

Students' Perception of the Effects of Educational Technology on Their Learning and Characteristics



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Abstract : Researchers and educators have stated many benefits for using technology in the classroom. However, almost all of the studies did not consider students' attitudes and experiences in this regard and the studies were unresponsive to students' concerns. The present study seeks to examine the students' perceptions about the effects of educational technology on their school experiences by interviewing them.

Key words: Educational technology, self-confidence, students learning, team-working.

INTRODUCTION

During several years, I have been privileged to teach robotics at several schools and at different levels. During these years, I used educational robot kits to teach robotics and robot application to students. My main goal was not only to teach robotics to students, but also to make them familiar with programming and electronics. During my teaching, I have witnessed the positive effects of robotics, as a new technology, on students' learning and also on their self-confidence and team-working skills. These experiences have prompted my interest to investigate the benefits of educational technology among its users, and confirming through research my anecdotal experiences.

Researchers and educators have stated many benefits for using technology in the classroom. Using technology changes the nature of tasks from teacher centered to student centered, causes students gain a greater sense of responsibility for their works, causes they possess the essential skills to successfully accomplish their assignments and improve the quality of their homework, promotes their access to resources and increases their knowledge and talent, gives flexibility to students to diversify tasks, empowers students by engaging them in the learning process, increases students' self-efficacy, increases students' self-confidence in their cognitive abilities, improves student self-worth and increase students' motivation and attitudes about themselves and about learning [1]–[8]. Technology-rich schools report higher attendance and lower dropout rates than in the past [9] and students are found to be challenged, engaged, and more independent when using technology [5].

The results from a review of literature show that most research about the effects of educational technology on students' learning are quantitative, indicating a lack of qualitative research in the existing literature. Additionally, almost all of the studies were unresponsive to students' concerns and did not consider students' attitudes and experiences with educational technology. This study was designed to fill this gap and determine:

(1) What are the students' perceptions about the effects of educational technology on their learning?

(2) What do students say are the benefits of the educational technology on their characteristics?

(3) What are the negative effects of the educational technology on students in their point of view?

The purpose of this grounded theory study is to develop a theory of the effects of educational technology on students' learning, and also on their personal characteristics. Indeed, this study intends to examine the students' perceptions about the effects of educational technology on their school experiences by interviewing them.

LITERATURE REVIEW

Many studies indicated that technology has changed the way classrooms operate; indeed, it has made teaching and learning more interactive and participatory. Technology-rich environments have had positive effects on students' achievement in all areas [11], [12]. Robotic technology; for instance, with its multi-disciplinary nature, provides constructive learning environments that are suitable for better understanding of more scientific and non scientific subjects and it has a significant role in learning mathematics, science, technology and engineering subjects [13]. Some researchers from Idaho Council for Technology in Learning examined the effects of educational technology on k-12 students, over a five-year study. Based on the Iowa Test of Basic Skills (ITBS), they found a positive relationship between using educational technology in K-12 schools and academic performance in language, math and reading [14]. Harold Wenglinsky in his study assessed the effects of technology on mathematics achievement, while controlled for class size, socio-economic status and teacher education [15]. His participants were 6227 fourth grade students and 7146 eight grade students. He found that there is a positive relation between students' achievement in mathematics and higher order uses of computers, for both fourth grade and eight grade students. Reference [16] implemented approved instructional software for 18 elementary schools and analyzed 950 students' achievement during an eight-year experience. This study concluded that there is a direct link between students' test scores and their participation in computer education course, and all students' test scores rose because of this BS/CE program. The results also showed that the more access students had to computers, the more positive students and teachers attitudes were toward computers and technology. James Kulik worked on the results from more than 500 research studies with using meta-analysis research technique [17]. He concluded that average score for students who used computer based instruction was 64%, whereas average score for students who did not use computer based instruction was 50%. Furthermore, students are more

interested in the computer-based classes and they earn more in less time compare to the non computer-based classes. He emphasized that schools' programs that provide greater challenges, can dramatically improve the brilliant students' achievement. He also stated that computer tutoring is more effective than other types of tutoring and instructional technologies that rely on paper and pencil are at the bottom of the scale of effectiveness.

Braun in [9] indicated that educational technology improves students' motivation and attitudes about learning and also about themselves. It also increases students' attendance and decreases dropout rates. Reference [18] examined the calculus instructors' perceptions about the impacts of using computers and calculators on specific topics of calculus, student motivation and student learning. The results identified that using computers increases students' self-efficacy, develops their positive attitude toward learning and makes learning more relevant, meaningful, and enjoyable; therefore, it causes declining in academic frustration. As the authors of [19] indicated, technology-rich classroom promotes students' motivation and self-esteem, as it gives students a chance for working at their own desired pace. Heafner in [19] indicated that using technology causes students display more self-confidence and take pride in their creations and eagerly share their works with their peers. It has been claimed that creative problem solving is an integral part of technology education and it should be a core content area and method of teaching technology [20], [21], [22].

Most of these studies that examined the effects of educational technology on students' learning are quantitative studies, so there is a lack of qualitative research studies in the existing literatures. Moreover, almost all of these studies did not consider students' attitudes and experiences in this regard. So as researchers were unresponsive to students' concerns, more exploration is needed to fill this gap in the existing literatures. So I decided to conduct a qualitative research study to examine students' perceptions in this regard.

THEORETICAL FRAMEWORK

I will employ two pedagogical approaches for this study:

The first theory is Piaget's Constructivism [23], [24], [25]. Piaget in his theory emphasized that learning takes place as a result of mental construction by the learner. In this theory, stress is placed on the learner instead of the instructor. This theory emphasizes that the learner gains understanding of the features and constructs his/her own conceptualizations and solutions to problems by interacting with objects and events. This methodology encourages autonomy and initiative. "A central tenet of the constructivist or constructionist learning approach is that a learner is actively constructing new understandings, rather than passively receiving and absorbing 'facts'" [26]. Indeed, this method of learning increases students' understanding of complex systems, promotes interest and motivation for students when assigned authentic problems studied within cooperative learning environments.

The second theory is the Papert's Constructionism theory which stresses the hands-on aspect; it emphasizes that working on a personally meaningful activity and project or building a tangible and meaningful object, finding problems and solving them is the most efficient way for learning [27]. Indeed, Papert emphasized that the construction of knowledge is more effective if learners engage in

constructing products that are personally meaningful to them. The goal of constructionism is "giving children good things to do so that they can learn by doing much better than they could before" [28].

DESIGN OF THE STUDY

The purpose of this study was to explore students' personal perspectives about using technology in education. To achieve a deep understanding of the experiences and perspectives of the participants, the researcher used a qualitative, grounded theory approach. Semi-standardized interviews were conducted by the researcher to assess students' perceptions. In order to enhance the credibility and conformability of the findings, precise description and member checks were utilized. For member checking, after the interviews, data were collected and transcribed, then I asked participants to review and check the data in order to address any issues that were overlooked or misunderstood.

METHOD

Participants

Participants were 12 students who had used (any kind of) technology for at least one semester during their schooling. Participants included seven school students (grades 10 and 11) and five university students who had recently finished their high school. Two university students and three school students were international students, while three university students and four school students were Canadian. All the research participants and also school students' parents voluntarily signed and returned the informed consents.

Data Collection Procedures

After receiving each informed consent and the participants' contact information, the researcher contacted the participants and scheduled interviews based on their availability. Data collection occurred through face-to-face semi-standardized interviews with participants during 3 weeks. Interviews lasted for 20 to 30 minutes and were recorded. In interviews, I asked participants to talk about their experience about using (any kind of) technology for educational purposes. All participants were free to express their thoughts and experiences. Five participants chose the "smart board" and talked about their experiences in working with smart boards. Six participants chose the "computer" as a technology that they had used in their schooling. Five students of these six participants focused on the "internet" and the other one focused on using "Microsoft office". Finally, the last participant talked about her experience with Lego mindstorm robot.

After transcribing the interviews, I asked each participant to review the documents, check the accuracy and add or delete some notes. Moreover, during the interviews and analysis, participants were kept anonymous using fictional names.

DATA ANALYSIS

In the grounded theory, researcher should collect data and analyze it immediately; each interview was transcribed completely, read precisely and coded completely. Data coding in grounded theory approach involves three coding system: open, axial, and selective [29].

The first step of coding in the grounded theory is open coding which refers to “the discovery of concepts” [29]. In this step, the interview was transcribed completely, I read the transcripts line-by-line, broke down the data to small set of categories and named (coded) them based on their properties. These categories are themes of basic information which the researcher identified and used in order to understand a topic as a process.

The next step is axial coding, which is relating categories to their subcategories. During this step, all transcripts were used to categorize the data based on the similar ideas or repeated words [30]. In this step, I linked categories and subcategories and supported the links with quotes and memos. I also reviewed and renamed the categories and subcategories that had emerged in the open coding step.

The last step is selective coding, which is “the process of integrating and refining the theory” [29]. In this step, the central category was discovered, all categories were integrated and the theoretical scheme was outlined.

I used Atlas-ti7, a code based theory builder software, for coding and analyzing the data. Atlas-ti7 allows users to highlight pieces of texts and code them with specific names, based on the extent of a particular function. ATLAS considers these highlighted parts as “quotations”.

RESULTS

Research questions of this study were:

- (1) What are the students' perceptions about the effects of educational technology on their learning?
- (2) What do students say are the benefits of the educational technology on their characteristics?
- (3) What are the negative effects of the educational technology on students in their point of view?

The analysis revealed two major themes in order to answer these three questions:

- The first theme is “improving students' learning”, which has four codes.
- The second theme is “effects on the students' characteristics”, which has four codes; three positive codes and one negative code (passivity) which is considered as a negative effect of technology on students.

Table 1 shows these two themes and their codes.

Improving Student's Learning

Students indicated that using technology facilitates learning by enhancing their motivation. For example, one of the participants stated that:

“My friends and I were very interested to go up to the board and work with the smart board. Indeed, there was a contest between us to go up to the board; this contest stimulated us to try more and study better and demonstrate our knowledge to others.”

On the other hand, using technology improves the students' concentration. Another student mentioned:

“I always had problem with taking notes while listening; taking notes distracted me from paying close attention to the teacher. While using the smart board, I only listened to the lessons and then read the notes that the teacher had saved and sent to us.”

Table 1: different themes and codes related to the effects of technology on students

| Theme | Code |
|------------------------------------------|--------------------------------------|
| Improving students' learning | By motivating students |
| | By improving their concentration |
| | By promoting students' interests |
| | By Providing interactive environment |
| Effects on the students' characteristics | Encourages their social skills |
| | Arousing self-confidence |
| | Improving team-working ability |
| | Encouraging passivity |

Students also stated that using technology improves their learning as it promotes their interests and attitudes toward the lesson by providing different meaningful materials:

“Our teacher used movies and images while teaching with the smart board, attracting my interest to the lesson and encouraging me to listen carefully.”

Lego Mindstorm “aroused my interest toward science and technology subjects.”

Students also indicated that using technology changes their learning by providing an interactive environment. For example, one of the participants mentioned:

“Using Mindstorm helped me to learn about some subjects such as gears, motion and forces, as I could see the action of the robot and its motion.”

Effect on the Students' Characteristics

Students also expressed that using technology (internet) encourages their sociality:

“I spend a lot of time chatting with friends, sending them emails and seeing their pictures in Facebook. In class, we also discuss our emails and pictures.”

“My friends and I are connected to each other in Facebook. It is a great way to know each other better; it has made us closer friends.”

Students believed that technology arouses their self-confidence as well. For example:

“I have a messy handwriting, I was ashamed of my handwriting and I was afraid to write. Now, I use the computer and Microsoft office without being ashamed.”

Students also stated that technology improves their team working ability:

“My friend and I were working on this project. I was responsible for building the robot body and my friend was responsible for programming. Of course, sometimes he helped me in constructing the robot and sometimes I helped him in programming.”

As students stated, one negative effect of using technology is encouraging their passivity:

"The internet made me lazy; I never try to memorize anything. I think whenever I need this information again, I will just "Google" it."

"I rely on my computer too much. A few weeks ago, I typed an essay, but now I cannot remember that. I think if I wrote it with my hand, I would definitely be able to remember it."

The Challenges of Using Technology

During this analysis, I found another major theme which I have called "technical issues". As the students stated, the only challenge of using technology is technical issues:

"I can remember that once the projector did not work and the teacher could not use the board. Unfortunately he had not any back up of the lesson to continue class."

"The smart board only supports one user at a time; it is not possible for two or more students to write on it at the same time."

DISCUSSION

Constructivism theory, which was described by Piaget, stated that the learner gains understanding of the features and constructs his/her own conceptualizations and solutions to problems by interacting with objects and events. Additionally, Jacobson and Wilensky stated that this method of learning increases students' understanding of complex systems, promotes interest and motivation for students when assigned authentic problems studied within cooperative learning environments [27].

It appears that the studied students' experience in this study is a new example of "Constructivism theory". In this research, I have evaluated the students' experiences and found that interacting with objects (smart board, computer, and LEGO Mindstorm) improved students' learning and understanding, motivated them and promoted their interests.

The Constructionism theory emphasized that the construction of knowledge is more effective if learners engage in constructing products that are personally meaningful to them [28].

This study provides a new example of "Constructionism theory" as well. Students' learning was improved as they engaged in meaningful products (e.g. LEGO Mindstorm, movies)

CONCLUSION

This study showed that technology has the potential to change students' understanding and their skills, abilities and characteristics. The findings represent new examples of constructivism and Constructionism theories. However, more studies are needed to improve this study, choosing participants from school students.

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