Grade 8 learner’s achievement and motivation level in geometry using kahoot! as a formative assessment

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Abstract. This paper dealt with the utilization of Kahoot! and its effects on the grade 8 learners’ motivation and achievement level in Geometry. The two pre-assigned sections were randomly selected as experimental and control group in Iligan City National High School. Kahoot was used as a formative assessment in the experimental group while in the control group, traditional method of assessment was used. Based on the data gathered, both methods of formative assessment were effective in increasing the achievement level of grade 8 learners. The experimental group had higher increase of mean score, meaning the group that was exposed to Kahoot! improved better in the Achievement Test than the controlled group. Learners from the experimental group were highly motivated in answering the quiz using Kahoot. The researchers strongly recommend the use of Kahoot! as a formative assessment in grade 8 learners’ because it was showed that there was an effect on its achievement and motivational level inside the classroom towards Geometry.

Keywords: Kahoot, achievement level, formative assessment and motivation level

1. Introduction

Today’s students from kindergarten to tertiary level of education symbolize the first generation to grow up with modern technology. They usually spent their lives using computers, playing online games, using cellphones and other gadgets available in this digital age [1]. Contrary to popular belief, research has shown that learners still experience deficiency of convenience and pleasing content that would engage and improved their learning process. Although computer games are most frequently thought of as a pure entertainment, it is essential to construe that they are powerful learning tool as well by using online games in a learning environment; it can support players’ passion to develop new skills, and improve their way of learning towards the subject. Research indicates that the use of technology can best affect student learning when learning goals are clearly articulated beforehand [2] and applied effectively. Technology not only increases student learning, understanding, and achievement but also motivates students to learn, encourages collaborative learning, and helps develop critical thinking and problem-solving skills [3], [11]. Learners are now capable of doing many things with technologies, whilst others are just using them to entertain themselves, but why not use of these gadgets and their computer literacy skills be combined and have a learning environment that is both amusing and helpful. There are lots of online games that would help students to strengthen their learning’s. So, the researchers thought of utilizing online game-based assessment inside the classroom and was done through Kahoot! This is an online game-based learning environment used as an educational tool to which teachers and students can have access. Anyone who has access to the environment can make their own sets of questions. Its purpose is to add excitement and new way of giving an examination. Since most of the students are now “experts” in using computers, Kahoot! would be facile to them. This would encourage them to drive more in terms of answering the questions and somehow improve their motivation or the willingness to learn in the classroom.
In the latest study on students’ perception of Kahoot!’s influence on teaching and learning, the researchers came up with an idea on how they’re going to implement the study by using an explorative case study. They intend to unravel complex perceptions and issues relating to the use of Kahoot! in the context of students’ engagement, motivation and learning. As an outcome, Kahoot! motivated students to engage and encourage interactions in the classroom. Student conceded that Kahoot!’s use in the course had a positive impact on the knowledge and skills they attained. Students noted that the drive to increase their attention, focus, interaction, and engagement strongly supported their learning in the course [4].

Hence this study suggested that the use of online game-based assessment in the classroom would lead the students to better process the information, and might motivate them for studying the lessons for next quizzes and also improved the quality of learning in the conventional classroom.

This study aimed to investigate the effects of Kahoot! on the learners’ motivation and achievement in Geometry.

Specifically, this study answered the following questions:
1. What is the learners’ achievement level in Geometry?
2. What are the learners’ motivational level in Geometry?
3. Is there a difference on the learners’ achievement level before and after exposing them with traditional method of assessment and Kahoot!?
4. Is there a difference on the learners’ motivational level before and after exposing them with Kahoot!?
5. What are the gain scores of the learners’ achievement level in Geometry?
6. Is there a difference in gain scores between the learners’ achievement level in the control group and experimental group?
7. What insights can be drawn from the learners’ math journal?

The figure below is the conceptual framework of the study.

![Conceptual Framework](image)

In the conceptual framework the researchers both have the experimental group and control group involved in the study, the two randomly selected sections of grade 8 level of students were exposed in experimental group and traditional teaching design. In experimental group, the researchers assumed that the motivational and achievement level of Grade 8 students would improve using the game application known as Kahoot! In contrast, the control group used the traditional teaching where the researchers presume that only their achievement level would improve. Both groups underwent pre-test and post-test so the researchers compared their scores for that particular topic in the whole quarter of geometry subject if they gained or not and also determined their motivation level and learner’s achievement.
2. Research Methodology

This study was conducted at Iligan City National High School located at Mahayahay Iligan City with a total of 66 respondents of two selected sections of grade 8 level students. The sections were being selected as the control and experimental group by drawing lots. The original number of learners in control and experimental group were 42 and 45 respectively, 33 out of 42 in control group and 33 out of 45 in experimental group had taken both of the pre-test and post-test. Moreover, the two sections were comparable.

This study involved Quantitative and Qualitative data.

The following instruments were used:

**Achievement Test** - The instrument was used to measure the achievement level of Grade 8 learners and its changes for both group before and after the instrument was given; control group for traditional teaching method and experimental group for Kahoot!. The achievement test was given as pre-test and post-test for both groups.

**Motivation Questionnaire** - The researchers adapted and modified from Cheng [5]. The motivation questionnaire has 30 questions, composed of 15 positive and 15 negative questions.

**Math Journal** – The instrument was used to validate the quantitative data which is the motivational level of the students. It also helped the researchers oversee the learner’s progress weekly and the interview was done in the form of journal where students answered it after the weekly assessment.

The following tables were the basis for all the qualitative and quantitative data interpretations

### Table 1 Achievement Test Scores Range

| Score Range | Percentage     | Interpretation   |
|-------------|----------------|------------------|
| 36-40       | 90% and above  | (A) Advance      |
| 34-35       | 85% - 89%      | (P) Proficient   |
| 32-33       | 80% - 84%      | (AP) Approaching Proficiency |
| 30-31       | 75% - 79%      | (D) Developing   |
| 0-29        | 74% and below  | (B) Beginning    |

Source: [https://www.ciit.edu.ph/k-to-12-grading-system/](https://www.ciit.edu.ph/k-to-12-grading-system/) with modified suited to the present study

Table 1 above presents the achievement test score, percentage and achievement level interpretation with the passing average of 75% of the pretest and posttest of the two groups. This is based on the K-12 grading system of DepEd.

As seen in Table 2 in, the gain score summary focuses on the change that occurs from pretest to posttest. By analyzing the change scores within each group, the researchers can specify whether both groups improved at different rates, whether one group improved while the other group showed no improvement, or even whether one group improved while the other deteriorated

### Table 2 Gain Scores Range

| Gain Scores | Achievement Level Increase Descriptions |
|-------------|----------------------------------------|
| 33-40       | Very High Increase                     |
| 25-32       | High Increase                          |
| 17-24       | Average Increase                       |
| 9-16        | Low Increase                           |
| 1-8         | Very Low Increase                      |

*Adapted from Salazar [6] with Modifications*

### Table 3 Range of Motivation Level

| Mean Score Range | Interpretation          |
|------------------|-------------------------|
| 4.00—5.00        | High Level              |
| 3.50—3.99        | Upper Moderate Level    |
| 3.00—3.49        | Moderate Level          |
| Below 3.00       | Low Level               |

*Adapted from Hew K. and Huang B. [7] with modifications*
The data gathered from the motivation questionnaire was used to measure the level and type of learning motivation by a five-point Likert scale.

3. Results and Discussion

3.1 Achievement Level

The table below showed the mean score and the interpretation of the learners’ achievement level in Geometry.

**Table 4 Mean Scores of the learners’ Achievement Test**

| Group           | Average Score | Interpretation |
|-----------------|---------------|----------------|
|                 | PRE-TEST      | POST-TEST      |
| Experimental    | 18.82         | 24.85          | Beginning     |
| Control         | 15.06         | 19.18          | Beginning     |

The learners’ achievement level in both pre-test and posttest in the experimental and control groups were both beginning.

**Table 5 Achievement Test Scores**

| Range Scores | Control Group Pretest | Control Group Posttest | Experimental Group Pretest | Experimental Group Posttest | Interpretation |
|--------------|-----------------------|------------------------|---------------------------|-----------------------------|----------------|
|              | f                     | P                      | f                         | P                           |                |
| 36-40        | 0                     | 0%                     | 0                         | 0%                          | Advance        |
| (90%-100%)   |                       |                        |                           |                             |                |
| 34-35        | 0                     | 0%                     | 0                         | 0%                          | Proficient     |
| (85%-89%)    |                       |                        |                           |                             |                |
| 32-33        | 0                     | 0%                     | 0                         | 0%                          | Approaching    |
| (80%-84%)    |                       |                        |                           |                             | Proficiency    |
| 30-31        | 0                     | 0%                     | 0                         | 0%                          | Developing     |
| (75%-79%)    |                       |                        |                           |                             |                |
| 0-29         | 33                    | 100%                   | 32                        | 97%                         | Beginning      |
| (74%-0%)     |                       |                        |                           |                             |                |

Legend: f - Frequency P - Percentage

Table 5 shows the frequency and the percentage of the range scores of the learners’ achievement level pretest and posttest of both control and experimental group. As seen in the table, 100% (33 out of 33) of the learners’ achievement scores in both control and experimental groups in the pretest falls in the range 29-40 which was indicated as “beginning” in the learners’ achievement level classification. On the other hand, 97% (32 out of 33) of the learner achievement scores in control group and 90.9% (30 out of 33) of the learners’ achievement scores in the experimental group in the posttest falls in the range 29-0 which was indicated as “beginning” in the learners’ achievement level classification. Also 3% (1 out of 33) of the learner achievement scores in control group and 9.1% (3 out of 33) of the learners’ achievement scores in the experimental group in the posttest falls in the range 31-30 which was indicated as “Developing” in the learners’ achievement level classification.
3.2 Motivational Level

The table in the next page showed the mean score and the interpretation of the learners’ motivational level in Geometry in grade 8 learners.

| Motivation Test | Mean Score | Interpretation          |
|-----------------|------------|-------------------------|
| Pre-Test        | 3.56       | Upper Moderate Level    |
| Posttest        | 4.01       | High Level              |

The table above shows the mean score of the pre and post motivation with the interpretation. The pre motivation of experimental group have mean score of 3.56 which is classified as “Upper moderate level” while in the post motivation of the experimental group have mean score of 4.01 which is classified as “High level”.

Table 7 the frequency and percentage of the range of the mean scores with interpretation. It can be seen that in pre-motivation 13.3% of the mean scores falls in the range 4.00-5.00 indicated as High level, 50.0% of the mean scores falls in the range 3.50-3.99 indicated as Upper Moderate Level and 36.7% of the mean scores falls in the range 3.00-3.49 indicated as moderate level. While in post- motivation 60.0% of the mean scores falls in the range 4.00-5.00 indicated as High level, 20.0% of the mean scores falls in the range 3.50-3.99 indicated as Upper Moderate Level and 20.0% of the mean scores falls in the range 3.00-3.49 indicated as moderate level.

| Mean Score Range | f  | Pre-motivation | Post-motivation |
|------------------|----|----------------|-----------------|
|                  | P  |                 |                 |
| 4.00-5.00        | 4  | 13.3% High Level| 18 60.0% High Level |
| 3.50-3.99        | 15 | 50.0% Upper Moderate Level | 6 20.0% Upper Moderate Level |
| 3.00-3.49        | 11 | 36.7% Moderate Level | 6 20.0% Moderate Level |
| Below 3.00       | 0  | 0% Low Level    | 0 0% Low Level   |
| Total            | 30 | 100%            | 30 100%          |

Legend: f- Frequency P- Percentage I- Interpretation

3.3 Difference on the Learners’ Achievement Level

| Groups and Test Compared | n  | Mean Rank | Sum of Rank | Test Used          | p-value (2-tailed) |
|--------------------------|----|-----------|-------------|--------------------|-------------------|
| Between Groups           |    |           |             |                    |                   |
|                          |    |           |             | Mann-Whitney U Test |                  |
| Pretest: Control Group vs Experimental Group | 33 | 23.32 [2| 769.50 [2|                   | 0.000*           |
|                          |    | 43.68 [2| 1441.5 [2|                    |                   |
| Posttest: Control Group vs Experimental Group | 33 | 21.08 [2| 695.5 [2|                   | 0.000*           |
|                          |    | 45.92 [2| 1515.5 [2|                    |                   |
| Within Groups            |    |           |             |                    |                   |
| Experimental Group: Pretest vs Posttest | 33 | 0.00 [2| 0.00 [2| Mann-Whitney U Test | 0.000*           |
|                          |    | 16.00 [2| 496.0 [2|                    |                   |
| Control Group: Pretest vs Posttest | 33 | 7.50 [2| 15.0 [2|                   | 0.000*           |
|                          |    | 16.07 [2| 450.0 [2|                    |                   |

Legend: a – control group, b – experimental group, c – negative rank, d – positive rank, e – pretest, posttest. * - Significant at 0.05 level of significance
As gleaned from table 8 above, the comparison of the test results within groups showed that there is a significant difference on the learners’ achievement level before and after exposing them in traditional method of assessment and Kahoot game. That is, both group control and experimental group have obtained better scores after exposing them in traditional method of assessment and Kahoot game respectively, since that the p-values are less than 0.05 level of significance which are 0.000 and 0.000.

Furthermore, by the used of Mann-Whitney U Test it was found that there is a significant difference on the learners’ achievement test scores. That is, both group control and experimental group have obtained better scores after exposing them in traditional method of assessment and Kahoot game respectively, since that the p-values are less than 0.05 level of significance which are 0.000 and 0.000.

Previous research could support the interpretation above that the learning motivations of students have significant impact on the learning achievement, and the learning achievements of students with game-based learning are better than those who use the traditional face-to-face teaching, and the results could provide the related educators as reference [8]. This concludes that using Kahoot game in the classroom would greatly affect the learning achievements of the students as well as the motivation of the students taking the quizzes.

3.4 Difference on the learners’ Motivational Level

The table below was used to determine the difference of the learners’ motivational level.

| Groups and Test Compared | N  | Mean Rank | Sum of Rank | Test Used    | p-value (2-tailed) |
|--------------------------|----|-----------|-------------|--------------|-------------------|
| Within Experimental Group | 33 | 1.03      | 33.99       | Friedman     | 0.0000*           |
| Posttest                | 33 | 1.97      | 65.01       | Test         |                   |

*Significant at 0.05 level of significance

Based from the table 9, there exists a statistically significant difference in the perceived motivational level depending on which teaching method was employed which is supported by a significant p-value lesser than 0.05.

A study found out that gamification seems to also foster interaction in the classroom and trigger students to pay more attention to the design of the course [9], thus it was also concluded in the study [10] that gamification as an assessment and learning tool, can contribute to improvement of cognitive, engagement and motivation despite no research managing to achieve all the elements successfully. The researchers found out that the use of Kahoot boost the students’ interest and motivation in answering the quizzes as it also leads in creating positive classroom environment.

3.5 Gain scores of the Learners’ Achievement Level

Based from the table below, the mean scores of the gain scores in both groups experimental and control group are 6.03 and 4.06 respectively. Both of the results are classified as “Very low increase”, that is both group in the study acquire a very low increase from the pretest to posttest.

| Group     | Mean Scores | Interpretation     |
|-----------|-------------|--------------------|
| Experimental | 6.03        | Very Low Increase  |
| Control   | 4.06        | Very Low Increase  |
Table 11 Gain Scores of the Learners’ Achievement Level

| Scores | Experimental Group | Control Group |
|--------|-------------------|---------------|
| 33-40  | 0                 | 0             |
| 25-32  | 1                 | 0             |
| 17-24  | 0                 | 0             |
| 9-16   | 6                 | 3             |
| 1-8    | 24                | 25            |
| 0 below| 2                 | 5             |

Legend: f- Frequency   P- Percentage   I- Interpretation

As seen in the table 11 in the previous page, 73% (24 out of 33) of the students in experimental group obtained a very low increase in their gain scores and 18% (6 out of 33) gained a low increase. On the other hand, 76% (25 of 33) of the students in control group obtained very low increase and 15% (5 of 33) obtained low increase in their gain scores respectively.

Six percent of the students (2 out of 33) have gain scores 0 below in experimental group and 5 out of 33 students yielded gain scores 0 below. These are the students whose pre-test scores are greater than their post test scores.

3.6 Difference in gain scores between the learners’ achievement level in the control group and experimental group.

Based from table 12 that can be seen in the next page, the p-value is 0.19 which is greater than 0.05. It reveals that there is no sufficient evidence to say that the students’ scores significantly differ between the experimental and control group, i.e., experimental and control group respectively. However, the advantage of using Kahoot! in the classroom was supported.

Table 12 Difference in Gain Scores Between the Learners’ Achievement Level in the Control Group and Experimental Group

| Groups and Test Compared | n   | Mean Rank | Sum of Rank | Test Used         | p-value (2-tailed) |
|--------------------------|-----|-----------|-------------|-------------------|-------------------|
| Between Groups           | Control 33 | 1.03     | 30.39       | Mann-Whitney U Test | 0.19**            |
| Experimental             | 33   | 1.97      | 36.61       |                   |                   |

** - not significant at 0.05 level of significance

3.7 Responses in the Math Journal

As the researchers gathered the data from the experimental group section, the researchers gave a follow-up journal to each student to write down what they really felt during the implementation. Every journal prepared by the researchers composed of a diary and a variety of different questions.

The questions below were used in gathering the insights of each learner; however, the pictures showed some of the learners’ opinion and answer in each question.

What is surprising to you about the Kahoot?!

Learners had written the same thought answered the question by describing the features of the Kahoot! and how the application made their learning fun in the class. The researchers came up with this question to know how the game boosted the excitement of the learners and how the learners react as they experienced it as a formative assessment instead of using paper and pen test.

What are your expectations for this experience?

Learners had written the same thought and answered this question by expressing their feelings on it and expectations of where they can learn faster than traditional method of assessment. Learners had written also on their journal that it would be an enjoyable quiz yet make the lesson more understandable. The researchers have created the second question to get the expectations of each learner after experiencing.
Kahoot! if there’s something to improve or change in the game design and on the content or may have learn something on it.

**What did you notice while playing Kahoot!? Does it increase your memory and does your classmate become very competitive?**

41 learners had written their journal with just the same thoughts. The learners answered the questions by explaining that they notice themselves when they started to play the game, they increased their retention memory and become very competitive in answering the questions. As the researchers observed, the students during the implementation, it creates fun and positive atmosphere and at the same time learners revealed their side of being a competitive one.

**How did you find Kahoot! as a way of testing/answering?**

There are 39 students who had written the same thoughts on their journal. Students answered this question by expressing their thoughts that they felt it like a math quiz bee as a reason of being active in reading and answering the problems in Kahoot! because of the limited time given to the learners each problem. Some students answered that they’ve seen it as a motivation way for every student who needed to learn and become active in participating the Geometry subject.

**Do you feel excited to take a quiz using Kahoot! or do you prefer the traditional one or the paper and pencil test? If yes or no, explain.**

There are 36 students who had written the same thoughts on their journal. According to their answers, learners felt an excitement when they answered the quiz through Kahoot! Most of the learners prefer to take a quiz through this online game than traditional one.

**In what way do you feel that you can improve your performance?**

There are 42 students who had written the same thoughts on their journal. Based on the learners’ feedback along with the guide questions, playing Kahoot! helped the learners improve their performance in the subject content. They have written also that they were encouraged to learn the topic and study before taking the quiz as a reason of incentives and ranking system given in the game that helped them improve the performance.

4. Conclusion

The achievement level of both groups in pre-test and post-test were both beginning as a reason of not having enough knowledge about Geometry. However, there was an increase in their mean scores for the post-test in both groups. As a result, the motivational level of the students were highly motivated due to the exposure of the game Kahoot!. The learners’ math journal showed an evidence of the learners becoming motivated not just on academics but also to their personal willingness and interest on the subject Geometry. According to test results and analysis, it was found that there is a significant difference on the learners’ achievement level before and after exposing them with traditional method of assessment and Kahoot! There is also a significant difference on the learners’ motivational level before and after exposing them Kahoot! However, according to the test results and analysis it was found that no sufficient evidence to prove the significant difference in the gain score between the experimental and control group. However, it is possible to improve the achievement level of the students using Kahoot! as formative assessment. Based on the findings, Kahoot! as formative assessment can be an effective learning platform to help students retain the knowledge and be motivated with the subject Geometry and get a higher score.

5. Recommendations

After a thorough analysis of data, the following recommendations are hereby made:

1. The future researchers must encourage the learners to use the game application Kahoot! in the classroom as well as provide computer with internet connection for each student.
2. The study encourages the future researchers to teach the learners in the classroom as well as utilizing the game application, Kahoot!
3. Replicate the study in another different level of respondents e.g., college students and use it as an enrichment activity. This research study suggests that the learners must have strong fundamentals on the subject content as well as their deep conceptual understanding and prior knowledge of the subject must be achieved through a prior teaching style.
4. Consider the time allotment for every question you create and must be appropriate with the learners’ capability. Be aware of the text characters you input as it has a character’s limit. However, you can make a picture for a long question and use that since this game application enables you to insert an image or
5. To better ascertain the effectiveness of using the online game-based learning inside the classroom, verbal lessons should be prepared and researched beforehand.

6. Integrating Kahoot! Application in the assessment is a good way of evaluating the students’ capabilities on the subject content and it also provides the benefit of giving a pleasant experience to the learners. However, one can find another learning game app that does not require an internet connection or one can design a game application to do the same.

The researchers also tried to apply the Kahoot! as a sort of review during their practice teaching session. They noticed that administering this kind of teaching method inside the classroom boosts the interest and cultivates the mind of the learners. Moreover, the students also enjoy the environment and are excited towards learning the subject. This conclusion was based on the feedback collected from the researchers after the session was over.

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