Designing a pocket book to support students in ordinary differential equation online learning: a need analysis

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Abstract. This study aimed to investigate the need for developing a pocket book as a supplementary materials in supporting students who study Ordinary Differential Equation (ODE) through online learning platform. This research is a qualitative study. The subject of this study is 73 students of Mathematics Department of Universitas Negeri Padang (UNP) who took ODE course in the academic year of 2019/2020. They experienced learning through e-learning portal of UNP. The techniques in collecting data is by giving an online questionnaire to the participants. The result of this study shows that lecturer need to design a pocket book for ODE course in order to support students in the online learning process.

1. Introduction

Education in this era is moving forward into a new form, especially in the practice of using digital technology in delivering knowledge. Interestingly, nowadays, due to the spread out of COVID-19, technology is not merely used as a supplementary tool, but it plays a role as the primary device in the learning process. For example, in Indonesia, the minister of education has announced the use of online learning for almost all courses conducted in higher education levels until there is a better condition [1]. Many universities in Indonesia have established online lecture policies, including at Universitas Negeri Padang (UNP). In UNP, each lecturer should use the online learning portal provided by the university in conducting the lesson; this also applied to ordinary differential equation (ODE) courses [2].

ODE courses are compulsory subjects that must be completed by students in the mathematics department, both students of mathematics and mathematics education program [3,4]. The expectation goal of this course is that students understand the general form and able to find solutions of 1st, 2nd, and higher order of ODE, including with the skills to correct problems related to these topics. Many mathematical problems need ODE notion to find their solutions. Therefore students majoring in mathematics need to get an updated understanding and also skills related to ODE.

Various innovations have been carried out to achieve the ODE course objectives [5-9]. One of the novelties is the adaptation to the rapid development of technology in line with the direction of educational development in welcoming the 21st century, which is characterized by digital integration in the learning process [10, 11]. The innovation included conducting lessons through online learning [12]. The online learning method is widely used in education in these recent years, including in mathematics education [13]. This is an effort to adjust learning with technological advances in the current digital revolution. Online learning is learning in a network that has a goal to reach a more
massive and broad group [14]. Technology integration is carried out in line with efforts to apply learning based on Science, Technology, Engineering and Mathematics (STEM) [10].

Implementation of online learning requires support both in terms of teacher skills in designing learning and the availability of learning resources because the substance of learning must still be the same as face-to-face learning mode [12]. Therefore, it cannot be denied for ODE course students should have a textbook as a reference in studying so that the material learned is on the track and in line with the learning goal to be achieved after joining the course. But the problem is that the current available ODE textbook used in UNP either printed or unprinted mostly still in english version and have many pages which make it uneffective to use.

In addition to the main learning resources, students also need to be supported with additional teaching materials that they can use practically. Supplement teaching materials are defined as teaching materials that are intended to enrich, add to or deepen curriculum content [13]. One supplement of teaching materials that can support students in getting concepts is a pocket book. According to experts the pocket book is a book that is small, concise, practical to carry and can be read easily [14, 15]. This pocket book is expected to help students to easily learn the essence of learning concepts that are being taught by lecturers.

Based on the above explanation, the aim of this study is to investigate the need for developing a pocket book as a supplementary materials in supporting students who study ODE through online learning platform.

2. Methods
This research is a qualitative study. In a qualitative study, in order to get notions of a particular phenomena, the researcher collect, analyze and give interpretation to narration and visual data comprehensively [15]. The subject of this study is 73 students of Mathematics Department of UNP who took ODE course in the academic year of 2019/2020. They experienced learning through e-learning portal of UNP. The techniques in collecting data is questionnaire which consist of 7 questions. The questionnaire was designed by the researchers and had been validated. the questionnaire was given to the participants of this study through an online platform. The component of the questionnaire focuses in investigating the following three points; students’ learning sources when studying ODE via online, their perception on those learning sources and their need of a suplementary source.

3. Result and Discussion

3.1. students’ learning sources when studying ODE
Figure 1 shows response of the respondent to statement whether they have an ODE textbook when they joined ODE course and followed by a figure that shows participants’ response on whether they try to find other learning sources to support them in learning ODE.

![Figure 1. Students' learning sources when studying ODE](image-url)
Based on the first pie chart in Figure 1, it is clearly seen that almost all respondents (about 96%) have ODE textbook when they took ODE course. However, it is interesting to look at the second pie chart which shows that these respondents also try to find other related materials to help them in the learning.

The aforementioned results indicate that textbook and other supporting materials are needed by the students in order to help them to reach the goal of the ODE course. As experts stated that textbook plays significant role in supporting teaching and learning process [16, 17] as well as other supportive learning sources [18].

3.2. students’ perception on the learning sources

In this section, the researchers will describe participants’ responses on the following two statements. Firstly about their opinion of current learning materials used by the lecturer. In this study the learning materials used were in the form of textbook entitle “Introduction to Ordinary Differential Equations” [19] and some video tutorials about ODE related topics designed by the researcher which can be accessed on Youtube. Secondly, the participants were asked to respond to what extent they agree about the following statement “I cannot comprehensively understand ODE concepts and applications if the textbook used is in English”. The researcher put this statement on the questionnaire because as mentioned above the participants’ ODE course used an english textbook as the main reference. The result for these items can be seen in Figure 2 and 3.

![Figure 2. Students' opinion about learning sources used in their ODE Course](image)

![Figure 3. Students' opinion about learning sources language used in their ODE Course](image)
Based on Figure 3, the majority of the participants feel that they struggle in develop their understanding about the ODE concepts and its application when they learn through learning source in English which is not their mother tongue. The percentage for Very agree is 14% followed by 53% agree. Oppositely, the participant who Disagree and Very disagree are 30% and 3% respectively. The result is in line with statement that learning source including textbook should meet the aspects of language eligibility [20–22].

3.3. students’ need to suplementary learning source

In order to gain participants’ opinion on their need to a suplementary learning source for helping them in studying ODE through online learning platform, the researchers investigate their responses on the three given statements below. The first statement in this section is about participants’ feeling whether they are interested to study if there is practical and concise learning source available for them. The second and the third statements are intended to know participants agreement about renewing the learning source and designing a pocket book for ODE course. The results of participants’ responses to those statements can be seen in Figure 4 and 5 respectively.

![Figure 4](image1.png)

**Figure 4.** Students’ opinion on whether practical and concise learning material can increase their motivation to study ODE.

Based on Figure 3, the bar chart shows that the participants in this study support the statement with a very high proportion, 96% in total which consists of 64% agree and 32% very agree. Meanwhile only 4% stated that they disagree with the statement. This result implies that participants need a more practical and concise learning source to encourage them in studying ODE.

![Figure 5](image2.png)

**Figure 5.** Students’ opinion about the need to develop a new ODE course supported learning source

(a) In my opinion, the textbook we used should be renewed because it is an old edition and overly dense content

(b) The lecturer need to develop a suplementary learning source in the form of a pocket book which has more concise content
The pie charts in Figure 5 show participants percentage of agreement and disagreement about the need to renew the current textbook used in their ODE course (Figure 5a) and the need to develop a pocket book about ODE materials (Figure 5b). More than a half of the participants (about 54%) agree that the lecturer should use more up to date textbook with concise content. In addition to that percentage, 7% of the participants said that they very agree toward the statement. In contrary, 38% of them disagree and 1% very disagree. Furthermore, the second pie chart (Figure 5b) is the result of participants’ opinion on whether the lecturer need to develop a pocket book about ODE materials. Interestingly the majority of the participants express positive agreement toward the statement, 42% very agree and 52% agree. The result is in line with the results of the two previous statements in this section which indicates that the participants’ need a more concise and new learning materials and it can be in the form of a pocket book. Many studies support the use of pocket book in supporting students’ learning [23–25].

4. Conclusion
Based on the need analysis described in the previous section, it can be concluded that participants in this study aware about the importance of having learning source in studying ODE although the learning conducted using online learning platform. Not only the compulsory textbook used by the lecturer, they also give effort in finding other sources that can support their learning. However, there is also result of this study which implies that the learning source used by the lecturer is not adequate to support the learning. One of the reason is about the language of the materials especially the textbook used in the course. In addition, the participants express their need for a concise and up to date sources. Therefore, the result of this study support that lecturer need to design a pocket book for ODE course in order to support students in the learning, especially when the course is conducted online.

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