International Journal of Research Publication and Reviews

The Fast Learning Method (FLM) on Mobile Robot to Novice High Technical School Student to Understand Robotics Faster

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DOI: https://doi.org/10.55248/gengpi.5.0124.0204

A B S T R A C T

The implementation of Fast Learning Method to Technical High School student studying robotics is very important nowadays. Nevertheless, there has been a steady increase in the number of studies investigating educational robotics and its impact on academic and social skills of young students. This study was done by collaboration between Politeknik Sultan Ibrahim, Johor Malaysia and Politeknik Negeri Padang, Indonesia. This study situated in Malaysia with senior technical high school. This joint project intended to promote robotic fast learning method to novice high technical school student. That the student projected to master robot skill and knowledge. Since, the available learning duration is restricted, the fast learning method on robotic is able to meet basic educational requirement. The project created the new atmosphere of robotic fast learning for senior technical school student. Educational robots were used both in and out of school environment to enhance Senior Technical High School students' interest, engagement, and academic achievement in various fields in Senior High School. Some prior studies show evidence for the general benefit of educational robotic as being effective in providing impactful learning experiences. However, there appears to be a need to determine the specific benefits which have been achieved through robotics implementation in Senior Technical School and informal learning settings. In this study, we present the fast learning method on mobile robot to increase understanding, interest and academic performance of Senior Technical School student. The fast learning method on robotics is a kind of practices that attended by a class of students. The process includes tutorial, robot assembling, programming and robot testing. The assembling and programming tasks are done according to course note. The testing process is freely done by the student.

Keywords: fast learning method, robotic, education

Introduction

Robotic education is the promising way for the senior high school student to get interested in robotic and related fields. This has high potential opportunity to the teachers and educational researchers to study this fields. The topic includes educational robot programming, robot design, robot construction and computational thinking[1]. This learning method will make the students interested in this topic and engage to them. The studies of those topics show that utilization of robots in school setting could lead to improvement of student science literacy. The understanding of basic skill in robotic of the novice student with not prior experience at school on robot building is very important. This basic knowledge will explore student's interest to study robotic as deep as they will[2]. Besides increasing student interest in robotic learning, the robot education also can anticipated technological advances in the challenges and changes of the revolution 4.0, The educational practitioners must prepare the students to be able to follow these challenges and changes by using a learning process. The common term in learning robotic is known as robot education (RE)[3]. The detail of the method is as shown in Fig. 1. In general, the method was divided into three main phases. The exploration phase, interpretation phase and communication phase. Each phase has sub activities. The first phase has exploration belief and topics, selecting and deselecting information. The second phase has analyzing and synthesizing tasks. The last, communication phase perform student presentation and final report. The robot education intend to identify what kind of skill can be trained in the learning process using ER method and the evaluation performed to what kind of suitable robot applied to student. The other importance and purposes of learning robotic for high school student is to adapt and develop computational thinking in early student years[4]. This early age robot learning method will introduced the challenges of computational thinking sooner. That they can adapt easier to this circumstance in the future.
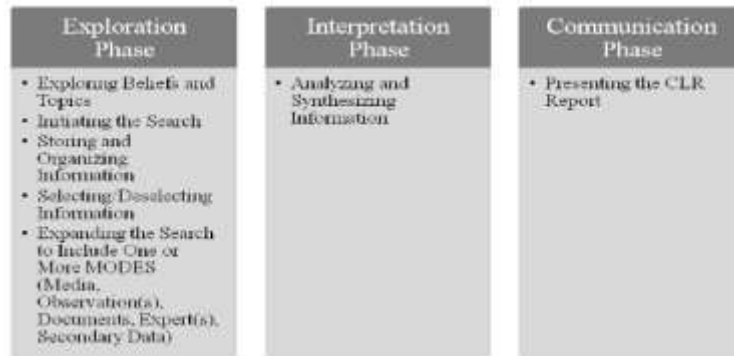
Fig. 1 The method of teaching learning process[3]

The other method show that critical thinking method in robot education in better than problem based learning. It can enhance student by cooperative learning[5]. Further, the effective method in study robotic is taken place in classroom, where they can build their own concepts and themes. Here, they have their own experiences and memories. Finally, they can construct knowledge and meaning from interaction with their teacher. This method is suitable to study electrical field of robotic[6]. The other innovative research, Edurosc-kids, it purpose to prevent frustration and inattention student while learning robotic. This fashion considered robot as a important resource and be used to solve a problem[7]. This method consist main focus and secondary focus. The main focus is teaching robotics, otherwise the secondary focus is a few task that implemented in robotics. It refers to learning process in many fiels such as communication, math and arts. The detail of the Edurosc–kids method is as shown in Fig. 2 below.
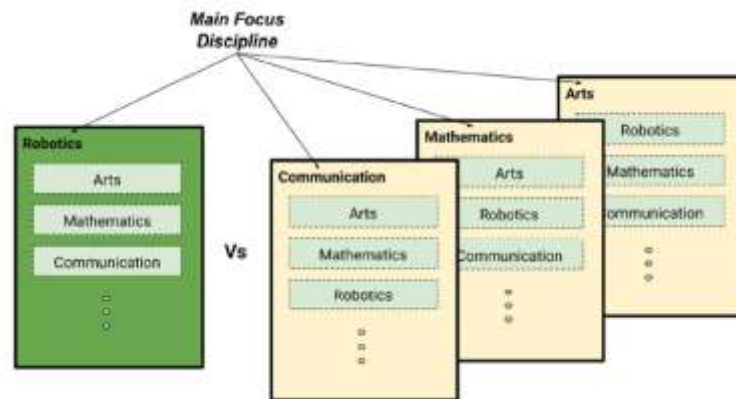

Fig.2 The architecture of Edurosc-kid[7]

Fig.2 shows the secondary focus contains many fields. Nevertheless, they were a few implemented in robotic learning. Further, the content of the class tutorial is mechanics, robotics and society, control, electronics and programming tasks. The correlation among them is as shown in Fig. 3 below
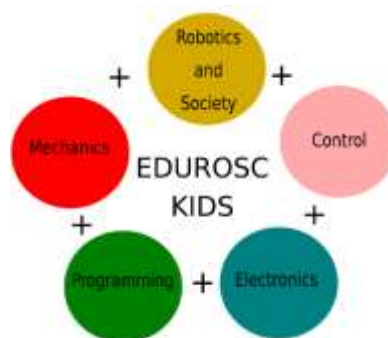

Fig. 4 The curriculum structure of Edurosc-kids[7]

As the computational thinking is very important for the student, that it needs to be improved, The computer supported project based learning (CSPBL) method is used. The method is able to improve student's thinking better and according to computational thinking[8]. The IkasBot is a program that use robot as a tool. It intends to promote social robot[9]. The detail of the method is as shown in Fig. 5 below.
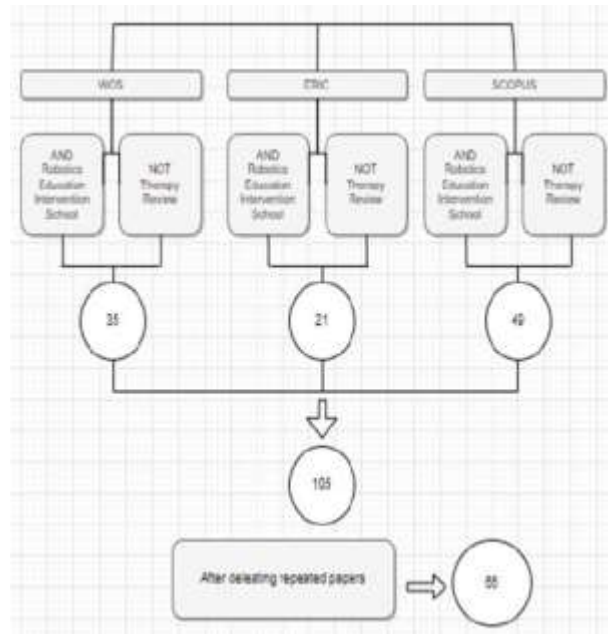
Fig. 5 The architecture of IkasBot[9]

Fig. 5 shows the usage of IkasBot in research paper where that method is very popular among researcher.

Method

There are many factors influence student's interest to motivate in robotic education, such as situation and place, duration, method and tool. The proposed method blends all those factors to form Fast Learning Method on Robot Education. The research involves novice student of various senior technical school of Johor, Malaysia. The teachers prepared the robot modules, course note and presentation or instructions. The robot modules are selected based on some criteria, such as the usage of the system in daily life, the availability in common market, arising interest factor and the construction complexity. Based on those deliberation, the mobile robot is a best choice. Then, in order to make fluently communication among student, they are devided into group with four student members each. The group is compounded by student with close each other. The fast learning method on robotic education took place in suitable classroom where the track exist. The atmosphere of Fast Learning Method on Robotic Education is as shown in Fig. 6 below.
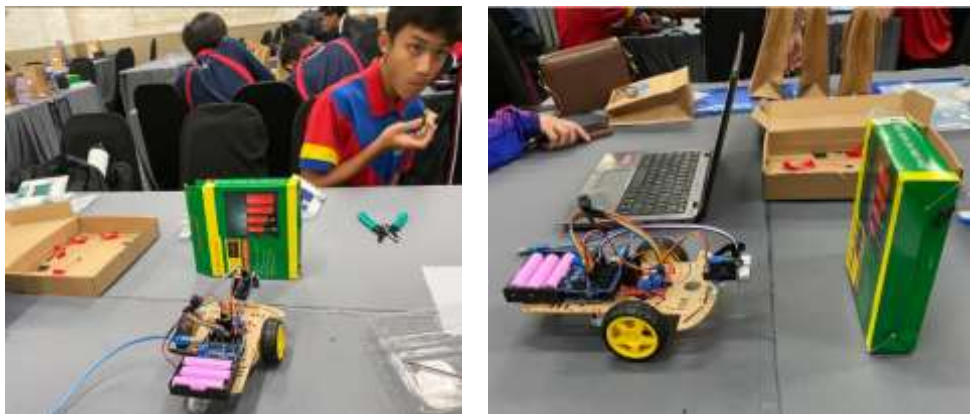

Fig. 6 The student group of FLM method

Fig. 6 shows each student group has the requirement to perform robotic education based on Fast Learning method on Robot Education task. They assembly their own electronics devices, mechanic components and batteries. The also do computer programming task that they can control the robot movement. The propose method contains three phases, the tool, robot learning design, Fast Learning (FLM) Method. The Fast Learning Method consists of FLM Analysis, FLM Implementation and FLM Testing. The detail of the Fast Learning Method on Robot Education is as shown in Fig. 7 below.

Fig. 7 The block diagram of proposed Fast Learning Method on Robotic Education

Fig. 7 shows three phases of FLM method and other three sub-phases of fast learning method. They are FLM Analysis, FLM Implementation and FLM Testing. The Learning Design is created based on blending selected previous methods. The selected methods are as described in section 2.

The FLM method spends about 5 hours to complete all the phases. At the beginning, the teachers explain the importance of robot education in the future. This motivation increases student's engagement in Robot Education. The predicting of robotic role is ubiquitous. Since, the industrial sectors need operation done automatically as long as it could. The automatics means the operation can start and stop at any time with a few human interfere. This dynamic operation in industrial sector offers the high adaptability of the industries refers to availability of raw material, market demand, storage and transportation.

These challenges motivated senior high technical school student to dive deeper in the following robot learning tasks. The motivation is the beginning speeches in the event. It spend about fifteen minutes. The second opening speech is about teacher experiences in developing robot. This section also presented how the robot can help rural farmer to facilitate farming jobs. While this section taking place, the students have chance to ask any doubtful sentences from the teacher. Every students who rise their hand, the teacher responded them quickly. This second opening speech spent about twenty minutes. Finally, the students have good understanding on robot education concept.

The assembly process is starting from counting all the components and batteries. Fortunately, each group obtain complete components and accessories. They assembly them to build a mobile robot. It is as shown in Fig. 8 below.
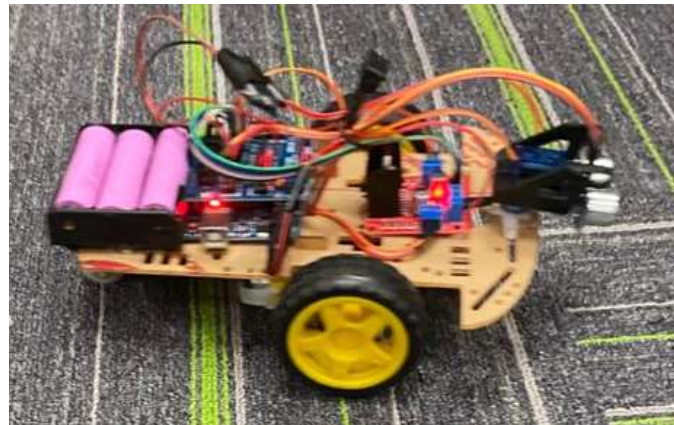

Fig. 8 The robot mobile model

Fig. 8 shows the target model of robot mobile of the FLM method assembled in Politeknik Sultan Ibrahim, Johor Malaysia in October 2023. One important to note is the student can eat and drink while studying. Whereas, this learning process is very tired. It can keep the student to be convenient as long as possible. So while assembling process, the students get attention when they were in trouble or in doubt. The teacher come to them to re-explain what trouble they got. The assembling process took about three hours. The last sub-phase is testing. This phase is download the computer program into the processor. The sample program is offer to student and the trick to modify the programming list is explained. They make their own computer programming to run the robot. Finally, they can make a mobile robot that is very common found in industry.

Result

After the fast learning process on robot education finish, the students can try to run their own mobile robots. The mobile robot can prevent the barrier in front and rear of it. Then, It can run to many save directions and retreat when the barrier standing in front site. The sequence of running mobile robot are as shown in Fig. 9 below.
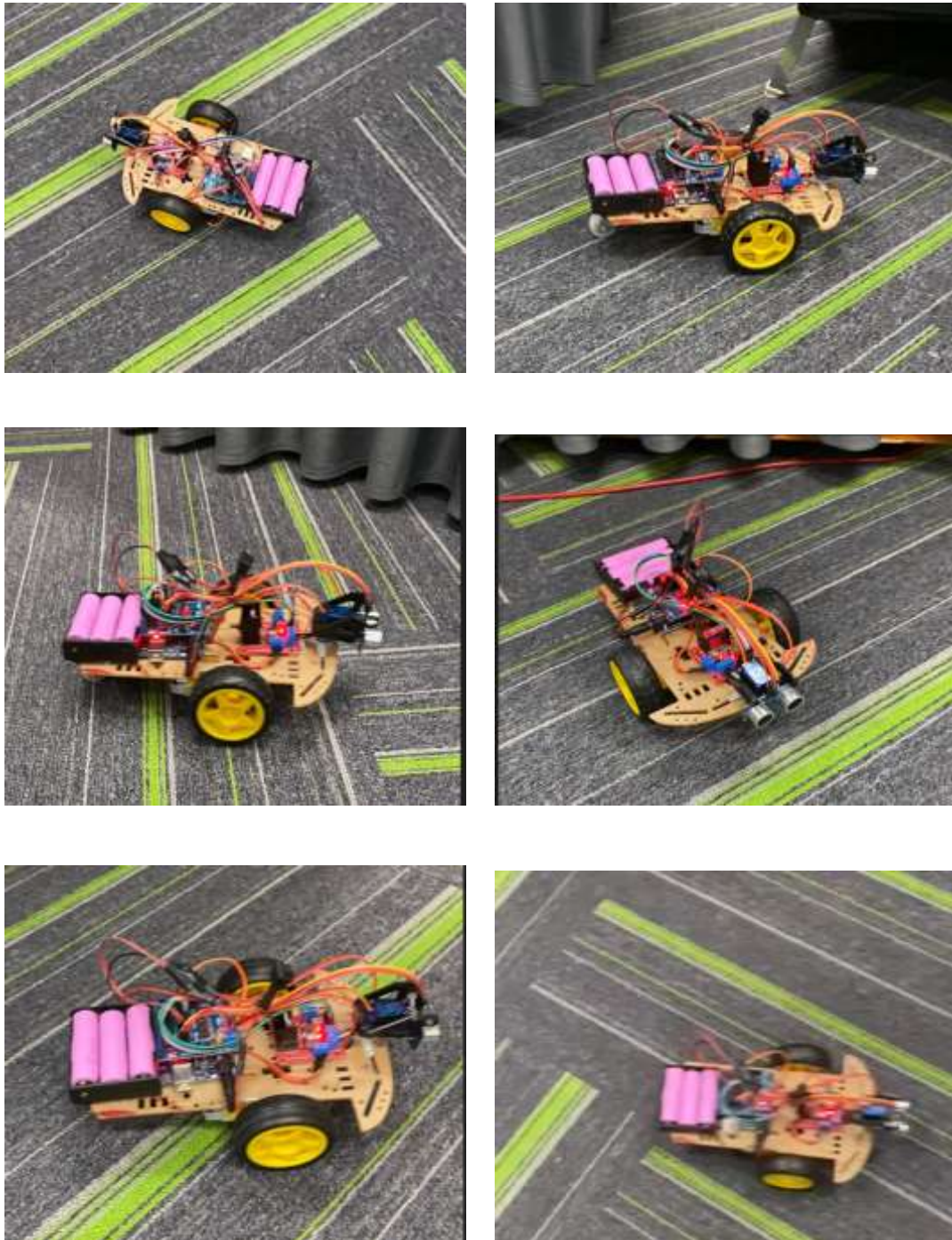

Fig. 9 the image sequence of mobile robot tracts the field

Fig.9 shows the sequence image of movement of the mobile robot in the space area at back part of classroom. This laboratory is located in Politeknik Sultan Ibrahim, Johor Malaysia. The robot movement is very fast and frisky. Further, it make the novice student very enthusiastic. This atmosphere presents that all the student satisfied and understand well about robot education. The simple dialogues with them disclose that they wish to joint and attend the same learning at the Politeknik Sultan Ibrahim.

At the end, the total time duration to complete all the phases in Fast Learning Method on Robot Education is about 5.30 hours. This is very short time. It is less than 6 credits in university lecturing.

Based on the student respond, the proposed method is effective to offer students with no prior experiences in robotic fields.

Conclusion

The Fast Learning Method on Robot education is a kind of method to make student with no prior experiences can interested in robot education. This study involves student of high technical school in Johor, Malaysia. The teacher team provides the student with modules, note, clear and interesting presentation, motivation, convenient atmosphere and logical dialogues. The students divided into several group with based on their interests. The student can catch all the learning material deeply. Then, the assembling process can run smoothly. In several hours, they can mastery the main concept of mobile robot well. The quality metric of the learning method is measured by the output process. The robot running and the student know why, where the robot should run is one parameter to measure the method. At the end, this method is suitable for the research team that need short time, enough modules and space to teach no-prior experience student to study robot. There is might be an obstacle. It the cost is a bit higher, but it is affordable.

Acknowledgements

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