Trends shaping education- measuring students attitudes (thinking skills) bringing technology in the classroom

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Abstract

Education is evolving at a faster pace than any other period in recent history. Because of this, it's more important than ever to understand how and where it's changing so that educators and schools can support students in preparing for challenges and careers that don't exist today.This report aims to identify and examine research-based by bringing technology to the usage in the classroom, in a technical university. The results are referring to the students' attitudes about HOTS and the learners' experiences with technology, used for educational purposes.

Keywords: ICT tools, technology attitudes, thinking skills, STEM.

1 Introduction

Learning is based on the opening and deep involvement of learners and is predicated on the social meaning of communities of learning such as inquiry-based learning, collaborative learning, video-games, project learning, and other findings. For this purpose, new ideas of teaching are concerning. The researchers (Chiappea, Ternent de Samperb, Willsc,2020) find that relevant activities for learners can remodel their skills, like those for the 21st century. These digital opportunities are often virtual and will be supporting the power for learners to collaborate with others globally, by using technology.

Related to OECD (2019) report, the data collected shows that students in colleges who used computers in their activities attended to have higher learning outcomes than learners used computers seldom. However, these findings square measure supported information collected through city testing and its interpretations cannot be generalized. Learning a continuous process and the new ICT teaching tools reflect what happens when there are used to create innovative activities

This paper provides a framework for the importance of the effect of using ICT tools in mathematics and science on future teachers' student's development of critical thinking skills.

3 Higher-order thinking skills (HOTS) and ICT tools in education

HOTS is based on Bloom Taxonomy of Educational Objectives (1956), revised by Anderson & Krathwohl et al (2001) in levels as remembering, understanding, applying, analyzing, revising, and creating.

Higher-order thinking skills are closely joined with a high level of learning and thinking. Usually, the role of a teacher as a mediator is a great thought of essential thinking skills, included under the term of behavior (Martinez &McGrath, 2014). Rutherfoord&Rutherfoord (2013) associate this idea to 'flipping the classroom' that technology has enabled for students. McMahon (2009) conducted a research about these ideas and the evidence correlate with specific activities links that children in operation in a video-games environments surroundings were ready to correlate to higher-order thinking skills. The same study shows that those with higher programming skills incontestable develop a bigger ability to transfer these skills and picks out combinations of new deep thinking skills than people who had lower programming skills.

Thinking skills and the use of technology has been closely connected as a region for analysis by researchers. Mojica (2010) and Zenisky(2014) conducted a big research about the benefits of

using video tools and its interaction with thinking skills. This study is concerned by a range of digital sources like Lego® Mindstorms™ NXT artificial intelligence system, Digital Storytelling, Marble Maze Challenge,Kahoot and others. The research instrument (Cornell essential Thinking Test) explores the potential effect of using technology tools (like video tools) and its approaches in relation to high order thinking skills, results that are not confirmed in the cited study.

Computers and digital devices are like-minded to support the acquisition of procedural knowledge through explaining their understanding in mathematics and science, explaining style and structure of the text in mathematics and science, drawing inferences and generalizations from the text in mathematics and science, making predictions about what will happen next in mathematics and science, practice skills and procedures in maths and science, using ICT tools to process and analyze data in maths and science, processing and analyzing data in maths and science, solving problems with no obvious method of solution in maths and science using HOTS indicators. Computers conjointly already support additional or less complex kinds of adaptational learning, as an example by mechanically adjusting the issue of the projected tasks to this level of mastery of the scholars.

Other researchers write about the technology in education enhanced development higher order thinking skills at students in science and maths, like Vincent-Lancrin, Urgel, Kar, and Jacotin (2019). In the author's opinion, for example, practicing skills and procedures in mathswith ICT tools is a very important step in learning. In the same report, in education, academics report that the share of scholars oft mistreatment computers for practicing skills and procedures during eighth-grade arithmetic lessons has swollen by twenty-three share points on average (2007-2015). The average amendment between 2007 and 2015 has been positive for all OECD countries (participants at research), around twenty-three share points. At the OECD level, the share of eighth-grade students frequently mistreatment this learning strategy ranged from nearly 8% in Slovenia to over fifty-seven within the US (2015 data), according to the teachers' views. Another indicator of higher-order thinking skills is practicing and drilling. Vincent-Lancrin and all. (2019) found that the share of 15-year-old students mistreatment this learning using video-games in maths, apply a minimum of once a month practice. This activity is frequent in most countries, for example, in 2015, 100% of scholars in Japan used it a minimum of once a month, against seventy-four in the Scandinavian nation. European country recorded the biggest decline during this domain, of regarding sixteen share points. Whereas computers will currently build complex calculations with excellent accuracy, a part of this procedural data permits students to grasp however mathematicians suppose and assess a way to wear down mathematical problems.

The focus faraway from the information demand of thinking skills discussed by Starkey(2011) above strong evidence about the use of digital technologies in learning, despite there, is a massive number of teachers who do not have a high level of digital skills. In a full world of virtual learning, MOOCS platforms, online course, social media, learning sites,video-games and other adapted digital resources, useful for 21st-century learners, the need for an adaptive education, and new teaching strategies are increasing in every second (Mishra, Fahnoe, Henriksen,2013).

Measurement of thinking skills appears to be some rivalry concerning the way to live, in what is the signification of thinking is (Allen, 2004). There is a general meaning of the thought concept that is close to analyzing and evaluating data victimization sure psychological feature skills come through, a selected goal, or achieve a selected result. Definitions of vital thinking vary in step with different levels of learning and tasks, included explications, reasoning, reflection, judgments, analysis and transfer the meaning in other contexts, to improve learning and innovation.

About the importance of introducing technology in teaching and learning and developing the high order thinking skills at students and its practices will be described in the next Framework for the PISA 2021 ICT cycle(OECD 2019).

4 Research Methodology

4.1 Study purpose

The next stage described is the process of research questions:

1.Do students using ICT tools demonstrate better use of high-order thinking skills (analysis skills, synthesis skills, evaluation skills) than students using traditional tools?

2.Do students using ICT tools demonstrate better use of higher-order thinking skills(analysis skills, synthesis skills, evaluation skills) in maths and than students used traditional tools?

3.Do students using ICT tools demonstrate better use of higher-order thinking skills(analysis skills, synthesis skills, evaluation skills) in science than students used traditional tools?

4.2 Sample

The research group is composed of 172 students, in the first year of faculty in the field of engineering (STEM), to become teachers in secondary education The profile of respondents are presented in Table no 1. The total number of students involved in this research was 172, 71% male students and 28% female students, with the age with an age between 19 and 24 years.

4.3 Research instrument

This study used a pretest and posttest instrument research, based by indications of Kim & Mueller (1978). The treatment and comparison groups, which means all students future teachers, were given the questionnaire of HOTS processes in science and maths. After that, were selected the students that response they not use video tools for learning in science and maths, and they do in a traditional way, writing on their notebooks (comparison groups). For insurance, a questionnaire of HOTS development are used to compare all students involved in research (N=216) to be sure if the data processed are unaltered and all the respondents involved in the experimental group have the same level of development of HOTS, in science and maths. Watson-Glaser Critical Thinking Test (W-GCTA) are used to collect initial data and select de target groups, because it deals with testing of the 3 categories of HOTS (analysis, synthesis,evaluation) as well as the fact that this is a practical test to identify the level of development of skills. Because of the small number of students enrolled, it is not possible to apply research group sampling methods.

The questionnaire used 32 Likert-type questions noted with numbers 1-4 which 1- every or almost every day; 2-once or twice a week; 3-once or twice a month;4- never or rarely happened. The reliability coefficients of the pretest instrument for HOTS were calculated using data from all students involved in research (Alpha Cronbach= .78). The value reflects that the internal consistency of the research instrument is a good range, according to the research scales getting by DeVillis (1991). Measures of final research instrument produced Cronbach's alpha coefficients ranging from 0.70 through to 0.78, which suggests that the self-perceived instrument of HOTS using ICT tools provides a reliable means of measuring students' skills.

4.4 Results and discussion

A analysis of variance was used to provide data from initial equivalence of HOTS skills respondents on the indicators instrument for pretest, about the level of high-orderthinking skills(HOTS). The ANOVA test indicated that, in the first step of research, there are no significant difference between the treatment groups and comparison groups(Table no.3).

ANOVA Test	Gender	Age
HOTS in science	x	x
HOTS in maths	x	x

Note used by author:X-no difference, - difference

Table 3. Summary of data showing the differences among demographic factors -pretest data

The results for HOTS using ICT tools (Table no.6) indicate that the difference between the scores for the final results of the research group was statistically significant. The research group scores (used ICT tools) were higher than the results of those who have not used these ICT tools, in performance on the synthesis and evaluation skills, but no significant difference in analysis skills. We do not know exactly what is the cause of these results obtained for the analysis, but for justification, it is necessary to use qualitative research tools (interviews with students) to identify the practices used in the use of ICT tools for learning.

Indicators	Variable	Sum of squares	df	F-value	Significance of F
Analysis	Between	574.227	1	33.629	0.000*
	Within	1451.383	86		
Synthesis	Between	2.060	1	0.092	0.762
	Within	1904.216	86		
Evaluation	Between	54.298	1	2.248	0.137
	Within	2053.105	86		

* Significant at the 0.05 level

Table 6. Summary of data showing the differences among research groups-analysis, syntethisis, evaluation

Analyzing in detail the data obtained, as can be seen in Diagram no1 and Diagram no2, the results obtained for the 3 categories of HOTS are different in the field of mathematics and science. Describing an example, the one of the synthesis category, we can see that, although the results indicate that the research group that uses ICT tools has developed high order thinking skills, they are different in the mathematical field from the one in the science field. For the synthesis skills category, the proportion that uses ICT tools to process and analyze data in mathematics every day is higher than in the science field. If we look at the case of students comparing texts with their own experiences using ICT tools, in mathematics, most use them once / twice a month and once / twice a month while for science, students do this activity every / almost day and once / twice a week. The differences between the areas, from the perspective of the use of ICT tools by students for different activities, is quite different.

The data obtained in this research, although extremely limited due to the small group, certifies that the use ICT tools can contribute to the development of HOTS. Of course, it is important to mark that, during the research, all learners also had access to traditional instruments, both the experimental and the comparison group. Therefore the conclusion should be that the use of these digital tools in the field of maths and science can be a real aid to student learning and can contribute to the development of HOTS, as long as it is used for the given limits.

The results of the study revealed that students are using ICT tools and there is a significant correlation between these ICT tools and the development of students' higher-order thinking skills in maths and science, but not in a plenary development (such as analysis skill). The research findings can be an important framework to introduce the use of digital tools for increasing students HOTS in class, as a daily practice, and for better learning in science and maths.

Surely, because the data are used from a student's perspective, as a self-perceived instrument, it can be an important limitation and is necessary to introduce validated tests, like used by McMahon (2009) and Ganapathy and Kit Wai (2017) to compare the results obtained.

Diagram no1: Students responses for the synthesis skills inmaths(part of HOTS)

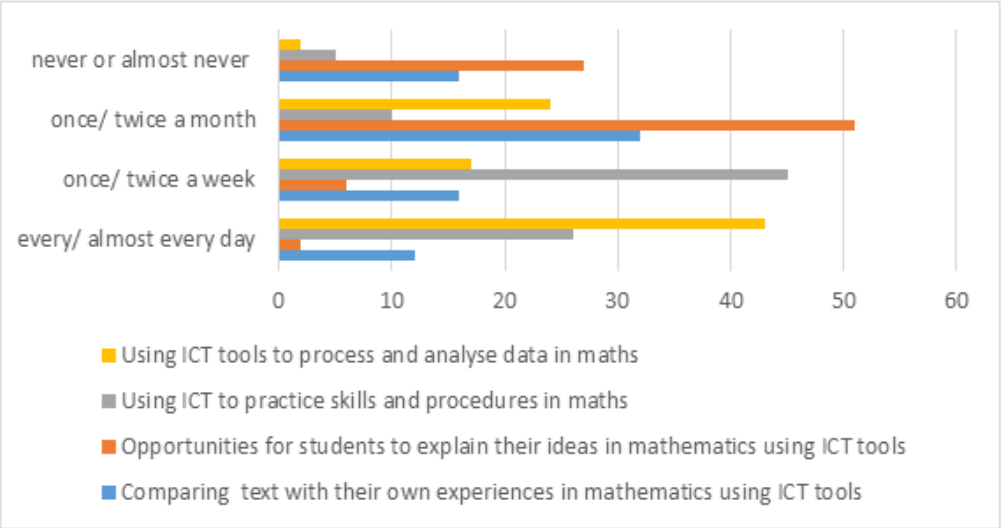
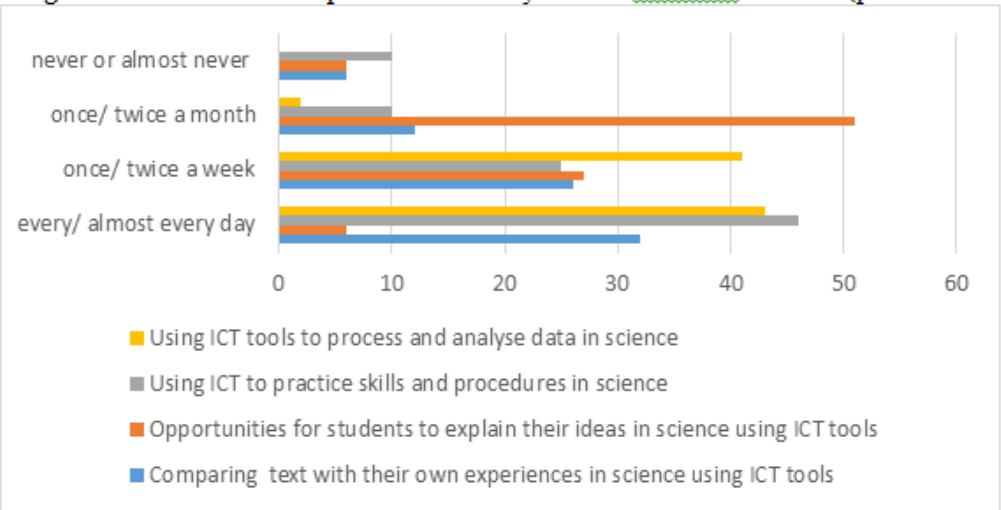


Diagram no2: Students responses for the synthesis skills in science (part of HOTS)



4 Conclusion

The data presented showed that the use of ICT tools in education, like in HOTS development can change the meaning of learning, for students engaged in the research.

Teaching HOTs ought to be a priority for each teacher as a result of it will greatly influence their students' long success. Edtech provides a range of opportunities for teachers to allow students an opportunity to observe these skills. With the correct Edtech solution, academics will greatly influence their students to imagine inventive solutions to the issues that face them. The research findings that there is a significant correlation between using video-games and the development of students higher-order thinking skills, especially in math and science and this can

be an encouraging strategy for teachers practices to introduce these ICT tools in the classroom, early students use them to make individual learning easier, even if they do not use with the support of teachers.

Higher-order thinking (HOT) could be an important talent that students got to learn before they venture out into the important world. To achieve success outside of the school, students should learn to judge the knowledge before them and solve issues creatively. Nowadays, teachers have a variety of tools at their disposal to assist students to learn this all-important talent (HOT), however education tech development may well be able to play a polar role. The right Edtech programs (like video-games) and approaches will contribute to major growth in areas associated with important thinking, especially with deep thinking and learning. There are many of the foremost outstanding ways that teachers are mistreatment technology to assist their students to learn to suppose and rewrite arguments. Reflection and discussion prompt to encourage students to contemplate multiple viewpoints.

In the latest cycle of the OECD`s Teaching and Learning International Survey (OECD, 2019), participants were asked about their use of a range of teaching practices. The results are impressing: 58% of teachers said that frequently or always give a task that requires students to think critically, 50% of teachers have students work in small groups to come up with a joint solution to a problem or task, 45% of teachers ask students to decide on their procedures for solving complex tasks, 34% of teachers present tasks for which there is no obvious solution.

From meaning, putting their concepts down on paper forces students to look at wherever their thoughts STEM from. Some academics would possibly opt to assign freelance work prompts to allow students an opportunity to reflect on their progress in a very explicit space. Keeping a journal about schoolroom experiences in a folder like Google Doc is a method to form positive that their concepts are recorded. At the top of every semester, teachers will review this document along to ascertain wherever every student had the foremost important gains(and students too). Every student needs to post a solution to an issue or discussion topic, to moderating by teachers. Seeing all students thoughts on paper are often terribly useful, many folks opt to use mind maps or alternative sorts of diagrams to ascertain however their thoughts flow This can be an important issue to recommends requiring students to cite their sources within the reflections and discussion boards as to how to make sure they're mistreatment important thinking Most students got to observe their important thinking and their speechmaking skills, therefore why not bundle them each together? Podcasts are very simple tools that students have to form on a subject of teacher/own selecting. They need the liberty to gift the fabric in no matter manner they select, however they need to try and do all of the analysis on their own. This forces them to find out massive volumes of data, script it into a format that suits them, then record a finished product. Graphing their thoughts in diagrams will facilitate students to ascertain a lot of relationships between concepts and to attach the ideas to teach them. Educational tech tools will facilitate students to form their mind maps and flowcharts in Google Docs with the Lucidchart Diagrams add-on and other tools, free to use it. This makes it unbelievably simple for all kinds of students to digitalize their thoughts and modify them as they learn a lot of data.

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