Striving for Excellence: Enhancing Madrasah Quality through Analysis of Science Competition Questions and ICT-Driven Learning Transformation

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Abstract: This article focuses on a community service program designed to enhance the quality of madrasah education in the Malang Regency and City regions, East Java, Indonesia. The program encompasses various aspects, such as integrating Islamic values into Science Competition Questions (KSM IPA), utilizing virtual laboratories in science and mathematics learning, and implementing Information and Computer Technology (ICT) in teaching. Educational challenges have grown complex in an era marked by globalization and technological advancements. The program aims to improve critical thinking skills and student competitiveness by integrating Islamic values into science education. The article discusses the program's objectives, methods employing the Asset-Based Community Development (ABCD) approach, coordination, training, and post-mentoring evaluation. The positive participant response and measurable impact reflect the relevance of enhancing teacher competence and technology integration. This initiative aligns with the region's efforts to provide quality education and foster student development.

Introduction

Education plays a central role in shaping morally upright and knowledgeable young generations[1]. In Islamic education, madrasahs play a crucial role in providing quality education, encompassing not only religious aspects but also the development of general knowledge and skills. Malang Regency and Malang City in East Java are regions

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[1] Jason Reece, Mildred E. Warner, and Xue Zhang, "Broadening the Paradigm: Community Development, Schools and the Dimensions of Power," *https://doi.org/10.1080/15575330.2023.2217881* 54, no. 4 (2023): 468–478, accessed August 28, 2023, https://www.tandfonline.com/doi/abs/10.1080/15575330.2023.2217881.; M. Zulkifli, "The Existence of Provincial Accreditation Board for School/Madrasah (BAP S/M) in Improving Madrasah Education Quality in Southeast Sulawesi," International Journal of Applied Engineering Research (2016).

striving to enhance the quality of education, including within madrasahs. In alignment with these goals, the program "Guidance for Improving Management, Curriculum Development, and Technology-Based Madrasah Learning" was initiated as part of the community service program in 2023, with a specific focus on enhancing the quality of madrasahs through activities such as the Analysis of Science Competition Questions in Natural Sciences (IPA), the Utilization of Virtual Laboratories in Science and Mathematics Learning, and the Implementation of ICT in Madrasah Teaching for teachers in the Malang Regency and City regions, to elevate the quality of madrasah education.

In facing the era of globalization marked by rapid technological advancements, education confronts increasingly complex challenges. Amidst these dynamics, efforts to enhance the quality of education have become even more urgent. In the context of the program "Enhancing Madrasah Quality through KSM IPA Question Analysis," the "KSM IPA Question Analysis" activity holds a particularly relevant objective. It aims to comprehend scientific materials and cultivate students' competitiveness in the global arena. Success in adapting to changing times is also contingent upon students' capacity for critical thinking in response to challenges. Critical thinking involves the ability to analyze based on logical reasoning. Students with critical thinking skills do not readily accept or reject information; they scrutinize, analyze, and evaluate before determining whether to accept or reject information[2]. Critical thinking involves constructing concise and in-depth explanations, devising strategies to address problems, drawing conclusions, and evaluating situations astutely. It reflects logical and reflective thought, aiming to make appropriate decisions regarding what to believe or do[3].

Educational quality is also closely tied to the competencies of madrasah teachers. The competencies of teachers significantly influence educational quality. Proficiency in utilizing information and communication technology (ICT) in teaching is crucial for teachers to deliver more interactive and relevant content. The advancement of information and communication technology (ICT) has facilitated the conduct of teaching and learning processes. The rapid dynamics of ICT development necessitate adaptation to avoid falling behind. The utilization of ICT also yields positive impacts on achieving general learning objectives[4]. Utilizing virtual laboratories in science and mathematics will positively change students' comprehension of complex concepts. More specifically, the effectiveness of virtual laboratories in enhancing students' learning experiences can be realized through the utilization of the PhET application, which serves as an engaging

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[2] Evi Susanti, Mohammad Taufiq, and Muhammad Thamrin Hidayat, "Kemampuan Berpikir Kritis Siswa SDN Margorejo VI Surabaya Melalui Model Jigsaw," *Bioedusiana: Jurnal Pendidikan Biologi* 4, no. 1 (July 22, 2019): 55–64.

[3] Alec Fisher, *Critical Thinking : An Introduction* (Cambridge University Press, 2011).

[4] Ema Martiana, "Penggunaan ICT Dalam Pembelajaran," in *Social, Humanities, and Educational Studies (SHES): Conference Series*, vol. 3, 2020, 1579–1583, accessed August 22, 2023, https://jurnal.uns.ac.id/SHES/article/view/56976.

tool in the learning process, particularly in the context of science subjects[5].

Based on the brief explanation, this implemented program is designed to provide training and enhance competencies for madrasah teachers in the Malang Regency and City regions. Through this program, madrasahs can become centers of quality education, producing morally upright students with solid academic competencies capable of facing future challenges. The synergy between madrasahs, teachers, and the academic community is anticipated to bring about tangible changes in education within this region. Through innovation and technological integration, the young generation emerging from madrasahs in Malang Regency and City will become a positive force in society, contributing significantly to the nation's development.

This engagement aims to significantly enhance the quality of education in madrasahs within the Malang Regency and City regions by enhancing madrasah teacher competencies and utilizing information and communication technology (ICT) in teaching and learning. Through an effective training program, teachers empower themselves to enhance their mastery of Science Competition Questions (KSM IPA), which holds the potential to support students' achievements in science. Furthermore, enhancing teachers' competencies in ICT utilization can improve the learning process in a more interactive and relevant manner. The positive responses from participants and the measurable positive impact of this program illustrate the relevance and benefits of enhancing teacher competencies and integrating technology with education. Evaluations conducted on activities involving the analysis of KSM question characteristics, training on virtual laboratory utilization, and using ICT will provide valuable guidance for improvements and the program's future development.

Methods

This program employs the ABCD (Asset-Based Community Development) method. ABCD is an approach to community development that emphasizes understanding the context and independently and maximally identifying and utilizing assets, potentials, strengths, and benefits[6]. To ascertain the community's capabilities along with its potential and assets, efforts for community development must be initiated early. The aim is to foster a community-driven involvement where individuals take the initiative in all improvement endeavors[7]. This method serves as a guiding approach in mentoring,

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[5] Chyntia Clarinda et al., "Efektivitas Penggunaan Virtual Laboratory Terhadap Peningkatan Hasil Belajar Siswa SMA Di Era New Normal," *EduMatSains : Jurnal Pendidikan, Matematika dan Sains* 6, no. 2 (January 31, 2022): 257–266.

[6] Sri Lestari and Gandes Nawangsari, "Pelatihan Menulis Esai Bagi Guru-Guru Amal Usaha Muhammadiyah Di Kecamatan Gatak," *Jurnal Pengabdian Masyarakat Indonesia* 3, no. 4 (August 5, 2023): 491–495.

[7] Moh Hafiyusholeh et al., "Pendampingan Guru Madrasah Untuk Mewujudkan Kompetensi Pedagogik Guru Matematika Yang Berdaya Melalui Penguasaan Soal High Order Thinking Skills (HOTS),"

grounded in the local assets of a given area. These assets are developed to effectively address local challenges during the empowerment process[8]. Here, the community (teachers) has the potential to become agents of change, utilizing their initiatives and creativity, thereby discovering the essence of empowerment and sustainability.

The program carried out three stages[9]. First, the pre-assistance stage, namely conducting observations, interviews, and coordination with madrasas and madrasa teachers in the Malang Regency and Malang City areas. Based on observations, it was found that many science teachers still need to integrate Islam into practice questions and that the use of ICT has not been maximized in learning. At this early stage, it was explained to them that the service team intended to assist in making science questions integrated with Islam so that students would be more familiar with KSM questions. As well as providing an overview of the use of ICT in learning activities to make it more effective. Second, the mentoring stage, namely, the service team conducts training for madrasa teachers regarding creating evaluation questions that are integrated with Islam and ICT-based learning. Third, the post-mentoring stage, namely evaluation and reflection, can be used as material for research on the condition of the research subject after the action. The evaluation was conducted using a satisfaction questionnaire for the mentoring activities. Questionnaires were given to participants with several indicators, as shown in Table 1. Each participant gives a score from 1 to 5.

Table 1. Community Service Activity Evaluation Questionnaire

Code	Community Service Satisfaction Indicator
P1	The suitability of the material with the theme of community service activities
P2	Appropriateness of delivery time of service activity material
P3	The level of speakers in mastering the material and problems
P4	The Level of facilities and infrastructure supporting community service activities
P5	The Level of subject participation in community service activities
P6	The level of cohesiveness of the service program implementation team
P7	The level of relevance and competence of the service program implementation team
P8	The service program can increase the quality, quantity, and added value of resources
P9	The service program can increase the level of independence
P10	Conformity of service activities with community expectations

Result

Coordination and Planning of Activities

The activity was carried out twice. Namely, the first target activity was for Madrasas in the Malang Regency area, and the second was aimed at Madrasas in the Malang City area. Initial coordination was carried out with the Madrasah Working Group (KKM) throughout Greater Malang. The activities offered include training in analyzing and preparing KSM questions based on High Order Thinking Skills (HOTS), which are integrated with Islamic values. As well as training activities on using ICT in education so that learning activities run effectively.

Analyzing Characteristics of KSM Questions

Most KSM questions are HOTS-based science questions where each question is integrated with Islamic values. The first speaker discussed the importance of integration between science and Islamic values in the KSM. The speaker explained in detail how the process of forming KSM questions was directed carefully, considering aspects from the Qur'an. It is emphasized how these questions are a window to explore the concept and application of Islamic values such as zakat, falak, and other relevant issues.

The speaker also highlighted the vital goal of assisting students in carrying out a holistic analysis of Islamic concepts and knowledge in science. Another critical point is the inclusiveness of the questions, which are arranged in three languages, namely Indonesian, Arabic, and English. In addition to questions that are purely related to science, madrasah students are encouraged to be able to compete on an equal footing with science olympiad participants from outside the madrasah. Activities about analyzing KSM questions characteristics can be seen in Figure 1.

Application of ICT in Learning

The second speaker described how Artificial Intelligence (AI) has tremendous potential in advancing education in madrasas. The explanation describes the capabilities of AI in increasing efficiency, accuracy, and personalized learning according to student needs. The belief that AI can create engaging and effective learning experiences for students is conveyed by it, opening new opportunities in technology-enabled teaching techniques. The presentation of the material was also supplemented by simple practices using AI in learning activities. In the follow-up session, the speaker also explained and demonstrated clearly and technically about using a PhET Simulation website or virtual laboratory learning as well as ICT-based media. ICT application in learning activities can be seen in Figure 3.

Figure 1. Analyzing KSM Questions Characteristics Activity

Figure 2. ICT application in learning activities

Activity Evaluation Results

From the madrasah data in Malang Regency and Malang City, 23 madrasas sent their representatives to participate in this activity, totaling 56 teachers. Madrasah representatives who took part in the activity are shown in Table 4.

The results of the activity evaluation, in general, showed a very significant level of satisfaction. Participants felt that the service material with the theme of the service activity had significant compatibility, the delivery time for the material was right, and under the service activities, the speakers had a good mastery of the material, the facilities, and the infrastructure supporting the program, the participation of the service participants is very responsive, the cohesiveness of the service team is very good, the service implementing team is relevant, the service program can increase the quality, quantity, and added value of human resources/madrasah teachers, can increase the level of independence, and meets the expectations of the teachers. In general, the participants were delighted with this activity. The average assessment of activity indicators from Table 1 is shown in Figure 3.
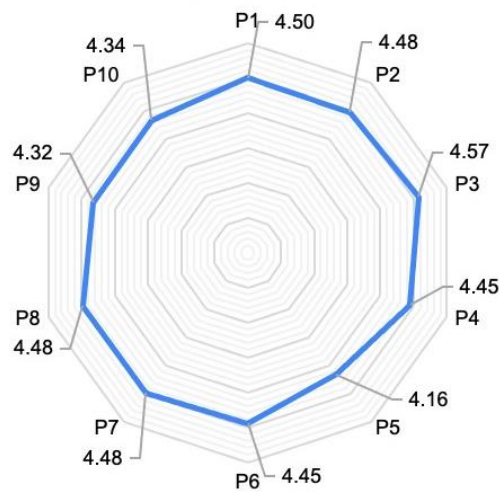
Figure 3. Average Assessment of Activity Indicators

Discussion

The first significant outcome of this community service program is the substantial impact on educational quality of the madrasahs within the Malang Regency and City. This finding aligns with existing study emphasizing the crucial role of teacher competence and technology integration in enhancing educational quality. Studies such as those by Hadijah and Shalawati (2017)[10] have highlighted that teachers' proficiency in utilizing ICT positively correlates with improved educational outcomes. The theoretical perspective here underscores the importance of pedagogical competence and technology integration in madrasah educational settings.

The program's focus on enhancing teacher competencies, specifically in crafting and comprehending KSM science questions, holds promise for boosting student achievements in science. This aligns with the theoretical framework proposed by Russel et al. (1986)[11], emphasizing the vital role of teacher expertise in curriculum development. Moreover, research by Fauth et al. (2019)[12] stresses that teachers' deep understanding

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[10] Sitti Hadijah and Shalawati Shalawati, "Investigating Teachers' Barriers to ICT (Information Communication Technology) Integration in Teaching English at Senior High Schools in Pekanbaru," in *Proceedings of ISELT FBS Universitas Negeri Padang*, vol. 5, 2017, 302–310.; Ema Martiana, "Penggunaan ICT Dalam Pembelajaran," in Social, Humanities, and Educational Studies (SHES): Conference Series, 3:1579–1583, 2020, accessed August 22, 2023, https://jurnal.uns.ac.id/SHES/article/view/56976.

[11] Russell Gersten, John Woodward, and Craig Darch, "Direct Instruction: A Research-Based Approach to Curriculum Design and Teaching," *http://dx.doi.org/10.1177/001440298605300102* 53, no. 1 (September 1, 1986): 17–31.

[12] Benjamin Fauth et al., "The Effects of Teacher Competence on Student Outcomes in Elementary Science Education: The Mediating Role of Teaching Quality," *Teaching and Teacher Education* 86 (November 1, 2019): 10288.; Abdul Kholid Achmad, "Peranan Kelompok Kerja Madrasah (KKM) Sebagai Skoci Peningkatan Mutu Pendidikan Islam," J-MPI (2021).; Azwar Annas, Miftahul Huda, Aidillah Suja, and Muthmainnah Muthmainnah, "Efforts of Islamic Boarding Schools in Enhancing the Quality of Education at MTs Tahfidz Yanbu'ul Qur'an, Menawan, Kudus," Al Hikmah: Journal of Education (2023).; Zulfikar Ali Buto

of subject matter positively impacts student learning outcomes.

The evaluation conducted on various aspects of the program, including KSM item analysis, virtual laboratory training, and ICT utilization, serves as a critical component. This evaluation process draws from the theoretical framework of program assessment and improvement, as emphasized by Milstein and Wetterhall (2000)[13]. It underscores the importance of evaluating the community development program for the future improvement and ensuring positive impacts.

In conclusion, the community service program has not only improved teacher competencies and educational quality but also underlined the importance of continuous teacher development and technology integration in madrasah. The program's outcomes contribute to shaping morally upright and knowledgeable young generations and align with the ongoing efforts to enhance educational quality in the region.

Conclusion

From the discussion described in the previous chapter, the conclusions of this activity are: First, the program to improve the competence of madrasa teachers and the use of information and communication technology (ICT) in learning has significantly impacted the quality of education in madrasas in Malang Regency and City. Second, through a dedicated service program, teachers can increase their mastery of KSM Science questions, which in turn has the potential to support student achievement in science. In addition, increasing teacher competence in using ICT can improve the learning process in a more interactive and relevant way.

Third, the positive response from the participants and the measurable positive impact of this program illustrate that the need to improve teacher competence and the integration of technology in education is very relevant and helpful. The evaluation carried out on the KSM item characteristic analysis activities, training on the use of virtual laboratories, and the utilization of ICT technology will provide valuable guidance for program improvement and development in the future.

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[13] Bobby Milstein and Scott Wetterhall, "A Framework Featuring Steps and Standards for Program Evaluation," *Health Promotion Practice* 1, no. 3 (July 1, 2000): 221–228.

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