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Building a Research Ecosystem in Islamic Education: Principal Strategies for Enhancing Student Innovation Competencies

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ABSTRACT

The Society 5.0 era requires educational institutions to develop students' critical thinking, creativity, collaboration, and research competencies. However, studies examining how madrasah principals foster student research and innovation remain limited, particularly within Islamic secondary school contexts. This study investigates the strategies employed by the principal of MTsN 7 Lima Puluh Kota, an Islamic junior secondary school in Indonesia, to enhance student achievement in research and innovation competencies. A qualitative case study design was employed. Data were collected through in-depth interviews, observations, and document analysis involving the principal, two research supervisors, and one student actively participating in research and innovation activities (n = 4). Data were analyzed using the interactive model of Miles, Huberman, and Saldaña, consisting of data condensation, data display, and conclusion drawing. The findings indicate that the principal implemented six interconnected strategies: systematic research program planning, strengthening the SPEKTRA extracurricular research program, mentoring teachers and students, providing supporting facilities and infrastructure, fostering motivation and recognition systems, and establishing partnerships with external institutions. These strategies collectively contributed to students' achievements in national research competitions, including a bronze medal in 2024 and silver and bronze medals in the Indonesian Student Research and Innovation Competition (KREASI) in 2025. The study demonstrates that transformational leadership plays a significant role in building a sustainable research culture and innovation ecosystem within madrasah education. The findings contribute to the limited body of literature on research competency development in Islamic schools and provide practical insights for educational leaders seeking to cultivate innovation-oriented learning environments.

Keywords: Islamic school leadership, research and innovation competencies, research culture development, student research achievement, transformational leadership

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INTRODUCTION

The transformation of education in the 21st century has presented new challenges for educational institutions in producing human resources capable of adapting to the rapid advancement of science, technology, and social change. Critical thinking, creativity, communication, collaboration, digital literacy, as well as research and innovation competencies have become essential skills for navigating the era of globalization and Society 5.0 (Trilling & Fadel, 2009; Lase, 2019). In this context, educational institutions are required not only to focus on academic achievement but also to foster students' abilities to generate ideas and innovations that contribute positively to society.

The concept of Society 5.0, introduced by the Japanese government, places humans at the center of technology-based innovation. Education plays a strategic role in preparing future generations who can utilize technology to solve various life problems creatively and innovatively (Fukuyama, 2018). Therefore, schools and madrasahs need to develop learning systems that encourage students' research, problem-solving, and innovation skills from an early stage.

As Islamic educational institutions, madrasahs are responsible not only for developing students' academic excellence but also for nurturing their character, religiosity, and global competitiveness. Achieving these objectives requires visionary and transformational leadership from madrasah principals in managing all educational resources effectively (Wahjosumidjo, 2018). Madrasah principals occupy a strategic position as agents of change who direct educational organizations toward an innovative learning culture and continuous quality improvement (Mulyasa, 2022).

Transformational leadership has emerged as a relevant approach to addressing the challenges of modern education. Transformational leaders are capable of inspiring organizational members, fostering collective commitment, and creating an environment that supports positive change (Avolio & Yammarino, 2013). Within the madrasah context, transformational leadership can be manifested through the development of a research culture, enhancement of teacher competencies, strengthening of student development programs, and provision of facilities that support educational innovation.

Previous studies have demonstrated that school leadership plays a crucial role in improving educational quality and student achievement. Nikma et al. (2023) found that madrasah leadership strategies in the Society 5.0 era contributed to increasing students' added value through various innovative programs. Similarly, Syafitri et al. (2024) reported that transformational leadership among madrasah principals enhanced students' learning motivation and academic performance by creating a conducive learning environment. Furthermore, Nurfhadila et al. (2023) revealed that flagship programs designed by madrasah principals significantly influenced students' academic achievement. However, most of these studies have primarily focused on general academic performance and have not specifically examined how madrasah principals develop students' research and innovation competencies. Consequently, there remains a limited understanding of leadership strategies employed by madrasah principals in fostering a sustainable research culture and innovation ecosystem, particularly at the junior secondary madrasah level.

This research gap warrants further investigation because research and innovation competencies are essential skills required for students to face the challenges of the 21st century and the Society 5.0 era. Students are expected not only to master academic knowledge but also to develop critical thinking skills, identify problems, conduct research, generate innovative solutions, and communicate research findings effectively.

Therefore, understanding how madrasah principals cultivate these competencies is crucial for improving educational quality and enhancing students' future competitiveness.

This study seeks to address this gap by focusing on the leadership strategies employed by madrasah principals in developing students' research and innovation competencies. The novelty of this study lies in its examination of how a madrasah principal establishes a sustainable research culture through the SPEKTRA extracurricular program at MTsN 7 Lima Puluh Kota. Unlike previous studies that have predominantly emphasized students' academic outcomes, this study focuses on the processes, mechanisms, and leadership practices that contribute to students' success in national-level research competitions. Therefore, this study is expected to contribute theoretically to the development of transformational leadership and research culture studies within madrasah settings, while also providing practical insights for madrasah principals in developing sustainable student research and innovation programs.

MTsN 7 Lima Puluh Kota was selected as the research site because it has successfully developed a structured and sustainable student research program. This success is evidenced by students' achievements in the Indonesian Student Research and Innovation Competition (Kompetisi Riset dan Inovasi Siswa Indonesia/KREASI), including a national bronze medal in 2024 and silver and bronze medals in 2025. These achievements indicate the effectiveness of the madrasah principal in establishing a productive research ecosystem oriented toward the development of students' competencies. Based on this background, the study aims to answer the following questions: What strategies are employed by the principal of MTsN 7 Lima Puluh Kota to enhance students' achievements in research and innovation competencies? How are these strategies implemented within the madrasah context? And what outcomes result from the implementation of these leadership strategies in developing students' research and innovation competencies?

RESEARCH METHODE

This study employed a qualitative approach using a case study design. The qualitative approach was selected because the study aimed to gain an in-depth understanding of the strategies employed by the madrasah principal to improve students' achievement in research and innovation competencies based on real conditions in the field. According to Creswell and Creswell (2018), qualitative research is used to explore and understand the meanings that individuals or groups assign to social phenomena. Meanwhile, Yin (2018) argues that a case study is an appropriate research strategy for investigating a phenomenon in depth within its real-life context, particularly when the boundaries between the phenomenon and its context are not clearly evident.

This study adopted Yin's (2018) case study tradition using a single-case study design, as MTsN 7 Lima Puluh Kota was considered a unique and relevant case in developing students' research and innovation competencies through the SPEKTRA extracurricular program, which has produced achievements at the national level. The single-case design was chosen to obtain a deeper understanding of the processes, practices, and leadership strategies implemented within the madrasah context rather than to compare multiple cases. The scope of the case was limited to the principal's strategies for fostering a research and innovation culture among students during the implementation of research programs at MTsN 7 Lima Puluh Kota in the 2025/2026 academic year. Therefore, the unit of analysis in this study was the leadership strategies employed by the madrasah principal in developing students' research and innovation competencies.

The study was conducted at MTsN 7 Lima Puluh Kota during the second semester of the 2025/2026 academic year. The site was selected because the madrasah has a flagship program in student research and innovation through the SPEKTRA extracurricular activity and has achieved success in the national Indonesian Student Research and Innovation Competition (KREASI).

Research participants were selected using purposive sampling. This technique was employed because participants were chosen based on specific considerations relevant to the research objectives and possessed direct knowledge and experience related to the development of students' research and innovation competencies in the madrasah (Sugiyono, 2022). The participants consisted of one female madrasah principal holding a master's degree (M.Ed. equivalent) who served as the policymaker and coordinator of the madrasah research program, two research and innovation mentors holding bachelor's degrees who were directly involved in guiding student research activities, and one ninth-grade student who actively participated in the research and innovation program and had experience in research competitions.

The selection criteria were based on the participants' direct involvement in the planning, implementation, supervision, and participation in research and innovation programs at MTsN 7 Lima Puluh Kota. The relatively small number of participants was considered adequate because this study employed a case study design that emphasizes information-rich cases rather than population representation. The purpose was not statistical generalization but rather obtaining an in-depth understanding of the principal's leadership strategies in fostering a culture of research and innovation among students. Although the study did not include parents, the madrasah committee, or additional student representatives, the data obtained from the four participants were considered sufficient to provide relevant and comprehensive information aligned with the research focus.

Data were collected through observation, in-depth interviews, and documentation. The fieldwork was conducted on May 19, 2026, at MTsN 7 Lima Puluh Kota. The researcher acted as the primary research instrument and was directly involved in the processes of data collection, processing, and interpretation. Observations focused on the implementation of student research and innovation programs, particularly SPEKTRA extracurricular activities, interactions among the principal, mentor teachers, and students, as well as various forms of support provided by the madrasah in fostering a research culture. Observations were conducted during research mentoring activities to obtain a realistic understanding of program implementation.

In-depth interviews were conducted with all participants, including the principal, two research mentor teachers, and one student. Each participant was interviewed in a single session lasting approximately 60 minutes. Interviews were conducted in Indonesian to enable participants to express their experiences and perspectives more clearly and naturally. The interviews were semi-structured and guided by questions focusing on the principal's strategies for developing a culture of research and innovation, the implementation of research programs, support provided to teachers and students, challenges encountered, and the impact of the program on student achievement. Sample interview questions included: "How does the principal plan student research and innovation programs?", "What forms of support are provided to teachers and students in research activities?", and "How has the research program affected student achievement in the madrasah?"

Documentation was utilized to obtain supporting data, including photographs of activities, program plans, activity reports, achievement certificates, competition archives,

and other documents related to the development of students' research and innovation competencies. Data obtained through observation, interviews, and documentation were subsequently compared and verified to develop a comprehensive understanding of the principal's strategies for fostering a culture of research and innovation at MTsN 7 Lima Puluh Kota.

Data were analyzed using the interactive model proposed by Miles, Huberman, and Saldaña (2014), which consists of three stages: data reduction, data display, and conclusion drawing. The analysis was conducted continuously from the beginning of data collection until the completion of the study. During the data reduction stage, interview recordings were transcribed and manually coded by identifying keywords, concepts, and significant information relevant to the research focus. Coding was conducted through three stages: open coding to identify initial categories, axial coding to establish relationships among related categories, and selective coding to generate overarching themes explaining the principal's strategies for developing students' research and innovation competencies. Research themes emerged through repeated comparison and categorization of data from interviews, observations, and documentation until consistent patterns and relationships were identified. Data analysis was conducted manually without qualitative analysis software because the volume of data and number of participants were manageable for in-depth analysis by the researcher.

During the data display stage, coded data and emerging themes were organized into descriptive narratives supported by observational and documentary evidence. Conclusions were drawn through interpretation of patterns emerging across multiple data sources. When discrepancies or contradictory information were identified among participants, the researcher revisited field data by comparing interview findings, observational records, and relevant documents to gain a more accurate understanding of the phenomenon under investigation.

The trustworthiness of the data was ensured through source triangulation, methodological triangulation, and time triangulation to enhance the validity and credibility of the findings. In addition, the researcher conducted repeated checks of data interpretations to minimize potential bias throughout the analytical process.

RESULT AND DISCUSSION

Strategic Planning for Research and Innovation Programs

The findings revealed that the madrasah principal demonstrated a strong commitment to fostering a culture of research and innovation through systematic program planning. The research program was designed based on the madrasah's vision, which emphasizes academic excellence and students' competitiveness. Planning activities included the development of annual work programs, identification of students' interests and talents, and the establishment of achievement targets to be attained each year. The principal explained:

"The research program is not implemented spontaneously. At the beginning of each academic year, we identify students who have an interest in research, then develop mentoring programs and determine the competitions that will be targeted." (P1)

This statement was supported by a research mentor teacher who stated:

“We receive clear guidance from the principal regarding mentoring targets and schedules for student research activities, allowing the mentoring process to be carried out more effectively.” (G1)

These findings indicate that the principal effectively performed managerial functions through a well-structured planning process. According to Mulyasa (2022), a school’s success in achieving educational goals is strongly influenced by the principal’s ability to design programs that align with students’ needs and developments in the educational environment. From the perspective of transformational leadership, this strategy reflects the dimension of *inspirational motivation*, namely the leader’s ability to establish a clear vision and inspire all school members to achieve shared goals. This finding extends the work of Syafitri et al. (2024), which primarily focused on academic achievement, by demonstrating that transformational leadership also contributes to the development of students’ research and innovation competencies.

Strengthening SPEKTRA as a Platform for Research Competency Development

One of the principal strategies implemented by the madrasah principal was the strengthening of the SPEKTRA extracurricular program as the center for student research and innovation development. The program was systematically organized through activities such as research methodology training, proposal writing, field observations, experimentation, seminars, and competition mentoring. One mentor teacher explained:

“Through SPEKTRA, students learn how to identify research problems, develop proposals, collect data, and present research findings in various competitions.” (G2)

Similarly, a student participant stated:

“Through SPEKTRA, I learned how to conduct research, collect data, and confidently present research findings.” (S1)

These findings indicate that SPEKTRA functions not only as an extracurricular activity but also as a mechanism for cultivating a sustainable research culture. The program provides opportunities for students to develop critical thinking, creativity, scientific communication, and problem-solving skills. These findings are consistent with Trilling and Fadel (2009), who argue that twenty-first-century skills are developed through active, collaborative, and problem-based learning experiences. From a transformational leadership perspective, the strengthening of SPEKTRA reflects the dimension of *intellectual stimulation*, as students are encouraged to think critically, explore new ideas, and generate innovations through research activities.

Teacher and Student Development in Building a Research Culture

The findings further revealed that the principal focused not only on student development but also on strengthening the competencies of mentor teachers. Teachers were encouraged to participate in training programs, seminars, research workshops, and various professional development activities. One mentor teacher stated:

“We are given opportunities to participate in research training and seminars, which enhance our ability to guide students.” (G1)

The principal further emphasized:

“The success of the research program depends not only on students but also on the competencies of the teachers who mentor them.” (P1)

In addition to teacher development, students received intensive guidance from the stages of idea generation through research implementation and participation in competitions. This strategy demonstrates the principal’s understanding of the importance of human resource development as a key factor in educational success. These findings support Hallinger (2020), who emphasizes that educational quality improvement is highly influenced by leaders’ ability to empower teachers as agents of change. Within transformational leadership theory, this strategy reflects the dimension of *individualized consideration*, which refers to leaders’ attention to the developmental needs of individuals within the organization.

Provision of Supporting Facilities and Infrastructure

The success of the research and innovation program was also supported by the availability of various facilities and infrastructure. Observational findings indicated that the madrasah provided internet access, computer facilities, mentoring rooms, and other resources necessary for conducting research. The principal explained:

“We strive to provide the facilities needed by students to conduct research, although some limitations still exist.” (P1)

Interestingly, interview results revealed that budget constraints remained a challenge in the development of research programs. Nevertheless, these limitations did not hinder program implementation, as the madrasah sought to optimize available resources and establish partnerships with external stakeholders. These findings suggest that the success of a research culture is determined not only by the availability of facilities but also by leaders’ ability to manage resources effectively. This finding enriches previous studies that primarily emphasized infrastructure by demonstrating that adaptive leadership can be a determining factor in the success of research programs.

Providing Motivation and Recognition for Student Achievement

The findings showed that the principal consistently motivated students and mentor teachers through guidance, encouragement, and recognition of their achievements. Forms of recognition included academic awards, certificates, and the publication of student achievements through various madrasah media channels. One student explained:

“When we achieve something, we receive recognition and our accomplishments are announced during madrasah activities. This motivates us to participate in future competitions.” (S1)

These findings are consistent with the transformational leadership theory proposed by Avolio and Yammarino (2013), which suggests that transformational leaders inspire organizational members to achieve higher levels of performance through motivation and recognition. This strategy demonstrates how motivation and appreciation serve as important instruments in cultivating a culture of achievement within the madrasah.

Collaboration with External Stakeholders

Another strategy employed by the principal was establishing partnerships with universities, research institutions, professional experts, and other educational organizations. A mentor teacher explained:

“Through collaboration with various institutions, students gain broader learning experiences and receive direct input from experts.” (G2)

Such collaborations provided students with opportunities to gain deeper research experience and greater access to academic resources. These findings support Rahman (2023), who found that external collaboration contributes to improving the quality of student research programs. However, the present study further demonstrates that external partnerships not only enhance research quality but also strengthen the sustainability of the research culture within the madrasah.

The Impact of the Principal’s Strategies on Student Achievement

The implementation of these various strategies had a positive impact on student achievement. This was evidenced by the success of MTsN 7 Lima Puluh Kota students in winning a national bronze medal in 2024, as well as silver and bronze medals in the Indonesian Student Research and Innovation Competition (KREASI) in 2025. These achievements indicate that a systematically developed research culture can enhance students’ critical thinking, creativity, innovation, and competitiveness.

Overall, the findings demonstrate that the successful development of students’ research and innovation competencies is not determined by a single strategy but rather by the integration of multiple transformational leadership strategies that mutually reinforce one another. The dimension of *inspirational motivation* was reflected in the formulation of the vision, achievement targets, and recognition provided to students and teachers. The dimension of *individualized consideration* was evident in the continuous mentoring and support provided to teachers and students, while the dimension of *intellectual stimulation* was manifested through the strengthening of the SPEKTRA program, which encouraged students to think critically and produce innovative ideas.

This study contributes theoretically by extending the application of transformational leadership theory to the context of research culture development in madrasahs. Furthermore, the findings demonstrate that a sustainable research culture can flourish despite resource limitations, provided that it is supported by leadership that is visionary, collaborative, and innovation-oriented.

CONCLUSION

This study examined the strategies employed by the principal of MTsN 7 Lima Puluh Kota in improving students’ achievement in research and innovation competencies. The findings reveal that the principal implemented six integrated strategies, namely systematic program planning, strengthening the research program through the SPEKTRA extracurricular activity, capacity building for teachers and students, provision of

supporting facilities and infrastructure, motivation and recognition of student achievements, and the development of collaboration with various external institutions. The implementation of these six strategies successfully fostered a sustainable research culture within the madrasah and contributed to improving students' achievements in various national-level research competitions, including the attainment of medals in the Indonesian Student Research and Innovation Competition (KREASI) in 2024 and 2025.

Theoretically, this study contributes to the development of educational leadership theory, particularly transformational leadership. The findings indicate that the *intellectual stimulation* dimension is manifested through the strengthening of research programs that encourage students to think critically, creatively, and innovatively, while the *individualized consideration* dimension is reflected in continuous mentoring and guidance provided to both teachers and students. In addition, this study expands the understanding of how madrasah principals' leadership can be translated into students' research competencies through the development of an organizational culture that supports research, innovation, and achievement. The findings also enrich the literature on school culture formation by demonstrating that a research culture develops through the synergy of formal programs, intensive mentoring, reward systems, and collaboration with various stakeholders.

Practically, the results of this study provide several important implications for madrasah principals and educational policymakers. First, the development of students' research competencies should be systematically designed and sustainably implemented through programs that are integrated with the vision and objectives of the madrasah. Second, improving the competencies of mentor teachers should be a priority, as the quality of teacher mentoring directly influences students' success in research activities. Third, motivation and recognition should be consistently provided to increase student participation and commitment. Fourth, partnerships with universities, research institutions, and external organizations should be strengthened to broaden students' access to resources and research experiences. Fifth, student research outputs and achievements should be widely disseminated to enhance the madrasah's academic reputation and increase support from various stakeholders.

However, this study has several limitations. It was conducted in only one madrasah with a limited number of participants; therefore, the findings cannot be generalized to all madrasahs in Indonesia. In addition, this study did not include perspectives from parents, the madrasah committee, or other stakeholders, who may provide more diverse insights into the development of research culture in schools.

Based on these limitations, future research is recommended to involve a larger number of participants and multiple stakeholder groups, as well as to employ a multiple case study design or a mixed-methods approach to gain a more comprehensive understanding of the factors influencing the success of students' research and innovation competencies. Future studies may also compare the leadership practices of madrasah principals across different educational levels and regions in order to develop a more comprehensive and applicable model of research culture development.

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