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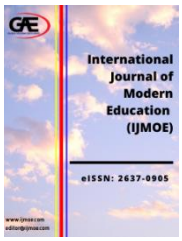

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STRATEGIES TO BOOST PARTICIPATION IN SCIENCE INNOVATION COMPETITIONS AT SJK (TAMIL) SCHOOL IN THE KINTA UTARA DISTRICT

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Abstract:

This article discusses the proposals by school principals to increase participation in the Science Innovation Competition in SJK (Tamil) schools in the Kinta Utara district through Hermeneutic Methods. The objective of the study is to identify suggestions for enhancing participation in the science innovation competition. This qualitative study involves 14 schools and 14 principals from SJK (Tamil) as respondents. Data were obtained through a triangulation of questionnaires, interviews, and document analysis. The results of the analysis indicate that suggestions for encouragement and motivation, as well as seeking financial resources, recorded the highest frequency (60%), followed by rewards and praise (40%), and technical support and expert innovation guidance (30%). The study suggests a more focused and strategic approach to address the challenges of low participation of schools in the science innovation competition. The implications of the study show that principals, as instructional leaders, can effectively drive participation from SJK (Tamil) in the science innovation competition in the Kinta Utara district.

Keywords:

Science Innovation Competition, Hermeneutics, Science, SJK (Tamil)

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Introduction

The Fourth Industrial Revolution (4IR) has had a significant impact on various fields, including education, particularly in STEM education and students' interest in science subjects. The Science, Technology, and Innovation Policy (DSTIN) 2021-2030 aims to steer the country's education towards STEM by strengthening its implementation in both primary and secondary schools. The science curriculum is designed with various strategies to enhance students' interest in learning science, which is a key discipline within STEM. Consequently, project-based learning in science innovation has begun to receive emphasis (Said & Jamil, 2019).

Science innovation is a crucial aspect of science education as it not only stimulates critical and creative thinking but also provides opportunities for students to apply their theoretical knowledge through practical applications. In education, science innovation is closely related to Concrete Theory in educational psychology, which emphasizes the importance of direct experiences and learning through real objects or situations for the cognitive development of students, especially children. This theory is often associated with Jean Piaget, who outlined the stages of cognitive development in children, particularly the concrete operational stage (ages 7-11), where they better understand concepts when related to concrete and practical experiences (Sundararaj & Taneja, 2020).

Moreover, the transfer of theoretical knowledge to practical application occurs through science innovation learning. For instance, science innovation allows students to apply abstract concepts such as physical laws, chemical principles, or biological phenomena through experiments and practical activities. Learning about gravity becomes more effective when students can observe gravity's effects through experiments involving dropping objects from different heights (Ng & Shamsuddin, 2018). Furthermore, science innovation stimulates critical or creative thinking through direct experiences because when students engage in science innovation, they must analyze problems, seek solutions, and test hypotheses. This process reflects concrete exploration, which is an essential element in cognitive development, according to Piaget. Practical activities in science innovation are usually engaging for students as they are fun and closely related to everyday life. This aligns with the principles of Concrete Theory, which asserts that learning relevant to the real world is more engaging and meaningful for students (Zainal & Othman, 2021; Ismail, Mohammad Nazeri & Syed Mohamad, 2021).

The development of practical learning leads to beneficial discoveries that can result in products capable of solving human problems and being competitive in the market. Project-based learning continues to evolve and be competed for. Schools are beginning to participate in science innovation competitions organized by government bodies and non-governmental organizations. However, participation in science innovation competitions among SJK (Tamil) schools in the Kinta Utara district remains low. This situation raises the need to identify barriers and challenges that hinder these schools' participation in science innovation competitions and to find effective solutions. Therefore, this study aims to analyze proposals put forward by school principals to enhance participation in science innovation competitions among SJK(Tamil) schools in Kinta Utara that are currently inactive or less active in participating in such competitions.

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Methodology of the Study

Research Design

This research employs a study design based on qualitative methods that focus on the analysis and interpretation of texts using Hermeneutic methods. This approach aids in obtaining information through data triangulation, which includes questionnaires, interviews, and document analysis. Instruments such as structured questionnaires, semi-structured interviews, and document analysis are used to gather data from the principals. The primary source of data is the results from the interviews, which encompass suggestions from the principals to enhance participation in the science innovation competition. The data is analyzed using thematic analysis, where key themes related to participation factors and suggestions for improvement are identified. This study also refers to other supporting data such as previous competition reports and statistics on school participation in the district.

Location and Sample of the Study

This study is conducted in 14 Tamil national-type schools SJK (T) in the Kinta Utara district of Perak. A total of 14 principals are selected as respondents for this study. The selection of these 14 principals aligns with the suggestion by Khairi Anuar and Nur Hafizah (2022), who argue that a small sample is sufficient for qualitative research because the primary focus is on obtaining in-depth information from the data collection process. Additionally, a small sample size is adequate in qualitative studies that utilize interviews since data collection is carried out by school principals. The principals participating in the study come from diverse backgrounds in terms of gender, age, academic qualifications, and experience.

Research Instruments

The purpose of this research is to analyze the steps that principals can take to enhance participation in the science innovation competition among SJK(Tamil) schools in the Kinta Utara district that are currently inactive or less active in participating. In this study, three types of instruments are used by the researcher: questionnaires, interviews, and document analysis. These instruments have been prepared by the researcher and validated by a panel of experts from Sultan Idris Education University. The researcher can administer the questionnaires and conduct interviews with the respondents, while to obtain findings regarding SJK (T) participation in the Kinta Utara district, the researcher had to seek assistance from science teachers at the schools to complete the innovation competition participation forms and obtain confirmation from the principals.

Findings and Discussions

Analysis of Respondent Demographics

Based on the demographic analysis of the respondents' gender, 71% are female principals, while 29% are male principals. Furthermore, regarding ethnicity, 100% of the respondents are of Indian descent. In terms of academic qualifications, 29% of the respondents hold a Master's degree, while 71% hold a Bachelor's degree. Regarding experience, 36% of the principals have taught science for 0 to 1 year, 14% have taught for 2 to 5 years, another 14% have taught for 6 to 10 years, and 36% have more than 11 years of experience. Table 4.8 presents the suggestions made by the principals to enhance participation in the science innovation competition among

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SJK(Tamil) schools in the Kinta Utara district that are currently inactive or less active in participating in science innovation competitions.
Table 4.8

Suggestions to Increase Participation in the Science Innovation Competition Among SJK(Tamil) Schools in the Kinta Utara District that are Currently Inactive or Less Active in Participation

Ways Suggested by Principals to Increase Participation in the Science Innovation Competition for SJK(Tamil) Schools in the Kinta Utara District that are Currently Inactive or Less Active in Participation

Table 1: Strategies to Enhance Participation in Science Innovation Competition

Participants	Frequency
Financial Resources	GB1, GB3, GB7, GB8, GB10, GB12
Encouragement and Motivation	GB3, GB10, GB11, GB12, GB13, GB14
Rewards, Recognition, Prizes, and Praise for Teachers	GB3, GB5, GB12, GB13
Technical Support, Guidance, Expert Mentorship, Professional Learning Community (PLC)	GB3, GB7, GB10
Responsibilities of Principals	GB3, GB7, GB13

This table summarizes the suggestions made by the principals regarding strategies to enhance participation in science innovation competitions among SJK (Tamil) schools in the Kinta Utara district.

Table 4.8 summarizes the findings from the interpretation of the original text, showing the suggestions made by principals to enhance participation in the science innovation competition among SJK (T) schools in the Kinta Utara district, Perak. Referring to Table 4.8, the suggestions to address financial resource challenges and to provide encouragement and motivation to science teachers both show the highest frequency, with 6 respondents each. The results from interviews with these 6 respondents support the findings from the questionnaire data. One respondent noted, "Financial constraints can be addressed through external relationships" (RGB1). This highlights the importance of seeking external partnerships and resources to overcome financial limitations in promoting participation in science innovation competitions.

"The administration needs to investigate what issues are hindering active participation in this competition. Problems such as financial constraints and infrastructure can be addressed if there is a collaboration with the Parent-Teacher Association (PIBG) of the school" (RGB3). This statement emphasizes the importance of identifying specific barriers to participation and suggests that working together with the PIBG can provide solutions to overcome challenges related to funding and infrastructure.

"Providing moral and financial support to teachers involved in innovation competitions" (RGB7). This statement emphasizes the importance of offering both emotional encouragement

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and financial assistance to teachers participating in innovation competitions. Such support can enhance their motivation and ability to engage effectively in these initiatives, ultimately leading to increased participation and success in the competitions.

"School leaders must ensure that teachers do not bear the costs associated with participating in innovation competitions. Registration fees for certain innovation competitions should also be managed by the school. The school manages financial resources in collaboration with the Parent-Teacher Association (PIBG), the School Management Board, alumni, and non-governmental organizations" (RGB8). This statement highlights the responsibility of school administrators to alleviate the financial burden on teachers by covering participation costs and managing registration fees. It also emphasizes the importance of collaboration with various stakeholders to secure necessary funding and support for participation in innovation competitions.

Expenditures for the preparation of innovative materials and participation fees for certain competitions must also be considered by leaders, as these costs burden science teachers or innovation teachers at schools if not funded by anyone or provided by the school. Thus, this becomes a barrier for teachers, leading to a lack of interest in participating in competitions. To address this situation, leaders need to seek financial resources to cover the expenses of science innovation competitions. Perhaps by seeking funding from the Parent-Teacher Association (PIBG) and the School Management Board (LPS), leaders can help alleviate this financial issue. Teacher participation may increase if supported with the necessary financial resources" (RGB10). This statement emphasizes the importance of addressing financial constraints that hinder teachers from participating in innovation competitions and suggests that collaboration with various stakeholders can provide the necessary support to enhance participation.

"Obtain financial assistance to purchase equipment for participation in innovation competitions" (RGB12). Additionally, the principals suggest providing encouragement and motivation to science teachers to participate in science innovation competitions. The findings from interviews with 6 respondents support the data obtained from the questionnaire interpretation. This statement highlights the need for financial support to enable teachers to acquire the necessary resources for participation and emphasizes the importance of motivating educators to engage actively in innovation competitions.

"Parent-Teacher Associations (PIBG) and the School Management Board (LPS) can also provide prizes for the winners of innovation competitions. Even if there are groups that do not win, it is essential to motivate them to continue participating. Rewards should also be given to teachers if their group is selected" (RGB3).

Leaders need to motivate teachers at schools that are less active or not participating in science innovation competitions to inspire enthusiasm and confidence in the teachers so that they will join the science innovation competitions (RGB10).

"Teachers and students need to be praised and encouraged so that they can dedicate time to participate in competitions. Principals should be attentive to the needs of teachers and students to understand their requirements" (RGB11).

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Teachers and students need to be praised and encouraged so that they can dedicate time to participate in competitions. Principals should be attentive to the needs of teachers and students to understand their requirements (RGB12).

"Principals can foster innovation among teachers at the school level and provide rewards and prizes as a means of motivation and to boost morale" (RGB13).

"Schools may perceive the competition as a burden. The workload at school makes science teachers less interested in participating in innovation competitions. Therefore, it is necessary to motivate science teachers at schools so that they are interested, as motivation is an important factor in encouraging teachers to participate more actively in science innovation competitions" (RGB14).

Furthermore, the principals suggest providing rewards, recognition, and prizes to science teachers, as well as praise for teachers, to encourage them to be more committed and enthusiastic about participating in science innovation competitions. The findings from interviews with 4 respondents support the data obtained from the questionnaire. This statement emphasizes the importance of acknowledging and appreciating the efforts of science teachers in fostering their commitment and motivation to engage in innovation competitions. By implementing a system of rewards and recognition, schools can create a positive environment that encourages teachers to actively participate in such initiatives. The alignment of interview findings with questionnaire data reinforces the validity of this approach, highlighting a shared understanding among educators regarding the need for motivation and support in enhancing participation in science innovation competitions.

"Parent-Teacher Associations (PIBG) and the School Management Board (LPS) can also provide prizes for the winners of innovation competitions. Even if there are groups that do not win, it is essential to motivate them to continue participating. Rewards should also be given to teachers if their group is selected" (RGB3).

"The provision of more substantial and eye-catching prizes. Recognizing all participants" (RGB5).

"Teachers' and students' mindsets need to be changed with the provision of rewards in the form of substantial prizes" (RGB12).

Principals can foster innovation among teachers at the school level and provide rewards and prizes as a means of motivation and to boost morale (RGB14).

In addition, the principals suggest that science teachers should be provided with technical services, guidance, expert mentorship, and a Professional Learning Community (PLC) to enhance participation in science innovation competitions. The findings from interviews with 3 respondents support the data obtained from the questionnaire. This statement underscores the importance of offering comprehensive support to science teachers, which can significantly improve their engagement in innovation competitions. By providing access to technical expertise and mentorship, teachers can develop their skills and confidence, making them more likely to participate actively in such initiatives. The emphasis on establishing a PLC highlights the value of collaboration among educators, allowing them to share best practices and

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resources. This collaborative approach can foster a culture of innovation within schools, ultimately leading to increased participation in competitions and enhanced educational outcomes for students.

Teachers need to be exposed to information related to science innovation. Courses or workshops should be organized, and information regarding how to participate in competitions must also be shared with teachers. Science innovation teachers should be appointed, and these teachers will establish an Innovation Association or Club (RGB3).

"Planning and organizing a mentor-mentee program among active and less active teachers." (RGB7)
Finally, guidance for science teachers is also very important because many teachers lack skills related to innovation, which leads to their less active participation. Teachers often lack confidence in their abilities and do not know how to acquire knowledge about innovation to create innovative materials and train students for science innovation competitions. Therefore, they need mentors or innovation experts (RGB10).

In addition, some principals have stated that as school leaders, they must play an important role, and it is the principals who are responsible for increasing the school's participation in science innovation competitions. The following are the findings from interviews with 3 respondents that support the data obtained from the questionnaire interpretation. This statement emphasizes the critical leadership role that principals play in fostering a culture of innovation within their schools. By taking responsibility for encouraging participation in science innovation competitions, principals can create an environment that motivates both teachers and students to engage actively in these initiatives.

One of the main steps that need to be taken is to make it a mandatory activity for the committee, recorded in the school calendar. The school organizes innovation competitions at the school level (RGB3).

"Administrators should go down to the field or engage with innovation teachers to instill strong confidence in less active teachers" (RGB7).

Strategic planning within the State Education Department, District Education Office, and schools is essential. Principals need to identify the strengths and weaknesses of less active teachers. Together with senior teachers, principals should conduct a SWOT analysis to identify suitable interventions for teachers who have shortcomings (RGB13). This statement underscores the importance of strategic planning in enhancing teacher effectiveness and participation in educational initiatives. By conducting a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats), principals can gain valuable insights into the specific challenges faced by less active teachers and develop targeted strategies to support their professional growth.

In studying this research question, the researcher has proposed strategies that can be used to increase participation in science innovation competitions among schools that are inactive or less active in SJK (Tamil) in the Kinta Utara District.

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Based on the analysis conducted on Table 4.8, several key themes have been identified in efforts to increase participation in science innovation competitions. The need for additional financial resources from external parties, such as corporate companies, local authorities, and non-governmental organizations (NGOs), is a suggestion put forth by 6 principals. Without adequate financial support, many schools face difficulties in providing the necessary equipment and materials for innovation projects. This viewpoint is supported by Abdullah (2023) in the Journal of Educational Leadership, which states that a lack of financial allocation is a major challenge for schools in providing learning materials and projects. Principals often have to seek additional funding through Parent-Teacher Associations (PIBG), NGOs, or the corporate sector to cover these shortfalls.

Furthermore, according to Sariff and Hamid (2024) in the Malaysian Journal of Education, the leadership of principals is crucial in leveraging external resources such as government allocations and community cooperation to support educational and innovation projects in schools. Hadi (2021) emphasizes in his study related to educational technology that the role of principals as instructional leaders influences the success of educational innovations. Principals must spearhead changes with strategies such as involving external parties to financially support educational projects. All these research findings underscore the importance of securing additional financial support to enhance the success of innovation projects in schools.

Most principals also emphasize the importance of providing encouragement and motivation to teachers and students to actively participate in this competition. Offering words of encouragement and emotional support can help boost the self-confidence of participants. The study by Tze, Tan and Abdullah (2021) shows that student involvement in co-curricular activities is high when supported by teachers and parents. This research demonstrates that interest and motivation are key factors driving students to be more active in school activities. According to Ramle and Faridah (2021), both intrinsic and extrinsic motivation play a crucial role in overcoming educational challenges, especially among students from low socioeconomic backgrounds. Teachers who provide rewards or incentives, as well as positive feedback, are reported to be able to enhance student motivation.

In addition, the recognition and rewards given to teachers involved can enhance their commitment to supporting students participating in competitions. Four principals have suggested that rewards and prizes can provide additional encouragement for teachers. Abdullah (2022) in the article "Recognizing the Role of Teachers in Student Success" emphasizes the importance of providing recognition and rewards to teachers to enhance motivation and teaching quality. Furthermore, Hanaysha, Abdullah and Hamid (2020) in their article "The Impact of Recognition and Rewards on Teacher's Motivation and Effectiveness" demonstrate that recognition and rewards play a vital role in increasing teachers' job satisfaction.

Three principals have suggested the need for innovation experts to provide guidance to both teachers and students. Establishing a mentor-mentee system and creating a Professional Learning Community (PLC) can provide a platform for teachers to share knowledge and experiences in the field of science innovation. Research on the role of professional development for teachers demonstrates that support from mentors and technical services are key drivers in enhancing teacher and student participation in educational innovations (Harteis, 2018; M. Kowalczuk-Walędziak, 2020). Additionally, studies emphasize the importance of external expertise and support to help teachers remain competitive in implementing innovative

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practices. Technical guidance from mentors not only aids in building necessary skills but also strengthens the application of innovation in schools (Kim, Jo, & Jung, 2020; Marta Kowalczuk-Walędziak, Lopes, & Menezes, 2022).

Conclusion

The study indicates that the low participation in science innovation competitions among SJK (Tamil) schools in the Kinta Utara District can be improved through various suggestions put forth by principals. Key steps include ensuring adequate financial resources, providing encouragement and motivation, recognizing teachers' efforts, as well as offering guidance and mentoring. Additionally, enhancing infrastructure, employing creative teaching methods, and implementing more strategic planning are essential measures to support science innovation at the school level. By implementing these recommendations, it is hoped that participation in science innovation competitions will increase, fostering a culture of creativity and problem-solving among students in SJK (Tamil) schools.

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