# DESCRIPTION OF THE EXPERTISE OF MATHEMATICS EDUCATION LECTURERS AT RIAU ISLAMIC UNIVERSITY BASED ON PUBLICATION WORKS: SYSTEMATIC LITERATURE REVIEW

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**Received:** 10-07-2025; **Accepted:** 15-09-2025; **Published:** 31-10-2025

**Abstract**: Mapping lecturers' expertise is a strategic effort to enhance the quality of education and research, particularly in the field of mathematics education. However, there has been no comprehensive study that systematically documents the academic contributions and areas of specialization of lecturers based on their scientific publications. Therefore, this study aims to describe the expertise of Mathematics Education lecturers at the Faculty of Teacher Training and Education, Universirtas Islam Riau (UIR), through an analysis of their published works using the Systematic Literature Review (SLR) approach. The study identifies the main research themes, evaluates the quality and quantity of publications in reputable journals, and explores trends in lecturers' expertise based on dominant topics. The research process consists of five stages: determining inclusion and exclusion criteria, searching for relevant literature, screening and selecting articles, conducting thematic and quantitative analyses, and compiling a descriptive report. The findings reveal that most lecturers' research focuses on innovations in mathematics learning, the integration of technology in teaching, and the development of instructional materials. Furthermore, the published works indicate an increasing level of collaboration, both internally within the university and externally with other institutions. This study highlights the vital role of lecturers in advancing mathematics education and contributing to pedagogical innovation. Nevertheless, several potential areas remain underexplored, suggesting opportunities for future research development. The findings are expected to guide institutional policies in strengthening lecturers' research capacity and improving the overall quality of academic publications.

**Keywords**: Lecturer Expertise, Scientific Publications, Systematic Literature Review, Mathematics Education

## 1. INTRODUCTION

Mathematics education plays a crucial role in developing competent generations in science and technology. In the era of globalization, mathematical ability not only serves as a foundation for fields such as physics, chemistry, and engineering but also represents a fundamental skill required in everyday problem-solving and decision-


ISSN: 2620-4129
E-ISSN: 2621-3885

making [1], [2]. Therefore, the quality of mathematics education must continuously be improved to produce graduates who can compete globally [3], [4].

Educators are responsible not only for delivering content but also for developing curriculum and pedagogy innovatively through reflective and research-based practice [5]. In the context of higher education, lecturers' professional expertise is reflected in their scholarly productivity, including their research activities and publications. Through scientific publications, lecturers contribute to the development of knowledge, disseminate educational innovation, and strengthen institutional reputation [6], [7]. At the Faculty of Teacher Training and Education (FKIP), Universitas Islam Riau (UIR), mathematics education lecturers are expected to continuously improve their research competence and publication quality. However, systematic documentation and mapping of their academic expertise based on publication content are still limited. Most studies measure lecturers' productivity only quantitatively (e.g., number of publications, citation index, h-index), while overlooking the qualitative dimensions that describe research themes, methodological patterns, and intellectual focus [8]. This evaluation aims to identify strengths and weaknesses in lecturers' research and provide an overview of their contributions to mathematics education. The results of this evaluation can be used to develop curriculum and education policies [9], [10] particularly at FKIP UIR.

A Systematic Literature Review (SLR) is an appropriate method for conducting this evaluation. SLR enables researchers to systematically and structurally identify, evaluate, and interpret all relevant research findings related to specific research questions [11]. This method helps summarize existing evidence and provides a comprehensive overview of the studied topic [12], [13]. In this context, the researcher employs the SLR method to identify and analyze the publications of mathematics education lecturers at FKIP UIR. By analyzing these publications, this study aims to describe the lecturers' expertise, identify key research themes, and evaluate their scientific contributions. This step is expected to provide deeper insights into the expertise profiles of mathematics education lecturers at FKIP UIR.

This research is also expected to offer both academic and practical benefits. Academically, it will enrich knowledge and literature in the field of mathematics


ISSN: 2620-4129
E-ISSN: 2621-3885

education. Practically, the findings can be utilized by FKIP UIR to develop strategies for improving lecturers' competence and career advancement, as well as for curriculum enhancement and educational policy development [5]. Furthermore, this study may serve as a foundation for future, more in-depth research on lecturers' expertise in mathematics education. The findings can be used as a reference to identify areas requiring more attention and to formulate effective strategies for improving the quality of mathematics education at FKIP UIR. This analysis is essential because it establishes a clear connection between the research output and the academic expertise of mathematics education lecturers. By systematically mapping publication themes, methodologies, and contributions, the study identifies the intellectual focus that defines the department's research identity. This common thread—linking individual publications to institutional academic development—justifies why such an analysis is both necessary and meaningful for understanding and strengthening research capacity at FKIP UIR.

In this digital era, access to information and scientific literature has become increasingly convenient, enabling researchers to conduct SLRs more efficiently and accurately. Therefore, this study is expected to produce valid and reliable results to support evidence-based decision-making at FKIP UIR. Within this overall context, the research will make a significant contribution by portraying the expertise of mathematics education lecturers at FKIP UIR through a systematic analysis of their scientific publications. This study is not only relevant to institutional development but also contributes positively to improving the overall quality of mathematics education in Indonesia [14], [15].

## 2. RESEARCH METHODS

This research is a qualitative study using the SLR method. This method can help summarize existing evidence and provide a comprehensive overview of the topic under study [16], [17]. The steps are as follows:


ISSN: 2620-4129
E-ISSN: 2621-3885

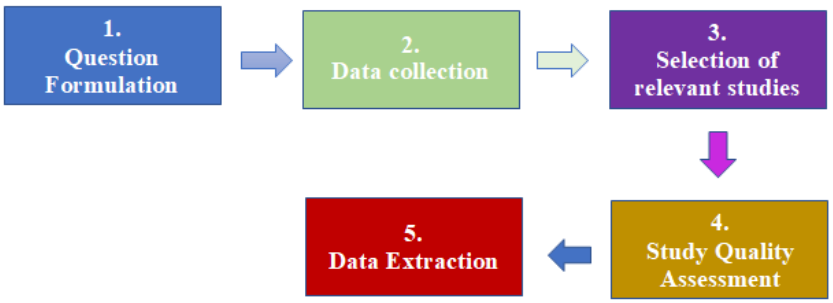


Figure 1. Research Stages

***Question Formulation***

First, the researcher formulated a specific and focused research question. This question will serve as the basis for the subsequent process, including the literature search. The research question in this study is "What are the research themes and trends of FKIP UIR lecturers in the field of Mathematics Education?" A good question should be clear, specific, and relevant to the topic being studied [16]. This question aligns with the research topic, namely mathematics education. This study focused on qualitative thematic synthesis, while bibliometric mapping is suggested for future studies.

***Data collection or literature search***

The next step after formulating the research question is data collection. In data collection, researchers engage in a comprehensive literature search across various sources, such as Google Scholar, Web of Science (WoS), Scopus, Garuda, SpringerLink, ScienceDirect, and DOAJ. SpringerLink and ScienceDirect were selected for their comprehensive access to peer-reviewed educational research, while national sources like Garuda ensured inclusion of local studies relevant to Indonesian mathematics education. An effective search strategy is crucial to ensure that all relevant studies are identified. This search is conducted using keywords related to the research topic [18]. Keywords used include: mathematics education, learning models, learning strategies, interactive teaching materials, mathematics learning technology, mathematics learning evaluation, and so on. Next, researchers establish inclusion and exclusion criteria, such as: relevance to the research topic or theme, publication type, and accessibility.

***Selection of relevant studies or article screening***

The next stage is the selection of relevant studies or article screening. At this stage, researchers screen studies based on inclusion and exclusion criteria. Inclusion criteria determine which studies are included in the review, while exclusion criteria determine which studies are excluded. This process helps ensure that only studies meeting certain quality standards are analyzed further [19].

***Study Quality Assessment and Data Extraction***

Study quality assessment is a crucial stage in the SLR. Each selected study is evaluated using a checklist created in Excel format. This assessment covers various aspects, such as internal and external validity, methodological clarity, and suitability to the research question, as well as compliance with inclusion and exclusion criteria. This assessment helps ensure that the synthesis of results is based on quality studies. Next, data extraction involves gathering important information from each study, such as study characteristics, methods used, and key findings. The extracted data is then synthesized to provide a comprehensive overview of the research topic. Synthesis can be conducted qualitatively or quantitatively, depending on the type of data collected and the research objectives. The final step is data analysis and interpretation. The results of the SLR provide strong and reliable evidence to answer the research questions [20].

## 3. RESULTS AND DISCUSSION

### A. RESULTS

This study aims to describe the expertise of Mathematics Education lecturers at the Faculty of Teacher Training and Education, Riau Islamic University based on a systematic analysis of their published works. The research process began by determining inclusion and exclusion criteria to ensure only relevant publications were analyzed. The inclusion criteria designed by the researcher included publications discussing mathematics education, the development of teaching materials, or the implementation of technology in mathematics learning, as well as articles published between 2002 and 2024 in indexed journals such as Google Scholar, Web of Science (WoS), Scopus, Garuda, SpringerLink, ScienceDirect, and DOAJ. Conversely, publications that were not relevant to the theme of mathematics education or had incomplete metadata were excluded from the analysis. Based on article searches through


*Mathematics Research and Education Journal, Vol. 9, No.2, October 2025, 27-41*
ISSN: 2620-4129
E-ISSN: 2621-3885

Google Scholar, Web of Science (WoS), Scopus, Garuda, SpringerLink, ScienceDirect, and DOAJ.

The initial search strategy was to search for articles based on the names of mathematics education lecturers at the Faculty of Teacher Training and Education, Universitas Indonesia (FKIP UIR) across all databases. Furthermore, we relied on keyword combinations such as "mathematics education," "teaching materials development," "learning media," "assessment," "learning technology," and "learning models." The initial search yielded a total of 1,114 articles. After a screening process based on inclusion and exclusion criteria, 33 articles were selected for further analysis. The remaining articles were excluded due to their irrelevance to the research focus and incomplete metadata. Thematic and quantitative analyses of the selected publications were conducted. The analysis revealed that the lecturers' primary research focuses cover several areas, as shown in Table 1.1 below:

**Table 1. Main Focus of Lecturer Research**

| Lecturer Code | Main Focus | Number of Publications |
|---|---|---|
| AML | Technology in learning, CAM, CT, Higher order thinking skills | 83 |
| AS | Learning model | 34 |
| IAM | Ethnomathematics and Learning Models | 13 |
| EAL | Learning Models and Media | 19 |
| WP | Learning Models and Media | 26 |
| STA | Learning Tool Development | 38 |
| WA | Learning Models and Media | 44 |
| TEZL | Learning Models and Media Development | 65 |
| ISE | Technology-Based Learning, Learning Media and Models | 89 |
| REHS | Learning Models, Methods, and Media and Technology-Based Learning | 78 |
| RUS | PCK, Learning Models, Methods, and Media and Technology-Based Learning | 87 |
| WI | Learning Models and Methods and ESD | 20 |
| WR | Learning Methods, Difficulty Analysis, and Mathematical Thinking Skills | 30 |
| RS | Media, Learning Models and Methods and Development | 43 |
| VON | Media, Learning Models and Methods | 59 |


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ISSN: 2620-4129
E-ISSN: 2621-3885

| | | |
|---|---|---|
| AR | Mathematical Thinking and Media, Learning Models and Methods | 110 |
| DBA | Media, Learning Models and Methods | 20 |
| ADR | Media, Methods, and Technology in Learning | 100 |
| YF | Learning Models and Methods | 39 |

Table 1.1 represents the results of the initial step of searching for metadata from various relevant sources and filtering based on inclusion and exclusion criteria. Next, the researcher confirmed the findings through direct communication, such as telephone and WhatsApp. This step aims to ensure the accuracy of the search results and verify the accuracy of the information obtained. The results of direct communication are explained as follows: Based on the mapping of research focus that has been done, AML has conducted extensive research on various themes such as Concept Attainment Model (CAM), Augmented Reality (AR), learning methods and media, learning theory, difficulty analysis, bibliometrics and learning instruments. However, AML stated that so far its research has focused more on technology research, learning models, and higher-order mathematical thinking skills. AML stated that its learning technology focuses more on digital teaching materials and augmented reality, then its learning models focus more on CAM, while higher-order mathematical thinking skills focus more on critical thinking, creativity, problem solving and in recent years computational thinking (CT). Furthermore, SIA tends to conduct research on learning models with problem solving. In addition, SAI also conducts various research projects, including analysis, acceleration, learning tools, development, instruments, and learning media. IAM focuses more on learning models focused on the Student Teams Achievement Division (STAD) model. Furthermore, IAM also conducts research on ethnomathematics, learning media, teaching tools, learning methods, visual thinking, and creative thinking.

A total of 19 of the 47 EAL articles that can be traced, both research conducted alone and in collaboration with other lecturers. Based on the mapping of research focus, EAL is more focused on conducting research on learning models and media, namely learning media using Macromedia Flash 8. Furthermore, WP conducted research on


*Mathematics Research and Education Journal, Vol. 9, No.2, October 2025, 27-41*
ISSN: 2620-4129
E-ISSN: 2621-3885

learning models. The research is more focused on the STAD learning model. However, WP also conducted other research such as learning devices, contextual mathematics, self-efficacy, instruments, media, and learning modules. Furthermore, STA conducted research on learning models with a focus on the Problem Based Learning (PBL) learning model. In addition, STA also conducted various studies such as cooperative, technology, media devices and learning strategies. Then, WA conducted research on learning models and media that focused on the Think Pair Share (TPS) model. WA also conducted other research such as learning devices, Anxiety, local wisdom culture, revolution, CT etc. Furthermore, TEZL conducted research focused on innovation in mathematics learning, learning strategies such as PBL, TAPPS, and cooperative to improve critical thinking, problem solving, and mathematical communication. Furthermore, she has conducted numerous studies on learning that integrates technologies such as GeoGebra, Adobe Flash, flipbooks, and Scratch to improve understanding of mathematical concepts. Her research also focuses on self-efficacy, self-regulation, and the development of PBL, BBL, and RME-based learning tools.

ISE has also conducted several studies oriented towards innovation in mathematics learning, especially through the use of technology such as GeoGebra, Geometer's Sketchpad, Algebrator, and IT-based media (e-modules, flipbooks, PowToon, and mobile learning) to improve conceptual understanding, mathematical communication, and reduce mathematics learning anxiety. In addition, ISE researches the effectiveness of various learning models, such as PBL, Direct Instruction (DI), TPS, and cooperative learning in improving self-efficacy, self-regulation, and creative thinking of prospective mathematics teacher students. Its studies also include teacher training in the preparation of teaching materials and the implementation of the independent curriculum, as well as research on the evaluation of technology-based learning. Some of its research also discusses the integration of ethnomathematics and research trends in mathematics education. Furthermore, the focus of REHS's research is on learning models/methods, dominant learning media in the LKPD/RPP/LAS/Curriculum/teaching materials section, and technology-based learning that is dominant with Algebrator & Geogebra. In addition, REHS also conducts research


ISSN: 2620-4129
E-ISSN: 2621-3885

with various themes, namely Ethnomathematics, Pedagogical Content Knowledge (PCK), PTK, and others. The focus of research conducted by RUS is PCK, about learning media & models or learning methods (dominantly PBL). In addition, SR also conducts research with various themes, namely PTK, Ethnomathematics, and others.

Learning models and methods and ESD are the focus of WI's research. WI tends to conduct research on learning models or methods, dominant learning media in the contextual learning & Education for Sustainable Development (ESD) section. In addition, IW also conducts research with various themes, namely creative thinking skills, sustainable, difficulties analysis, Distance Education (PJJ), and others. Likewise with WR, WR publishes articles on the results of its research that focus on learning methods, difficulties analysis and mathematical thinking skills. WR also conducts research with various themes, namely Learning Media, PTK, AR, and others. Furthermore, RS focuses on development research and media, learning models and methods. SR also conducts research on learning models and methods, namely PBL, PTK, ethnomathematics, and others. Then, VON tends to conduct research on media, learning models and methods such as PBL, contextual, and cooperative. Application of geogebra in learning. VON also conducts research on the themes of ethnomathematics, self-efficacy and self-regulated, ADDIE, direct instruction, and others. Furthermore, AR conducted research focusing on mathematical thinking and media, learning models, and methods. AR's research focuses on media, learning models, and methods such as PBl, CTL, cooperative learning, and mathematical thinking. In addition, AR also conducted research on technology-based learning, cognitive styles, HOT questions, CAR, AIR, problem-solving error identification, STAD, self-regulation and self-efficacy, and others.

Similar to other lecturers, DBA also conducts extensive research, particularly focusing on media, models, and learning methods. He researches innovative learning models, the use of technology, and problem-solving strategies to improve student understanding. His research on learning media examines the influence of interactive teaching materials and the role of educators in effective learning. Furthermore, his ethnomathematics studies explore the relationship between mathematical concepts and


ISSN: 2620-4129
E-ISSN: 2621-3885

local culture to support student understanding. Furthermore, ADR's research also focuses on media and learning methods, but recently he has expanded his research focus to the field of technology in learning. Finally, YF also conducts published research focusing on learning models and methods. The learning model is PBL-oriented to improve critical thinking skills and the use of technology in learning. He also develops innovative teaching tools and researches student self-efficacy in understanding mathematics. Furthermore, his studies are on NHT and TSTS as cooperative learning strategies. In addition, YF also conducts development research on the integration of technology in teaching materials to improve student understanding.

Based on quantitative analysis, articles published in the Garuda, Scopus, and Google Scholar databases are shown in Figure 1.2. This indicates that Mathematics Education lecturers at the Islamic University of Riau actively contribute to national and international publications. Publications in Scopus and WOS indicate that some research has a global impact, while articles in Garuda demonstrate strong involvement in educational development at the national level.

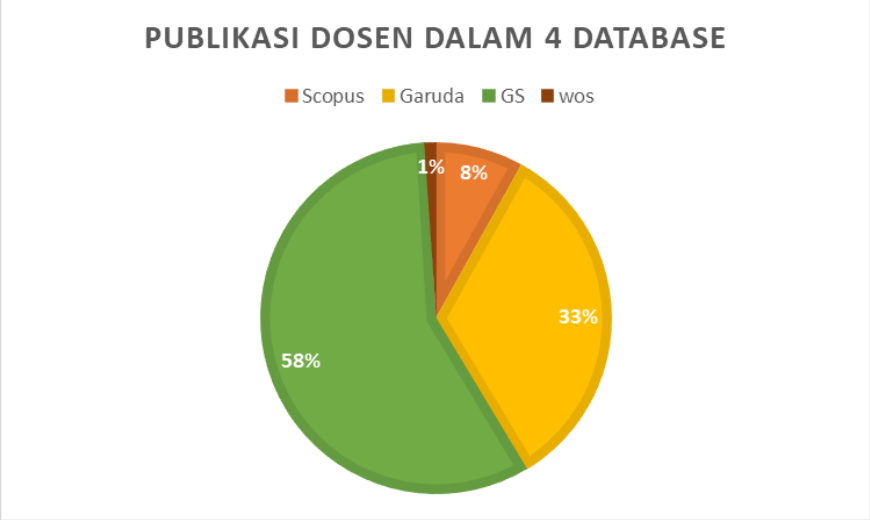


Figure 1. Lecturer publications in 4 databases

Based on Table 1.1 and Figure 1.2, the focus of this publication reflects attention to technological innovation, effective learning models and methods, and the development of relevant teaching materials. This research has academic relevance and


ISSN: 2620-4129
E-ISSN: 2621-3885

impacts teaching practice. With this trend, lecturers have the opportunity to continue contributing to the advancement of mathematics education in the digital era.

## B. DISCUSSION

Based on Table 1.1 and Table 1.2, the results of this study show several important findings related to the expertise of lecturers in Mathematics Education, Faculty of Teacher Training and Education, Islamic University of Riau (UIR) based on their scientific publications. The findings include: 1) lecturers' research focus, 2) differences between national and international publications, 3) trends in lecturers' expertise, 4) quality and quantity of publications, 5) relevance of research to institutional development. Lecturers in Mathematics Education, Faculty of Teacher Training and Education, Islamic University of Riau (UIR) have a strong research focus on educational technology, learning models or methods, and the development of teaching materials.

The dominant research focus reflects attention to innovation in learning, such as: Augmented Reality (AR), Problem-Based Learning (PBL), and the development of digital-based teaching materials. These technologies, such as AR, can be used to enhance students' learning experiences and increase student interactivity and engagement in learning [21], [22]. Technologies such as mobile applications, Learning Management Systems (LMS) platforms, and artificial intelligence-based software are used to efficiently evaluate student learning outcomes [23]. Problem-based learning approaches serve as tools for developing critical thinking, problem-solving, and collaboration skills [24], [25]. Meanwhile, development demonstrates concern for student needs [26]. Lecturers' international publications focus on global themes, such as AR and technology-based innovation. This indicates that some lecturers are involved in globally relevant educational issues.

For national publications, lecturers place more emphasis on developing teaching materials based on local culture and the Indonesian educational context. The trend of lecturers' expertise is reflected in their research, which is dominated by technology themes. The themes of digital media for assessment and the use of applications in learning indicate that lecturers are actively seeking ways to improve technology-based


*Mathematics Research and Education Journal, Vol. 9, No.2, October 2025, 27-41*
ISSN: 2620-4129
E-ISSN: 2621-3885

learning. Publications listed in reputable indexes (e.g. Scopus) indicate good research quality in an international context and more national publications, but show a variety of themes relevant to national educational needs.

Based on the research findings, the results of this study have significant benefits in enhancing international research collaboration, optimizing lecturer professional development programs, and developing strategies for curriculum and teaching materials development. The results are also useful for determining the focus of lecturers' future research. Lecturers can deepen research themes relevant to their field of study. By mapping dominant research themes and identified trends, lecturers can design more focused and impactful research strategies. Furthermore, the results of this study can be a strategic tool for lecturers to strengthen academic contributions, increase publications, and demonstrate specialization in specific fields. By utilizing the results of this study, lecturers can more easily meet the requirements for promotion to associate professor or professor, as well as improve the quality of teaching and research. Therefore, this study can make a significant contribution to improving the quality of education in Indonesia, especially in mathematics education study programs.

The novelty of this study lies in the SLR method, which has not been used in previous studies to assess academic expertise, such as lecturers' expertise as seen from published works. In most cases, research on academic expertise is conducted nationally or internationally, for example through bibliometric analysis in Scopus or WoS [27]–[29]. However, research using the SLR approach at the university level is still rare [30]. In mathematics education studies, SLR as a method for analyzing academic expertise is still rare. Typically, lecturers' expertise is determined through evaluations of their own academic performance or self-evaluation. However, in this study, researchers used publication-based analysis.

This research makes a significant contribution to mapping lecturers' expertise through publication analysis. Identifying frequently discussed topics in lecturers' scientific works can help uncover the specific areas of expertise pursued by each lecturer. This approach aligns with studies that developed systems to identify lecturers' expertise based on indexed publication track records. A limitation of this study is that it

only used data from publications indexed in Garuda, Google Scholar, Scopus, and WOS. Therefore, lecturers' publications not yet documented in these three databases were not analyzed. This could lead to bias in describing lecturers' expertise, especially for those who primarily write in local proceedings or non-indexed journals. Given these limitations, future researchers could continue this study with a broader and more in-depth approach to enrich the understanding of lecturers' expertise as seen from a more comprehensive set of scientific publications.

## 4. CONCLUSION

The conclusion of this study indicates that the expertise of the Mathematics Education lecturers at the Faculty of Teacher Training and Education, Universitas Islam Riau (FKIP UIR) can be mapped based on their scientific publications. The analysis reveals a tendency for research topics to focus on innovation in mathematics learning, the use of technology in education, and the development of teaching materials. Furthermore, the publications they produce reflect the level of collaboration between researchers, both within the university and with other institutions. This publication trend demonstrates that the Mathematics Education lecturers at the Faculty of Teacher Training and Education, Universitas Islam Riau (FKIP UIR), have made significant contributions to the development of mathematics and mathematics education, utilizing a variety of approaches that continue to evolve in line with current needs. However, several areas of research remain under-recognized, potentially providing opportunities for further research. Therefore, the results of this study are expected to inform the formulation of academic policies that support the strengthening of lecturers' expertise and improve the quality of future scientific publications.

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ISSN: 2620-4129
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ISSN: 2620-4129
E-ISSN: 2621-3885