Educational Robotics Is a Useful Tool in Education

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Abstract

In the contemporary educational system, the inclusion of educational robotics in the curriculum of schools has been controversial. The research paper argues for the integration of educational robotics in curriculum of schools. The purpose is to encourage educators and schools to integrate educational robotics in their curriculum to create a useful learning environment for students to exhibit their knowledge and develop the important skills needed for their futures. The paper offers three grounds: educational robotics provides an effective learning tool for students in various fields as math, physics, and biology (STEM); educational robotics improves students' communication, collaboration, and teamwork skills; educational robotics creates a fun and engaging learning environment for students. These grounds argue against schools that refuse to insert the educational robotics in their curriculum because of the time needed for educational robotics and of the high cost for it. Data was collected from resources that provided approaches and studies, which teachers and schools can benefit from it to know the importance of educational robotics. In conclusion, educational robotics is a useful learning tool for students, so it should be a crucial part in the curriculum of each school.

Keywords: educational robotics, technology, programming, codes, arduino

Introduction

Take a look at your house, your workplace, your school, everywhere you can find a technological tool. The world is changing in a fast way, and technological improvements have increased in all sectors (Eguchi, 2014). Robotics technology has been included in a lot of fields including rehabilitation, home appliances, and education. The new technological tool has been attached to all people's lives, and technology has become a major part of life, especially a major part of education. According to Eguchi (2014), the technology dominates all the students' minds and becomes an indispensable part of their lives. They grow up using all kinds of technology such as laptops, games, and Smartphone, but they never think about how it is made and how it is repaired. Although the world is changing in a fast pace, education has almost the same system since the end of 1900s, and the real problem here that a lot of schools are preparing students to future in the mentality of past. "Learning with educational robotics provides students with opportunities for them to stop, question, and think deeply about technology" (Eguchi, 2014, p.28). Educational robotics is a purely technological method of learning. In the last decade, robotics have attracted a lot of researchers, teachers, and schools as a very essential learning tool to develop many skills from pre-school to high school (Alimisis, 2013). Also, a lot of innovative companies have been moved to introduce a lot of valuable tool such as EV3, NXT, WeDo, and

Arduino. The 21st century skills highly depend on skills gained by educational robotics like creativity, critical thinking, problem solution, and many other skills (Eguchi, 2014). Therefore, educational robotics is a very helpful tool in education and should be used in all schools.

Supporting Reasons

Effective Learning Tool

The most important reason to consider educational robotics as a useful tool in education is that educational robotics is a really helpful tool in education because it helps students to learn subjects in an effective way. It provides an effective learning tool for students in various fields as science, technology, engineering, math, physics, and biology (Kubilinskiene, Zilinskiene, Dagiene, & Sinkevièius, 2017).

Students well understand the subjects by using educational robotics. For example, educational robotics activities enhance the classroom teaching, so students can learn more efficiently the subject studied in class (Kubilinskiene et al., 2017). It improves the cognitive and the learning skills of students by learning to construct objects. Also, educational robotics introduces the students to solve the problems manually, so it relates the science concept that students learned in class to the experience. Therefore, educational robotics can be an aid tool for teachers to improve the learning skills for their student (Kubilinskiene et al., 2017). Robotics can really help students to better understand the subjects and let them apply what they learn in schools in hands-on projects. According to Eguchi (2014), educational robotics opens a lot of doors in front of the students and helps them to really understand a lot of concepts in math and

physics. A lot of studies indicate that educational robotics provides learning opportunities in many areas such as biology, science, geography, and programming.

Also, educational robotics develops programming skills by related the programming codes written in the computer and the reality in order to function the robots. According to Kunduracioglu (2018), programming is an effective skill for all age's students. Programming has become one of the most important skills of efficiency today not only for workers with computers but also for all ages because these skills improve productivity and creativity. The need of students for programming skills has increased with the importance of these skills, so all ages begin to interest about studying programming. The levels of education are different, so many programming education materials have created to appropriate each level. According to Kunduracioglu (2018), different tools are needed to learn programming such as Arduino that are used to facilitate the learning of programming. Arduino is a platform that receives a code from the computer and gives these orders to function a robot (Junior et al., 2013). Therefore, the usage of Arduino makes a relationship between the programming codes written in the computer and the reality, so students can more understand these codes to function their robots.

In addition, educational robotics improves the computational thinking and the creativity of students to help them learn different subjects. According to Kunduracioglu (2018), robotics becomes more popular today, so it is necessary to be inserted in education. Robots are used in some countries for many courses such as science, mathematics, and physics. For instance, the tools used in robotics are many different such as Robo Mind, Parallax Robotics Kits, Mindstorms EV3, and Make Block Kits. Each of these tools has their own program, but all rely on Python, C++, and Java. Moreover, educational robotics enhances the computational thinking of students that becomes an important element to learn STEM (Science, technology, engineering, and

mathematics) in primary and secondary education (Eguchi, 2014). Computational thinking contributes to create a successful generation that meets the increasingly concerned of the modern economy about technology. The integration of engineering education which relies on STEM learning in schools from elementary to secondary education increases the ability of students to learn engineering subjects (Eguchi, 2014). Robotics is one of the most important elements of technology to integrate engineering technology into school. The use of educational robotics contributes to increasing the creativity of students in technology and encourages them to make the right decision that makes them inventive in the future.

Developed Important Skills

The second reason is that educational robotics enhances different types of skills that are very important for the mind's development of students (Eguchi, 2014).

Educational robotics enhances the communication skills and different types of skills needed for the future of the students. For example, educational robotics not only merges STEM but also merges many specialties such as dance, art, science, music, and literature. It gives students the opportunity to work together, so it develops the cooperation skills among student by sharing each other's ideas to come up with an ideal solution of the problems in their projects. According to Kubilinskiene et al. (2017), the communication provided by the educational robotics activities help students to control the problems that face in their projects. Some students face difficulty in understanding some concepts to apply their project, so they can work in groups to more understanding these concepts by sharing the ideas with each other to reach the perfect idea. Moreover, educational robotics contributes to learning many important skills for a better future (Almisis, 2013). There are weaknesses with most of the students in the skills needed for the future like critical thinking, teamwork, creativity, and problem-solving. Those skills should be

built from an early age by engaging the educational robotics in the curriculum of the schools, so the students become able to achieve the success criteria for a brilliant future. Furthermore, educational robotics is a heavy course and it should be worked or studied in groups and after student begins working with robotics tool, they became aware that they should collaborate to finish their tasks. According to Alimisis (2013), most uses of technology in our schools don't help students enough to be a powerful part of the 21 centuries. In a simple way, new technology used reinforcing old ways of learning, and school labs are not appropriate to elaborate a lot of important skills for students such as critical thinking, creativity, critical thinking, and teamwork. In those labs, students are guided to do only specific things and don't let them use their innovative skills. Students of the 21st century should have the ability to communicate and collaborate with others and they should learn how to listen carefully to others and learn how to take ideas from them and all those skills are shared by educational robotics. Moreover, robotics competition allow students to make connections with other students in their country and even with students from all over the world taking FLL as an example in this competition (Eguchi, 2014). Therefore, students will have points of view if they work in groups and collaborate with each other. These prove that educational robotics create an environment of collaboration and teamwork.

Fun Learning Environment

The final reason is that educational robotics is a learning tool that creates a fun and attractive learning environment for the students. It creates a combination of fun and education to make the students attracted and interested to learn (Eguchi, 2014).

Educational Robotics gives the students the chance to work in groups and to do hands-on projects that create a fun learning environment (Eguchi, 2014). Students enjoy working in groups

with each other because learning in groups makes them understand better the concepts by communicating and sharing the ideas together in an atmosphere of fun and enjoyment. Educational robotics is based on working in groups so that motivate students to learn and have fun at the same time. As students enjoy working in groups than work alone, educational robotics can be the best tools for students to engage in learning. In addition, educational Robotics motivates students to do hands-on projects in a fun learning environment (Eguchi, 2014). Students enjoy learning practically because it can more understand the concept studied in class in a fun environment. According to Eguchi (2014), educational robotics contributes to the development of students in the physical part because it is a hands-on tool for learning. This hands-on nature of educational robotics offers an exciting and fun atmosphere by allowing the students to assemble their own robots such as Lego that consists of different parts to be assembled by the students to create a robot, so integrating educational robotics encourages students in a fun environment to acquire different skills like collaboration, problem-solving, decision making, and communication skills required for them to reach the final design of their projects (Eguchi, 2014).

In addition, educational robotics creates a fun learning environment by giving the students the chance to participate in many competitions and by making math fun with C-STEM. (Eguchi, 2014). Competition is the most important thing that attracts students and encourages them to participate in different fields especially in education. In educational robotics, students have to work on their projects and finalize them in order to compete with each other and with others schools, so that caught the attention of students who enjoy the challenges. Also, teachers and school begin to be more interested and attracted to the educational robotics because it motivates students to compete for valuable things and have fun at the same time that developed their personality. Therefore, students consider the competitions organized in educational robotics like a game that

enjoys it very much. Students love to play games that based on competition and spend a lot of time playing it, so with educational robotics students can enjoy playing by compete each other's in many competition such as FLL, Roboparty, and WRO and at the same time learning valuable things instead of just playing games that no benefit from it on play-station and computer. Moreover, educational robotics gives the students the chance to well understand math's problems by making it fun with the C-STEM program (Eguchi, 2014). Many students feel boring in the math class because they just do the calculation without understanding their meanings, and others cannot understand it because they feel that it is very complicated. C-STEM is a program that helps student enjoy the math class and well understand their purposes and their meanings by making a relation between the usage of the concept of math, the computer programming, and the educational robotics.

Rebuttal

Some schools think that there are some obstacles to make robotics a critical part in school curriculum such as the time needed for educational robotics and the high cost needed of some equipment, so this push many schools to refuse the integration of educational robotics in their curriculum (Alimisis, 2013). These schools think that the integration of educational robotics is a waste of time because it requires a lot of times, so it prefers to insert the main courses such as Math, physics, chemistry, biology, and languages than consider the educational robotics as a main course . In addition, these schools consider that the cost of equipment needed to insert the educational robotics in the school curriculum is very high, so it prefers to not spend money on these things because it doesn't benefit the student like the traditional learning. These arguments are false. According to Kubilinskiene et al. (2017), educational robotics allow the students to more understand the concept of the courses, so it is never wasting time but it a valuable time that

gives students the opportunities to practice and convert the rule studied in class into reality. In addition, educational robotics shouldn't be stopped because of financial problems; there is a lot of products in this area that begins from only 14$ to reach 4000$, so everyone has the chance to learn robotics (Junior et al., 2013). Therefore, the school can bring the equipment needed for educational robotics with an affordable cost corresponding with their financial capacity, and they should not forget that students' creativity can be trigger by using educational robotics no matter their prices are.

Conclusion

In conclusion, educational robotics attracts the importance of many schools as a useful tool in education and others schools don't consider it as a useful tool and refuse to introduce it in their curriculum. Today, technology and education become the most important topics, and as educational robotics is a combination of these two topics, it attracts the importance of schools, teachers, researchers, and students. According to Junior et al. (2013), educational robotics is a new effective and useful tool in education. It reflects the evolution of modern education, so it should be affordable to all students all over the world for many important reasons. The most important reason is that educational robotics provides an effective learning tool for students in various fields such as science, technology, engineering, and math (STEM). Another reason is that educational robotics improves communication, collaboration, and teamwork skills. The final reason is that educational robotics creates a fun and engaging learning environment for students. These reasons are very sufficient to convince schools that consider educational robotics as a waste of time and as a high-cost tool in the importance of these tools to the success of the students in present and future in all majors and courses. Thus, educational robotics should be a crucial part in schools because it is a useful tool in education. Educational robotics contributes to

learning many important skills for a better future because it provides learning opportunities in many areas such as biology, science, geography, and also critical academic skills like collaboration, problem-solving, decision making, and communication skills (Eguchi, 2014). Those skills should be built from an early age by engaging the educational robotics in the curriculum of the schools, so the students become able to achieve the success criteria for a brilliant future (Alimisis, 2013). All schools should consider educational robotics as a crucial part because it provides a successful future for students and helps them to be a part of a successfully managed society where technology is the major part controlling it.

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