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DEVELOPMENT OF MICRO CREDENTIAL VARIABLE IN C++ FOR NOVICE PROGRAMMERS.

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ABSTRACT

*There are many courses developed to support e-learning rapidly grown into a global issue in education throughout Massive Open Online Course (*MOOC*) and Micro-Credential (MC) in University Technology MARA. MC Variable in C++ (MCVC++) is one of the courses that is designed to help novice programmers to learn basic concepts in C++ programming. Students from multiple disciplines such as engineering, information technology, and computer business are required to study basic C++ programming. The C++ programming language is the foundation of all software and current programming languages. As novice learners, they will face problems in learning C++ program in short duration time. As a result, many students who are unable to grasp the most fundamental concept of programming are unable to write basic programs and also unable to acquire and understand more complex concepts. The learning outcome for this MCVC++ students will be able to understand the basic concept for variables in C++ programming and students also will be able to learn how to declare variables, where, and how to use variables in C++ programming. This paper explains the development process of the MCVC++ using action research model based on the guidelines provided by Institute of Continuing Education and Professional Studies (iCEPS) UiTM.*

Keywords: MC, novice programmer, C++ programming, action research model

Introduction

In the trend of online learning many approaches are being applied to the process to make it easier and flexible. Massive Open Online Course (*MOOC*) and Micro-Credential (MC) approaches is a present technological innovation of teaching and learning in the modern higher education environment. As known, there are many key advantages of online learning includes flexibility and convenience, cost saving, self-paced learning and accessibility (Gautam, 2021). MC is designed to provide learners with a rapid and efficient method of acquiring specialized skills or knowledge relevant to their careers or personal interests. Educational institutions, online learning platforms, and professional organizations frequently provide these credentials.

C++ is a popular and evergreen general-purpose programming language for creating programs in a wide range of application domains. Despite the fact that it was introduced a long time ago, C++ is now the fourth most popular programming language (Cass, 2021). Nonetheless, due to the nature of formal language, many students continue to struggle with C++ (Aung et al., 2022). One of the topics covered in an introductory programming course is an introduction to data types, which includes declaring, initializing, data input and output. Learning computer programming is a difficult task for a novice (Prasad et al., 2021). Data from around the world show that an increasing number of students do not want to pursue a major in computer programming in higher education (Papadakis, 2020). One reason why novice fail to learn programming is that they struggle with relational reasoning (Corney et al. 2011)

due to some variable misconceptions (Kohn,2017). As a result, they are often unable to accurately understand the fundamentals of programming (Prasad et al. 2021) or to combine the various statements and structures of the programming language into a valid program (Sana'a et al., 2020).

A Micro-credential is a learning certification for a smaller set of courses or modules designed to provide learners with knowledge, skills, values, and competencies in a specific field of study (Selvaratnam & Sankey, 2020). Unlike conventional transcripts, which are controlled by the institution, students will have control over their micro-credentials and will be able to distribute them digitally (Matkin et al., 2020).

Micro-credential development in this paper entails the introduction of data types in C++. Data types define the type of data that a variable can hold, such as an integer variable holding integer data, a character type variable holding character data, and so on. Considering these factors, Micro-credential is used to introduce a smaller set of programming courses based on the MARA University of Technology (UiTM) syllabus that can be completed in a short period of time. Various short-term courses are offered through these micro-credentials program and can be used as credit in learning as long as they meet the Malaysian Qualifications Agency (MQA) criteria. The development of the Micro-credentials program is critical to UiTM because it is self-forming and will be effective in future.

Methodology

Action research is a research method that that been applied in this study whereby the model tries to examine and address a problem at the same time. This model is created by Kurt Lewin, an MIT professor in 1944. **Figure 1** shows the diagram of the action research model. In this modal, there are four (4) main steps known as planning, action, analysis and conclusions.

Figure 1: Action Research Model

Based on the model, the planning stage design is used, in which we specify the content demand, the content presentation, the number of assessments, and the style. Detailed explanations will be provided during the design phase. In the action stage, we begin to put the planning into action. Once the contents are complete, we post them to the ufuture online platform supplied by the Institute of Continuing Education and Professional Studies (iCEPS) UiTM. The ufuture is an online learning platform designed to benefit both students and instructors. Once the material and contents are complete, evaluations are performed by the selected people assigned by iCEPS to ensure that the MCVC++ course meets the iCEPS criterion. Once the MCVC++ archived the marks required then only the course will be published and can be accessed by the students. In the result and discussion, we will elaborate in detail the analysis stage that apply in MCVC++. In the conclusion stage, we will plan the any improvisations needed based on the analysis and feedback from the students.

Design and Development Phase

In the content development design, MCVC++ has fulfils the requirements and guidelines as provided by iCEPS UiTM. Instructional design concepts are also applied in MC development guidelines provided by iCEPS UiTM. In the design stage firstly the total content and assessments are planned based on the requirement. Four (4) subtopics are identified, three (3) formative assessment and one (1) summative assessment are planned to complete the overall material for MCVC++. Once the topics and the type of content are defined, the storyboard is developed. Developers must focus on creating meaningful content with a clear storyline and applying educational theory-based instructions to make animation and videos more creative and interactive, which leads to a quality content presentation (Kurniawati, 2020).

The video content material for MCVC++ are develop using variety of software like Canva, MS Power Point, Filmora and ClipChamp. Kapwing is one of the software that is used to edit video content. The content materials also have various forms like infographic, cartoon conversation, coding writing and simple example explanation. **Figure 2** below shows the various types of content material used in MC Variable in C++.

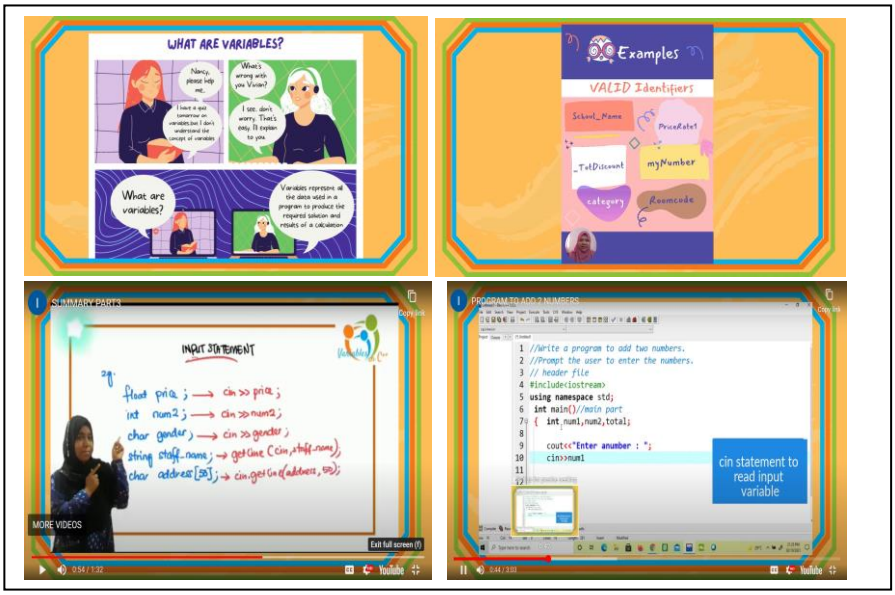

Figure 2:Variety of video notes content for MCVC++

MCVC++ also provides e-book with detail explanation as an additional material to help student understand better. Anyflip is used to convert the pdf material in the form of e-book. The content of the e-book is complete with additional examples and detail notes. **Figure 3** shows the layout of the e-book for MCVC++.

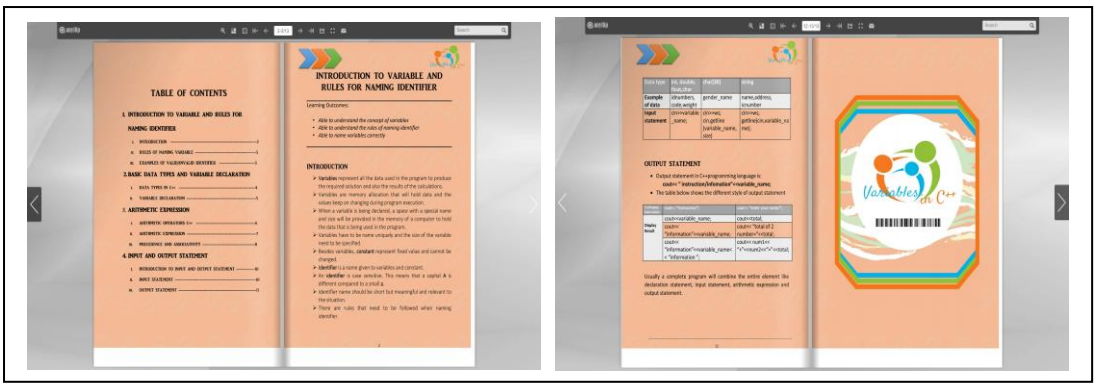

Figure 3**:** Layout of e-book content for MCVC++

MCVC++ has designed various styles of assessment to make sure the student is able to interpret and explain what they have learn. The questions are designed in the form of objective questions, structured questions and writing a complete program. **Figure 4** shows the layout of various types of assessment applied in MCVC++.

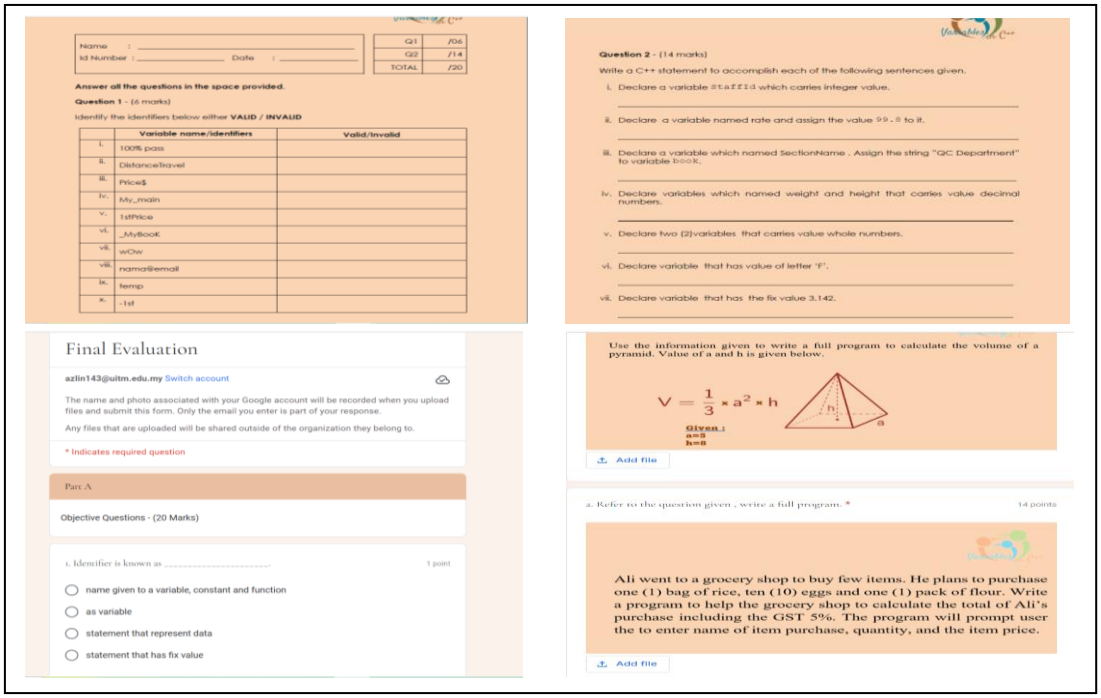

Figure4: Layout of various type assessment in MCVC++

Conclusion

MCVC++ is an MC course designed to assist students master the fundamentals of C++ programming. The courses are designed to assist students in understanding and mastering C++ programming skills. This course's content is provided in such a way that students may readily learn and apply it in their daily lives. Finally, the variety of information in these MCVC++ helps inexperienced programmers improve their comprehension of the fundamentals of the C++ programming language. In the future, additional modules and examples may be added to make this course more consistent and complete.

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