Writing a Literature Review: Activities on Research in Mathematics Education to Support Students in Conducting Research

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Abstract. Literature review as a crucial requirement in planning a mathematics education research project has received attention in the lecturing of mathematics education research methods in higher education environments. However, the students' ability to write literature reviews that require skills in managing and analyzing previous relevant research to students' research requires special attention. This paper aims to represent the significant activities in supporting students’ ability to collect, structure, summarize research finding, and write literature reviews that are relevant to students’ research. Initial data of 15 students’ writing literature review ability was analyzed. Design research comprised the preliminary design, teaching experiment, and retrospective analysis was applied. The outcome of the research presents that students can produce scientific articles through the developed activities of writing literature reviews.

Keywords: Literature Review, Research activities, Writing Skill, Design Research

1. Introduction

Research requires a literature review to analyze a subject of study deeply. A literature review is a critical assessment of an unbiased synopsis of information that contains a balanced, inconsistent, established and current view[1]. This literature review activities are crucial in conducting research and writing the results. Higher education institutions pay special attention to this activity in the research methods subject[2]. However, students quiet face difficulties in writing good literature reviews. Students still lack attention in managing the collected information to strengthen their insights about the background of a research issue.

Students need to conduct a literature review to develop research ideas. Through literature review activities, students can consolidate their basic research ideas with other published research. Literature review activities motivate students to identify knowledge gaps and how the research process carried out. The activities will help students to hypothesize and formulate their research questions. A research data needs a clear context so that the research can be seen its relevance and usefulness. A literature review activity will help students identify other studies, review recent reference points, and position their potential research idea.

Writing a thesis is a compulsory requirement for obtaining a bachelor's degree in mathematics education students[3]. Students of mathematics education have to conduct research at the end of their
studies. The students are obliged to take research methods subjects to support the ability to carry out research. The literature review is one of the essential introductory activities of the research method subjects. Students wrote literature reviews of published research during the early stages of coursework and research. Consequently, they designed their research ideas and evaluated the reviewed research findings to the context of their research [4-5].

The stage of exploring ideas by reading and observing a research result is the initial procedure before conducting research[6]. The activities of literature reviews frame this stage into an approach in research methods subjects. Therefore, this study aims to design literature review activities to support the skills of collecting, structuring, evaluating, summarizing research findings, and writing literature reviews into relevant research for mathematics education students.

2. Research Method
A research method of this study uses design research to achieve research objectives. This research conducted was a collaboration between lecturers and researchers during the learning process[7]. A set of experience-based activities designed for 15 students of mathematics education was conducted as an approach to support the skills of collecting, structuring, studying, researching, and reviewing literature into research relevant to mathematics education student research. 15 students of mathematics education divide into 5 groups.

This iterative research constitutes preliminary design, teaching experiment, and retrospective analysis. The iterative research contains inventions and revisions during the design of learning activities [8]. or more details, this paper will describe the stages of this research.

2.1. Preliminary design
This study collected and examined the literature on activities that support students' research skills. This stage aims to create conjectures of students' initial thinking in conducting research. The ability to write literature reviews is one of the crucial skills that students of mathematics education must possess. At this stage, activities can develop the ability to write a literature review were designed. The design noticed the curriculum analysis of research methods subjects. Researchers observed students' initial ability in writing a literature review and designed the learning trajectory and hypothetical learning trajectory. Furthermore, this research formulates the conjecture of the local instructional theory into learning objectives, learning activities, and tools to help the research learning process[2].

2.2. Teaching experiment
This stage aims to evaluate the activity conjectures that support students' skills in writing a literature review. At this stage, the researcher tried out the activity designed of writing a literature review in preliminary design. The researcher also hypothesized students' strategies and thinking during the learning process. This conjecture was reviewed and modified as improvements to subsequent activities.

2.3. Retrospective analysis
At this stage, the data of writing a literature review activity examined at the teaching experiment were collected. The initial data analysis was used as consideration for developing revised activities in subsequent learning activities. This stage aims to develop a local instructional theory and compare the hypothetical learning trajectory with the initial learning. This three-stage research was organized iteratively. The iterative process aims to discover a new theory that a revision of learning theory was tested (Figure 1).
3. Result and Discussion

The results of this study indicate that the designed activity of writing a literature review in mathematics education has a very significant role in helping mathematics education students to conduct mathematics education research.

Students collect information about evidence and research data to support their research ideas. Students must read reputable and accredited articles to get a good literature review formula. The designed activity was formulated based on the sequence of instructional activity on research in mathematics education to improve students' ability in writing literature reviews to support students in conducting research. For further details, the researcher will describe the results of the learning process integrated into the design of writing a literature review activity on mathematics education research (Figure 2).

![Design Research Stages](image-url)
Figure 2. Designed activities in writing a literature review

Selecting reviewed theme. The first activity accomplished by students was to select and identify the reviewed topic of research. The first activity accomplished by students was to select and identify reviewed topic of research. The crucial activity aimed to encourage students to select literature skillfully and prudently as supporting material of their research idea. Students were also directed to visit free journal sites and select open access articles.

Identifying keywords. The step students demand in searching for literature was to compile a list of keywords. Students broadly identified keywords and select research articles related to the chosen keywords.

Searching the source of research articles. Students accessed online information as a tool in finding research data that students need, such as Google, Google Scholar, Science Direct. com, and others.

Generating reading list of research articles. Students use the applications that manage various research journals such as Mendeley, Zotero and Endnote. This application help students to index and organize the article archived. Students prepare an evaluation and comparison between the publications they have been collected.

Evaluate research articles. Then students analyzed the research findings and the gaps in the former and current research. In this activity, students need to read articles thoroughly. Students summarize research findings and evidence in their own words. Students need to be reminded that the articles selected are the point of view of other researchers that can be used as a support for their research ideas but cannot be plagiarized.

Structuring Research Article. At this stage, the students then structure the research articles that have been selected and evaluated. Students define the research objective and resume relevant to their research. This activity will help students determine the limitation of their research. Students structure relevant research articles starting from a resume of scientific article titles, authors, background, types and methods of research, instruments used, data analysis, results and discussion, and conclusions. This resume will help students identify the gaps in previous research and what solutions can be offered in their experiment.
Writing a literature review. At the stage of writing a literature review, students separate important texts into sub-text. The partition was condensed into a complete narrative. Structuring research article activities make students accessible to group different and similar findings. Then students also comment on the results of the literature review. Students provide their perspectives and interpretations of the gravity of the literature reviews they write. The depth of analysis of student literature reviews becomes a critical perspective on the subject of their research.

Furthermore, all student groups made a thesis proposal based on the literature review they had conducted and registered it in a research proposal seminar (Table 1).

| Name                  | Title of research                                                                 |
|-----------------------|-----------------------------------------------------------------------------------|
| Ira Scintia Oktavina  | Analysis of Student Errors in Solving Mathematical Problems Based on High Order Thinking (HOT) Using the Newman Error Analysis Method. |
| Rizka Khairani         | Mathematical Thinking Analysis of Eighth Graders with Mental disabilities on Applying the Realistic Mathematics Education Approach. |
| Dinda Wahyuni          | Analysis of Problem Based Learning on Students' Mathematical Problem Solving Ability by Supporting ICT. |
| Serli Yustina Simamora| The Effectiveness of Mathematics Online Learning for Eighth Graders During Covid-19 Pandemic Era. |
| Windi Shayang Situmorang| The Effectiveness of Realistic Mathematics Education on Seventh Graders' Mathematical Problem Solving Ability. |

4. Conclusion
This study created learning activities in writing literature reviews to support the ability to conduct research for mathematics education students. Activities formulated consisted of selecting reviewed themes, identifying keywords, searching the source of research articles, generating reading lists of research articles, evaluate research articles, structuring research articles, and writing a literature review. The results of this study indicate that the designed activity of writing literature reviews in mathematics education has a very important role in assisting mathematics education students to conduct research in mathematics education.

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