KONTRIBUSIA, Vol 9, Issue 2, 2026
ISSN 2614-1582 E-ISSN 2614-1590
Published by Research and Community Development Center

Mastering the Basics: C-Programming Workshop for SMAM 1 Gresik

Author
Pressa P. S. Saputra[1], Zainal Mustakim[1], Heri Ardiansyah[2]
[1,2] Universitas Muhammadiyah Gresik, Indonesia
[3]Universitas Negeri Surabaya, Indonesia

Correspondence
Universitas Muhammadiyah Gresik, Indonesia,
pressa@umg.ac.id

Abstract:
The rapid development of information technology demands early mastery of digital competence and computational thinking skills, including at the secondary school level. However, programming education in Indonesian high schools still faces limitations in curriculum, qualified educators, and practical facilities. Abstract contains about a brief summary of the related articles, the paper settings should be in A4 size.
This community service activity aims to provide a fundamental understanding of algorithms and programming logic, train students in writing simple programs using the C language, and foster students' interest in information technology. The activity was conducted on May 9, 2026, at SMA Muhammadiyah 1 Gresik, involving 38 tenth-grade students with no prior formal programming experience. The implementation method included preparation, material delivery, hands-on practice, mentoring, and evaluation through pre-tests and post-tests.
The results showed an improvement in students' understanding of basic programming concepts, including syntax, variables, data types, and user input, as reflected in higher post-test scores compared to pre-test scores. Beyond cognitive gains, the activity also increased students' confidence, willingness to ask questions, and enthusiasm toward programming.
The choice of the C language was considered strategic, as it serves as a foundation for further learning in Arduino-based IoT applications and for programming courses at the tertiary level. This activity is expected to serve as a model for sustainable training programs to strengthen students' digital literacy and prepare young generations for digital transformation and the industrial revolution.

Keyword: C Programming, Community Service, Digital Literacy, Hands-On Learning, High School Students

Received: 18 April 2026. Accepted: 14 July 2026

Introduction

The development of information and communication technology has brought significant changes to the world of education, particularly in the demand for mastering 21st-century digital competencies. A report by the Organisation for Economic Co-operation and Development through Education 2030 emphasizes that digital skills and computational thinking have become primary needs for future generations. Programming is not only regarded as a technical skill, but also as a means of training logical, systematic thinking and problem-solving abilities that are highly relevant in the era of digital transformation.

In Indonesia, programming education at the secondary school level still faces various challenges, such as curriculum limitations, a shortage of educators with programming competencies, and inadequate practical facilities. This condition has resulted in most students not yet gaining structured and applicative programming learning experiences. In fact, introducing programming from an early stage has been proven to enhance critical thinking, creativity, and students' readiness to face the development of technology-based industries.

Various studies have shown that practice-based learning approaches, such as hands-on learning and project-based learning, are effective in improving students' understanding and interest in learning programming. Through direct practice in writing code and solving simple problems, students find it easier to understand abstract concepts in computer science. Interactive and applicative approaches are also able to reduce the sense of difficulty and frustration often experienced by beginners when learning programming languages.

Based on these needs, a community service activity titled C Programming Language Training for Grade XI Students of SMA Muhammadiyah 1 Gresik was designed as an effort to improve students' digital competence. The C language was chosen because it is a foundational programming language that is strong in building an understanding of algorithmic concepts, control structures, data types, and fundamental programming logic. Mastery of basic C programming is expected to serve as a solid foundation for students to learn more advanced programming languages.

This training aims to: (1) provide a basic understanding of algorithmic concepts and programming logic, (2) train students' skills in writing and running simple programs using the C language, (3) foster students' interest and motivation in the field of information technology, and (4) support the readiness of the younger generation to face the challenges of the industrial revolution and digital transformation. With an applicative and interactive approach, this activity is expected to contribute to strengthening the digital literacy of students at SMA Muhammadiyah 1 Gresik and encourage the creation of a more adaptive and innovative technology learning culture.

Method

The methods applied in this activity aim to provide a basic understanding of programming through an interactive approach and hands-on practice. With this approach, students not only understand the theory but are also actively involved in practice that motivates them to develop better programming skills. The comprehensive evaluation conducted provides a clear picture of the improvement in students' ability to program using the C language.

The activity began with several stages, namely:

1. **Preparation**, which included coordination with the school, preparation of materials, and preparation of learning tools/equipment.
2. **Implementation**, namely the delivery of basic C programming material, installation of related software, and practice in creating simple programs. The session began with an introduction to basic programming concepts using simple analogies. Next, coding material was taught with practical examples, such as creating a 'Hello, World!' program using the C language.
3. **Mentoring**: Instructors provided direct mentoring to ensure students understood the basic syntax and program logic in the C language.
4. **Evaluation**: Evaluation was conducted by observing students' ability to write and run the programs that had been taught. This evaluation was carried out through direct observation and questionnaires to measure students' level of understanding of the material provided. The questionnaire-based evaluation was conducted using pre-tests and post-tests to measure student understanding before and after the training. In addition, observation was carried out during the question-and-answer session and practice to assess student engagement.
5. **Documentation**: All activities were documented in the form of photos, attendance records, and student work as evaluation material. Result analysis was conducted to evaluate the development of students' programming abilities.

Results and discussions

The C programming language training held at SMA Muhammadiyah 1 Gresik aimed to provide Grade XI students with a basic understanding of computer programming. This program serves as an initial step in preparing students to engage with the rapidly evolving digital world. This training was also designed

to foster students' interest in technology and introduce them to the world of programming, a skill that is highly needed in the era of Industry 4.0.

The basic C programming training was held on May 9, 2026, at SMA Muhammadiyah 1 Gresik. There were 38 participants from Grade X who did not yet have formal programming learning experience. Participants were selected based on coordination with the school, taking into account their interest in the field of information technology. The C language was chosen because, going forward, these students will receive material on the application of IoT using Arduino and similar tools, which requires C programming skills for IoT programming.

The activity began with an opening session and introduction of the implementation team to the participating students. In this initial stage, the students (university students/facilitators) introduced themselves and explained the objectives of the activity, the benefits of the training, and a general overview of the material to be studied. This introductory stage aimed to build rapport between the presenters and the students, so that the learning atmosphere would become more conducive and interactive.

To assess participants' level of understanding, a pre-test was conducted before the material and a post-test after the practice session. The pre-test and post-test took the form of interactive question-and-answer sessions related to programming languages, such as the types of programming languages, their history, their uses, and even their syntax. The pre-test results showed that the majority of participants had limited understanding of programming languages, particularly low-level programming languages such as C.

Following the opening session, the training continued with the delivery of basic material on C programming. In this session, students were given an explanation of basic programming concepts, the role of programming in everyday life, and the reasons for choosing C as a programming language suitable for beginners, which is also commonly used in universities as an introductory programming language (making it beneficial for students later when they continue to higher education). The material was delivered in a simple manner and adapted to the comprehension level of high school students to make it easier to understand. Throughout the session, the training was designed to be interactive, with the presenter posing quiz-style questions for students to answer. Students were actively engaged, competing enthusiastically to answer the presenter's questions.

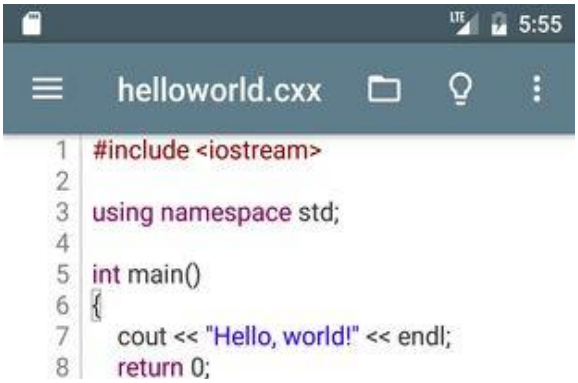

Figure 1. Hello World display on an Android phone

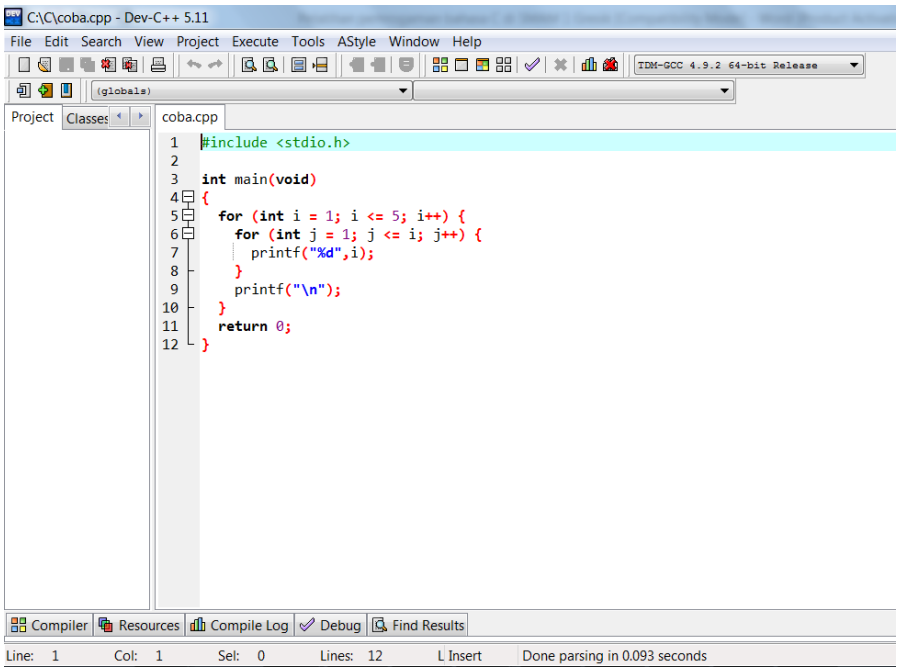

Figure 2. Dev-C++ display on Windows

The practical session was conducted through live demonstration using a projector. The instructor typed example programs while explaining each step, and several students were selected to come forward and try writing code with direct guidance from the presenter. Students could also type program code via their phones, since C could be installed as a mobile application. The introductory programming material included writing "Hello, World!" and understanding the flow of program writing and execution. Direct mentoring was provided by the university student facilitators to ensure that every student could follow the practical steps well. The results of this session showed that most students were able to run C programs independently after being given examples and guidance.

After students understood the basics of using the C language, the material continued with a discussion of variables, data types, and the use of user input. Students were trained to create simple programs, such as building a calculator program and receiving input from users. At this stage, students began to show improved understanding of basic programming concepts, although some students still required more intensive guidance. The hands-on practice approach combined with step-by-step explanations proved effective in helping students understand the material provided.

To increase students' motivation and enthusiasm, the activity was also interspersed with a reward challenge session, consisting of small challenges to write simple programs. Students who successfully completed the challenge were given appreciation as recognition of their effort and courage in trying. This activity had a positive impact on student engagement, making them more willing to try and unafraid to ask questions when facing difficulties.

At the end of the activity, a post-test was conducted in the form of question-and-answer and impressions/feedback. From the questions posed, with students randomly selected to answer, students were able to answer correctly. This shows that the material had been well delivered.

Figure 3. Assistance Program in DEV C++ application

From a non-academic perspective, this training also had an impact on increasing students' self-confidence. Many students who had previously felt afraid to try programming ended up feeling happy and challenged to learn it further. The interaction between participants and facilitators also went well, creating a learning atmosphere that was relaxed yet productive.

Conclusion

The C programming training activity for Grade X students at SMA Muhammadiyah 1 Gresik, held on May 9, 2026, with 38 participants, proved effective in introducing basic programming concepts to students who previously had no formal programming learning experience. Through an interactive, applicative, and hands-on learning approach, students were able to understand basic concepts of algorithms, C language syntax, variables, data types, and the use of user input, as demonstrated by the improvement in results between the pre-test and post-test.

In addition to the cognitive aspect, this activity also had a positive impact on non-academic aspects, namely increased self-confidence, courage to ask questions, and student enthusiasm in trying new things in the field of technology. The use of the reward challenge method and direct mentoring by university student facilitators also contributed to creating a conducive and learning atmosphere that was fun.

The selection of C as the foundational material was considered appropriate, as it aligns with students' planned advanced learning related to IoT implementation using Arduino, while also preparing students for higher education, where C is commonly used as an introductory programming language. Overall, this training successfully achieved its objectives in strengthening students' digital literacy, fostering interest in

the field of information technology, and supporting the readiness of the younger generation to face the challenges of digital transformation and the industrial revolution.

As a suggestion, similar training activities need to be conducted continuously with a longer duration and followed up with advanced material (such as data structures or direct application to Arduino/IoT), so that the competencies that have been built do not stop at the introductory stage.

References

GeeksforGeeks. (2026). *C programming language tutorial*. GeeksforGeeks. https://www.geeksforgeeks.org/c/c-programming-language/

Kernighan, B. W., & Ritchie, D. M. (1988). *The C programming language* (2nd ed.). Prentice Hall.

Lusiani, T., Anindita, D., Churniawan, A. D., Sulistiowati, S., & Wardhanie, A. P. (2025). Pengenalan dunia coding: Pelatihan dasar pemrograman bagi siswa SMA Negeri 5 Surabaya. *Jurnal Ragam Pengabdian*, *2*(2), 230–236. https://doi.org/10.62710/cy2w6834

Malik, K. M., & Zhu, M. (2022). Do project-based learning, hands-on activities, and flipped teaching enhance student's learning of introductory theoretical computing classes? *Education and Information Technologies*, *28*, 3581–3604. https://doi.org/10.1007/s10639-022-11350-8

Organisation for Economic Co-operation and Development. (2018). *The future of education and skills: Education 2030 position paper*. OECD Publishing.

Organisation for Economic Co-operation and Development. (2019). *OECD future of education and skills 2030: OECD learning compass 2030*. OECD Publishing. https://www.oecd.org/en/about/projects/future-of-education-and-skills-2030.html

Organisation for Economic Co-operation and Development. (2025). *The impact of digital technologies on students' learning: Results from a literature review* (OECD Education Working Papers No. 335). OECD Publishing.

Öztürk, F. U., Özdemir, M., & Özbaşı, D. (2021). Investigation of project-based learning method in teaching programming in terms of academic achievement, cognitive load and behavior change. *Educational Policy Analysis and Strategic Research*, *16*(2), 248–270.

Pohl, I. (2025). *C for everyone, part 1: Programming fundamentals* [MOOC]. Coursera. https://www.coursera.org/learn/c-for-everyone

Programiz. (2025). *Learn C programming*. Programiz. https://www.programiz.com/c-programming

Qasem, A. A. (2025). The effectiveness of project-based learning in development of C# programming language skills among educational technology students. *Discover Education*, *4*(1). https://doi.org/[cek DOI asli]

Safitri, R., Jamal, A., Ripmiatin, E., Hermawan, D., & Supriyanto, A. (2019). Pengenalan dan pelatihan pemrograman dasar. *Pemberdayaan Masyarakat Universitas Al Azhar Indonesia*, *1*(1), 1–6.

Saharuddin, S., & Prihatmono, M. W. (2022). Pengenalan dan pelatihan dasar bahasa pemrograman Python pada siswa/i SMA Negeri 3 Makassar. *SELAPARANG: Jurnal Pengabdian Masyarakat Berkemajuan*, *6*(4), 2233. https://doi.org/10.31764/jpmb.v6i4.10569

Sakti, A., Risal, A. A. N., & Alfiani, V. (2025). Pelatihan peningkatan literasi pemrograman dasar bagi siswa SMA melalui pemrograman terstruktur berbasis Java. *POTENSI: Jurnal Pengabdian Kepada Masyarakat*, *2*(2), 86–93. https://doi.org/10.61689/potensi.v2i2.36

W3Schools. (2026). *C tutorial*. W3Schools. https://www.w3schools.com/c/index.php

Wilyani, F., Arif, Q. N., & Aslimar, F. (2024). Pengenalan dasar pemrograman Python dengan Google Colaboratory. *Jurnal Pelayanan dan Pengabdian Masyarakat Indonesia*, *3*(1), 8–14. https://doi.org/10.55606/jppmi.v3i1.1087

Wing, J. M. (2006). Computational thinking. *Communications of the ACM*, *49*(3), 33–35. https://doi.org/10.1145/1118178.1118215

Yuliati, D., & Ulinnuha, N. (2025). Basic Python programming training to enhance digital literacy among students at SMA Wachid Hasyim 2 Sidoarjo. *Jurnal Pemberdayaan Masyarakat Madani*, *9*(1), 71–83. https://doi.org/10.21009/JPMM.009.1.06