

# Improve Learning Programming through Small Private Online Course and Virtual IDE

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**Abstract** – *In learning programming languages there are some technical problems such as the difficulty of installing IDE applications and tend to be heavy, cannot be used on various operating system platforms and there are no programming tutorials. MOOC is an online course platform designed to be accessible by everyone. SPOC adopts the MOOC platform but is only used for specific groups. SPOC is effectively used for offline and online learning methods. By providing online and open learning content for certain organizations and Virtual IDE to support SPOC, it can help students to improve programming skills, has video as the main material in delivering knowledge and there are quiz as a tool to better understand the lesson. The purpose of this research is to create a SPOC LMS that has a Virtual IDE as a learning support. The Quantitative Method was used as a research method in this study to make a conclusion from the experimental results. The results of this study concluded that LMS SPOC and Virtual IDE can help students understand language programming, can study before or after lectures, can adjust their learning speed, because it has the main material in the form of videos that can be watched again.*

**Keywords:** *Virtual IDE; Learning Management System (LMS); Small Private Online Course (SPOC)*

## I. INTRODUCTION

Based on the results of a questionnaire on 64 early semester students of Computer Science, the results obtained from the questionnaire showed 64% (41) of respondents stated that there was no tutorial after college, 13% (8) stated that IDE applications could only be installed on certain operating systems, 13% (8) stated that there were no quizzes to understand the lesson, 11% (7) stated that the IDE application was difficult to install.

MOOC is an online course platform designed to be accessible by everyone. SPOC adopts the MOOC platform but is only used for specific groups. SPOC is effectively used for offline and online learning methods (Blended Learning) (Scherjon et al., 2019). The advantage of the Blended Learning Method is that students can learn according to their learning pace (Lou, 2016) Learning content in online courses is digital and interactive such as videos, articles, animations, applications, e-books and can be the main material to replace physical books (Hatem et al., 2005). In SPOC, Video is used as the main material in delivering material (Aguayo Sarasa & Bravo-Agapito, 2017).

Study conducted by Julio Ruiz-Pamelo, states that the SPOC descriptive learning method can increase the completion rate of 8% from previous online training activities (Ruiz-Palmero et al., 2020).

Problem solving is one of the skills needed in finding a job in Computer Science and learning programming languages. To support this, a Virtual IDE is needed that can evaluate automatically and provide feedback to users (Rodríguez-del-Pino et al., 2022). With automatic grading in online compilers (Virtual IDE), students get learning experiences to improve their learning performance (Daradoumis et al., 2019). The online compiler also makes student learning more effective because the evaluation results are immediately shown (Cardoso et al., 2018). The use of an online compiler (Virtual IDE) is a solution for students who find it difficult to install or configure IDE software that can be used on mobile phones (Sinanaj et al., 2022). Based on this background, the aim of conducted this study is to create a system where students can access learning content in the form of SPOC through the LMS platform that can be monitored by lecturers.

## 1.1 Previous Studies

In 2017, Sufang An conducted study about the flipped classroom teaching method based on SPOC. In this model, there are 3 stages of the teaching process: before class, in class, and after class. The results of the study show that this model increases the effect of teaching, learning and providing references to students and lecturers (An et al., 2017).

In 2018, S Bali conducted a study about student perceptions of online learning and face-to-face learning. The results of this study show that the perception of face-to-face learning is higher than online learning in terms of interaction and presence. There is no significant difference between face-to-face learning and online learning. Some students assume that online learning is more comfortable because of the development of computer technology (Bali & Liu, 2018).

In 2018, Yue Wu conducted a study about mixed teaching methods between face-to-face teaching, MOOC, and SPOC (hybrid). The method carried out for 2 years has a good teaching effect and plays a positive role in talent training at universities and can be used as a good model for teaching reform in universities (Wu et al., 2018).

In 2019, Shan Zhou conducted an experiment about combining face-to-face teaching with online learning. The experiment shows that combining these methods can increase student learning efficiency (Zhou et al., 2019).

In 2020, Noura investigated the impact MOOC at a university. The results of the analysis carried out turned out that MOOC had a direct impact on the University and resulted in an increase of 65% in Education (Alhazzani, 2020).

In 2021, Georgous conducted a study about learning methods that compare face-to-face teaching with mixed teaching supported by SPOC. The results of this study show that mixed teaching supported by SPOC achieves much higher value and quality than teaching that is not supported by SPOC. Students also feel very satisfied with the teaching supported by SPOC (Psathas et al., 2020).

In 2022, Juan Carlos conducted a study about the Virtual Programming Lab (VPL) which was integrated with the university's e-learning platform through a questionnaire. The results of this study indicate that early semester students who are just starting to program using VPL and get an assessment automatically, assume that VPL is very useful and effective for mastering programming languages (Rodríguez-del-Pino et al., 2022).

## II. METHODS

This study used quantitative methods. This quantitative method is used to get conclusions that the existence of the SPOC LMS platform and Virtual IDE can improve learning. The questionnaire technique will be used to obtain quantitative data through the SPOC LMS experiment platform and virtual IDE. The sample used was early semester Computer Science Students. The research

stages are described in Figure 1.

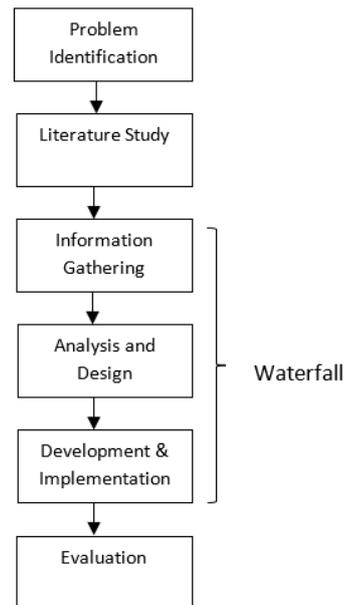


Figure 1. Research Stage

In the first stage (problem identification), the research scope and problem statement are prepared. The second stage through the study literature completed the problem statement that are prepared. The third to fifth stages were conducted by developed the system using the waterfall method. At the development stage, information gathering was conducted through distributing questionnaires. The next stage is creating the UI, followed by coding and testing. The last stage is an evaluation by distributing questionnaires.

## III. RESULTS AND DISCUSSION

In the system development stage, the waterfall method is used. The waterfall method is a sequential software development process. In the first stage (Requirement), data collection is done through journals to find information about the LMS SPOC and Virtual IDE. After the information is collected, analysis and design is carried out in the second stage to determine the requirements for the system. After the requirements are determined, the system design is carried out by creating UML, database, and prototype UI designs. The third stage of application development uses a programming language, and an implementation system is carried out after the development is completed. The fourth stage is testing from the developer side (alpha testing). The final stage is to evaluate the system including improvements in terms of features or additional features.

The system is implemented using MySQL Database, Linux Operating System, Microsoft Azure, Apache Server, and Web-Based Programming. To access the system, student's login using email. On the SPOC content page, students can access the content that is provided (Figure 2). On this page, students can access tutorials before or after lectures. After watching the video content, students are required to take the quiz that consists of multiple choice (Figure 3) and cases in the virtual IDE (Figure 4). Quiz can help students understand the lesson given. In Virtual

IDE there are online editors (Figure 5), online compilers (Figure 6) and automatic evaluation (Figure 7). With an online editor, students do not need to install or configure IDE software and can be accessed on all operating systems, because with web programming.



Figure 2. SPOC Content

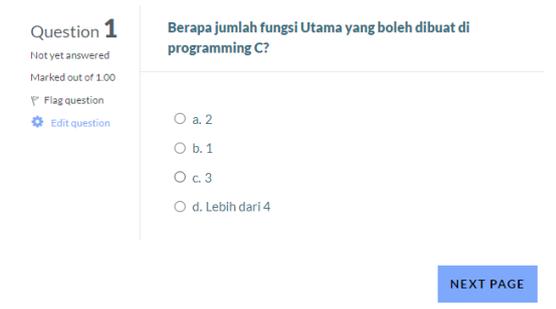


Figure 3. Quiz



Figure 4. Case Virtual IDE



Figure 5. Editor Online



Figure 6. Compiler Online



Figure 7. Automatic Evaluation

Table I. User Evaluation

Question	54 Respondent	
	Yes	No
The application could help in understanding the programming language	48 (89%)	6 (11%)
The application was easy to use	44 (81%)	10 (19%)

User evaluation was conducted by distributing questionnaires to 54 early semester students of Computer Science. The questionnaire consists of questions about the effectiveness and ease of application. The results of the questionnaire show that 89% (48) of the respondents stated that the application could help in understanding the programming language, and 81% (44) of the respondents stated that the application was easy to use.

## IV. CONCLUSION

This study concludes that SPOC LMS and Virtual IDE can be run on all operating systems without having to install and have video content in the form of tutorials so that they can improve programming learning for students. Based on the questionnaire, most stated student that this application could help in understanding language programming and the application was easy to use and learn.

For further studies, content can created that gamification method, so that student learning will be more interesting.

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