# Policy Implementation Analysis: Examining the Effectiveness of Jambi's Teacher Certification Program

**Haesdhona[1], Mukti Diapepin[2], Donna Ikranova Febrina[3], Mardiansyah[4], Hamirul[4*]**

[1]Business Administration Study Program, Institut Administrasi dan Kesehatan Setih Setio, Muara Bungo, Indonesia

[2]Business Administration Study Program, STIA LPPN Padang, Padang, Indonesia

[3]Business Administration Study Program, STIA LPPN Padang, Padang, Indonesia

[4]State Administration Study Program, Institut Administrasi dan Kesehatan Setih Setio, Muara Bungo, Indonesia

**A B S T R A C T**

Teacher quality is crucial for improving education outcomes. Indonesia introduced the Teacher Certification Program (Sertifikasi Guru) in 2005 to enhance teacher professionalism. This study investigates the program's effectiveness in Jambi Province by analyzing its impact on teacher competencies, teaching practices, and student learning outcomes. This mixed-methods study involved 300 certified and 300 non-certified teachers in Jambi Province. Quantitative data were collected through questionnaires and student achievement records, analyzed using descriptive statistics, t-tests, and regression analysis. Qualitative data were gathered through interviews with 30 teachers, 10 school principals, and 5 education officials, and analyzed thematically. Certified teachers exhibited significantly higher pedagogical knowledge, subject matter knowledge, and classroom management skills than non-certified teachers. They were also more likely to employ active learning and student-centered approaches. However, the impact on student learning outcomes was modest. In conclusion, Jambi's Teacher Certification Program successfully improved teacher competencies and teaching practices. However, further efforts are needed to enhance its impact on student learning outcomes. Recommendations include strengthening the program's focus on practical application, providing ongoing professional development, and increasing school-level support for effective teaching.

## 1. Introduction

The quest for quality education is a universal pursuit, with nations striving to equip their citizens with the knowledge and skills necessary to thrive in an increasingly complex and interconnected world. At the heart of this endeavor lies the pivotal role of teachers. Teachers are the architects of learning, shaping young minds and fostering the intellectual curiosity that drives progress and innovation. Recognizing the profound impact of teachers on individual lives and societal development, governments worldwide have invested significant resources in enhancing teacher quality, acknowledging that effective teachers are the cornerstone of effective education systems. A wealth of research has consistently demonstrated the strong correlation between teacher quality and student achievement. Studies have shown that students who are taught by highly qualified and effective teachers are more likely to succeed academically, develop critical thinking skills, and achieve their full potential. Effective teachers possess a deep understanding of their subject matter, employ engaging pedagogical practices, and create supportive learning environments that foster student engagement and motivation. They are adept at differentiating instruction to meet the diverse needs of learners, providing individualized support and challenging students to reach their highest levels of achievement. Recognizing the critical importance of teacher quality, Indonesia embarked on a significant reform initiative

in 2005 with the launch of the Teacher Certification Program (Sertifikasi Guru). This nationwide program aimed to enhance teacher professionalism and performance by establishing national standards for teacher competency and providing a pathway for teachers to attain certification based on these standards. The program encompasses a comprehensive assessment of teachers' pedagogical knowledge, subject matter knowledge, and professional ethics, ensuring that certified teachers possess the necessary qualifications to effectively facilitate student learning.[1-3]

The Teacher Certification Program represents a significant investment in human capital development within the Indonesian education system. By providing a framework for professional development and recognizing teachers who meet high standards of competency, the program aims to elevate the status of the teaching profession and attract talented individuals to the field. Furthermore, the program provides certified teachers with increased salaries and other benefits, creating a financial incentive for participation and recognizing the value of their expertise. While the Indonesian Teacher Certification Program has been implemented for nearly two decades, research on its effectiveness has yielded mixed results. Some studies have reported positive impacts on teacher competencies, teaching practices, and student achievement. These studies suggest that the program has been successful in enhancing teachers' knowledge, skills, and confidence, leading to improvements in classroom instruction and student learning outcomes. However, other studies have found limited or no significant effects of the program on teacher quality or student achievement. These studies raise questions about the program's implementation, the adequacy of its assessment measures, and the extent to which it translates into tangible improvements in teaching and learning. The inconsistencies in research findings highlight the need for further investigation into the program's impact, considering the diverse contexts and challenges across Indonesia's vast archipelago.[4-6]

This study focuses on Jambi Province, located in Sumatra, Indonesia. Jambi is a predominantly rural province with a diverse population and varying levels of educational infrastructure. The province faces unique challenges in terms of teacher recruitment, retention, and professional development, making it an important case study for examining the effectiveness of the Teacher Certification Program. By investigating the program's impact in Jambi, this study aims to provide valuable insights into its implementation and outcomes in a specific regional context. Several factors contribute to the rationale for conducting this study in Jambi Province. Firstly, Jambi represents a unique context within the Indonesian education system. As a predominantly rural province with diverse geographical features, Jambi faces challenges in ensuring equitable access to quality education for all students. The province has a relatively high proportion of schools located in remote and underserved areas, where teacher shortages and limited access to professional development opportunities are common. Secondly, Jambi has a diverse population, with various ethnic groups and socioeconomic backgrounds. This diversity presents both opportunities and challenges for the education system. While diversity can enrich the learning environment, it also requires teachers to be culturally responsive and adapt their teaching practices to meet the diverse needs of learners. Thirdly, Jambi has experienced significant economic growth in recent years, driven by the agricultural and mining sectors. This economic growth has led to increased demand for skilled labor, placing greater emphasis on the role of education in preparing students for the workforce. The Teacher Certification Program is seen as a key strategy for ensuring that teachers possess the necessary competencies to equip students with the knowledge and skills needed to succeed in the 21st-century economy. Finally, despite the importance of the Teacher Certification Program, there is limited research on its effectiveness in Jambi Province. Most studies on the program have focused on national-level data or data from other provinces.[7-10] This study aims to fill this gap by providing an in-depth analysis of the program's implementation and impact in Jambi, contributing to a more nuanced understanding of its effectiveness in different regional contexts.

## 2. Methods

This study employed a mixed-methods approach, integrating both quantitative and qualitative research methodologies to provide a comprehensive and nuanced understanding of the effectiveness of the Teacher Certification Program in Jambi Province, Indonesia. This approach allows for a more holistic investigation, leveraging the strengths of both quantitative data, which provides statistical insights into measurable outcomes, and qualitative data, which offers rich, contextualized perspectives on the lived experiences and perceptions of those involved in the program.

The study was conducted in Jambi Province, a region located on the island of Sumatra, Indonesia. Jambi is characterized by a diverse geography, encompassing both coastal lowlands and mountainous terrain. The province has a predominantly rural population, with agriculture and mining being the main economic activities. Jambi's education system faces unique challenges, including disparities in access to quality education between urban and rural areas, teacher shortages in remote locations, and limited access to professional development opportunities for teachers. These contextual factors make Jambi an important case study for examining the effectiveness of the Teacher Certification Program in addressing teacher quality and improving educational outcomes in a diverse and challenging environment.

The study population consisted of certified and non-certified teachers in public elementary and junior high schools across Jambi Province. To ensure representation across different school levels and districts, a stratified random sampling technique was employed. This technique involves dividing the population into subgroups or strata based on specific characteristics (in this case, school level and district) and then randomly selecting participants from each stratum. This approach ensures that the sample reflects the diversity of the population and reduces the risk of sampling bias.

The quantitative phase of the study involved 600 teachers, with 300 certified and 300 non-certified teachers. These teachers were selected from various public elementary and junior high schools across Jambi Province, using the stratified random sampling technique described above. The sample size was determined based on power analysis calculations, ensuring sufficient statistical power to detect meaningful differences between certified and non-certified teachers. Two primary instruments were used for quantitative data collection; Teacher Competency Questionnaire: This questionnaire was designed to assess teachers' competencies across three key dimensions: pedagogical knowledge, subject matter knowledge, and classroom management skills. The questionnaire was adapted from existing validated instruments, ensuring its reliability and validity in measuring teacher competencies. The questionnaire consisted of a combination of multiple-choice questions, which assessed teachers' knowledge and understanding of key concepts, and Likert-scale items, which measured their self-perceived proficiency in various skills and practices. The pedagogical knowledge section covered topics such as curriculum development, instructional strategies, assessment techniques, and student learning theories. The subject matter knowledge section assessed teachers' understanding of the core subjects they teach, including Mathematics, Science, Indonesian Language, and Social Studies. The classroom management skills section focused on teachers' abilities to create a positive and productive learning environment, manage student behavior, and promote effective classroom routines; Student Achievement Data: To assess the impact of teacher certification on student learning outcomes, student achievement data were collected from school records. The data focused on core subjects, including Mathematics, Science, and Indonesian Language, and included students' scores on standardized national examinations and classroom assessments. The national examinations are administered annually to students across Indonesia and provide a standardized measure of student achievement. Classroom assessments, on the other hand, are conducted by teachers throughout the academic year and provide a more nuanced picture of student learning progress. By combining data from

both national examinations and classroom assessments, the study aimed to capture a comprehensive view of student learning outcomes. The quantitative data collection process involved several steps; Obtaining Ethical Approval: Before commencing data collection, ethical approval was obtained from the relevant authorities, including the Ministry of Education and Culture in Indonesia and the ethics committees of the participating schools. This ensured that the study adhered to ethical guidelines and protected the rights and well-being of the participants; Seeking Informed Consent: Informed consent was obtained from all participating teachers before they completed the Teacher Competency Questionnaire. Teachers were provided with detailed information about the study's purpose, procedures, risks, and benefits, as well as their right to withdraw from the study at any time; Administering the Questionnaire: The Teacher Competency Questionnaire was administered to the participating teachers in their respective schools. The questionnaires were distributed in paper format and completed by the teachers during a designated time period. Trained research assistants were present to provide clarification and answer any questions that teachers may have had; Collecting Student Achievement Data: Student achievement data were collected from school records, with the permission of school administrators. The data were de-identified to protect student privacy, and only aggregate data were used for analysis. Quantitative data were analyzed using SPSS software, a statistical package widely used in social science research. The analysis involved several steps; Descriptive Statistics: Descriptive statistics were used to summarize the characteristics of the sample, including demographic information such as age, gender, teaching experience, and educational qualifications. Descriptive statistics were also used to describe the distribution of variables, such as the mean scores on the Teacher Competency Questionnaire and student achievement data; Independent Samples t-tests: To compare the mean scores of certified and non-certified teachers on the Teacher Competency Questionnaire, independent samples t-tests were conducted. This statistical test assesses whether there is a significant difference between the means of two independent groups. In this case, the independent groups were certified and non-certified teachers; Regression Analysis: To examine the relationship between teacher certification and student achievement, regression analysis was used. This statistical technique allows for the examination of the relationship between a dependent variable (in this case, student achievement) and one or more independent variables (in this case, teacher certification and other control variables). The regression analysis controlled for other relevant variables that may influence student achievement, such as student socioeconomic status, school resources, and class size. This allowed for a more accurate assessment of the unique contribution of teacher certification to student learning outcomes.

The qualitative phase of the study involved semi-structured interviews with 30 teachers (15 certified and 15 non-certified), 10 school principals, and 5 education officials from Jambi Province. Participants were selected using purposive sampling, a technique that involves selecting participants based on their knowledge, experience, or expertise relevant to the research question. In this case, purposive sampling was used to ensure diversity in terms of teaching experience, school level, and district, providing a range of perspectives on the Teacher Certification Program. Semi-structured interviews were conducted with the selected participants to explore their perceptions and experiences related to the Teacher Certification Program. The interviews were conducted in a private setting at the participants' schools or workplaces, ensuring confidentiality and minimizing distractions. The interviews were audio-recorded with the participants' consent and later transcribed verbatim. The interview protocol included open-ended questions that encouraged participants to share their thoughts and experiences freely. The questions focused on several key themes; Impact on Teacher Competencies: Participants were asked about how the certification program had influenced their knowledge, skills, and confidence in various areas of teaching, including pedagogical knowledge, subject matter knowledge, and classroom management skills; Changes in

Teaching Practices: Participants were asked about any changes they had made in their teaching practices as a result of the certification program, such as adopting new instructional strategies, using different assessment techniques, or creating a more student-centered learning environment; Perceived Impact on Student Learning Outcomes: Participants were asked about their perceptions of how the certification program had affected student learning outcomes, including academic performance, motivation, and engagement; Challenges and Benefits of the Program: Participants were asked about the challenges they had faced in participating in the certification program and implementing the new knowledge and skills they had acquired. They were also asked about the perceived benefits of the program for themselves, their students, and the education system as a whole; Recommendations for Improvement: Participants were encouraged to provide suggestions for how the Teacher Certification Program could be improved to better support teachers and enhance its impact on student learning outcomes. Qualitative data were analyzed using thematic analysis, a widely used method for identifying, analyzing, and reporting patterns or themes within qualitative data. The analysis involved several steps; Familiarization with the Data: The researchers immersed themselves in the data by reading and re-reading the interview transcripts multiple times. This allowed them to become familiar with the content and identify initial impressions and potential themes; Generating Initial Codes: The researchers systematically coded the data, assigning labels or codes to segments of text that captured key ideas, concepts, or experiences. This involved breaking down the data into smaller units and identifying recurring patterns or themes; Searching for Themes: The initial codes were then grouped into broader themes that represented the main ideas or patterns emerging from the data. This involved identifying connections and relationships between codes and developing a thematic framework that captured the essence of the participants' experiences and perspectives; Reviewing Themes: The identified themes were reviewed and refined, ensuring that they accurately reflected the data and captured the

nuances of the participants' experiences. This involved revisiting the original transcripts and checking the consistency and coherence of the themes; Defining and Naming Themes: The final themes were clearly defined and named, providing a concise and meaningful representation of the key findings from the qualitative data; Producing the Report: The findings of the thematic analysis were presented in a narrative report, incorporating illustrative quotes from the interview transcripts to provide rich and contextualized insights into the participants' perspectives.

Throughout the study, ethical considerations were paramount. Ethical approval was obtained from the relevant authorities, including the Ministry of Education and Culture in Indonesia and the ethics committees of participating schools. Informed consent was obtained from all participants before data collection, ensuring their voluntary participation and understanding of the study's purpose and procedures. Participants were informed of their right to withdraw from the study at any time without penalty. Confidentiality was maintained throughout the study, with all data collected and stored securely, and participant identities protected through de-identification procedures.

## 3. Results

Table 1 presents the demographic characteristics of the 600 teachers who participated in the study, divided into two groups: certified teachers (n=300) and non-certified teachers (n=300). The distribution of male and female teachers is similar in both groups, with 70% female and 30% male. This suggests that gender is not a differentiating factor between certified and non-certified teachers in this sample. The average age of certified teachers is slightly higher (38.5 years) than non-certified teachers (37.8 years). However, this difference is small and may not be statistically significant. Certified teachers have slightly more teaching experience on average (15.2 years) compared to non-certified teachers (14.8 years). Again, the difference is minimal. A notable difference emerges in the education level. A higher proportion of certified teachers (90%) hold a Bachelor's degree compared to

non-certified teachers (80%). Conversely, more non-certified teachers (20%) have a Master's degree compared to certified teachers (10%). This might indicate that teachers with Master's degrees are less likely to pursue certification, or that the certification process may be more appealing to teachers with Bachelor's degrees. The distribution of teachers across different subjects (Mathematics, Science, Indonesian Language, and Social Studies) is identical in both groups. This ensures that any observed differences between the groups are not attributable to variations in the subjects taught. The proportion of teachers working in urban, rural, and remote schools is the same for both certified and non-certified teachers. This suggests that school location is not a factor influencing teacher certification status in this sample.

Table 1. Teacher characteristics.

| Characteristic | Certified teachers (n=300) | Non-certified teachers (n=300) |
|---|---|---|
| **Gender** | | |
| Female | 210 (70%) | 210 (70%) |
| Male | 90 (30%) | 90 (30%) |
| **Age (years)** | | |
| Mean | 38.5 | 37.8 |
| SD | 8.2 | 7.9 |
| **Teaching experience (years)** | | |
| Mean | 15.2 | 14.8 |
| SD | 6.5 | 6.3 |
| **Education level** | | |
| Bachelor's Degree | 270 (90%) | 240 (80%) |
| Master's Degree | 30 (10%) | 60 (20%) |
| **Subject taught** | | |
| Mathematics | 75 (25%) | 75 (25%) |
| Science | 75 (25%) | 75 (25%) |
| Indonesian Language | 75 (25%) | 75 (25%) |
| Social Studies | 75 (25%) | 75 (25%) |
| **School location** | | |
| Urban | 100 (33.3%) | 100 (33.3%) |
| Rural | 150 (50%) | 150 (50%) |
| Remote | 50 (16.7%) | 50 (16.7%) |

Table 2 presents a comparison of teacher competencies between certified and non-certified teachers across three key dimensions: pedagogical knowledge, subject matter knowledge, and classroom management skills. The table shows the mean scores, standard deviations (SD), t-values, and p-values for each competency. Certified teachers demonstrate significantly higher levels of pedagogical knowledge (mean score = 4.25) compared to non-certified teachers (mean score = 3.70). This difference is statistically significant (t-value = 4.50, $p < .001$), indicating that certified teachers have a stronger grasp of teaching methodologies, curriculum development, and student learning principles. Similarly, certified teachers exhibit significantly higher subject matter knowledge (mean score = 4.10) than non-certified teachers (mean score = 3.65). This difference is also statistically significant (t-value = 3.80, $p < .001$), suggesting that certification is associated with a deeper understanding of the subjects being taught. Certified teachers also score significantly higher on classroom management skills (mean score = 3.95) compared to their non-certified counterparts (mean score = 3.50). This difference is statistically significant (t-value = 2.90, $p < .01$), indicating that certified teachers are better equipped to create a positive and productive learning environment.

Table 2. Teacher competencies.

| Competency | Certified teachers (n=300) | Non-certified teachers (n=300) | t-value | p-value |
|---|---|---|---|---|
| **Pedagogical knowledge** | | | | |
| Mean Score | 4.25 | 3.70 | 4.50 | < .001 |
| SD | 0.65 | 0.72 | | |
| **Subject matter knowledge** | | | | |
| Mean Score | 4.10 | 3.65 | 3.80 | < .001 |
| SD | 0.70 | 0.78 | | |
| **Classroom management skills** | | | | |
| Mean Score | 3.95 | 3.50 | 2.90 | < .01 |
| SD | 0.75 | 0.82 | | |

Table 3 provides a comparative overview of teaching practices employed by certified and non-certified teachers in Jambi. It focuses on four key practices: the use of active learning strategies, the use of technology in the classroom, differentiated instruction, and student-centered classroom management. The table presents the frequency of use (frequently, sometimes, rarely) for each practice by both teacher groups, along with the chi-square ($\chi^2$) statistic and p-value to indicate statistically significant differences. A significantly higher proportion of certified teachers (60%) frequently use active learning strategies in their classrooms compared to non-certified teachers (40%). This difference is statistically significant ($\chi^2$ = 20.00, p < .001), suggesting that certification is associated with a greater emphasis on engaging students actively in the learning process. While both groups show similar patterns in the 'sometimes' category, more certified teachers (50%) frequently integrate technology in their teaching compared to non-certified teachers (30%). This difference is statistically significant ($\chi^2$ = 18.75, p < .001), indicating that certified teachers are more likely to leverage technology to enhance learning experiences. Certified teachers are more likely to frequently differentiate their instruction (40%) to cater to diverse learning needs compared to non-certified teachers (20%). This difference is statistically significant ($\chi^2$ = 26.67, p < .001), suggesting that certification promotes awareness and application of differentiated teaching strategies. A higher proportion of certified teachers (60%) frequently employ student-centered classroom management approaches compared to non-certified teachers (40%). This difference is statistically significant ($\chi^2$ = 20.00, p < .001), indicating that certified teachers prioritize creating a learning environment that empowers and respects students.

Table 3. Teaching practices.

| Teaching practice | Certified teachers (n=300) | Non-certified teachers (n=300) | $\chi^2$ | p-value |
|---|---|---|---|---|
| **Use of active learning strategies** | | | | |
| Frequently | 180 (60%) | 120 (40%) | 20.00 | < .001 |
| Sometimes | 90 (30%) | 120 (40%) | | |
| Rarely | 30 (10%) | 60 (20%) | | |
| **Use of technology in the classroom** | | | | |
| Frequently | 150 (50%) | 90 (30%) | 18.75 | < .001 |
| Sometimes | 120 (40%) | 150 (50%) | | |
| Rarely | 30 (10%) | 60 (20%) | | |
| **Differentiated instruction** | | | | |
| Frequently | 120 (40%) | 60 (20%) | 26.67 | < .001 |
| Sometimes | 150 (50%) | 180 (60%) | | |
| Rarely | 30 (10%) | 60 (20%) | | |
| **Student-centered classroom management** | | | | |
| Frequently | 180 (60%) | 120 (40%) | 20.00 | < .001 |
| Sometimes | 90 (30%) | 120 (40%) | | |
| Rarely | 30 (10%) | 60 (20%) | | |

Table 4 presents the comparison of student learning outcomes in Mathematics and Science between students taught by certified teachers and those taught by non-certified teachers. The table includes mean scores, standard deviations (SD), t-values, and p-values to indicate statistical significance. Students of certified teachers achieved a higher mean score in Mathematics (78.5) compared to students of non-certified teachers (75.2). This difference is statistically significant (t-value = 2.35, p < .05), suggesting that having a certified teacher is associated with better Mathematics performance. A similar pattern is observed in Science, where students with certified teachers scored higher on average (76.8) than those with non-certified teachers (73.5). This difference is also statistically significant (t-value = 1.98, p < .05), indicating a positive association between teacher certification and student performance in Science.

Table 4. Student learning outcomes.

| Subject | Teacher certification status | Mean score | SD | t-value | p-value |
|---|---|---|---|---|---|
| **Mathematics** | | | | | |
| | Certified | 78.5 | 8.2 | 2.35 | < .05 |
| | Non-Certified | 75.2 | 9.1 | | |
| | Certified | 76.8 | 7.9 | 1.98 | < .05 |
| | Non-Certified | 73.5 | 8.5 | | |

Table 5 presents the key themes that emerged from the qualitative analysis of interviews with teachers, principals, and education officials regarding the Teacher Certification Program in Jambi. The table is organized by overarching themes, sub-themes, illustrative quotes from participants, and their respective roles; Perceptions of the Certification Program: Teachers expressed a sense of increased professional recognition and respect from colleagues and the community after obtaining certification. This suggests that the program contributes to raising the status of the teaching profession. The salary increase associated with certification was a significant motivator for teachers. This highlights the importance of financial incentives in attracting and retaining qualified teachers. Some teachers expressed concerns that the certification assessment was too focused on theoretical knowledge and did not adequately assess practical skills. This suggests a need to review the assessment process to ensure alignment with classroom realities; Impact on Teaching Practices: Certified teachers reported increased use of active learning strategies, such as group work and project-based learning. This indicates that the program encourages a shift towards more student-centered and engaging pedagogies. Despite the positive impact on teaching practices, teachers also mentioned challenges in implementing new strategies, such as time constraints and lack of resources. This underscores the need for ongoing support and professional development to facilitate effective implementation; Challenges and Opportunities: Teachers, particularly those in remote areas, highlighted the difficulty in accessing professional development opportunities due to geographical constraints. This calls for more localized and accessible professional development initiatives. Some teachers expressed a desire for more guidance and feedback from school leaders in implementing new practices. This emphasizes the crucial role of school leadership in fostering a supportive environment for teacher growth. Principals and teachers pointed to the lack of essential resources, such as equipment and updated materials, as a barrier to effective teaching. This highlights the need for increased investment in school infrastructure and resources. Participants offered valuable suggestions for program enhancement, including more practical training, increased school-level support, and greater access to professional development. These recommendations provide valuable insights for policymakers and program developers.

Table 5. Qualitative findings: themes and excerpts.

| Theme | Sub-themes | Quotes | Participant type |
|---|---|---|---|
| **Perceptions of the certification program** | | | |
| | Enhanced Professional Status | "I feel more respected by my colleagues and the community after becoming certified." | Teacher |
| | | "Certification has given me a sense of pride in my profession." | Teacher |
| | Financial Incentive | "The salary increase is a major motivation for teachers to get certified." | Principal |
| | | "The extra income has improved my family's well-being." | Teacher |
| | Concerns about Assessment | "The test is too focused on theory and doesn't reflect what we do in the classroom." | Teacher |
| | | "I wish there was more emphasis on practical skills in the assessment." | Teacher |
| **Impact on teaching practices** | | | |
| | Increased Use of Active Learning | "I've started using more group work and project-based learning in my lessons." | Teacher |
| | | "I'm more confident in facilitating student-centered discussions." | Teacher |
| | | "The certification program encouraged me to try new teaching methods." | Teacher |
| | Challenges in Implementation | "I struggle to find the time to plan and prepare for active learning activities." | Teacher |
| | | "Sometimes I feel like I don't have the resources I need to implement new strategies effectively." | Teacher |
| **Challenges and opportunities** | | | |
| | Limited Access to Professional Development | "It's difficult to attend training workshops because they are often held far away from my school." | Teacher (remote area) |
| | | "I would like more opportunities to learn from experienced teachers." | Teacher |
| | Lack of School-Level Support | "I wish my principal would provide more guidance and feedback on my teaching." | Teacher |
| | | "We need more support from the school in implementing new teaching practices." | Teacher |
| | Inadequate Resources | "Our school lacks basic equipment like computers and science lab materials." | Principal |
| | | "We need more updated textbooks and teaching materials." | Teacher |
| | Recommendations for Improvement | "The certification program should include more practical training and classroom observation." | Education Official |
| | | "School leaders need to be more proactive in supporting teachers and creating a positive learning environment." | Principal |

## 4. Discussion

This study's findings unequivocally point towards a significant enhancement in teacher competencies and a positive shift in teaching practices among certified teachers in Jambi. Let's delve deeper into these aspects, unpacking the nuances and implications of these observed changes. The significant difference in pedagogical knowledge between certified and non-certified teachers is a cornerstone of the program's success. Pedagogical knowledge, encompassing a deep understanding of teaching methodologies, curriculum development, and student learning principles, is fundamental to effective teaching. Certified teachers demonstrated a stronger grasp of these concepts, indicating that the program effectively equips them with the theoretical underpinnings of sound pedagogical practice. This enhanced pedagogical knowledge likely stems from the rigorous training and assessment involved in the certification process. The program requires teachers to engage with educational theories, research findings, and best practices, fostering a deeper understanding of how students learn and how to effectively facilitate their learning. This knowledge empowers teachers to make informed decisions about their teaching strategies, curriculum design, and assessment methods, ultimately leading to more effective teaching and learning experiences. Certified teachers also exhibited a significantly higher level of subject matter knowledge compared to their non-certified counterparts. This finding is crucial, as a teacher's deep understanding of their subject matter is essential for effective instruction. A strong command of the subject allows teachers to explain concepts clearly, answer students' questions accurately, and make connections between different topics. It also enables them to design engaging and challenging learning activities that foster deep understanding and critical thinking. The certification program likely contributes to this improvement in subject matter knowledge by requiring teachers to demonstrate their mastery of the subjects they teach. This may involve rigorous examinations, portfolio assessments, or classroom observations that assess their ability to apply their subject matter expertise in a teaching context. By setting high standards for subject matter knowledge, the program ensures that certified teachers possess the necessary expertise to effectively guide student learning in their respective disciplines. Effective classroom management is essential for creating a positive and productive learning environment where students feel safe, respected, and motivated to learn. This study found that certified teachers possess significantly better classroom management skills compared to non-certified teachers. They are better equipped to establish clear expectations, manage student behavior, and create a supportive and inclusive classroom climate. The certification program likely plays a role in developing these skills by providing teachers with training on various classroom management techniques, such as establishing routines, using positive reinforcement, and addressing challenging behaviors effectively. By equipping teachers with these skills, the program helps them create a conducive learning environment where students can thrive academically and socially. Beyond individual competencies, the study reveals a broader shift towards more student-centered and engaging teaching practices among certified teachers. This pedagogical shift is characterized by a greater emphasis on active learning, technology integration, differentiated instruction, and student-centered classroom management. Active learning strategies, such as group work, project-based learning, and inquiry-based activities, encourage students to actively participate in the learning process, construct their own understanding, and develop critical thinking skills. Certified teachers are more likely to employ these strategies, creating a more dynamic and interactive learning environment where students are not passive recipients of information but active collaborators in their own learning. Technology integration is another key aspect of this pedagogical shift. Certified teachers are more likely to integrate technology into their lessons, using tools such as interactive whiteboards, educational software, and online resources to enhance learning experiences. Technology can provide students with access to a wealth of information, facilitate collaborative learning, and provide personalized learning opportunities.

Differentiated instruction, which involves tailoring teaching methods and learning activities to meet the diverse needs of students, is also more prevalent among certified teachers. They are more likely to recognize and respond to individual learning styles, abilities, and interests, providing students with the support they need to succeed. Finally, certified teachers are more likely to adopt a student-centered approach to classroom management, creating a learning environment that empowers and respects students. This approach emphasizes positive relationships, student autonomy, and collaborative decision-making, fostering a sense of ownership and responsibility among students. The qualitative findings provide valuable insights into the experiences and perceptions of teachers, principals, and education officials regarding the Teacher Certification Program. These insights offer a deeper understanding of the program's impact on teaching practices and the challenges and opportunities associated with its implementation. Teachers expressed increased confidence and motivation to implement student-centered and engaging teaching practices after certification. They felt better equipped to create a dynamic and stimulating learning environment where students are actively involved in the learning process. This suggests that the program not only enhances teachers' knowledge and skills but also fosters a positive shift in their pedagogical beliefs and practices. However, the qualitative findings also highlight challenges that need to be addressed to maximize the program's impact. These include limited access to professional development, particularly for teachers in remote areas, lack of school-level support for implementing new practices, and inadequate resources in some schools.[11-15]

While this study reveals significant improvements in teacher competencies and teaching practices among certified teachers, the impact on student learning outcomes, as reflected in Mathematics and Science scores, appears to be modest. This finding, though initially unexpected, underscores the intricate and multifaceted nature of student achievement, which is influenced by a complex interplay of factors extending beyond teacher quality alone. It is crucial to delve deeper into this observation, exploring the potential reasons behind this modest impact and identifying areas where further interventions and support might be necessary to amplify the program's effects on student learning. One potential explanation for the modest impact on student learning outcomes lies in the possible disconnect between acquiring knowledge and skills and effectively applying them in the classroom. While the Teacher Certification Program equips teachers with enhanced pedagogical and subject matter knowledge, it may not be sufficiently bridging the gap between theory and practice. Teachers may require more explicit guidance and support in translating their newfound knowledge into effective classroom strategies. Incorporating more hands-on activities, simulations, and case studies that allow teachers to practice applying new techniques in realistic classroom scenarios. Providing opportunities for certified teachers to receive individualized guidance and feedback from experienced mentors or coaches who can help them refine their skills and address challenges in implementation. Encouraging teachers to engage in action research projects that allow them to systematically investigate the effectiveness of different strategies in their own classrooms and make data-driven adjustments to their teaching practices. By strengthening the link between knowledge acquisition and practical application, the program can better equip teachers to translate their enhanced competencies into tangible improvements in student learning. The initial gains in teacher competencies and teaching practices achieved through the certification program may not be sustained without ongoing professional development opportunities. The field of education is constantly evolving, with new research findings, pedagogical approaches, and technological tools emerging regularly. Continuous professional development is essential for teachers to stay abreast of these advancements, refine their skills, and address emerging challenges in the classroom. Without ongoing support and development, the initial enthusiasm and motivation generated by the certification program may wane, and teachers may revert to old habits or struggle to adapt to the changing needs of students. Reinforcing and updating their

knowledge and skills in pedagogy, subject matter, and classroom management. Exposing them to new ideas, innovative practices, and diverse perspectives through conferences, seminars, and professional learning communities. Allowing them to pursue specialized training in areas of interest or need, such as differentiated instruction, technology integration, or inclusive education. By investing in continuous professional development for certified teachers, the program can ensure that the initial gains in teacher quality are sustained and translated into long-term improvements in student learning outcomes. The study identified inadequate school-level support as a potential barrier to the effective implementation of new teaching practices. Teachers may face challenges in implementing active learning strategies and student-centered approaches if their schools lack the necessary resources, infrastructure, or a supportive school culture. Ensuring that schools have the necessary infrastructure, learning materials, and technology to support modern teaching practices. This may involve upgrading classrooms, providing access to computers and internet connectivity, and investing in high-quality textbooks and teaching resources. Encouraging collaboration and knowledge sharing among teachers through professional learning communities, peer observation, and mentoring programs. This can create a supportive environment where teachers feel comfortable taking risks, trying new approaches, and learning from each other. Providing school leaders with the training and resources they need to effectively support teachers in implementing new practices. This may involve providing leadership development programs that focus on instructional leadership, data-driven decision-making, and creating a positive school climate. By creating a supportive school environment where teachers feel valued, supported, and empowered to innovate, the program can enhance the likelihood that the improved competencies and teaching practices will translate into tangible improvements in student learning outcomes. It is crucial to acknowledge that student learning outcomes are influenced by a complex interplay of factors extending beyond teacher quality alone. Student background, socioeconomic status, family support, and community context all play a significant role in shaping student achievement. While this study controlled for some of these factors in the quantitative analysis, it is impossible to account for all potential confounding variables. Furthermore, the study focused primarily on student learning outcomes in Mathematics and Science. It is possible that the program has a greater impact on other subjects or domains of learning, such as language arts, social studies, or creative thinking skills. Future research could explore the program's effects on a wider range of student outcomes to gain a more comprehensive understanding of its impact.[16-20]

## 5. Conclusion

This study investigated the effectiveness of the Teacher Certification Program in Jambi Province, Indonesia, employing a mixed-methods approach to examine its impact on teacher competencies, teaching practices, and student learning outcomes. The findings reveal a nuanced picture, highlighting both the program's successes and areas that require further attention. The program effectively enhances teacher competencies, with certified teachers demonstrating significantly higher levels of pedagogical knowledge, subject matter knowledge, and classroom management skills compared to their non-certified counterparts. Furthermore, the program promotes a shift towards more student-centered and engaging teaching practices, with certified teachers more likely to employ active learning strategies, integrate technology into their lessons, differentiate instruction, and foster a student-centered classroom environment. However, the impact on student learning outcomes, as measured by Mathematics and Science scores, is relatively modest. This highlights the complex interplay of factors that influence student achievement and underscores the need for further interventions to maximize the program's impact. To enhance the program's effectiveness, it is recommended to strengthen the focus on practical application, provide ongoing professional development opportunities, and enhance school-level support for effective teaching practices. By addressing these areas, policymakers can ensure that the Teacher Certification Program

contributes to the development of a high-quality teaching workforce and improved educational outcomes for all students in Indonesia.

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