieve learning objectives through the evaluation given so that it can improve achievement and learning outcomes including problem solving skills.

**Method**

This research is a type of quasi-experimental research with a quantitative approach. The research design uses a posttest only design, where the measurement is done only by using the posttest value.

The problem solving ability of the respondents was measured by giving a research journal to the respondents. Respondents were asked to analyze the journal by paying attention to the indicators of problem solving skills which include: the ability to define the problem, find strategies, write hypotheses, evaluate solutions, implement solutions, and evaluate the solution. Scoring for each indicator of problem solving is done using the problem solving ability rubric developed by The Association of American Colleges and Universities in 2017. The problem solving ability rubric can be seen in Figure 3. The problem solving level categories can be seen in Table 1.

Table 1. The Problem Solving Level Categories

Category	Interval
Excellent	81 - 100
Good	61 - 80
Fair	41 - 60
Poor	21 - 40
Very poor	0 - 20

**Result and Discussion**

Data on problem solving ability was obtained from the results of a problem solving ability test on 56 students who were divided into two classes. 28 people in class B as the control class, and 28 people in class C as the experimental class.

The experimental class in this study learned by using gamification learning. The steps of gamification learning integrated with local wisdom based on character education are carried out with learning scenarios including: planning, communicates learning objectives, games, group discussions, discussing material, making conclusions, and calculating the scores of each group.

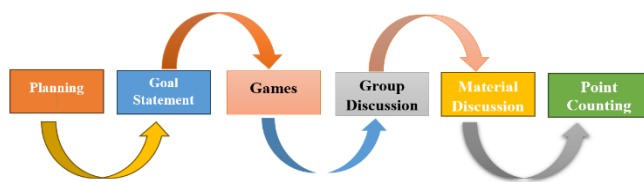


Figure 2. Gamification learning steps

In the planning stage, the lecturer conveys the lecture scenario that will be implemented. At this stage, the lecturer also divided students into study groups. Each study group has members who come from the indigenous tribes of Central Sulawesi. Furthermore, each group jointly discussed and explored information about local wisdom in Central Sulawesi which would become games in learning. At this stage the agreed local wisdom study consists of: Food, traditional ceremonies,

tribes, languages, dances, and proverbs in Central Sulawesi. The results of the study were then made in the form of a glossary. At the stage of the objectives statement, the lecturer conveys the learning objectives

that will be achieved in each lecture. In this step, lecturers also convey apperception and motivation so as to attract students' attention to learning.

	Capstone	Milestones		Benchmark
	4	3	2	1
<b>Define Problem</b>	Demonstrates the ability to construct a clear and insightful problem statement with evidence of all relevant contextual factors.	Demonstrates the ability to construct a problem statement with evidence of most relevant contextual factors, and problem statement is adequately detailed.	Begins to demonstrate the ability to construct a problem statement with evidence of most relevant contextual factors, but problem statement is superficial.	Demonstrates a limited ability in identifying a problem statement or related contextual factors.
<b>Identify Strategies</b>	Identifies multiple approaches for solving the problem that apply within a specific context.	Identifies multiple approaches for solving the problem, only some of which apply within a specific context.	Identifies only a single approach for solving the problem that does apply within a specific context.	Identifies one or more approaches for solving the problem that do not apply within a specific context.
<b>Propose Solutions/Hypotheses</b>	Proposes one or more solutions/hypotheses that indicates a deep comprehension of the problem. Solution/hypotheses are sensitive to contextual factors as well as all of the following: ethical, logical, and cultural dimensions of the problem.	Proposes one or more solutions/hypotheses that indicates comprehension of the problem. Solutions/hypotheses are sensitive to contextual factors as well as the one of the following: ethical, logical, or cultural dimensions of the problem.	Proposes one solution/hypothesis that is "off the shelf" rather than individually designed to address the specific contextual factors of the problem.	Proposes a solution/hypothesis that is difficult to evaluate because it is vague or only indirectly addresses the problem statement.
<b>Evaluate Potential Solutions</b>	Evaluation of solutions is deep and elegant (for example, contains thorough and insightful explanation) and includes, deeply and thoroughly, all of the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.	Evaluation of solutions is adequate (for example, contains thorough explanation) and includes the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.	Evaluation of solutions is brief (for example, explanation lacks depth) and includes the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.	Evaluation of solutions is superficial (for example, contains cursory, surface level explanation) and includes the following: considers history of problem, reviews logic/reasoning, examines feasibility of solution, and weighs impacts of solution.
<b>Implement Solution</b>	Implements the solution in a manner that addresses thoroughly and deeply multiple contextual factors of the problem.	Implements the solution in a manner that addresses multiple contextual factors of the problem in a surface manner.	Implements the solution in a manner that addresses the problem statement but ignores relevant contextual factors.	Implements the solution in a manner that does not directly address the problem statement.
<b>Evaluate Outcomes</b>	Reviews results relative to the problem defined with thorough, specific considerations of need for further work.	Reviews results relative to the problem defined with some consideration of need for further work.	Reviews results in terms of the problem defined with little, if any, consideration of need for further work.	Reviews results superficially in terms of the problem defined with no consideration of need for further work.

Figure 3. Problem solving rubric

The implementation of games is carried out in the form of tournaments for each group member. The lecturer will give each group the opportunity to answer questions. However, the group member who answers the question is determined by lottery. Each member in the group has its own lottery number. So that when the lecturer gives questions related to local wisdom in Central Sulawesi, the lecturer first takes the lottery number. The member whose lottery number is chosen is required to answer questions related to local wisdom in Central Sulawesi. If the member manages to answer the question correctly, then the group will get 10 points, but if it does not manage to answer the question, then the group will reduce its points by 10. Questions that cannot be answered will be thrown to another group. The starting point given to each group is 50. Every point earned by each group will be recorded for each meeting. 3 The group that has the highest points at the end of the meeting will get a prize.

After the games, the learning continued with group discussions. Each group is given their own material to discuss in front of the class. Each group has a turn every week to discuss their material. In the discussion process, other groups are given the opportunity to comment on the material provided by the presenting group. Comments can be in the form of questions, agreements, or responses to the material presented and the way the material is presented. During the discussion, the lecturer will draw members from other groups to give their comments. If the member can comment correctly, the member will get 10 points. However, if the group member cannot comment correctly, the group will get a

point deduction of 10 points. The rules of games in gamification learning is a helpful method to increase learners' active participation. To achieve maximum points, learners will actively ask their group mates and lecturers if there are unknown things. Learning activities in the form of knowledge exploration are forms of learning that can improve problem solving skills (Khairani et al., 2023).

At the end of the discussion, the lecturer will provide reinforcement and further discuss the learning material and together with students make conclusions about the lecture material. Furthermore, at the end of the meeting, the lecturer together with students accumulate the points obtained by each group to be used as starting points at the next meeting.

The control class in this study learned by using discussion learning. Each group was given their own material to be discussed in front of the class. Each group had a turn every week to discuss the material. In the discussion process, other groups are given the opportunity to comment on the material provided by the presenting group. Comments can be in the form of questions, agreements, or responses to the material presented. At the end of the lecture, the lecturer will provide reinforcement and further discuss the learning material and together with the students make conclusions about the lecture material.

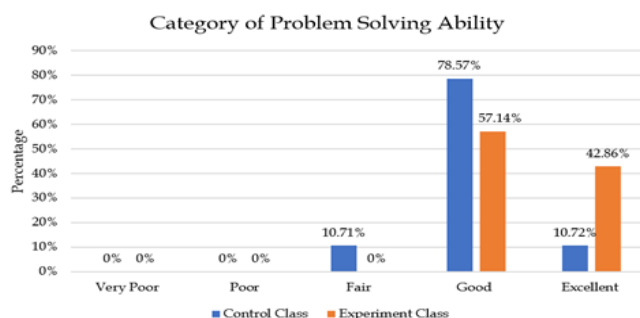
**Table 2.** Results of Descriptive Statistical Analysis of Problem Solving Ability

Statistik	Experimental Class score	Control Class Score
Minimum	65	55
Maximum	95	85
Ideal Value	100	100
Average	80.36	72.86
Deviation standard	8,381	7,985

In this study, the experimental and control classes were directed to discuss by paying attention to the aspects that became indicators of problem solving so that students were accustomed to being able to solve problems. The results of descriptive statistical analysis of problem solving ability can be seen in table 2. Based on the table, it can be seen that the average value of experimental class problem solving (80.36) is higher than the control class (72.86).

The categories of problem-solving ability levels can be seen in Figure 4. Based on Figure 4, it can be seen that the problem solving ability in the experimental class is only in two categories, namely the good category (57.14%) and the very good category (42.86%). Meanwhile, the problem solving ability in the control class is in three categories, namely the moderate category (10.71%), good (78.57%), and very good (10.72%). The results of data analysis presented in Figure 4 show that the highest frequency in the experimental class and control class is in the moderate category. However, the number of students who reached the excellent category in the experimental class was higher than the control class so that it could be said that the problem solving ability in the experimental class was better than the control class. In line with the results of this study, Musnidar et al. (2022) stated that gamification learning allows learners to work independently and actively. This learning process will help improve the cognitive abilities of learners.

Inferential statistical analysis in this study began with testing the normality and homogeneity of the data. Based on the results of data analysis, the data normality value obtained through the Shapiro Wilk test is 0.134 and the homogeneity value through the homogeneity of variance test is 0.833. The significance value is > from the degree of confidence which is 0.05 so it can be concluded that the data in this study are normally distributed and homogeneous. Furthermore, the hypothesis test was carried out independent sample t-test. The results of the hypothesis test obtained a significance value of 0.000. The significance value is > from the degree of confidence which is 0.05. Therefore, it can be concluded that there is an effect of gamification learning on students' problem solving skills.



**Figure 4.** Categories of problem-solving ability levels

Student activity in the learning process taught using the gamification learning model was higher than the class taught with discussion learning. Students in the experimental class competed to answer the questions given related to local wisdom in Central Sulawesi. They were also very enthusiastic to be active in discussions in an effort to add points or scores to their team. Meanwhile, students in the control class taught with the discussion learning model were also quite active in the discussion, but only most students were active. There were only 1 or 2 students in a group who often asked questions or responses in the discussion.

The research results obtained are supported by the statement from (Jusuf, 2016) that the gamification learning model aims to motivate the students by maximizing the feeling of enjoyment and engagement in the learning process by using elements in games. The feeling of enjoyment and elements in the games will make students able to focus their attention in the learning process so that learning objectives can be achieved. This statement is also in accordance with the opinion Winatha et al. (2020), that the gamification learning model makes students more eager to learn. They consider that by playing the learning process becomes more fun, less boring, and allows them to collaborate with the team to answer questions faster. This learning model seems to force them to recall the material that has been given in the previous meeting.

**Conclusion**

Based on the results of data analysis, it can be concluded that students' problem solving skills are in the good category. There is an effect of gamification learning model on students' problem solving ability. classes that learn with gamification learning have a higher average value of problem solving ability than classes that learn with discussion learning.

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### Author Contributions

Conceptualization, D.S.A. and M.F.; methodology, M.F. validation, M.F., D.S.A and D.P.; formal analysis, D.S.A.; investigation, D.S.A; MF; DP.; resources, D.S.A; MF.; data curation, M.F; D.S.A.; writing—original draft preparation, D.S.A; M.F.; writing—review and editing, D.S.A; M.F.; visualization, D.S.A; M.F.; supervision, M.F; project administration, D.P.; funding acquisition, D.P.

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### Conflicts of Interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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