Educational Tutorial Video with Aspects of Psychological Sensation and Perception in Academic Achievement

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ABSTRACT

In Mexico 75.5% of children and young students in elementary and secondary school are at insufficient and elementary levels in mathematics. The purpose of this research is to join the UNESCO initiative by granting quality education, boosted by technology (Rose, 2013). Specifically, the objective is to analyze the impact of using a tutorial video on academic achievement, based on Gestalt psychology stimulating the sensation and perception cognitive capabilities. Using a 50 student sample was used, which was divided into two groups (experimental and control) we test whether students that use a tutorial video based on sensation and perception increase their attention and interest to increase academic achievement. The experimental group was a virtual class with tutorial videos on the use of slopes, explanation of the equation, and a virtual graph generator. Both groups were a survey and an exam. The results show that a high impact on the grades and on the perception of knowledge in the experimental group; the average academic achievement of the experimental group was 9.31, against 2 in the control group. Thus, we conclude that the tutorial video presented stimulates cognitive capabilities and improves academic achievement with a 7.3 impact per additional unit of tutorial video, presented as reinforcement of the class.

1.0   INTRODUCTION

Rose (2013) indicates that secondary school teaching is the most efficient way to supply the competences needed for work and for life. A high quality secondary teaching that includes aptitudes, interests, and sources is fundamental to boost young people into the labor world and to provide countries with the qualified workforce to compete in today's world, driven by technology. The United Nations Educational, Scientific and Cultural Organization – UNESCO (2009) established in its statement "Education for All",

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twelve commitments to guarantee quality education to all the inhabitants of the world. Among these commitments, stands out the creation of a safe, healthy, integrated educational environment with its resources distributed equitably in order to favor excellent learning and well-defined achievement levels for everyone; also, to use the latest Information and Communications Technologies (ICT) to contribute along the objectives of education for all.

INNE -The national Institute for the Evaluation of Education (2013) indicates that integrating ICT into the curriculum of basic and middle education has acquired great importance so that, through the development of digital abilities, students can develop in a globalized world.

In Mexico, the 2013-2018 National Development Plan establishes that quality education needs to strengthen human resources according to a fairer and more prosperous society. The Mexican Educational System must be strengthened to be up to the challenge of the needs demanded by a globalized world. Lack of education is a hindrance for the productive development of the country, since it limits the capability of the population to communicate efficiently, work in a team, solve problems, use ICT efficiently, adopt processes and superior technologies, and comprehend the world we live in and be able to innovate (Presidencia de la Republica, 2013).

In Mexico, the Secretary of Public Education (SEP) follows the UNESCO commitments in order to guarantee quality education; thus, since the year 2006, the "Enlace" test is applied with the aim of evaluating academic achievement in the following areas: Spanish (language), mathematics, and a rotary third topic. According to the test, in 2012, 75.5% of children and young students in elementary and secondary school are at insufficient and elementary levels in mathematics and Spanish (Lluvia, 2012).

Taking the UNESCO commitments as reference with regard to Quality Education and use of ICT as contribution to the achievement of the objectives of education, as well as the renovation of the educational system dictated by the National Development Plan and the results of the Enlace test. Several researchers (Criado & Moreno, 2007; Borba & Zulatto, 2010; Shapley, et al. ,2011; Rodríguez, 2012; Cebolla & Agusti, 2012; Cebrian, 2012; Bataller, 2013; Fragoso & Gonzalez, 2013) indicate that ICT facilitates learning; So this paper aims to contribute to education with ICT, so to answer the following research questions: Is there a relationship between ICT, as a tutorial video, and academic achievement? Is there a relationship between psychological perception and virtual learning? In this research, we present a cuasi-experiment with a comparative analysis of the use of ICT (tutorial video – based on Gestalt psychology using sensation and perception of the Gestalt current) as support in quality education. Alternatively, we test the working hypothesis is that the students who use a tutorial video based on sensation and perception increase attention and interest to evaluate their academic achievement.

The rest of the paper is organized as follows. Section 2 presents the literature review, section 3 presents theoretical elements, section 4 presents materials and methods, section 5 presents the result and section 6 concludes.

2.0   INFORMATION TECHNOLOGIES AND COMMUNICATION IN EDUCATION

With ICT, new pedagogic methods and models are available, which facilitate didactic resources and enable new way to learn, and communicate between the teacher and the students and among students. This even affects the way that the teaching-learning process is conceived (Criado & Moreno, 2007).

Rodríguez (2012) indicates that video digitalization represents a new opportunity to advance in alphabetization, to potentiate social networks and collaborative learning with audiovisual aids, and turn class sessions into a space for encounter, interchange, and debate. Cebolla & Agusti (2012) suggest using ICT to innovate and improve the quality of education. Bataller (2013) mentions that ICT must be used with a theoretical base and with a clear sense of the educational ends, so that the quality of teaching and

learning can be strengthened. Researches like Shapley, et al., (2011) and Fragoso & Gonzalez (2013) concluded that there is a positive perception towards the use of ICT.

Cebrian (2012) worked on a Web project with aspects of visual perception and mathematics, based on Gestalt psychology whose basic principle is the law of Prägnanz (pregnancy), which states the tendency of perceptive experience to adopt the simplest possible forms. He also considered the Web as a means to reinforce student learning.

The use of ICT in mathematics contributes to an ever-greater debate regarding the possibilities and difficulties that the teachers face in using them. Teacher-student relationships are also affected by the use of ICT in the classroom, since the teacher and book's information is more accessible to students through the Internet (Borba & Zulatto, 2010).

3.0   THEORETICAL ELEMENTS

According to Gestalt psychology, the sensory process is the base of knowledge as the immediate response of the sensory organs (eyes, ears, nose, mouth, and skin) (Schiffman, 2004). Sensation is a process through which the senses turn external stimuli into elemental data of experience (Bruno and Wolfson, 2007). For Myers (2005), it is the input of physical energy from the environment codified into impulses.

With regard to perception, Myers (2005) mentions that since the beginnings of philosophy, the perception of objects was through the senses and the mind. Likewise, the thinking process allows selecting, organizing, and interpreting; this is to say, sensation be transformed into perception by being given meaning and organization in the memory (Goldstein, 2011). Sternberg (2007) founded the Gestalt approach on form perception, which be based on the idea that the whole is different from the sum of its parts.

Perception is carried out in zones of the perceptual field (figure and background) where attention is focused. Figure is the element that exists in a space, highlighting its interrelation with other elements; background is everything else that is not the figure. The figure-background set constitutes a whole, or *Gestalt*. Depending on the place where attention is focused, different figures can emerge from the background (Zamudio, 2014). Figure 1 shows a reality of perception; figures are found in function of a judgment with little information, with opinions of instantaneous form and two or more figures can be perceived. As people, see their point of view. With perception, the person articulated and organized sensations giving sense, turning them into objects. Therefore, in Figure 1, there are two images chords to sensations received.

Figure 1: Perception

Source: http://www.nothingbychancecoaching.com/the-zen-of-perception/

Table 1 summarizes some principles of Gestalt on form perception: perception of figure and background (on which this work is based), proximity, similitude, continuity, closing, and symmetry (Sternberg 2007).

Table 1: Gestalt principles of visual perception

Gestalt principles	Description
Figure-Background	Objects (figures) appear to stand out and other aspects of the field dissolve into the background.
Proximity	Set of objects that seem near each other, forming a group.
Similarity	Grouping of objects based on their likeness.
Continuity	Perception of continuous forms that influence softly instead of interrupted or discontinuous forms.
Closing	Perceptual closing of incomplete objects.
Symmetry	Perception of mirror objects by achieving center.

Source: Sternberg, 2007

Color adds beauty to our daily life; it carries out important signaling functions, both natural and manmade (Goldstein, 2010). It is an important element of the image; it gives it attraction and stimulation. Color helps the spectator focus attention, although we must realize that colors cause different sensations on the individual. For example, warm colors (yellow and red) are usually perceived as daring, sociable, exciting, powerful, and protective (González Ocampo, 2012). Cold colors (blue and green), on the other hand, are sedating. Blue generates a favorable disposition; light blue can suggest optimism. *Color contrast* is the degree of difference in color intensity. The greatest effectiveness is achieved through the combination of light colors (white, yellow, and orange) and dark colors (black, blue, and green). In general, a dark letter on a light background is more legible at a greater distance; however, the inverse has a more agreeable effect, especially with a blue background (Rosell, et al., 2012). Similarly, Goldstein (2010) mentions that red and green balance each other and that blue and yellow also do.

With regard to color perception, Gareca (2011) states that all we perceive around us is due to the effect of light, which allows us to distinguish one color from another. González Ocampo (2012) indicates that the sensation of expansion is an effect we experience when the sense of sight perceives luminous colors like white, yellow, or orange. When these colors are used as background in a slide, the optic illusion is created that the slide is larger when being projected, since it reflects a greater amount of light than do slides with dark background.

Gonzalez (2011) mentions that sound is the aural sensation caused by receiving ordered vibrations in the auditory organs and which are transmitted to the brain through sound waves. Its features are tone, intensity, timbre, and duration. Sound design is essential in multimedia production; it provides a different level of communication. Sound can communicate while other things are happening.

4.0   MATERIALS AND METHODS

The research was carried out in the year 2011 in a Junior High school in Mexico City using a 50-student sample out of a total population of 62. A Cuasi-experiment was used where two groups of students from the second grade of Junior high school participated. The Experimental group was made up of 25 students and the Control consisted of 25 students. Both groups received a class on the topic "Analysis of the behavior of lineal graphs".

The treatment for the Experimental group was reinforcement of the topic using an ICT tool (tutorial video – Web style software tool). The control group only received the standard class. The impact of the video was assessed in two ways: 1. Academic achievement, and 2. Gestalt psychology (Perception).

To evaluate the impact of the tutorial video shown on academic achievement, two variables were used: grades and treatment (tutorial video). The dependent variable was the grade obtained in a knowledge

test; the independent variable was the treatment. The presentation used consisted in the following five points:

1. **Virtual class**: It consisted in giving an introduction to the topic and the students were told that the class would be virtual.
2. **Information video about Slope**: An information video was played on the use of the slope.
3. **Tutorial video explaining the equation**: A tutorial video was shown about the Analysis of the behavior of lineal graphs, which included voice, audio, and colors. This was based on the Gestalt psychology, through sensation (ears and eyes) and perception of form through figure and background, coinciding with works regarding video by Rodríguez (2012), use of ICT in education by Cebolla & Agusti, (2012), Borba & Zulatto (2010), and Bataller (2013). With regard to perception, we considered Fragoso & Gonzalez (2013) and Cebrian (2012). The research was based on the theoretical aspects of sensation and perception cited by Myers (2005), Sternberg (2007), and avoiding distractors according to Vivas (2012). Regarding "background", it was based on the suggestions by Zamudio (2014) and Sternberg (2007). With regard to "color", the theory by Goldstein (2010), González Ocampo (2012), Rosell, et al., (2012), and Gareca (2011) was considered. As far as the audio for the video, we considered the statements by Gonzalez (2011). Some screens as that shown in Figure 2 are part of this tutorial video.

   Tutorial video about a virtual graph generator: A video was shown, based on a Microsoft Excel worksheet, and the steps to graph data were shown.
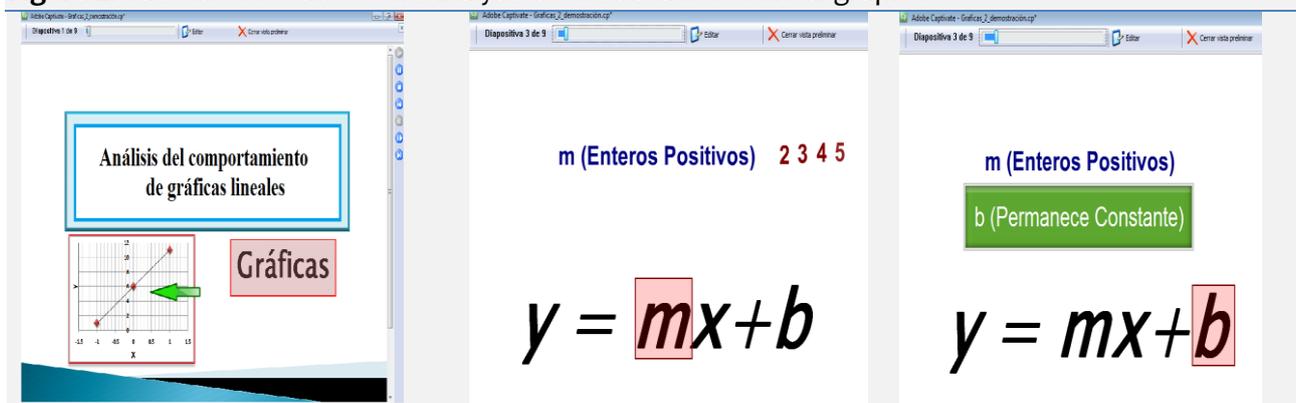
   As far as the technological part of items 3 and 4. The videos were made using Adobe Captivate 3, version 3.0.0 637, which includes several layers: one for audio (narrative of the theoretical explanation, music, and effects), another for animations, and a third for static images, which generated an online learning technological tool (eLearning) based on HTML5, which complies with Web standards.
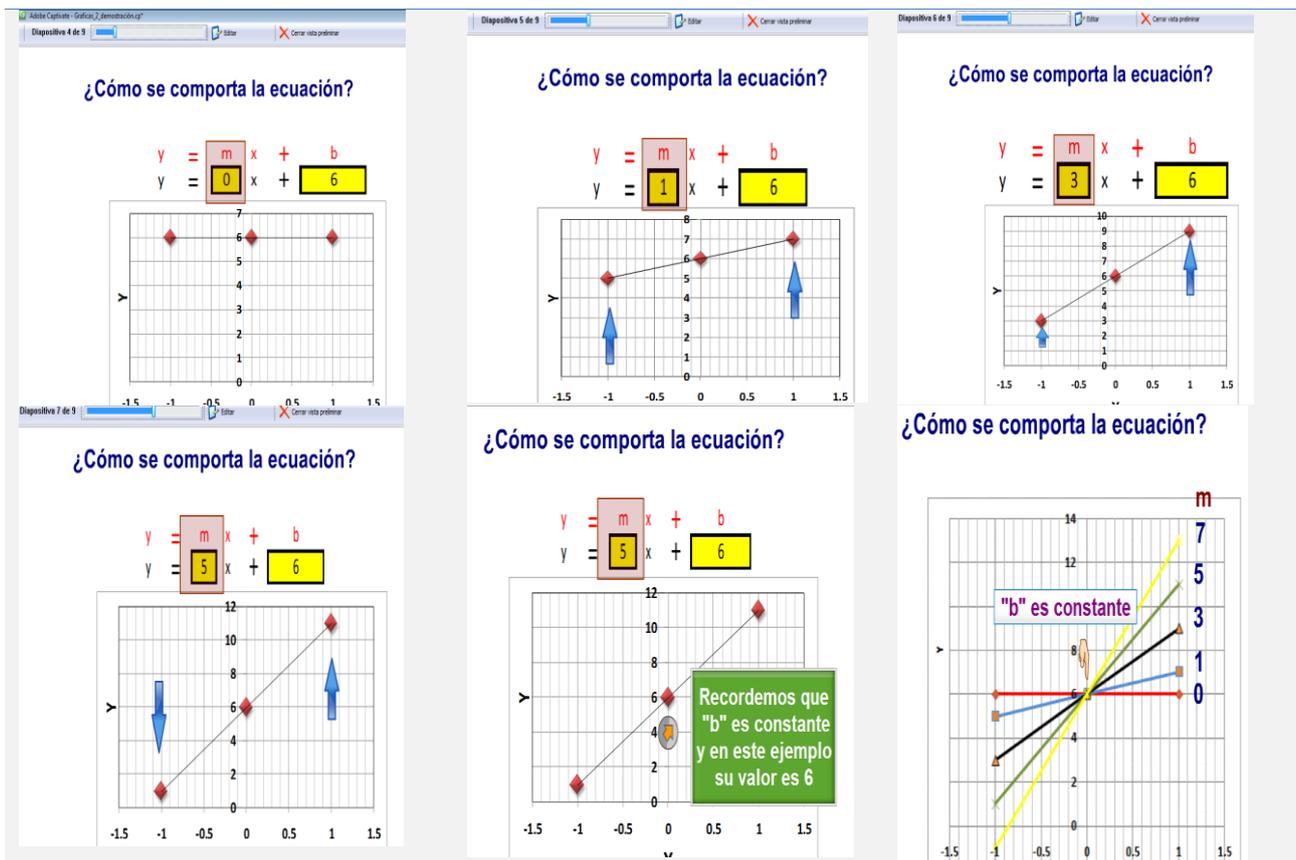4. **Use of slope in several applications**. A screen was shown with images about the use of slopes.

To assess the impact of the tutorial video regarding Gestalt psychology, which relates stimulation of the cognitive capabilities linked with sensation and perception, both groups were given a survey with only two questions: 1. What did you think of the class? and 2. Why? The answers of both groups were analyzed and classified according to aspects concerned with visual, aural, and acquired knowledge perception of each student.

Moreover, both groups took a semi-structured knowledge test, which is shown in Annex 1. The knowledge test was analyzed with the Cronbach analysis to check for reliability, with an alpha value of 0.812, which is acceptable. To evaluate normality of data, the Shapiro-Wilk and Kolmogorov-Smirnov tests were done, with successful normality assumption.

Figure 2: Tutorial video about the analysis of the behavior of lineal graphs.

Source: Self elaboration

The data were analyzed with a descriptive statistic of the variables, and then a variance analysis (ANOVA), since it has a categorical independent variable (tutorial video) and a normal distribution interval dependent variable (Grades) to test the mean differences of the dependent variable, broken down by levels of the independent variable. The Wilcoxon Mann Whitney and Tuckey non-parametric tests were also done as a different way to prove that the treatments were different. We also worked with the Bartlett and Levene tests to prove homogeneity of variance between the treatments. Finally, a lineal regression of the mentioned variables was done. All the tests were done using the SAS, version 9.1 software. The research was done as final product of the Social Psychology and Productivity course (DES608), of the Colegio de Postgraduados.

5.0   RESULTS

After applying the exams to both groups and considering the variables used, grade and treatment (tutorial video), Table 2 shows the results found regarding the relationship between academic achievement and the instrument used.

Table 2: Relationship between academic achievement and the instrument used.

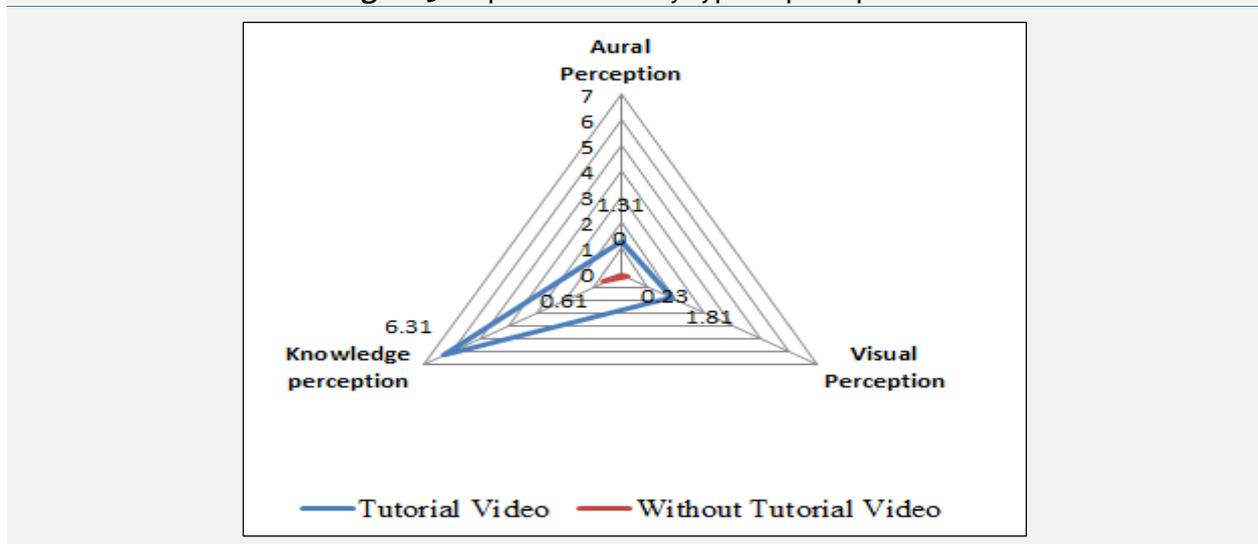| Variable	Minimum grade	Maximum grade	Average grade	Variance	Std. Dev.	Var. Coef.
Tutorial video	6	10	9.3125	1.295	1.138	12.223
Without tutorial video	0	6	2	3.33	1.825	91.287

With regard to the survey "Valorization of the impact of the tutorial video" of questions: 1. What did you think of the class?, and 2. Why?, the classification concerning visual, aural, and acquired knowledge

perception of each student, Table 3 shows the scores of each type of perception with the used treatment (tutorial video), which are shown in Figure 3.

Table 3: Scores per type of perception according to treatment (tutorial video).

Variable	Minimum	Maximum	Average	Variance	Std. Dev.	Var. Coef.
Tutorial Video						
Aural Perception	0	3	1.31	0.629	0.793	60.43
Visual Perception	0	4	1.81	1.229	1.108	61.16
Knowledge perception	3	10	6.31	6.095	2.468	39.112
Without Tutorial Video						
Aural Perception	0	0	0	0	0	.
Visual Perception	0	1	0.23	0.192	0.438	190.02
Knowledge perception	0	5	0.61	1.923	1.386	225.34

Figure 3: Representation by type of perception.

Source: Self elaboration

The results in Table 2 show a greater tendency in relation to academic achievement by the students who watched the tutorial video as support tool. Also, Table 3 shows a knowledge a knowledge perception of 6.31, followed by visual perception with 1.81, and finally aural perception with 1.31.

Table 2 shows that the mean of the dependent variable differs significantly between treatments. Moreover, using the ANOVA procedure, the value of the *F* test (174.22) is greater than that of the tables, and it showed a *p-value* of the *F* statistic with significant interpretation (<.001). Therefore, the two treatments are different and the students who used an educational instrument based on a tutorial video have a greater academic achievement.

Regarding the Bartlett test for variance equality, it has a *p - value* of the *ChiSq* statistical of 0.0907, which is greater than 0.05. The null hypothesis is therefore rejected, and the stated hypothesis stands: the students who use a tutorial video based on sensation and perception increase their attention and interest to raise academic achievement. The Levene test showed a *p - value* of the *F* statistic of 0.1676, which is also greater than 0.05, and the result stands.

With regard to the Wilcoxon Mann Whitney and Tuckey tests shown in Table 4, the results show that there is a statistically significant difference with the use of the instrument (tutorial video).

Table 4: Wilcoxon and Tuckey tests

Wilcoxon tests for two samples			
Z	4.6426		*t approximation*
With one side Pr < Z	<.0001	With one side Pr < Z <.0001	
With two sides Pr > |Z|	<.0001	With two sides Pr > |Z|<.0001	
Tukey Grouping	Mean	N	Tutorial Video
A	9.5000	25	Sí
B	1.9231	25	No

Also, a lineal regression was done with a dependent variable (grade) and an independent variable (tutorial video). The results are shown in Table 5. The *p-value* is less than 0.05, so we conclude that there is statistical evidence that the academic achievement is better with the use of the tutorial instrument than just the traditional class without the support of material like the tutorial video.

Table 5: Lineal regression of grade and tutorial video

Parameters Estimated with the Tutorial video instrument					
Variable	DF	Parameters	Error	*t value*	*p value*
Intercept	1	2	0.41151	4.86	<.0001
Tutorial video	1	7.31125	0.55401	13.2	<.0001

6.0   CONCLUSIONS

The Web tutorial video based on Gestalt psychology achieved the objective of stimulating students' sensation and perception, and clearly increased the comprehension of the topic: mathematics – Analysis of the behavior of lineal graphs. It proved to be an information and communication technology tool that allows educational growth, since the statistical results show a better academic achievement of the students that used the tutorial video as reinforcement, independently of the great debate that it generates, as stated by Borba & Zulatto (2010). Also, the instrument helps in school achievement; education is enhanced by having more than a single arena for learning, and strengthens the education triad (student-topic-teacher), according to Bronfenbrenner et al. (1987). Therefore, we recommend the use of tutorial videos in education, and that the video considers the adequate stimulus of sensory-perceptual capabilities of the students by applying the concepts of Gestalt psychology (audio, color, figure, background, and form), so that the students are motivated and their interest is sparked for the joy of educational content. One must also think about training teachers in the theoretical and instrumental aspects of making tutorial videos.

There is statistical evidence that a tutorial video increases learning of mathematics in the topic of analysis of the behavior of lineal graphs, since there was a greater academic achievement, with a 7.3 impact per additional unit of videos presented as reinforcement for the class. Knowledge perception (6.31) is the most outstanding, as compared against visual and aural perception.

Also, the use of a tutorial video as a support tool helps integrate ICT into quality education and leads students into a globalized world, thus supporting the substance of the Institute for the Evaluation of Education (2012), UNESCO (2009), and the National Development Plan (2013-2018). Finally, the technological tool proposed coincides with the results of Criado & Moreno (2007).

We propose that the government could implement video tutorials. These video tutorials should include aspects of sensation and perception. With this we have a quality education. Also we propose a system of economic benefits for teachers to using video tutorials in class. And we suggested that the government could pay more scholarships to students so they can develop more video tutorials. Therefore, a video tutorial should be used with caution to not alter extra class activities. The use a video tutorial is only an activity that is used to supplement the teacher.

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ANNEX 1: SURVEY AND TEST ON TUTORIAL VIDEOS

Objective: To analyze aural, visual and knowledge perception of tutorial videos in academic achievement.

Instructions: Fill in the blanks with the following data.

1. What is the formula of a lineal function?

   a) $Y= m + x^2$ b) $Y=mx+x$ c) $Y=mx + b$ d) none of these

2. How does the "m" slope of a lineal function behave?

a) It remains constant all the time

b) It is a circle centered on one point

c) It slopes according to the value selected or applied

d) None of the above

3. Describe the behavior of an "m" slope in a lineal function.

4. Where can the calculation of a lineal function be applied?

5. Graph the function: $Y=2x+6$.