



# Kahoot application in the Virtual Formative Evaluation in mathematics, Ricardo Bentín Educational Institution, Rímac

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## Abstract

The impact of information and communication technologies continues to bring benefits to education. The objective of this article is to analyze the influence that the Kahoot application has on virtual formative assessment in the learning of mathematics. The research has a descriptive, correlational and cross-sectional design. For the collection of information, two previously validated and reliable surveys were applied with V. Aiken and Cronbach's Alpha, which consisted of 20 items each, the sample consisted of 109 fifth grade high school students, which was determined using the probabilistic method with proportional stratified sampling. For hypothesis testing, Rho Spearman's statistic was used with a confidence level of 95% and a significance level of 5%. The results show that 39% of the students presented average levels of knowledge, skills and learning skills in mathematics as a result of the kahoot

**Keywords:** *Autonomy; formative evaluation; Kahoot App; Motivation; Self appraisal.*

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## 1. Introduction

Today the Peruvian educational system faces great challenges in the teaching-learning process as a result of the COVID 19 pandemic and scientific-

technological advances. Today's society demands professionals with greater quality, efficiency and competitiveness; Faced with this requirement, professionals in education must



constantly improve themselves and act responsibly. However, most teachers in Peru still concentrate on quantitative aspects and very few are helped by computer applications, it is necessary to make use of logical software based on games that improve learning. In particular, the so-called Kahoot application used by the teacher in the teaching-learning process that allows motivating, developing competencies in students in an interactive and fast way. (Tan & Saucerman, 2017).

On the other hand, formative evaluation plays a preponderant role, guiding because it diagnoses, prognostics and improves the teaching-learning processes, perfects the teaching task and helps to improve the results in the students favoring the development of their competences, feedback and self-evaluation. It should be noted that formative assessment regulates the educational process in the classroom (Segura, 2018).

### 1.1 Kahoot App

In the investigation and collection of information, it has been possible to find similar international and national investigations:

Rojas et al. (2021) study the use of Kahoot as a motivating element of the teaching-learning process with the aim of analyzing its application, with the empirical-analytical method of descriptive cut, with a study sample of 35 students of the specialty of pedagogy of experimental computer sciences at the Central University of Ecuador. The results revealed that the students felt very motivated when learning and being evaluated. Concluding then that the Kahoot is a motivating digital tool for the teaching-learning process, encourages

students to participate more actively within the classroom.

Likewise, Córdova and Pérez (2020), investigated the use of the Kahoot program in 2nd grade students at the Educational Institution the Educators of the district of San Luis, Lima, Peru. Type of quantitative research, with determination of non-probabilistic sample size of 30 students to whom they applied the instruments validated with the method of judgment of experts and reliable with the Cronbach's alpha coefficient 0.84, to perform the measurement of the degree of satisfaction of the Kahoot application in mathematics. The results showed that the level of the satisfaction variable was high after applying the Kahoot program in the educational environment for the learning of mathematics compared to traditional teaching without Kahoot.

Similarly Ramos (2020), investigated the educational software Kahoot as development of social and digital skills with the aim of comparing its use in students of the I.E José de San Martín. Pisco-Peru, with comparative descriptive design with quantitative approach with a non-probabilistic sample of 50 students 26 fifth grade B and 24 students fifth grade C. Applied the technique of the validated and reliable survey, the results showed that the students of the fifth section C had greater use of Kahoot and greater digital ability compared to the students of the fifth B. With the hypothesis test he showed that there is a significant difference in the digital and social dimensions in the students.

It should be noted that neuroeducation and Information and Communication Technologies, related to education, have generated the development of teaching, thus, that neuroscience allows positive emotions and the promotion of curiosity, achieving



a better learning capacity in students. (Barrios-Tao, 2016). According to a study by the National Institute of Statistics (INE) in the first quarter of 2020, in Peru for every 100 households 96 have at least one technological tool, that information was a good indicator to know the technological tools that our students have in order to carry out the study, in this sense the knowledge and understanding on the part of the teacher in the virtual classroom is also a fundamental element for the teaching-learning process (Alonso, 2021).

Considering, at present that Information and Communication Technologies is a set of tools related to the treatment of information and generated, from the technological evolution that humanity lives and that has been enhanced since the 1990s with the Internet (Mañas & Roig, 2020).

The Kahoot application is a digital virtual tool that allows gamifying learning and the philosophy of games as a resource for the teaching-learning process (Rojas et al., 2021).

In the same vein, he points out that the Kahoot is useful for teachers and students in learning and reviews in an entertaining way, simulating a knowledge contest. You have to have an account or register if you don't have one. (Ramirez, 2018). The Kahoot application contains different activities of personal answers and different ways of playing, among them: questionnaires, surveys, debates, which are observed as playful reasoning games. It is necessary to have an internet line. The teacher is the protagonist who creates the question. Likewise, students must have a PIN code that will allow them to have access to the activities (Ramírez, 2018). However, the Kahoot also motivates students, as well as encourages learning, helping to solve, in a playful

way, the mathematical problem that the subject may have; on the other hand, it allows to stimulate the student to obtain the most points (Kapp, 2012).

## 1.2 Formative assessment in mathematics

López (2013) who investigated the topic of educational evaluation from the perspective of the teacher: Formative evaluation in the Juan Rulfotelesecundaria, Tecnológico Monterrey, Mexico. The type of research was qualitative approach with exploratory method, collected data through reliable instruments and validated by expert judgment, which were applied to teachers and students. The results allowed to know the strengths and weaknesses when using the formative evaluation as part of the teaching-learning process and managed to demonstrate feedback between teacher and student that contributes to the improvement of the teaching-learning process.

Formative assessment is a planned process where evidence of student knowledge is obtained through assessment and is used by teachers to allow adjustment of their teaching methodologies, or also by students to readjust their learning techniques. (Pomeda, 2013). In the same vein, the development of formative evaluation systems produces improvements in the academic performance of students. (Aranda, Pastor, Oliva, & Romero, 2013).

It should be noted that there is a limited level of knowledge of the performances, competencies and abilities, which are proposed in the curriculum and are more evident when it is not possible to relate them; in this regard Poblete (2019), investigated the evaluation of learning in the area of mathematics and communication with the aim of making descriptions of the competence of



teachers of initial education to carry out evaluations from training approaches. Regarding the methodology, he used mixed descriptive research, the sample was made up of 27 teachers to whom he applied the validated and reliable instruments. The results showed an 81.19% regarding the competences to evaluate at the initial level and a 70.37% in skills for the recording of observation at the level not achieved and 59% in the ability to reflect on evaluation at the starting level.

It is necessary to point out that formative evaluation as a constant and systemic process that allows us to collect and analyze information to know and assess the learning processes and the levels of progress in the development of competences in particular area of mathematics, obliges us in a timely and pertinent way to continuously improve the teaching-learning processes, its purpose is to contribute to the development of students' competences. The process of formative evaluation with the help of information and communication technologies is a key element to evaluate competences (Olmos, 2008).

On the other hand, the virtual formative evaluation allows to assess the information received in order to carry out an effective and useful feedback about a certain object in the teaching process and allows to improve learning (Zepeda, 2017). Evaluation from its multiple models starts from being an essential component in any teaching process (Torres et al., 2021).

It should be noted that early feedback is useful and formative for the improvement of students, since it supports their progress within the subject, by acting immediately instead of

waiting until the work has been evaluated and returned to the student. However, it has to be directed towards the student individually and not generically (Brown & Race, 2013).

Likewise, the rubric as an instrument for evaluation, is based on quantitative or qualitative scales related to pre-established criteria, measuring the activities of the students according to the tasks or activities. (Gordillo & Rodríguez, 2010). Similarly, checklists are tools that allow you to evaluate performance products by determining compliance or non-compliance with certain indicators. They are characterized because they are simple to apply and only a check should be done to determine whether or not the indicators are presented in a certain evidence (Tobon, 2017, p.158).

The evaluation aims to carry out the follow-up, control of the teaching-learning process and has two functions. The first, the summative, qualifying or creditative, is the one that provides information on the progress of the students acquired in the teaching process, attributing values as a certifier, selective comparative and control. The second, the formative one, is one that contributes to the development of the student in accordance with the essential regularities of the individual's formation process and with the social purposes, in addition, it is able to detect their progress and difficulties. (Olmos, 2008)

It should be emphasized that according to the journal of innovation and education in Latin America, metacognition and self-regulation as strategies to learn to learn allow our students to think more explicitly about their own learning. Metacognition contains three essential components: the first, the cognition process involved in knowledge, understanding and learning;



the second, metacognition also called learning to learn; and, finally, the motivation that comes to be the willingness to compromise our metacognitive and cognitive skills. (Anijovich, 2019). (Torres et al.,2021).Finally,theobjectivetobeachieve distopublicizetheinfluenceoftheKahootap plicationintheformativeevaluationinthest udentsoftheRicardoBentínEducationalInsti tution,Rímac,Lima,Peru.

**2. Methodology**

This research in terms of its methodology had a quantitative approach, type of non-experimental research with correlational descriptive design, where the significant relationships between the Kahoot Application are disclosed, dimensions: Collaborative, Autonomy and Motivation with Formative Evaluation, dimensions Self-evaluation, Co-evaluation and Metacognition, In the same line, the study is quantitative with numerical medication with a statistical analysis at a descriptive and inferential level (Hernández, & Mendoza, 2018)

Correlational Es, because it allows to measure the study variables in terms of association, relationship or interdependence, but at no time explains that it is the cause of the other (Bernal 2006, p.113).

The population was made up of secondary education students totaling 149 from the Ricardo Bentín Sánchez Emblematic Educational Institution in the Rimac district, Lima Peru, having as a source of information the payroll of the number of students enrolled in the 2021 period, considering 109 students as an obt sample. Based on the formula that performs the sample calculation when the population is known, the sample selection was used with the probabilistic method and with the proportional stratified sampling technique, because the population was reduced according to sections ( Table1 and Table 2)

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**Table 1.**Population of fifth grade students in the area of mathematics

Specialties	Section	No.
Fifth degree	A	35
Fifth degree	B	32
Fifth degree	C	21
Fifth degree	D	30
Fifth degree	And	31
<b>Total</b>		<b>149</b>

**Sample**

The sample was determined using the probabilistic method to infer the total characteristics of the population and we used the following formula:

**Equation 1.** Sample

Where:

$$n = \frac{Z^2 \cdot p \cdot q \cdot N}{E^2 (N - 1) + Z^2 \cdot P \cdot q}$$

n = sample size  
 N = population size



Z= 1.96.  
 p= 0,5  
 q= 0,5  
 E= 0.05 5%.

*Replacing values*

$$n = \frac{(1,96)^2 \times 0.5 \times 0.5 \times 149}{(0.05)^2 \times (148) + (1.96)^2 \times 0.5 \times 0.5}$$

$$n = \frac{144.54}{0.3700 + 0,96} = \frac{144.54}{1.3304} = 108.6$$

n = 109

To be able to select the number of students per section, proportional stratified sampling was used, then the procedure is detailed

**Equation 2.** Proportional stratified sampling

$$p = \frac{109}{149} = 0.73154362$$

**Table 2.** Selecting the sample proportionally

ialties	Section	N	p	n
Fifth degree	A	35	0.73154362	26
Fifth degree	B	30	0.73154362	22
Fifth degree	C	23	0.73154362	17
Fifth degree	D	30	0.73154362	22
Fifth degree	And	31	0.73154362	22
<b>Total</b>		<b>149</b>		<b>109</b>

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The technique used for data collection was the surveys for each instrument taking into account the dimensions and indicators for each study variable, consisted of 20 items for each and its applicability was supported with online virtual tool, their answers were Likert type, and the instrument, the questionnaire; it is important to note that the reliability of the questionnaires for the variables of Kahoot applicative study and formative evaluation was determined their degree of reliability with the Cronbach's alpha coefficient obtaining results with the help of the SPSS statistical

software of 0.85 and 0.91 respectively for each study variable. This applicability and repeated consistency of the instrument produced similiary results (Arias, 2020).

As for the validity of content was determined with the statistical method of V. Aiken and expert judgment, the data were processed in an Excel table. The result of the concordance test of judges V Aiken was 0.83 and 0.84 respectively, which meant that the instrument has adequate validity. (See Table 3 and Table 4)



**Table 3.** Judges' concordance test: Applicative Kahoot

Dimensions	Clarity	Congruence	Context	Domain	Total
Collaborative	0.82	0.814285714	0.8	0.8	0.81
Autonomous	0.84	0.828571429	0.82857143	0.83571429	0.83
Motivation	0.83	0.891666667	0.875	0.858333333	0.86
<b>V. AIKEN</b>	0.83	0.8425	0.8325	0.83	<b>0.83</b>

**Table 4.** Judges' concordance test:Formative Assessment

Dimensions	Clarity	Congruence	Context	Domain	Total
Self-evaluation	0.84	0.828571429	0.82857143	0.82142857	0.83
Coevaluación	0.79	0.9	0.875	0.8625	0.86
Metacognition	0.83	0.783333333	0.85	0.833333333	0.83
<b>V. AIKEN</b>	0.825	0.839285714	0.84545455	0.83636364	<b>0.84</b>

### 3. Results

Of the 100% of the study population, 39% of students presented average levels of knowledge in mathematics, with respect to the Kahoot collaborative

dimension application, 11% presented very low levels, 12% low levels, 22% high levels and 17% very high levels allowing you to interact collaboratively with your peers (see Table 5).

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**Table 5.** Frequency analysis of Kahoot collaborative dimension application

Levels	Be	Percentages
Very low	12	11%
Low	13	12%
Middle	42	39%
High	24	22%
Very high	18	17%
<b>Total</b>	<b>109</b>	<b>100%</b>

Source: own elaboration

Of the 100% of the population under study, 39% of the students developed their abilities and skills of learning mathematics individually a high level with a tendency to rise, 19% have a medium level, 13% a low level, 10% very low and finally 18% a very high level, this meant that the Kahoot application improves significantly the level of virtual learning of mathematics in students

Of the 100% of the study population, 42% of students in a higher percentage presented medium levels in the area of mathematics product of the Kahoot

application that allowed them to motivate learning in an intrinsic and extrinsic way, 19% of students present high levels and 39% presented levels between low and very low

Of the 100% of the population, 41% of the students presented high levels as a result of the formative evaluation in relation to the co-evaluation, stimulating the evaluation among classmates, 46% of the students presented average levels with a tendency to rise as a product of the formative evaluation in relation to metacognition allowing their ability to

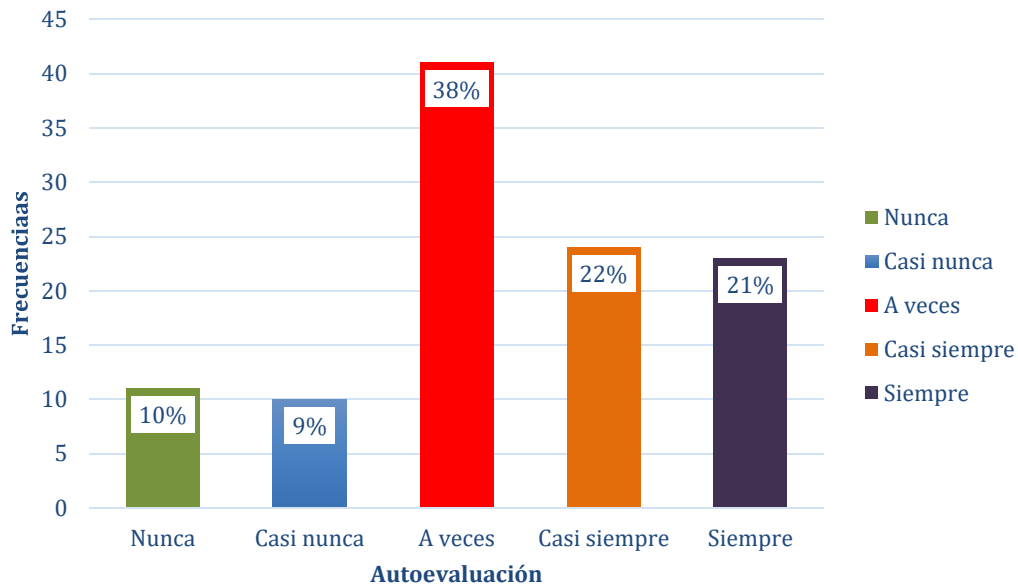


reflect on what they learned in mathematics.

Regarding the formative evaluation process in relation to its self-evaluation dimension after knowing its strengths and weaknesses, 10% of the students of the total state that the formative evolution never improved the learning processes of mathematics and facilitated self-evaluation. 9% of students say that almost never, 38% of students in greater percentage state that sometimes self-

evaluation contributes to improving the learning processes of mathematics and facilitates self-evaluation, 22% of students manifest almost always. Finally, 21% always say. Predominating in a higher percentage sometimes, according to these results it is inferred that formative evaluation and self-evaluation occurs at an average level with a tendency to rise in virtual learning of mathematics, as shown in Figure 1.

**Figure 1** Virtual formative assessment scores and their self-assessment dimension



After the application of the statistical test with Spearman's Rho non-parametric correlation statistic, with a confidence level of 95% and a significance level of 5%, it was found that, if there is a significant influence of the Kahoot application in the virtual formative evaluation in mathematics in the students of the quito degree secondary education of the

Ricardo Bentin Sánchez Educational Institution, district of the Rimac. Spearman's Rho value was 0.820 and contrasting with the bilateral sig. values = 0.000 and the significance level 0.05 has a high correlation demonstrating its significant influential link of the Kahoot application in the virtual formative evaluation. (see Table 6).





**Table 6, Test with Rho Spearman, influence of the Kahoot application in formative assessment**

Kahoot App			Formative Assessment
Rho Spearman	de Kahoot App	Correlation coefficient	1,000
		Sig. (bilateral)	0,820**
		N	. 109
	Formative Assessment	Correlation coefficient	0,820**
		Sig. (bilateral)	1,000
		N	0,000 109

\*\* The correlation is significant at level 0.05 (bilateral).

#### 4. Discussion

Compared to the descriptive study of Rojas, Álvarez and Bracero (2021) use of Kahoot as a motivating element of the teaching-learning process, which concluded by revealing that students were motivated when learning and being evaluated with the kahoot digital tool and demonstrated a more active participation in the classroom. Our study was of a non-experimental type with a quantitative approach, descriptive correlational design, demonstrating the influence of the Kahoot application variable on formative evaluation. The results also determined the medium and high levels of mathematics learning of our students in the dimensions of self-evaluation, co-evaluation, metacognition, motivation, collaborative and autonomy, determining the link, connection and preponderantly the influence of the Kahoot application variable on the formative evaluation at the educational institution Ricardo Bentin Sánchez, Rímac, Lima, Peru.

Kahoot without a doubt in the formative aspect of our students is motivating so it is currently serving us as an important part in the evaluation in a synchronous way today more than ever

the key to success in the evaluations of our students for being digital natives.

#### 5. Conclusions

Regarding the validity of the research instruments, the validity of content was carried out through Expert Judgment. To determine its adequate validity, the judges' agreement test with V. Aiken was used, obtaining values of 0.83 and 0.84 respectively, the reliability of the instruments with the Cronbach's alpha coefficient was also determined because the instruments had polytomous responses, also obtaining values of 0.85 and 0,91 respectively, the results indicated that the instruments if they had the adequate validity and a consistent reliability, consequently, the items to be measured correspond to the objectives of the research, therefore we considered that their use was applicable. Data analysis was also carried out at the descriptive level for the kahoot application variables and formative evaluation considering their dimensions to evaluate the relationship between the two. The results indicated that 74% of the students in the mathematics area of the Ricardo Bentin educational institution have a medium-high level in the use of the Kahoot



application in formative evaluation. To test the distribution of our data collected as a result of the application of the instruments, we underwent a normality test with the numerical method of Kolmogorov Smirnov for having a sample greater than 50, the results indicated that our data did not have a normal distribution, which is why we chose the Rho Spearman statistic to contrast the hypotheses raised. This test statistic allowed to statistically demonstrate the relationship between the Kahoot application and the formative evaluation. Concluding that in all the hypotheses raised the p-value were 0.00 less than the value of the significance level 0.05. Therefore, we made the decision to reject the null hypotheses and accept the alternate hypotheses. More than 60% of the students of the quinto grade of the Ricardo Bentin Sánchez educational institution of the Rimac district have average levels with a tendency to rise with respect to the use of the Kahoot application in the virtual formative evaluation. But 50% of students who use Kahoot get better grades in math and feel more motivated. More than half of the students obtained positive results in mathematics as a result of self-evaluation and metacognition with the use of the Kahoot application. Finally, at the 95% confidence level, it was determined that if there is a significant influence of the Kahoot application in the virtual formative evaluation.

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	<p>William Alberto HUAMANI ESCOBAR Doctor in Educational Sciences and Master in University Teaching, awarded by the National University of Education. Bachelor of Statistics and Bachelor of Statistics and Computer Science, awarded by the University of San Martin de Porres. Specialist in Systems Analysis granted by the PUCP. Professional with more than 40 years of experience in both private and public activity, information systems consultant at the Ministry of Agriculture, Systems Analyst at the Ministry of Transportation, head of Computing at the company Montana SA, regular professor at the University National Institute of Education in the specialty of Statistics and Informatics, professor at the IESTP Juan Velasco Alvarado, FAP Superior School of Air Warfare. Teacher in Postgraduate Schools of Public and Private Universities. Organizer of National and International Events, Author of various investigations and scientific articles. director of the Computer Center, UNE Library, director of the Professional School of Mathematics and Computer Science, currently Dean of the Faculty of Sciences.</p>
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	<p>Professor of the Faculty of Sciences of the National University of Education Enrique Guzmán y Valle. Doctor of Educational Sciences. Organizer of National and International Events, National and International Speaker. Author of various research and scientific articles.</p>
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