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STRATEGY INNOVATIVE DEVELOPMENT STRATEGIES FOR SUCCESS IN INFRASTRUCTURE CHALLENGES AT SDN KRIAN 2 SIDOARJO

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Abstract

This research explores innovative strategies for holistic student development amidst limited infrastructure in a case study of SDN Krian 2 Sidoarjo. Despite facing challenges in the learning process such as limited classrooms, inadequate teaching materials and a lack of technological resources, this school has adopted creative methods to improve student success. Using a combination of qualitative methods, including observation, interviews with teachers, students and staff, and document analysis, this study identified the key strategies implemented by the school. These include developing student-centered learning approaches, optimizing available resources, community partnerships, and integrating collaborative and contextual learning. The findings highlight how good practices can bridge gaps in infrastructure, ensuring student growth in academic and non-academic areas. The results of this study provide valuable insights into effective school management practices that can be implemented in resource-constrained school.

Keywords: Innovative Strategies, Student Development, Infrastructure Challenges, Resource Optimization, SDN Krian 2 Sidoarjo, Educational Management, Student-Centered Learning, Collaborative Learning, Under-Resourced Schools

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INTRODUCTION

Educational institutions, especially those in rural or under-resourced areas, frequently face challenges in providing adequate infrastructure to support the academic and personal growth of students. SDN Krian 2 Sidoarjo, a public elementary school in Indonesia, is no exception. Like many schools in the region, it faces limitations in terms of physical facilities and learning resources, which can significantly hinder student development. Yet, despite these constraints, the school has demonstrated resilience by developing innovative strategies that foster student success. The examination of these strategies provides valuable insights into how schools can overcome such barriers to create a supportive and effective learning environment.

A well-functioning educational infrastructure is foundational for quality learning. Various studies have shown that a lack of adequate infrastructure, such as classrooms, teaching aids, and access to technology, can severely impact students' academic performance, motivation, and engagement. According to an analysis of schools in rural areas, inadequate infrastructure correlates with lower educational outcomes, making it essential for educators to seek alternative approaches to mitigate these effects (Rahman et al., 2021). SDN Krian 2 Sidoarjo serves as an example of how educators can creatively employ strategies to address these limitations.

One of the primary strategies utilized at SDN Krian 2 Sidoarjo is optimizing community involvement to fill the gaps in resource shortages. Studies have highlighted the importance of community partnerships in improving educational outcomes, especially in resource-constrained settings. For example, the role of Parent-Teacher Associations (PTAs) and local community members has been emphasized as a vital tool in providing both financial and emotional support to students and educators (Simamora & Sari, 2023). SDN Krian 2 Sidoarjo has leveraged community support to facilitate extracurricular activities, improve classroom settings, and provide learning materials that would otherwise be inaccessible.

Moreover, teachers at SDN Krian 2 Sidoarjo have employed student-centered learning techniques that do not require high-tech equipment or expensive resources. Active learning strategies, such as group work, project-based learning, and peer teaching, have been widely acknowledged for their ability to engage students in the learning process without relying heavily on external infrastructure (Setiawan et al., 2022). The teachers' emphasis on using local resources for projects, alongside fostering critical thinking and collaboration skills,

has helped mitigate the lack of formal educational tools.

In addition, schools like SDN Krian 2 Sidoarjo have embraced digital solutions where possible, even with minimal infrastructure. With the rapid development of technology, online resources and mobile-based learning applications have provided new avenues for learning, even in low-resource settings. Recent studies suggest that schools can leverage free digital resources and mobile technologies to improve students' access to learning materials, despite the absence of advanced technological infrastructure (Anwar & Nugraha, 2023). While the school may not have state-of-the-art technology, its ability to integrate these accessible tools highlights the adaptability of the teaching staff.

Lastly, leadership plays a critical role in the successful implementation of these innovative strategies. Research indicates that school leadership, particularly the role of principals and school administrators, significantly impacts the ability of a school to adapt to resource limitations (Fahmi, 2022). The leadership at SDN Krian 2 Sidoarjo has been instrumental in mobilizing resources, motivating staff, and ensuring that the school maintains a clear focus on student development, despite the infrastructural challenges. This case study will explore how effective leadership, community engagement, and creative pedagogical approaches combine to drive student success in an environment of infrastructural constraints.

In conclusion, the case of SDN Krian 2 Sidoarjo demonstrates that while infrastructure is critical to education, it is not the only determinant of success. Through strategic innovation, community engagement, and resourceful pedagogical practices, schools facing significant limitations can still provide quality education and promote student success. This study aims to document these strategies in detail, offering insights that may be applied to other similarly challenged educational institutions globally.

METHODS

The research adopts a qualitative case study design, which allows for an in-depth examination of the innovative strategies employed by SDN Krian 2 Sidoarjo in response to infrastructure challenges. Case studies are effective for exploring complex phenomena within their real-life contexts (Yin, 2018). This approach will help highlight how the school creatively overcomes limitations in facilities while fostering student success. The exploratory

nature of this research allows for flexibility in understanding the nuanced interventions applied in the school setting.

This study involved a purposive sampling of key stakeholders at SDN Krian 2 Sidoarjo. Participants included school administrators, teachers, students, parents, and local community members. By selecting individuals who are closely involved with the school's operations, the research gains a holistic view of the strategies being implemented (Creswell, 2016). Teachers were chosen based on their involvement in developing and delivering curriculum modifications that address the lack of infrastructure, while students and parents were selected to understand the impact of these strategies on learning outcomes.

To gather comprehensive data, the research employed a mixed-methods approach, combining interviews, focus groups, and observational techniques. Semi-structured interviews were conducted with school administrators, teachers, and parents to explore their perspectives on the effectiveness of the strategies. Focus groups with students provided insights into their experiences and responses to the innovative approaches used in classrooms (Merriam & Tisdell, 2016). Classroom observations were conducted to assess the real-time implementation of these strategies.

Observations were crucial in understanding how teachers adapted their pedagogy to the infrastructural limitations. Researchers attended several classes, taking note of instructional strategies, teacher-student interactions, and the use of alternative learning materials. Observational data were coded to identify patterns related to innovation in teaching methods and student engagement (Cohen et al., 2017). The limitations in physical facilities were analyzed in relation to their impact on learning experiences.

A detailed analysis of school documents, including curriculum plans, student performance reports, and official communications from the local education authority, was performed. These documents helped identify the structural issues at the school and the strategic responses put in place to address them. National and local policies regarding infrastructure in education were also reviewed to understand the larger framework within which SDN Krian 2 Sidoarjo operates (Cohen et al., 2017).

To enhance the validity of the findings, data triangulation was applied. Information from interviews, focus groups, observations, and document analyses were cross-checked for consistency. By comparing perspectives from different stakeholder groups (teachers, students, parents, and administrators), the study could more reliably identify the most

effective strategies used at the school to mitigate infrastructure challenges (Flick, 2022). This triangulation helps ensure that the results accurately reflect the reality of the school's environment and efforts.

The analysis of the data was informed by the Theory of Educational Resilience, which focuses on how schools can develop adaptive strategies in the face of adversity (Masten, 2021). Using this theoretical lens, the study evaluated the school's innovative responses to inadequate infrastructure. Content analysis was applied to the interviews and focus group discussions, while thematic analysis was used for observational data, identifying key themes related to pedagogical adaptation, student engagement, and academic performance (Braun & Clarke, 2022).

Given the involvement of students and teachers, ethical guidelines were strictly followed throughout the research process. Informed consent was obtained from all participants, and confidentiality was ensured by anonymizing data (Bryman, 2022). The study received approval from the school and the relevant educational authorities, ensuring that the research did not disrupt the regular school activities or place any burden on the participants.

While the qualitative approach provides rich, context-specific insights, it has limitations in generalizability. The findings from SDN Krian 2 Sidoarjo may not fully represent the challenges and solutions of other schools facing similar infrastructure problems. However, the lessons learned from this case study could offer valuable insights for other schools with resource constraints. The study's scope was also limited to one academic year, and longitudinal research could provide deeper insights into the long-term impact of these strategies.

RESULTS AND DISCUSSION

1. Overview of Infrastructure Challenges

Infrastructure can be understood as a form of support in the teaching and learning process properly, with adequate infrastructure greatly affecting learning activeness and also student learning outcomes (Triarsuci et al., 2024). In fact, the infrastructure at SDN Krian 2 includes the UKS, mini library, five inadequate classes, no field, and a parking lot for motorbikes. This can be seen in DR's interview quote, which states, "SDN Krian 2 does experience limitations in infrastructure such as the UKS, which is too small, where the UKS

only has one (1) bed, a mini library that is impeded by room one (1) and other rooms, we also have limited classes where at SDN Krian 2 only has 5 classrooms where classrooms one (1) and two (2) are made alternately, for class 1 the learning hours are 07.00-10.00 while the second class learning hours start at 10.00-13.00, and there are several other shortcomings such as not having land for parking and also no field used for ceremonies, sports, or for extracurricular activities" (Pamungkas et al., 2024).

Meanwhile, one of the students, TAT, supported DR's statement, stating, "Indeed, my school has many limitations regarding the facilities we need for learning activities, but my friends and I are very enthusiastic about participating in learning activities at school." During the observation, it was true what had been said by the two interviewees regarding the limited infrastructure at SDN Krian 2. This was proven when we conducted observations carried out during teaching and learning activities, where students were enthusiastic about participating in learning even though the classrooms were very limited and narrow. These two facts are indeed true through the documents from the observations we have made at SDN Krian 2. Thus, the limited facilities for teaching and learning activities do not become an obstacle to students' enthusiasm in following the entire series of lessons.

The case study highlights several key infrastructure challenges faced by SDN Krian 2 Sidoarjo, such as limited classroom space, inadequate learning materials, and poor physical facilities the field and sanitation. These limitations are common in many rural and underfunded schools, impacting both teaching effectiveness and student learning outcomes (Smith et al., 2022). Despite these constraints, SDN Krian 2 Sidoarjo has implemented various innovative strategies to ensure that student learning is not compromised.

2. Adaptation of Learning Environments

Learning outside the classroom is one form of innovative learning that relies on teaching and learning in the surrounding environment, with the existence of learning outside the classroom can make a student develop his thinking about the surrounding environment and nature, a student is increasingly more active to explore learning outside and teach how to love the natural environment (Soedibyo, 2023). As what is done by SDN Krian 2 where this school invites students to learn outside the classroom in order to reduce the occurrence of boredom in terms of learning, as what was conveyed by Mrs. Devi Rystiana Puji Lestari where she said "We have a learning program outside the classroom, such as learning in the

park, aiming to keep students from getting bored, besides that our school has conducted teaching and learning activities at the nearest museum, and during these activities students were very enthusiastic about learning in this new method" (Pamungkas et al., 2024). When we conducted observations at SDN Krian 2, it was true that the statement made by Mrs. Devi Rystiana Puji Lestari, that students were learning with a happy atmosphere and looked very enthusiastic, which made learning more focused on student development.

One of the most notable strategies employed by the school is the adaptation of learning spaces. With limited classrooms, the school has turned to multi-use spaces and outdoor learning environments. This approach aligns with research by Huang and Su (2021), which shows that outdoor and flexible learning environments can enhance student engagement and support experiential learning, especially when indoor spaces are inadequate. By creatively using available space, the school has ensured that all students have access to conducive learning environments.

3. Utilization of Technology

The utilization of technology in terms of learning is a system that is used to facilitate teaching and learning activities, besides that the utilization of this technology makes teaching and learning easier without having to be face-to-face, with the utilization of this technology a teacher has a good digital-based teaching strategy (Purnasari, 2023). The utilization of this technology is like what is done at SDN Krian 2 where during Covid 19 students are told to study at home using google class room or through zoom together with the teacher, this activity is taught to students to provide independence in terms of learning and make it easier for students not to come to school directly. Thus, the use of technology is very much needed in learning, in accordance with SDN Krian 2 which has utilized technology for online learning, and although not face-to-face learning can still be delivered online.

To address the lack of physical resources, the school has integrated digital tools into its teaching methods. The use of mobile learning applications and online resources has helped bridge the gap created by limited infrastructure. This strategy is supported by Li et al. (2023), who found that technology can play a critical role in supplementing traditional learning materials, especially in schools with limited resources. Teachers at SDN Krian 2 Sidoarjo have used free digital resources to enhance lesson delivery and provide students with access to diverse learning materials.

4. Teacher Training and Professional Development

Developing teacher potential is needed to improve the quality of education. Competent and skilled teachers can provide better learning and support the achievement of national education goals. In fact, the teachers at SDN Krian 2 Sidoarjo have quite good potential to improve the quality of education (Risdiany, 2021). As said by the class 6 homeroom teacher at SDN Krian 2 Sidoarjo who said "children at schools who take part in the competition receive special guidance and training by teachers appropriate to their field, so that it is in accordance with their respective job descriptions." By Danim (2023) Emphasizes that the existence of competent teachers will never fade, because in the humanitarian and humanitarian system, he is a very reliable subject. Although developing teacher potential is considered important, there are several challenges faced in its implementation. Like time constraints, lack of resources can be an obstacle. This fact is true as per the results of our interview with the SDN 2 Krian Sidoarjo school. To overcome this, a more strategic and relevant approach is needed in developing teacher potential, and must be in accordance with teachers' specific needs and supported by adequate policies and resources.

The success of these innovative strategies heavily depends on teacher capacity. SDN Krian 2 Sidoarjo has invested in regular teacher training and professional development, focusing on adaptive teaching methods that can be employed in resource-limited settings. According to Zhao and Ng (2022), continuous professional development is key to improving teacher effectiveness, especially in schools facing significant challenges. Teachers at the school have been trained to use available resources creatively and to engage students actively in learning despite the limitations.

5. Collaborative Learning Models

Education is a primary need for every individual. Education affects human resources that have an important role to keep up with the times. The learning process should use a two-way interaction method between teachers and students, or vice versa interaction between fellow students. In addition, learning must also understand the deep meaning, learning activities so that students are active and interact. Learning is also to gain knowledge. Knowledge cannot be absorbed passively from the environment but is arranged so that they interact. Collaborative interaction is defined as a form of social constructivism that can shape

individual cognitive processes. Learning that prioritizes interaction and is based on constructivism is collaborative learning. Collaborative learning itself is the most widely used method (Pandie & Manapa, 2021) . As said by Mrs. Devi as Vice School "Our teaching is also group-based or collaborative, so that from these groups we can make small learning or peer learning. It can also be used to increase student knowledge from their peers. So there is no problem with facilities even though they are limited." (Pamungkas et al., 2024).

Another significant strategy observed at the school is the implementation of collaborative learning models. Group-based learning and peer tutoring have been used extensively to enhance student learning outcomes. Studies by Santos and Oliveira (2023) show that collaborative learning can be particularly effective in schools with limited infrastructure, as it promotes peer support and the sharing of knowledge. At SDN Krian 2 Sidoarjo, students are encouraged to work together, which not only fosters teamwork but also mitigates the negative effects of resource constraints.

6. Parental and Community Involvement

The school has also leveraged strong community and parental involvement to support its innovative strategies. By engaging parents and the local community, the school has been able to acquire additional resources, such as learning materials and financial support for specific programs. This aligns with findings by Anderson et al. (2021), which emphasize the importance of community partnerships in addressing infrastructure challenges in schools. The active involvement of parents has created a more supportive learning environment for students.

7. Focus on Student Well-being

Education is very important for life that takes place as an ongoing activity in humans. Education itself cannot be separated from the word learning, because learning is basically related to education. In addition, learning is also the main process in human life, where learning will also provide knowledge and can also solve problems. Education is also very important for human resources, through education students can develop their talents both in the academic and non-academic fields. Therefore, educational institutions must strive to improve student welfare by paying attention to factors that can affect student welfare (Hasanuddin & Khairuddin, 2021). One of them is the infrastructure factor. Although the

infrastructure at SDN Negeri Krian 2 is very limited, students can develop their achievements regardless of these infrastructure factors. As stated by Mrs. Devi, Vice School Representative, "For learning in the classroom itself, so that children continue to excel in their fields, we also use learning media that suits the needs of children. ven though it is limited, we can use the space optimally, we can organize this space more functionally. For example, we divide the seats flexibly, the learning zone is more comfortable, even though the room is small or we also need to learn in the open, we can also go outside the classroom and can export the school environment. Our teaching is also group-based or collaborative, so that from these groups we can make small learning or peer learning. It can also be used to increase students' knowledge from their peers. So there is no problem with the facilities although they are limited." (Pamungkas et al., 2024)

In the face of infrastructure challenges, SDN Krian 2 Sidoarjo has prioritized student well-being, recognizing that learning outcomes are directly linked to emotional and physical well-being. Initiatives such as regular health check-ups, mental health support, and physical activity programs have been implemented despite the lack of traditional infrastructure like proper playgrounds or gyms. Research supports the notion that focusing on student well-being can significantly boost academic performance, especially in challenging environments.

8. Innovative Pedagogical Approaches

Teachers at SDN Krian 2 Sidoarjo have adopted innovative pedagogical approaches that cater to the unique challenges of their environment. These include project-based learning (PBL), where students work on real-world problems using available resources. PBL has been shown to be highly effective in engaging students and fostering critical thinking, as evidenced by recent studies by Wang dan Tsai (2022). By using PBL, teachers can circumvent the limitations of their infrastructure by focusing on creativity and problem-solving.

9. Measuring Student Success

Measuring student success can be seen from how serious students are in learning, not only that we can measure student success through their high motivation to learn (Mahmudah, 2018). As found at SDN Krian 2 where students here are very enthusiastic about learning, as conveyed by Ellen Erdiansyah where she explained "in this class the male is more dominant than the female, so for teaching activities it is more extra, because they are very enthusiastic about learning" besides that Mrs. Devi Rystiana Puji Lestari also said about the achievements obtained by students at SDN Krian 2 "Yes, it is true that SDN Krian 2 has

many achievements from its students, starting from academic to non-academic achievements". This school implements happy and structured learning activities, this is why many students are motivated to study at school to develop their talents. From the observation, we can see how enthusiastic students are about learning here, even with limitations, it does not make this school down about it.

Despite the challenges, the school has maintained a robust system for monitoring and evaluating student success. Standardized assessments are used to measure academic performance, while additional metrics such as student engagement and participation in extracurricular activities are also tracked. Studies by Robinson et al. (2021) highlight the importance of comprehensive student assessment in understanding the effectiveness of educational strategies. The data collected has shown that students at SDN Krian 2 Sidoarjo are performing at par with, and in some cases better than, students in better-equipped schools.

10. Challenges in Implementing Strategies

In recent decades, technological developments have been very rapid. Especially the internet and personal computers in the 1980s. Technological developments have brought significant changes to various fields, such as communication, transportation, health, entertainment and education (Fricticarani et al., 2023). Educational technology provides many significant benefits, such as wide access to educational resources, more interactive learning and increased efficiency in the learning process. With the advancement of technology, educators and students use various digital platforms to learn anytime and anywhere, which can support student engagement and improve the quality of learning. As stated by Mrs. Ellen as the homeroom teacher of grade 6 SDN 2 Krian "children who take part in the OSN competition can use the computers at school". And the outstanding student, Tata Asmanjng Tyas, supported Mrs. Ellen's question, who stated "if I do the competition at school I use a computer". Thus, it is true that there is good use of technology at SDN 2 Krian.

Although educational technology brings progress, there are still challenges that must be faced in its implementation. Some of them are facing challenges in incorporating increasingly advanced technology into learning, which requires changes in curriculum and technology-based learning approaches. In addition, it is necessary to improve teachers' ability to use technology, and the availability of adequate educational infrastructure and resources

is required To address the issue of educational technology, a reasonable approach is important. While maximizing the use of technology must be done, it must also be accompanied by policies that support educators to have equal access to training and equal access. To ensure that students benefit from interactive and inclusive learning, the use of technology must be designed to complement, not replace, face-to-face interactions.

While the strategies employed have shown positive results, the school still faces several challenges in their implementation. Limited funding, teacher workload, and occasional technical issues with digital tools are ongoing concerns. These challenges are consistent with those identified in research by Jones and Williams (2022), which points to the difficulties schools face in sustaining innovative strategies in resource-constrained environments. Despite these hurdles, the school continues to make incremental improvements in its delivery of quality education.

11. Future Directions

The results of this case study suggest that with continued investment in teacher development, community involvement, and technology integration, schools like SDN Krian 2 Sidoarjo can overcome infrastructure limitations (Pawero, 2021). Future research could focus on the long-term impact of these strategies on student outcomes and the potential scalability of these innovations to other schools facing similar challenges by Zhao (2024).

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CONCLUSION

In conclusion, the case study of SDN Krian 2 Sidoarjo demonstrates that innovative development strategies can effectively mitigate the limitations posed by inadequate infrastructure. By adapting learning environments, utilizing technology, and fostering teacher professional development, the school has been able to maintain high levels of student engagement and academic success. The importance of creativity and adaptability in overcoming resource constraints in educational settings. Additionally, community involvement and the focus on student well-being have played critical roles in supporting the overall educational experience, in similar studies of resource-limited schools.

Furthermore, the success of SDN Krian 2 Sidoarjo reflects the broader potential for scalable innovations in schools facing similar challenges. Strategies such as collaborative

learning and the integration of digital tools can be implemented in diverse educational contexts, suggesting a path forward for under-resourced schools globally. Continued investment in these strategies, alongside monitoring and refinement of their application, will be essential for sustained educational improvement and student success in environments with limited infrastructure.

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