Improvement of Skills for Mu'allimin International Class Upper Secondary Level Students Through Line Follower Robot Training

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Abstract. Madrasah Mu'allimin Muhammadiyah Yogyakarta is a private religious-based educational institution. This campus has a superior class, namely Mu'allimin International Class Upper Secondary (MIC US). This class has 35 students and is divided into Upper Secondary A and Upper Secondary B classes. Even though Madrasah Mu'allimin has organized robotics extracurricular activities, in this MIC UP class all students cannot participate in these activities because the location of this class is far from the robotic site. MIC UP students' interest in robotics is quite high. Therefore, the students need to be given short training to improve their knowledge and skills in constructing robots. To realize this activity, Madrasah Mu'allimin collaborated with the Electrical Engineering Study Program at Universitas Muhammadiyah Yogyakarta (TE Study Program UMY), specifically line follower robot training. This activity is planned to be held for 1 day, starting with a pretest, delivering robotics material, building line follower robots, testing robots on the track, and closing it with a post-test. This activity was assisted by 2 international students from the TE Study Program UMY, coming from North Sudan and Qatar.

Keywords: Training, Line Follower Robot, Mu'allimin International Class Upper Secondary

1 Introduction

Robotics is a branch of technology related to the design, construction, operation, structural disposition, manufacture, and application of robots [1][2]. By learning robotics, students can apply the knowledge learned in these subject areas. Robotics can be an effective way for teachers to teach science, IT, and mathematics. Robotics provides opportunities for students to connect the lessons they have learned with productive technology in the present and the future [3][4].

Studying robotics will be very beneficial for students for it can increase their creativity and imagination which is then poured into real work in the form of a robot. In addition, robotics also trains a structured way of thinking and solves a problem accurately. By introducing robotics to students, it is one way for us to create a better next generation [5].

Until today, Madrasah Mu'allimin Muhammadiyah Yogyakarta Madrasah is a private religious-based educational institution. This madrasah is a Muhammadiyah cadre school

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which was founded directly by K.H. Ahmad Dahlan in 1918 under the name "Qismul Arqa" which was later changed into Pondok Muhammadiyah (1920), then became "Kweekschool Muhammadijah" (1924). Then, in 1930, at the Muhammadiyah Congress in Yogyakarta, the name was changed to "Madrasah Mu'allimin Mu'allimaat Muhammadiyah". A year later the madrasa was split, the Mu'allimin Muhammadiyah Madrasah (only for boys) was located in Kentungan, Yogyakarta and the Madrasah Mu'allimaat Muhammadiyah (only for girls) was located in Kampung Notoprajan, Yogyakarta. Madrasah Mu'allimin is currently led by a director, Ust. H. Aly Aulia, Lc., M. Hum.[9].

Mu'allimin has 1,705 students and 24 student communities[10]. These communities include MuinTV, 68 stores, Religion (Qiraatul Pole/Fahmil and Hifzil Qur'an/Smart Religion), Journalism/KweeksNews, Youth Scientific Work, National Science Olympiad (OSN) – Madrasah Science Competition (KSM), Language (Debate/Speech/Story Telling), Cloud Computing Club, and other communities. In addition, Madrasah Mu'allimin has student organizations including PR IPM Mu'allimin, PC Tapak Suci Unit 009, Hizbul Wathan Scout, Mu'allimin Library Friends, Sinar Media Creation and Communication, Mu'allimin Scientific Community, and Students' Medical Community.

In addition, Madrasah Mu'allimin also organizes extracurricular activities, namely Krida Groups (PMR, Tonti), Sports and Arts Groups (Futsal, Soccer, Basketball, Volleyball, Takraw, Badminton, Table Tennis, Archery, Tapak Suci, Athletics, Chess, Music) and Skill Groups (Robotics, Graphic Design)[11].

From year to year, Madrasah Mu'allimin experiences rapid development. For infrastructure development, Mu'allimin Madrasah Integrated Campus was built which is located in the Dusun Bandut Lor area, Argorejo, Sedayu, Bantul, Yogyakarta. In 2021, this school will start having an international class, namely Mu'allimin International Class (MIC) Upper Secondary. The curriculum in this international class is integrated by implementing a blended system in the Cambridge curriculum, national curriculum, and the typical Mu'allimin curriculum [12]. This international class is expected that it will increase the opportunities for achievement and competence of Madrasah Mu'allimin graduates more broadly, both on a national and global scale. The MIC Upper Secondary class has 35 students and occupies the Mu'allimin Madrasah Integrated Campus in Sedayu.

2 Methodology
2.1 Proposed Planning
At this stage, a service team was formed consisting of 3 lecturers from the Electrical Engineering Study Program, 1 lecturer from the UAD Informatics Engineering Study Program, 1 laboratory assistant, and 2 TE Study Program UMY students. The service team then determines the service scheme and partners.

2.2 Partner Needs Analysis and Proposal Preparation
After the team was formed, it started with discussions with potential partners related to the problems faced, the solutions offered included the preparation of activity schedules and agreements that were willing to become partners in this community service program. The next step was to prepare a service proposal for Universitas Muhammadiyah Yogyakarta through the Community Service Institute with the Muhammadiyah Service scheme.

2.3 Program Implementation Stage
After the proposal was funded by UMY in collaboration with UAD, the next stage was to realize Robotics training activities, especially Line Follower robots, as planned. Prior to the implementation day, Line Follower robot modules were made which were ready to be built by students. By going through the component test first, to ensure the robot creation
worked as expected. Then, a program that would be compiled in the Line Follower robot hardware was made. The next stage was the training process which will be held at the Mu'allimun Muhammadiyah Yogyakarta Integrated Campus.

2.4 Program Evaluation

The service party evaluated the service activities that have been carried out through input obtained from partners through pre-tests and post-tests, to measure the level of student understanding regarding the material provided. Apart from that, it also aimed to find out the flaws in this activity that can be evaluated and can be used as material for consideration in carrying out the next service activity.

2.5 Publication Output and Final Report Making Stage

At this stage, publication outputs are prepared in the form of activity news published through the mass media, publication articles, and community service activities videos. In addition, the reports on the results of the implementation of activities were also prepared.

3 Results and Discussion

3.1 Preparation

The preparation was carried out by coordinating in the form of FGD (Forum Group Discussion) with partners, which began with an FGD with an upper secondary level international class musyrif (residential advisor), namely Ustadz Nabil Makarim, followed by an FGD with the Deputy Director of Muallimin, namely Ustadz Solihin, M.Pd. related to the planned training program in the framework of community service. Identification of needs has been carried out at the time of submission of the proposal, but the budget allocated has not been able to fully meet the needs. Thus it is necessary to re-identify needs following budget allocations. In accordance with the identification of needs that have been carried out again, purchasing and functional testing of components and other supporting tools were taken.

3.2 Execution

The community service activity was held on Monday, 27 February 2023 at the MIC Building, Integrated Campus of Madrasah Mu'allimin Yogyakarta, which is located at Bandut Argosari Sedayu Bantul Yogyakarta with 35 students participating. Participants were students of the International Upper Secondary Level class. The activity was done from 12.30 WIB to 17.30 WIB. The activity was opened by the Deputy Director of Muallimin Yogyakarta namely Ustadz Solikhin, M.Pd. It was followed by the remarks from the head of the dedication, Mrs. Anna Nur Nazilah Chamim, ST., M.Eng. from the Electrical Engineering Study Program of Universitas Muhammadiyah Yogyakarta. In this community service activity, UMY collaborated with Ahmad Dahlan University, namely Mrs. Nurrohmah Dyah Pujiastuti, ST., M.Kom. The activity began by giving a pre-test to the training participants. The pre-test questions consisted of knowledge about robotics and its supporting components, as shown in Figure 1.

Figure 1. Pre-Test dan Post-Test
The next activity was the delivery of material about line follower robots and continued with the practice of building line follower robots that had been prepared by the team. Before the practice was carried out, the participants were first given a guide on how to assemble the robot. There were 10 kits prepared. Each kit was done by a group of 3 students. In this creating activity, students may ask the team if there were problems. The practice of creating a line follower robot is shown in Figure 2.

![Figure 2. Robot Assembly](image)

The next activity is testing the line follower robot on the track, as well as a speed race to reach the intended point. The trial and race track is shown in Figure 3.

![Figure 3 Test and race track](image)

After completing the entire series of implementation of the Line Follower robot training, a ceremony was held to hand over the goods in the form of 10 kits of line follower robots along with their trajectories. The handover was carried out by the head of the dedication team and received by Ustadz Solikhin, M.Pd., as the Deputy Director of the Madrasah Mu'allimin Yogyakarta, witnessed by the dedication team, Muallimin teaching ustaz (male teachers), along with all participants. The process of handing over the goods is shown in Figure 4.
3.3 Evaluation

In this service activity, it aims to find out the increase in knowledge about robotics, especially the line follower, a pre-test and post-test were carried out with the results shown in Table 1. Table 1 shows that the average number of participants who answered correctly during the pre-test was 16 participants (45%) while the average participant who answered correctly during the post-test was 30 participants (87%). It can be seen that there is an increase in knowledge/understanding of robotics based on the results of the pre-test and post-test, namely by 42%. The graph of the pre-test and post-test results is shown in Figure 5.

<table>
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<th>Question Number</th>
<th>Results Correct answers from 35 students</th>
<th>Pre-Test</th>
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<th>Post-Test</th>
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Figure 5. Pre-Test & Post-Test Results
4 Conclusion

Service activities have been carried out properly and smoothly without encountering any obstacles according to the plan. The activity was held on Monday, 27 February 2023 from 12.30 – 17.30 at the Madrasah Mu'allimin Yogyakarta Integrated Campus. The training was attended by 35 participants who were Upper Secondary Level International Class students. From the results of the pre-test and post-test, it was shown that there was an increase in knowledge about robotics, especially the Line Follower (LF) by 46%. In this activity, 10 LF Robot kits and their tracks were handed over to partners to the Deputy Director of Mu'allimin Yogyakarta.

References


