A preliminary study: The cause of university students' difficulties in programming subject

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Abstract. A computer programming course is essential for students majoring in computer science. Undergraduate computer science students can gain fundamental understanding from the college course. If students do not learn the fundamentals of computer programming, they will have trouble at work, particularly as programmers or software developers. Students majoring in computer sciences must complete a course in programming. For computer engineering majors, programming is a required course that must be completed to graduate. However, student failure in programming courses becomes a problem for lecturers and universities. This study aims to find the cause of university students' difficulties in programming subject to develop the solution of the problems. The results suggest that the most difficult topic to understand in programming is error handling, and students find it tough to learn programming when self-studying.

Keywords: university students, difficulties, programming subject.

1 Introduction

Programming is crucial nowadays because information systems assist people in many parts of their lives. Programming and accompanying technology, such as web applications, games, social media, online communication, and cloud storage, have become an integral part of our daily lives. To create a system, programming is aided by technologies such as virtual and augmented reality, artificial intelligence, machine learning, mobile programming, the Internet of things, and others. Programming is becoming increasingly important for students in today's atmosphere. Programming is a highly sought-after skill in a variety of industries, including software development, finance, healthcare, and even entertainment. Learning programming can lead to a variety of professional opportunities for students. Students must think rationally and creatively in order to solve problems. This skill is useful not only in computer science, but in many other areas of life as well.

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Students majoring in computer sciences must complete a course in programming. All computer major students are currently expected to have basic computational thinking skills, as well as reading, writing, and basic math knowledge [1]. They must seize those talents in order to live in a computer science major at university and stay up with instructors' and study material. According to a survey conducted by [2], only some college students receive full grades, while many fail to do so by skipping or dropping the course (up to 65%). According to [3], more than 30% of computer science undergraduate students worldwide dropped out or failed programming courses. The failure to release the introduction programme was linked to the cancellation of the diploma [4].

Students wish to skip courses that are required for all computer majors at all colleges, and the delay in graduation due to failure will be inconvenient. Instructors put forth significant effort and time with students in lectures and labs to help them understand programming; but, given the high costs of failure and drop out, such efforts may be considered futile. The difficulties that students experience in terms of primary programming because they are no longer only acquainted with a certain programming language [5]. They must also grasp three interrelated topics: programming structure, design, and programming language syntax.

Students majoring in electronics engineering must pass a programming course. Learning programming is a difficult undertaking for first-year college students. It is not only knowing programming language syntax. It also includes the students' ability to develop a set of rules that can be used to address a specific problem [6]. Variables, arrays, and iteration are some of the fundamental concepts that students may encounter throughout the course. Students have a tendency to engage in some bad programming behaviour in order to pass an assignment. For computer engineering majors, programming is a required course that must be completed in order to graduate. However, student failure in programming courses becomes a problem for lecturers and universities. Teaching tactics, teachers' topic knowledge and abilities, students' knowledge and abilities in cryptography, students' self-discipline, learning environment, and market resources for students are some of the factors for low student performance in programming [2].

2 Method

The questionnaire was used in the study to analyse the problems in studying programming courses from the perspective of students. The questionnaire is divided into four sections: profile, performance, technology, and anxiety. We may gather from the questionnaire responses that some students found the programming course challenging to learn. In addition, the researcher gathered preliminary research data by conducting interviews with lecturers to ascertain their perspectives on teaching and learning programming courses. Three (three) lecturers with programming knowledge were picked to respond to the researcher's inquiries.

Table 1. Questionnaire

Profile		
1	Gender	o Male o Female
2	Age	
3	Semester	

Performance

4 How do you think of learning programming course nowadays?

o Difficult

o Moderate

o Easy

5 What kind of issues you feel difficult in learning programming

o Using program development environment

o Understanding programming structures

o Learning the programming language syntax

o Designing a program to solve a certain task

o Dividing functionality into procedures

o Finding bugs from my own program

6 Rank the following topics below with 1 being the most difficult, example: Looping topic rank 1, then check 1; Arrays topic rank 3, then check 3; and so on until rank 7 is the easiest

Variables (lifetime, scope)	☒1 ☒2 ☒3 ☒ 4 ☒5 ☒6 ☒ 7
Selection structures	☒1 ☒2 ☒3 ☒ 4 ☒5 ☒6 ☒ 7
Loop structures	☒1 ☒2 ☒3 ☒ 4 ☒5 ☒6 ☒ 7
Arrays	☒1 ☒2 ☒3 ☒ 4 ☒5 ☒6 ☒ 7
Parameters	☒1 ☒2 ☒3 ☒ 4 ☒5 ☒6 ☒ 7
Error handling	☒1 ☒2 ☒3 ☒ 4 ☒5 ☒6 ☒ 7
Using language libraries	☒1 ☒2 ☒3 ☒ 4 ☒5 ☒6 ☒ 7

7 When do you feel that you learn difficulties in learning programming?

o In lectures

o In exercise sessions with colleagues

o Self-studying

o In practical session

o Joining discussion forums on internet

8 How do you feel after getting the result of you programming course study?

o Satisfied

o Moderate

o Not satisfied

Technology

9 Does the lecturers using any technology (such as: visualization or simulator or gaming) in teaching programming?

O Yes

O No

10 Do you think, is there a new way of learning programming?

O Yes

O No

11 Does the lecturers suggest to you for using any technology (such as: visualization or simulator or gaming) in learning programming?

O Yes

O No

12 How do you think of using a new technology (such as: visualization or simulator or gaming) in learning programming?

O Excited

O Not at all

Anxiety

Using the following scale, indicate how often you have the feelings or symptoms when you use a computer, think about using a computer or have to write a computer programme

13	I feel anxious whenever I am using computers	☒1 ☒2 ☒3 ☒ 4
14	I feel at ease with computers and programming	☒1 ☒2 ☒3 ☒ 4
15	I feel hot and sweaty when I am coding	☒1 ☒2 ☒3 ☒ 4
16	I feel lack of concentration when I am learning programming	☒1 ☒2 ☒3 ☒ 4

3 Results and Discussion

Technology, such as visualisation, gamification, evaluation tools, and other strategies, can be used to aid in the teaching of programming. However, the use of technology in teaching programming courses in higher education is relatively limited. Because programming is a set of abilities that necessitates a lot of practise [7], most students study it via analysing books or paying attention to instructor reasons, so the outcomes aren't always the best. Complicated cognitive abilities are required for computer programming. The variables required for studying programming courses are planning, logical thinking, and problem solving, which all play a role in the process of understanding programming.

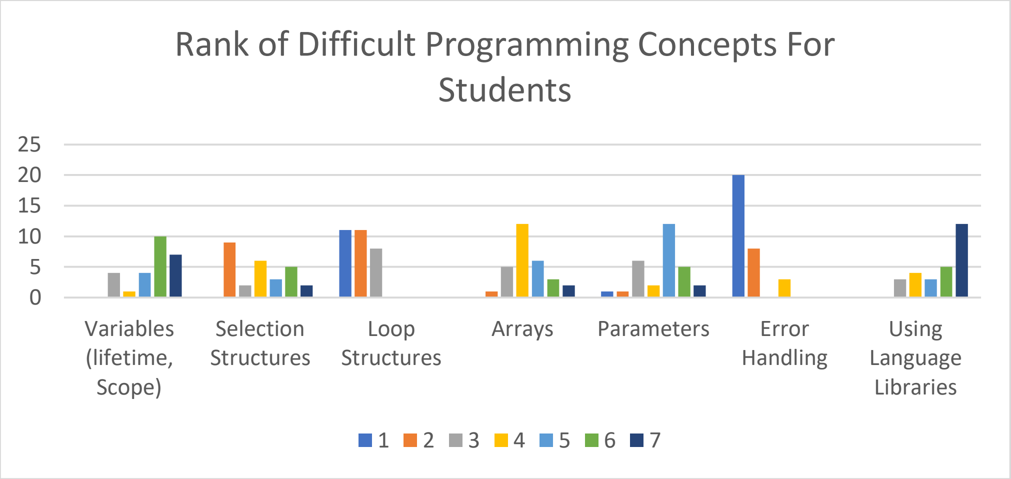

Fig 1. Questionnaire Data - Difficult Concept to Learn for Students

This corresponds to the questionnaire responses from students in Figure 1 identifying the themes that they find difficult. The most difficult topic to learn, according to 67% of student correspondents, is error management, which ranks first among other topics. Loop structures are the second most challenging topic. On the learning programming course, 12 of 30 students rated loop structures as the second most difficult topic after error management. Meanwhile, this is a basic understanding in programming.

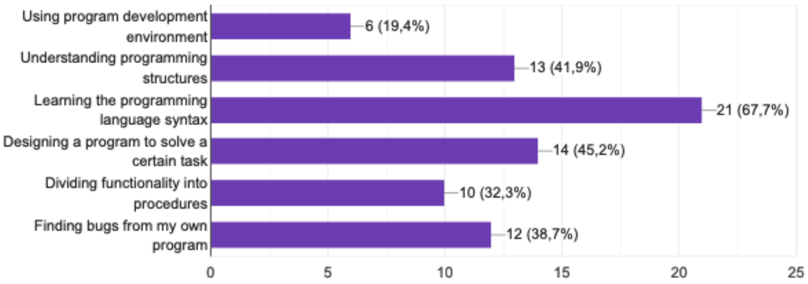

Fig 2. Difficult Issues in Learning Programming Course

Furthermore, according to the preliminary research questionnaire Figure 2, understanding programming grammar is the most hardest thing for students to master in a programming course. It was chosen as the issue of learning programming course by 67% of student correspondents. This is also related to the kids' ability to handle errors. They will be unable to address errors in their code if they do not learn the programming grammar. This is consistent with the issue raised by the researcher before.

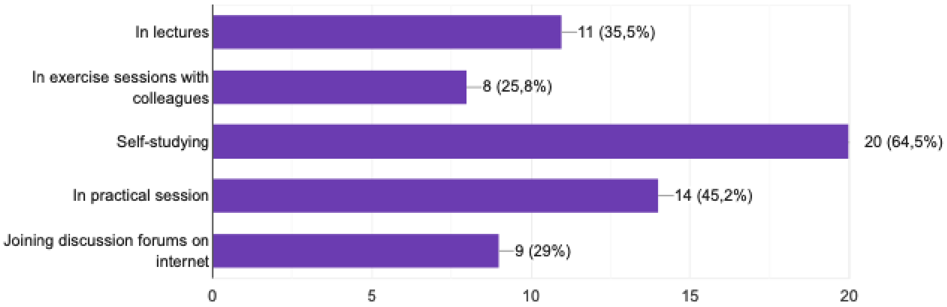

Fig 1. Questionnaire Data - Moment When Student Feel Difficult in Learning Programming

Figure 3 shows that 64.5% of student correspondents find learning programming challenging when self-studying. Previous research has found similar issues with students unable to learn programming courses in higher education. Students may just remember the coding and not the logic. As a result, when the instructor presented another issue with the same premise, the pupils were unable to solve it. As a result, they require a tool to assist them in learning programming on their own. Because, according to the researcher's experience, some students will give up easily if they cannot discover the answer to their question about learning programming when self-studying.

4 Conclusion

The results suggest that the most difficult topic to understand in programming is error handling, and students find it tough to learn programming when self-studying. The need for programmers is growing in tandem with the company's need for an information system. However, the number of programmers available in Indonesia is still relatively limited. As a result, better guidance throughout the lecture session is required to develop competent and skilled programmers. The use of technology in programming courses is intended to improve the number of skilled programmers produced by higher education. Technology, such as visualisation, evaluation tools, gamification, and other strategies, can also be utilised to aid in the teaching of programming courses.

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