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Enhancing Junior High School Teachers 'Capacity in Educational Problem-Solving: An Evaluation of a Design-Based Research Workshop

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A B S T R A C T

This study evaluates the effectiveness of a Design-Based Research (DBR) workshop in enhancing junior high school teachers' capacity to address educational problems. A four-day workshop was attended by 20 teachers from 5 junior high schools in a sample city. Mixed methods were used to analyze workshop outcomes, including pre-post surveys, analysis of mini DBR proposals, semi-structured interviews, and longitudinal follow-ups. Results show significant improvement in teachers' understanding and skills related to DBR. The workshop produced 15 mini DBR proposals ready for implementation. Key challenges included time constraints for data analysis, variation in participants' initial understanding, and concerns about institutional support. A three-month follow-up revealed that 60% participants had initiated DBR projects in their schools. This study highlights the potential of DBR workshops in enhancing research-based practices in schools and recommends strategies for sustainable implementation. The follow-up survey revealed that 60% of participants had initiated DBR projects in their schools within three months of the workshop. The analysis of the DBR implementation revealed several critical factors that contributed to successful outcomes, as well as certain barriers that posed challenges to the implementation process.

1. Introduction

Improving the quality of education at junior high school level is a global priority in efforts to achieve the Sustainable Development Goals (SDGs) in education. This imperative is particularly crucial in developing countries like Indonesia, where educational challenges are compounded by resource constraints and diverse socio-economic contexts (World Bank, 2014). One approach gaining attention in addressing these challenges is Design-Based Research (DBR), which allows educators to systematically design, implement, and evaluate educational interventions in real-world contexts (Barab & Squire, 2004; Plomp, 2007).

DBR provides a viable methodology for educational innovation by bridging the frequently noted gap between educational research and practice (Anderson & Shattuck, 2012). However, despite its potential, there is still a substantial gap between DBR theory and its practice in Indonesian schools. This disparity is largely due to teachers' lack of awareness and skills, as well as inadequate institutional support for research-based approaches (Nugroho et al., 2021). To address this gap, tailored professional development programs must be implemented to provide teachers with the information and skills they need to effectively implement DBR in their individual situations.

This study aims to evaluate the effectiveness of a DBR workshop in enhancing junior high school teachers' capacity to identify, design, and implement research-based solutions to educational problems in their schools. Specifically, this research seeks to answer the following questions:

1. How does the DBR workshop affect junior high school teachers' understanding and skills in applying DBR methodology?
2. What types of educational interventions do teachers design using the DBR approach?
3. What are the main challenges faced in implementing the DBR workshop and how can they be addressed?
4. To what extent do teachers implement DBR projects in their schools following the workshop, and what factors influence successful implementation?

By addressing these questions, this study contributes to the growing body of literature on teacher professional development in DBR, with a specific focus on the junior high school context. The findings have implications for educational policymakers, school administrators, and teacher educators seeking to promote research-based practices in schools.

Literature Review

Research design
Design-based research in education

This study employed a mixed-methods approach, combining quantitative and qualitative Design-Based Research is gaining popularity in the educational literature as a paradigm for bridging the gap between theory and practice (Anderson & Shattuck, 2012). DBR is distinguished by its iterative nature, which includes design, implementation, and analysis cycles, with a focus on creating practical solutions to real-world educational problems (McKenney & Reeves, 2012).The key features of DBR that make it particularly suitable for educational contexts include:

1. It is real educational contexts
2. Its focus on the design and testing of significant interventions
3. The use of mixed methods
4. Multiple iterations
5. Collaborative partnership between researchers and practitioners

6. Evolution of design principles
7. Practical impact on practice (Wang & Hannafin, 2005)

DBR in junior high school contexts

DBR has been employed in junior high schools to address a variety of educational challenges. For example, Wijaya et al. (2019) used DBR to improve digital literacy in Indonesian junior high school pupils by creating a curriculum that combined technology skills with subject-specific content. Hermawan et al. (2021) used DBR principles to create a STEM-focused curriculum for Indonesian junior high schools, indicating the methodology's potential for curriculum innovation
In another study, Prahani et al. (2016) used DBR to create and modify a problem-based learning model for junior high school science students with the goal of increasing critical thinking abilities. These studies demonstrate DBR's versatility in addressing varied educational difficulties at the junior high school level.

Teacher professional development and DBR

Effective teacher professional development is critical for the implementation of any educational innovation, including DBR. Darling-Hammond et al. (2017) identified numerous characteristics of good professional development, including subject focus, active learning, teamwork, effective practice models, coaching and expert support, feedback and reflection, and long-term duration.
However, research on the efficacy of DBR-specific workshops for junior high school teachers remains few, particularly in the Indonesian context. This gap is noteworthy, considering the potential of DBR to enable teachers to be researchers and innovators in their own classrooms.

Challenges in implementing DBR in schools

Despite its potential, the implementation of DBR in Indonesian schools faces several challenges. Nugroho et al. (2021) identified barriers including limited time for research activities, lack of institutional support, and teachers' unfamiliarity with research methodologies. Additionally, the hierarchical nature of the Indonesian education system can sometimes hinder the bottom-up innovation that DBR promotes. Addressing these challenges requires not only enhancing teachers' research skills but also fostering a supportive institutional environment for DBR. This study aims to contribute to this effort by evaluating a targeted DBR workshop and its impact on teachers' practices.

2. Methodology

Research design

This research utilized a mixed-methods approach, integrating quantitative and qualitative studies to assess the efficacy of the DBR workshop. The research approach comprised pre- and post-workshop evaluations, analysis of workshop

outputs, semi-structured interviews, and a three-month follow-up to evaluate the implementation of DBR projects.

Participants

20 junior high school teachers from 5 schools in a sample city, Indonesia, participated in the four-day workshop. Participants were selected based on principals' recommendations and their interest in educational research. The sample included teachers from various subject areas, with teaching experience ranging from 3 to 20 years.

Intervention

The DBR workshop was designed based on principles of effective professional development (Darling-Hammond et al., 2017) and covered four main components:
1. Introduction and fundamentals of DBR (Day 1)
2. Intervention design (Day 2)
3. Implementation and evaluation planning (Day 3)
4. Simulation and follow-up planning (Day 4)

The Design-Based Research (DBR) workshop, conducted over four days, successfully brought together 20 teachers from 5 different secondary schools. The workshop was structured following effective professional development principles based on Darling-Hammond et al.'s research framework. On the first day, participants were introduced to the fundamental concepts and methodology of DBR. They studied the core principles of DBR and examined various case studies successfully implemented in junior high school contexts. Engaging discussions emerged as teachers shared experiences and analyzed success factors from the discussed case studies.

Moving into the second day, the workshop shifted focus to designing learning interventions. Teachers were guided through the process of identifying and analyzing learning challenges in their respective schools. They were equipped with effective literature review techniques. Working collaboratively, participants began designing educational interventions tailored to their school contexts.

The third day of the workshop concentrated on implementation and evaluation planning. Teachers learned various data collection and analysis methods, and discussed ethical aspects of educational research. Each group of teachers developed detailed implementation and evaluation plans for their DBR projects.

On the final day, participants engaged in simulation and follow-up planning. They provided feedback through peer review processes to refine their developed DBR proposals. The DBR implementation simulation offered practical insights into potential challenges. The workshop concluded with the development of post-workshop implementation plans and support mechanisms for teachers during their DBR project execution.

This comprehensive workshop structure ensured that participants gained both theoretical understanding and practical skills necessary for implementing DBR in their educational settings, while building valuable professional connections with colleagues from other schools. The workshop employed a variety of active learning strategies, including group discussions, hands-on activities, and peer feedback sessions.

Data collection

Data were collected through multiple methods:

1. Pre-post surveys: Participants completed surveys before and after the workshop to measure changes in their understanding of DBR and their confidence in implementing DBR
2. Mini DBR proposals: Participants developed mini DBR proposals during the workshop, which were analyzed for content and quality.
3. Semi-structured interviews: participants were interviewed immediately after the workshop to gather in-depth insights into their experiences and perceived challenges.
4. Observations: Workshop facilitators conducted structured observations during sessions to assess participant engagement and understanding.
5. Three-month follow-up survey and interviews: All participants were surveyed three months after the workshop to assess the extent of DBR implementation. Follow-up interviews were conducted with a subsample (n=5) to explore factors influencing implementation.

Data analysis

Quantitative data from surveys were analyzed using descriptive statistics and paired t-tests to assess changes in participants' knowledge and attitudes. Qualitative data from interviews, observations, and open-ended survey responses were analyzed using thematic analysis, following Braun and Clarke's (2006). Mini DBR proposals were evaluated using a rubric based on key DBR principles.

3. Results and Discussion

Improvement in DBR understanding and skills

Pre-post survey results showed significant improvement in participants' understanding of DBR ($t(19) = 15.67$, $p < .001$). The mean score increased from 3.2 (SD = 1.1) in the pre-test to 8.7 (SD = 0.9) in the post-test (scale 1-10
Specific areas of improvement included:

1. Understanding of DBR principles: 91% improvement
2. Ability to design research-based interventions: 84% improvement
3. Knowledge of data collection and analysis methods: 77% improvement

83% of interviewees indicated enhanced confidence in implementing DBR within their schools. Qualitative examination of interview data indicated that participants

really appreciated the workshop's practical approach and the chance to develop solutions pertinent to their unique school environments. From the interview, a participant remarked, "Prior to the workshop, research appeared to be an endeavour exclusive to academics." I now comprehend how to utilize DBR to address tangible issues in my classroom.

Designed interventions

Of the 20 participants, 17 successfully designed DBR-based interventions. Figure 1 and Figure 2 show the discussion on DBR program. Analysis of mini DBR proposals revealed some categories of interventions:

1. Implementation of project-based learning models
2. Peer mentoring programs
3. Evaluation strategies

Figure 1. Discussion on the DBR planning

Figure 2. Sharing insights and providing constructive feedback with peers

The interventions were assessed as feasible and realistic by workshop facilitators. The proposals demonstrated a clear understanding of DBR principles, with 85% including plans and 80% incorporating mixed methods for data collection. The 20 workshop participants demonstrated remarkable engagement and competence in

executing all steps of the DBR process. In the initial phase, they skillfully identified educational problems within their respective schools through systematic observation and data collection. Their problem identification process was thorough, incorporating input from various stakeholders including fellow teachers, students, and school administrators. Moving into the problem-solving planning phase, participants utilized their understanding of educational theories and practical experience to develop comprehensive intervention strategies. They carefully considered local context, available resources, and potential constraints while designing their solutions. The teachers showed particular strength in connecting theoretical frameworks to practical classroom applications.

During the solution development phase, participants created innovative educational interventions tailored to their specific contexts. Their proposed solutions ranged from technology-integrated learning approaches to novel pedagogical strategies, all designed with clear learning objectives and implementation plans. Each intervention was thoughtfully crafted to address the identified problems while remaining feasible within their school environments. The participants also embraced the iterative nature of DBR in their evaluation processes. They developed detailed evaluation plans incorporating both qualitative and quantitative data collection methods. The teachers demonstrated a clear understanding of the importance of multiple iteration cycles, planning for continuous refinement of their interventions based on implementation feedback and results.

As mentioned before that the effectiveness of their engagement in the DBR process was reflected in the pre-post survey results, which showed a significant improvement in their understanding of DBR ($t(19) = 15.67$, $p < .001$). The dramatic increase in mean scores from 3.2 ($SD = 1.1$) in the pre-test to 8.7 ($SD = 0.9$) in the post-test indicated not just theoretical understanding, but practical mastery of the DBR methodology. Throughout the entire process, participants maintained strong collaborative relationships, regularly sharing insights and providing constructive feedback to their peers. This collaborative approach enhanced the quality of their DBR projects and contributed to the development of a supportive professional learning community focused on educational innovation and improvement.

Challenges and strategies

Through careful thematic analysis of participant interviews and observational data, several significant challenges emerged during the DBR workshop implementation. Time management emerged as a primary concern, particularly regarding the intensive nature of data analysis required in DBR projects. The participants expressed that finding adequate time for thorough data analysis while maintaining their teaching responsibilities posed a considerable challenge. Another notable challenge was the diverse range of research experience among participants. Some teachers entered the workshop with limited exposure to research methodologies, while others had more extensive research backgrounds, creating an initial knowledge gap that needed to be addressed. Additionally, many

participants voiced concerns about securing consistent administrative support for their DBR initiatives within their schools.

Access to research resources emerged as a practical barrier, with participants noting limited availability of academic literature and research tools necessary for comprehensive DBR implementation. The teachers also expressed significant anxiety about balancing their new research responsibilities with their existing teaching duties, highlighting the need for sustainable integration strategies. To address these challenges, several strategic solutions were developed. The workshop structure was enhanced to include a dedicated session focusing specifically on efficient data analysis techniques in DBR. To address the varying levels of research knowledge, pre-workshop materials were proposed to establish a foundational understanding among all participants before the main sessions began. Recognizing the importance of institutional support, steps were taken to actively involve school administrators in the DBR planning process, ensuring alignment with school objectives and resources. To overcome resource limitations, partnerships with local universities were proposed to provide participants with access to research databases and academic expertise.

Three-month follow-up results

The follow-up survey revealed that 60% of participants had initiated DBR projects in their schools within three months of the workshop. The analysis of the DBR implementation revealed several critical factors that contributed to successful outcomes, as well as certain barriers that posed challenges to the implementation process. Among the key success factors, administrative support from school leadership emerged as particularly significant. School leaders who actively supported their teachers' DBR initiatives provided necessary resources, schedule accommodations, and institutional backing that proved invaluable to project success. Strong collaboration among colleagues also played a crucial role in successful implementation. Teachers who worked together were able to share resources, provide mutual support, and offer constructive feedback throughout the research process. This collaborative environment fostered innovation and helped maintain momentum during challenging phases of the projects. Furthermore, projects that were closely aligned with existing school improvement goals garnered more institutional support and resources, making them more likely to succeed and create meaningful impact.

However, several significant barriers impeded smooth implementation. The most prominent challenge was time constraints due to heavy teaching loads. Teachers struggled to balance their regular teaching responsibilities with the demands of conducting research, often finding it difficult to allocate sufficient time for data collection and analysis. This time pressure sometimes compromised the depth and quality of their research efforts. Limited resources for intervention materials also posed a substantial challenge. Many teachers found it difficult to secure the necessary materials and tools needed to implement their planned interventions effectively. This resource constraint sometimes required them to modify or scale back their original intervention designs. Additionally, some teachers expressed a

lack of confidence in their research skills, despite the training received during the workshop. This self-doubt sometimes led to hesitation in making methodological decisions or analyzing data, potentially affecting the rigor of their research implementation. This finding suggests that ongoing mentoring and support might be beneficial for building teacher-researchers' confidence and capabilities in conducting DBR. These insights into success factors and barriers provide valuable guidance for future DBR implementations, highlighting the importance of institutional support, collaborative environments, and the need for adequate resources and continuous professional development in research skills.

Discussion

The results of this study indicate that the DBR workshop can effectively enhance junior high school teachers' capacity to apply research-based approaches to solving educational problems. The significant improvement in participants' understanding and confidence aligns with previous research findings on the effectiveness of intensive, practice-based teacher professional development (Darling-Hammond et al., 2017).

The diversity of interventions designed by participants reflects the flexibility of DBR in addressing various educational issues at the junior high school level. This suggests that DBR can be a valuable tool for keeping educational practices relevant and responsive to changing societal needs. The identified challenges, particularly related to time constraints and institutional support, highlight the need for a systemic approach to implementing DBR in schools. This aligns with Nugroho et al. (2021) findings on barriers to DBR implementation in Indonesia. The strategies proposed by participants for addressing these challenges, such as involving administrators and partnering with universities, offer promising directions for future initiatives. The follow-up results are particularly encouraging, demonstrating that the workshop had a lasting impact on teachers' practices. The fact that 60% of participants had initiated DBR projects suggests that the workshop was successful in not only imparting knowledge but also in motivating teachers to apply DBR in their contexts. However, the barriers identified in the follow-up also underscore the need for ongoing support and resources to sustain DBR implementation.

Drawing from the workshop's outcomes and participant feedback, several key recommendations emerged for enhancing future DBR implementations in educational settings. A primary recommendation focuses on restructuring the workshop format, either by extending its duration or dividing it into multiple sessions. This adjustment would provide participants with more dedicated time for practicing data analysis techniques and developing their research skills. Institutional support emerged as a critical success factor, leading to the recommendation of actively involving school administrators and policymakers in both planning and implementation phases. This involvement would help ensure that DBR initiatives receive necessary resources and align with institutional priorities.

To understand the broader impact of DBR implementation, longitudinal studies are recommended to evaluate how these research practices influence teaching methods and student learning outcomes over time. This long-term assessment would provide valuable insights into the effectiveness of DBR as a tool for educational improvement. Looking toward the future of education, the integration of DBR principles into pre-service teacher education programs is recommended. This early exposure would help cultivate a research-oriented mindset among future educators, preparing them to engage in systematic inquiry and improvement of their teaching practices.

Finally, establishing partnerships with local universities is recommended to provide teachers with access to academic resources and expertise. These partnerships would bridge the gap between academic research and classroom practice, offering teachers valuable support in their DBR endeavors. These recommendations collectively address the challenges identified during the workshop while building on its successes, providing a comprehensive framework for advancing DBR implementation in educational settings.

4. Conclusion

The DBR workshop proved effective in enhancing junior high school teachers' capacity to apply research-based approaches to solving educational problems. The study demonstrates the potential of DBR as a tool for empowering teachers as researchers and innovators in their own classrooms. However, long-term success will depend on continued support and integration of DBR into daily school practices. By implementing these recommendations, it is hoped that the DBR approach can be increasingly integrated into the Indonesian education system, promoting evidence-based innovation and ultimately improving the quality of education at the junior high school level. Future research should focus on the long-term impacts of DBR implementation on student outcomes and school improvement, as well as exploring ways to scale up DBR initiatives across the Indonesian education system.

References

Anderson, T., & Shattuck, J. (2012). Design-Based Research: A Decade of Progress in Education Research? *Educational Researcher*, 41, 16-25.

Barab, S., & Squire, K. (2004). Design-based research: Putting a stake in the ground. *Journal of the Learning Sciences*, 13(1), 1–14.

Braun, V., & Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3 (2). 77-101

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective Teacher Professional Development.* Palo Alto: Learning Policy Institute.

Hermawan, H., Siahaan, P., & Suhandi, A. (2021). Pengembangan kurikulum berbasis STEM untuk SMP menggunakan pendekatan design-based research. *Jurnal Penelitian Pendidikan IPA*, *7*(1), 134–143.

McKenney, S., & Reeves, T. C. (2012). *Conducting educational design research*. Routledge.

Nugroho, K., Widodo, A., & Rochintaniawati, D. (2021). Tantangan implementasi design-based research di sekolah menengah pertama Indonesia: Studi kasus pada pembelajaran IPA. *Jurnal Inovasi Pendidikan IPA*, *7*(1), 78–90.

Plomp, T. (2007). Educational design-based research: An introduction. In T. Plomp & N. Nieveen (Ed.), *An introduction to educational design-based research* (pp. 9–33). SLO Netherlands Institute.

Prahani, B., Soegimin, W., & Yuanita, L. (2016). Pengembangan perangkat pembelajaran IPA berbasis model problem based learning untuk meningkatkan keterampilan berpikir kritis siswa SMP. *Jurnal Penelitian Pendidikan Sains*, *5*(2), 1012–1021.

Wang, F., & Hannafin, M.J. (2005) Design-based research and technology-enhanced learning environments. *Educational Technology Research & Development,* 53, 5-23.

Wijaya, E., Sudjimat, D., & Nyoto, A. (2019). Peningkatan kompetensi digital guru SMP melalui pendekatan design-based research. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *4*(3), 382–389.

World Bank. (2014). *Indonesia Economic Quarterly: Investment in Flux*.

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