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A Needs Analysis of Science Learning in *Sekolah Agama Bantuan Kerajaan* (SABK): Teachers and Students Perspectives

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Abstract

Science learning at the lower secondary level, particularly for Form One students, constitutes an important foundation in the development of scientific concepts, science process skills, and the formation of attitudes towards science. However, the performance of Malaysian students in international assessments such as TIMSS and PISA consistently indicates significant weaknesses in aspects of scientific reasoning, conceptual understanding, and the ability to apply knowledge in real-life situations. These challenges become more pronounced in the context of *Sekolah Agama Bantuan Kerajaan* (SABK), which face constraints in laboratory facilities, limited instructional time, and restricted access to suitable experimental materials. Therefore, this study aims to identify the learning needs of Science in SABK from the perspectives of teachers and students as a basis for the development of a more structured, contextual, and student-centred instructional intervention. This study employs a quantitative research design supported by qualitative data in the form of open-ended questions, involving teachers who teach form one Science as well as form one students. Data were collected through questionnaires and semi-structured interviews. The findings of this needs analysis are expected to provide a clear picture of the actual challenges in the teaching and learning of Science in SABK. More importantly, the results of this study will serve as an empirical foundation for the development of a practical, easily implementable Self-Directed Science Experiment Module that is aligned with the learning needs of form one students in the SABK context.

Keywords: Need Analysis, Science, Module, Science Education, SABK

Introduction

In recent years, science learning among secondary school students in Malaysia has faced increasingly significant challenges, particularly in terms of students' interest in the subject, conceptual understanding, and mastery of scientific skills. This phenomenon is reflected in the declining participation of students in the Science, Technology, Engineering, and Mathematics (STEM) stream at the upper secondary level. Although various educational policies have established a target ratio of 60:40 between science and arts streams, this target has yet to be achieved (Fatin et al., 2014; Lilia & Thamby, 2016). Educational statistics for 2022 indicate that only 147,615 Form Four and Form Five students were enrolled in the pure science stream, representing merely 10.79% of the total secondary school student population (Educational Policy Planning and Research Division, 2022). This trend raises concerns regarding the effectiveness of science education in cultivating scientifically literate students who are prepared to meet national development needs.

At the international level, Malaysian students' performance in large-scale assessments such as the Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA), which has remained at a moderate to low level, continues to reveal persistent weaknesses in scientific reasoning, conceptual understanding, and the ability to apply knowledge in real-life contexts (Malaysia Education Blueprint, 2013; Ministry of Education Malaysia, 2015c, 2020; Educational Policy Planning and Research Division, 2016, 2023, 2024). These findings highlight an urgent need to strengthen the quality of science learning, particularly at the early secondary level, which serves as a critical foundation for the development of students' scientific literacy.

In the context of lower secondary science education, particularly for Form One students, early mastery of scientific concepts and science process skills is essential for supporting more complex science learning at subsequent levels. However, science teaching and learning practices in classrooms remain largely dominated by examination-oriented approaches and content-focused instruction, with a strong emphasis on rote memorisation rather than inquiry-based and experimental learning. This situation limits students' opportunities to develop meaningful conceptual understanding and to master science process skills through active learning experiences (Nik, 2019; Norazilawati et al., 2015; Wong & Kamisah, 2018; Fazilah, Othman & Azraai, 2016).

These challenges are further intensified in Government-Aided Religious Schools (Sekolah Agama Bantuan Kerajaan, SABK), which face constraints related to limited instructional time, inadequate laboratory facilities, and the prioritisation of religious subjects. Such constraints directly restrict opportunities for teachers and students to implement science experimental activities consistently and systematically, thereby affecting the achievement of science learning objectives that emphasise the development of science process skills and scientific thinking (Fatin et al., 2014; Fatin & Nor Athirah, 2012; Salawati & Fatin, 2011).

From the perspectives of constructivism and experiential learning, meaningful learning requires students' active engagement through inquiry and hands-on activities in order to connect abstract concepts with observable phenomena (Karpicke & Blunt, 2011; Edy, 2012; Fatimah, 2012). Without adequate opportunities to engage in experimental and investigative activities, students are more likely to develop surface-level understanding that is disconnected from real-world contexts. In addition, Self-Directed Learning (SDL) provides a theoretical framework that emphasises learner autonomy, responsibility for learning, and active engagement in the learning process as essential foundations for meaningful and sustained learning. In the context of science learning, the application of SDL principles enables students to plan, implement, and evaluate their own learning through structured and meaningful experimental activities. However, this approach has yet to be systematically implemented in science teaching practices in schools, particularly at the lower secondary level and within the SABK context (Faridah, Mohd & Suhailah, 2019; Hasmiza et al., 2023).

Although developments in educational technology, such as interactive simulations and visual technologies, have the potential to support science learning, their application in real school contexts remains limited and uneven. In schools with constrained resources, including SABK, technology-based approaches alone are often impractical for supporting the continuous implementation of experimental activities (Wun & Sunita, 2015; Azraai & Othman, 2015).

Therefore, a clear gap exists between the pedagogical demands of science learning, which emphasise conceptual understanding, science process skills, and learner autonomy, and the reality of classroom teaching practices. Despite the growing body of research on experiment-based learning, inquiry approaches, and Self-Directed Learning (SDL) in science education, limited studies have examined self-directed, experiment-based science learning using everyday materials in resource-constrained lower secondary contexts, particularly within Government-Aided Religious Schools (SABK), and from the combined perspectives of teachers and students. Accordingly, this needs analysis study was conducted to identify the actual learning needs of Form One science education in Government-Aided Religious Schools (SABK) from the perspectives of teachers and students, as a foundation for the development of a pedagogically grounded and contextually feasible instructional intervention in science learning

Lower Secondary Science Learning

Science learning at the lower secondary level, particularly for Form One students, represents a highly critical phase in establishing the foundation of scientific conceptual understanding and the initial mastery of science process skills. At this stage, students are transitioning from exploratory-based learning at the primary school level to learning that is more systematic, abstract, and reasoning-oriented. Successful mastery of concepts and skills during this early stage determines students' ability to engage with more complex Science learning at the upper secondary level and, consequently, influences their sustained interest in the field of Science.

Nevertheless, the implementation of Science learning at the lower secondary level continues to face various challenges, particularly in terms of the pedagogical approaches employed. Learning that remains focused on rote memorisation of facts and examination preparation limits students' exposure to hands-on, inquiry-based, and experimental learning activities, which should form the core of Science learning (Nik, 2019; Norazilawati et al., 2015; Ramlah, Jamil & Analisa, 2015; Fatin et al., 2014; Salawati & Fatin, 2011). This excessive emphasis on content mastery without active concept construction further restricts students' opportunities to develop higher-order thinking skills, science process skills, and positive scientific attitudes towards learning (Faridah, Mohd & Suhailah, 2019; Wong & Kamisah, 2018; Fazilah, Othman & Azraai, 2016).

Several previous studies have also reported that the implementation of experimental activities in classrooms remains at a low level and is not carried out consistently. Science learning tends to focus more on content delivery and factual transmission without active concept construction through investigative and exploratory experiences (Nik, 2019; Norazilawati et al., 2015; Ramlah et al., 2015; Faridah et al., 2019). As a result, students perceive Science as a purely theoretical subject, whereas in reality, Science is a process of inquiry grounded in observation, experimentation, and reasoning.

In the context of *Sekolah Agama Bantuan Kerajaan* (SABK), the challenges of implementing Science learning become more pronounced due to constraints related to limited instructional time, inadequate laboratory facilities, and the prioritisation of religious studies, which collectively influence the frequency and quality of experimental activities. Consequently, there is a clear need for a Science learning approach that is more practical, flexible, and student-centred.

Needs and Challenges in Science Learning
In line with lower secondary Science learning as discussed earlier, Science teaching and learning approaches must also evolve in response to the demands of the Industrial Revolution 4.0 (IR 4.0), which emphasises the mastery of 21st-century skills such as critical thinking, problem-solving, creativity, collaboration, and technological literacy. Accordingly, Science teaching and learning should shift from conventional teacher-centred methods to approaches that are more flexible, active, and student-centred (Che, Asmayati & Siti, 2020). However, findings from the Ministry of Education Malaysia (2012) indicate that only a small proportion of teachers demonstrate a high level of proficiency in applying a variety of instructional strategies, while the majority remain at moderate to low levels. This situation reflects a gap between educational policy aspirations and the realities of classroom practice, thereby reinforcing the need for a systematic needs analysis.

In the context of Science education, experimental activities are widely recognised as one of the most effective teaching and learning approaches, as they enable students to construct conceptual understanding through hands-on experiences and the integration of scientific skills (Ministry of Education Malaysia, 2015a). The reintroduction of practical examinations for pure science subjects in the Sijil Pelajaran Malaysia (SPM) and the implementation of School-Based Practical Assessment (Pentaksiran Kerja Amali, PEKA) for core science subjects further demonstrate the Ministry of Education Malaysia's strong emphasis on the mastery of experimental skills and science process skills among students (Malaysian Examinations Board, 2020). Nevertheless, the extent to which these approaches are effectively implemented at the school level remains a critical question that requires empirical investigation based on field data.

The implementation of practical examinations and PEKA aims to assess students' ability to apply science process skills and manipulative skills in practical contexts. The primary objective of PEKA is to produce students who possess scientific skills while simultaneously strengthening their understanding of scientific theories and concepts (Malaysian Examinations Board, 2004). However, in actual teaching and learning practices, the implementation of experimental activities is often constrained by limited instructional time, insufficient equipment, large class sizes, and pressure to complete the syllabus. Therefore, there is a clear need to examine both teachers' and students' perspectives, particularly in relation to the teaching and learning processes in Science subjects.

Previous studies have shown that inquiry-based experimental activities are capable of enhancing scientific literacy, science process skills, cognitive skills, and students' academic achievement (Demaria & Murphy, 2019; Lord & Orkwiszewski, 2006; Mayasari, 2016; Azlina, 2016; Nelly, 2012). Pedaste et al. (2015) further explain that the inquiry approach enables students to act as "young scientists" who construct knowledge through observation, investigation, and experimentation. However, the effectiveness of this approach is highly dependent on students' readiness, teachers' competencies, the quality of activity planning, and the availability of instructional support materials. Without a clear understanding of the actual needs of teachers and students, the implementation of inquiry-based approaches risks becoming unsystematic and less impactful.

Overall, this review indicates that although various policies, approaches, and methods for Science teaching and learning have been introduced, discrepancies remain between intended implementation and actual classroom practices. Therefore, a needs analysis represents a critical initial step in identifying the strengths, weaknesses, challenges, and actual needs of teachers and students in Science learning, particularly within the SABK context. The findings of this analysis will subsequently provide a solid foundation for the development of more structured, practical, and contextually relevant Science learning interventions or modules.

Methodologi

This study employed a needs analysis design using a descriptive quantitative approach supported by qualitative data in the form of open-ended questions. The primary purpose of this phase was to identify actual learning needs, teaching challenges, as well as the needs of teachers and students in Form One Science learning in *Sekolah Agama Bantuan Kerajaan* (SABK), including Form One Science topics that are difficult for teachers to teach and challenging for students to understand. According to Gagné et al. (2005), this phase is crucial for identifying issues that occur within a population, and these identified issues are subsequently used in seeking appropriate solutions. In addition, the analysis phase serves as a process to determine whether the instructional design developed is capable of addressing the identified issues.

This study utilised purposive sampling involving Form One Science teachers or teachers with experience teaching Form One Science under the Kurikulum Standard Sekolah Menengah (KSSM) for a minimum of three years. This selection aimed to ensure that the teachers involved were professionally trained and possessed adequate experience in teaching the KSSM curriculum.

Approval for this study was obtained from the Educational Policy Planning and Research Division, Ministry of Education Malaysia. In this needs analysis, a total of 265 students were involved as respondents, selected through cluster random sampling from five SABK schools, along with 32 Science teachers from SABK schools in Negeri Sembilan. The sample size was determined based on the Krejcie and Morgan (1970) population sample size determination table. The time allocated for both teachers and students to complete the questionnaire was 30 minutes. Subsequently, the data obtained were analysed as needs analysis data.

Instrument

The research instrument used in this study was a needs analysis questionnaire developed based on the framework proposed by Morrison et al. (2007), which classifies needs into two main components, namely existing needs and felt needs (teachers' and students' needs and preferences). This questionnaire was adapted from the study by Nurazidawati (2019) and was validated by three experts in the field of education. A five-point Likert scale was employed (1 = strongly disagree to 5 = strongly agree), in accordance with the recommendations of Sidek and Jamaludin (2008). This content validity process ensured that each item developed was relevant, clear, and aligned with the objectives of the study.

The instrument comprised closed-ended items in the form of Likert-scale statements to identify students' learning needs and Science topics perceived as difficult, as well as open-ended questions to obtain students' and teachers' perspectives on science learning in schools. This instrument was used to collect data from Form One students and Science teachers, particularly in Government-Assisted Religious Secondary Schools (SABK).

Data Analysis Methods

Data obtained from the needs analysis questionnaire were analysed using descriptive statistics. Meanwhile, data from the open-ended questions were analysed using thematic analysis to identify the main themes related to students' and teachers' perspectives on Science learning. The integration of quantitative and qualitative analyses enabled a more comprehensive understanding of the actual needs of teachers and students within the SABK context.

Needs Analysis Findings

Existing Needs: Science Topics Perceived as Difficult by Students and Teachers

The needs analysis questionnaire completed by students aimed to examine students' perspectives on the level of difficulty of form one science topics under the Kurikulum Standard Sekolah Menengah (KSSM). Overall, the form one science syllabus comprises nine main topics. In this phase, students were asked to evaluate the level of difficulty for each topic. Details of the difficulty levels based on students perspectives are presented in Table 1.

Table 1

Ranking of difficulty levels of form one science topics (students perspective)

Chapter	Topic	Mean difficulty ranking	Rank
1	Introduction to scientific investigation	6.3	8
2	Cells as the basic unit of life	5.5	6
3	Coordination and response	4.8	4
4	Reproduction	3.8	3
5	Matter	6.1	7
6	Periodic table	1.7	1
7	Air	4.9	5
8	Light and optics	3.3	2
9	Earth	8.6	9

Based on Table 1, students indicated that the Periodic Table topic was the most difficult, with the lowest mean score (M = 1.7), followed by Light and Optics, Reproduction, Coordination and Response, Air, Cells as the Basic Unit of Life, Matter, Introduction to Scientific Investigation, and Earth. According to the principles of descriptive analysis, lower mean values indicate lower levels of mastery or understanding, reflecting greater difficulty in comprehending a topic (Creswell, 2012; Fraenkel et al., 2012). Therefore, a lower mean value signifies a higher level of difficulty. In addition to students perspectives, this study also examined the difficulty level of form one science topics from teachers perspectives. The findings from the teachers needs analysis are presented in Table 2.

Table 2
Difficulty levels of Form One Science topics (teachers' perspective)

Chapter	Topic	Mean difficulty ranking	Rank
1	Introduction to scientific investigation	6.14	7
2	Cells as the basic unit of life	6.57	8
3	Coordination and response	5.00	4
4	Reproduction	2.43	2
5	Matter	5.00	3
6	Periodic table	1.29	1
7	Air	5.14	5
8	Light and optics	5.71	6
9	Earth	7.71	9

Based on Table 2, teachers agreed that the Periodic Table topic was the most difficult to teach, with the lowest mean score (M = 1.29), followed by Reproduction, Matter, Coordination and Response, Air, Light and Optics, Introduction to Scientific Investigation, Cells as the Basic Unit of Life, and Earth. Overall, these findings indicate consensus between teachers and students that the Periodic Table is the most challenging topic in Form One Science.

Felt Needs (Teachers' and Students' Preferences)
Theme 1: High Student Interest in Experimental Activities
The findings indicate that most of the students demonstrated a high level of interest in experimental activities, as such activities help them understand Science concepts more easily and meaningfully. Students reported that learning through experiments makes Science more enjoyable and less abstract, particularly at the Form One level, which is perceived as more challenging than primary school Science.
The following student excerpts support this finding:
"I like carrying out experimental activities." (R005M)
"Through experimental activities, I understand more easily. Moreover, Form One Science is more difficult than Year Six Science." (R029M)
"I feel more excited when conducting experiments." (R223M)
"Experiments help me to understand more easily." (R204M)

Theme 2: Constraints in the Implementation of Experiments in Science Teaching and Learning
Although students showed high interest in experiments, the findings also revealed that the implementation of experimental activities in schools is very limited. The main constraints identified from students' perspectives were insufficient time and the low frequency of conducting experiments.
The following student excerpts illustrate this theme:
"I do not have the opportunity to carry out experiments because time is insufficient." (R077M)
"I rarely do experiments because the teacher does not have time to conduct experiments." (R112M)
"I often do not have the opportunity to carry out experiments." (R173M)

"I rarely go to the laboratory and rarely conduct experiments." (R203M)
"Science experiments are very rarely conducted at school." (R061M)

Theme 3: Students' Preference for Conducting Experiments Individually

The findings further show that students prefer to conduct experiments individually rather than in groups. This preference arises because, in group activities, students often act merely as observers and have limited opportunities to be directly involved in each step of the experiment.

The following student excerpts reinforce this finding:
"I prefer to conduct Science experiments individually." (R164M)
"I do not really like doing experiments in groups because I do not get frequent opportunities to carry out the experiments." (R026M)
"I like doing experiments, but I cannot always do them because I have to share with my friends." (R209M)
"I like doing experiments, but it is usually my other friends who get the chance." (R093M)

Theme 4: Students' Perceptions of the Difficulty of Form One Science

Students also reported that form one science is more difficult than science at the primary school level. This perception increases the need for learning approaches that are more practical and easier to understand.

The following excerpts reflect this finding:
"Form One Science is more difficult than primary school Science." (R182M)
"I will understand better if I do experiments because Form One Science is difficult." (R159M)
"Science is more difficult than other subjects for me." (R173M)

Theme 5: Teachers' Constraints in the Implementation of Science Teaching and Learning

From teachers perspectives, the main challenges identified include shortages of laboratory equipment and materials, insufficient Per Capita Grant (PCG) allocation, a dense syllabus, limited instructional time, and restricted access to laboratory facilities. These factors directly affect the continuity and effectiveness of experimental activities.

The following teacher excerpts support this finding:
"Limited time to conduct experimental activities and a shortage of Science equipment and laboratory apparatus." (R01G)
"Shortage of Science equipment and materials." (R08G)
"The dense DSKP limits the time available to conduct each experiment." (R11G)
"Time constraints – SABK has limited instructional time." (R18G)
"Limited use of the laboratory." (R16G)
"Insufficient materials or apparatus due to limited PCG allocation." (R07G)

Theme 6: Teachers' Need for Alternative Experimental Modules

The findings indicate that the majority of teachers expressed a clear need for alternative experimental modules that can be implemented without full reliance on laboratory facilities and that allow each student to be individually involved.

The following teacher excerpts support this need:
"Can help through the use of learning modules." (R09G)
"A learning module, especially for implementing alternative experimental activities so that students can conduct experiments." (R26G)

"A module that students can carry out on their own, with the teacher acting only as a facilitator." (R11G)
"Experimental activities that can be conducted without having to use the laboratory." (R22G)
"Methods that help all students to carry out experimental activities." (R29G)

Summary of Findings

Overall, the findings indicate that students have a high level of interest in experimental activities; however, opportunities to conduct such activities are limited due to constraints related to time, equipment, and teaching and learning approaches. Students also show a preference for individual experimental activities due to greater active involvement. From teachers' perspectives, constraints related to resources, syllabus demands, and instructional time are the main factors limiting the implementation of experiments. Consequently, both students and teachers consistently expressed the need for the development of a flexible, practical, and easily implementable self-directed experimental module.

Discussion and Conclusion

The findings of the needs analysis indicate that the Periodic Table topic was identified as the most difficult topic to be mastered by students and to be taught by teachers among Form One students in Government-Assisted Religious Secondary Schools (SABK). This difficulty is consistent with findings from previous studies, which reported that the abstract concepts embedded in the Periodic Table require a high level of conceptual understanding as well as the ability to establish relationships between the properties of matter, particles, and physical changes in substances (Dani et al., 2015). In the context of Form One students who are still in the transitional phase from concrete to abstract learning, this difficulty becomes more pronounced in the absence of effective experimental support.

The findings further reveal that students demonstrate a very high level of interest in experimental activities and acknowledge that learning through experiments helps them understand Science concepts more easily and enjoyably. However, the implementation of experimental activities in daily teaching was found to be very limited due to time constraints, restricted laboratory use, and shared equipment. This supports the views of Wan and Lilia (2016) as well as Nurzatulshima and Lilia (2013), who emphasised that conceptual mastery and the development of scientific skills are more effective when students are directly involved in authentic experimental activities rather than relying solely on theoretical explanations.

In addition, students showed a strong preference for conducting experiments individually, as they perceived limited opportunities for active participation when experiments were carried out in groups. This finding is consistent with studies by DeMaria and Murphy (2019) and Cotabish et al. (2013), which highlighted that active learning through self-engagement enhances students' confidence, understanding, and meaningful knowledge construction. Therefore, approaches that enable students to conduct experiments independently are considered highly significant within the context of Science learning in SABK.

From the teachers' perspective, the findings indicate that the main constraints in Science teaching and learning involve shortages of materials and apparatus, limited PCG allocation, a dense syllabus, and insufficient instructional time. These constraints directly affect the consistent implementation of experimental activities. This issue has also been reported by the Ministry of Education Malaysia (2020), which noted that the implementation of practical-based learning continues to face challenges related to resources and instructional time, particularly in schools with limited facilities.

More importantly, the findings show that teachers consistently expressed the need for a learning module that can support the implementation of alternative experimental activities using easily obtainable materials and that can be conducted outside the laboratory. This need aligns with the demands of 21st-century learning and the Malaysia Education Blueprint (PPPM) 2013–2025, which emphasises strengthening STEM learning through hands-on approaches, problem-solving, and experiential learning.

Based on the overall findings of this needs analysis, it can be concluded that there is a clear gap between students' learning needs and the constraints faced in the implementation of Science teaching in SABK. Students require more active learning experiences, opportunities for self-directed experimentation, and learning that is focused on authentic experiences, while teachers require practical and flexible pedagogical support. Therefore, the development of a Self-Directed Science Experiment Module is both appropriate and relevant as a pedagogical intervention to bridge this gap by providing systematic, easily implementable experimental activities that do not rely entirely on laboratory facilities, while strengthening students' conceptual mastery, science process skills, and self-directed learning.

In terms of research implications, these findings contribute significantly to the field of Science education, particularly within the context of religious-based schools such as SABK, which face constraints related to time and facilities. This study demonstrates that a self-directed experimental learning approach using everyday materials has the potential to serve as an effective alternative for enhancing the quality of Science learning at the lower secondary level.

In conclusion, this needs analysis has empirically identified the actual needs of both students and teachers in Science learning within the SABK context. The findings provide a strong foundation for the development of a more contextualised, inclusive, and student-centred pedagogical approach. Further research is recommended to evaluate the effectiveness of this module in terms of conceptual mastery, science process skills, and self-directed learning among SABK students using a quasi-experimental research design.

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