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# BARRIERS TO EFFECTIVE SCIENCE TEACHING: IMPROVING STUDENT ACHIEVEMENT IN THE CAMBRIDGE PRIMARY SCIENCE CHECKPOINT

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## Abstrak

Penelitian ini bertujuan untuk mengidentifikasi tantangan dalam persiapan ujian Cambridge Primary Checkpoint, khususnya dalam pendidikan sains, serta mencari solusi untuk meningkatkan efektivitas pembelajaran dan hasil ujian siswa. Masalah utama yang ditemukan adalah ketidaksesuaian antara soal latihan yang ada dengan soal ujian yang sesungguhnya, di mana soal latihan cenderung lebih mudah dan tidak mencerminkan kesulitan soal ujian yang lebih kompleks. Selain itu, format soal dalam buku latihan tidak sejalan dengan format ujian yang lebih menuntut pemahaman konsep dan penerapan praktis. Penelitian ini juga mengungkapkan bahwa penggunaan buku latihan yang sama untuk kelas reguler dan kelas tambahan membatasi keberagaman materi latihan yang bisa digunakan siswa dalam mempersiapkan ujian. Berdasarkan temuan tersebut, penelitian ini merekomendasikan pengembangan buku latihan tambahan yang dirancang khusus untuk melengkapi buku latihan yang sudah ada. Buku latihan tambahan ini diharapkan dapat menawarkan soal yang lebih menantang dan beragam, sesuai dengan format soal ujian yang sesungguhnya. Dengan demikian, siswa akan lebih siap menghadapi ujian dan dapat lebih mudah mengembangkan keterampilan berpikir kritis serta penerapan konsep ilmiah. Hasil penelitian ini memberikan wawasan penting bagi pendidik dan lembaga pendidikan untuk meningkatkan kualitas persiapan ujian melalui materi latihan yang lebih sesuai dengan kebutuhan dan tantangan ujian, serta menciptakan pengalaman belajar yang lebih efektif dan menyeluruh.

**Kata kunci**: Pengajaran Sains, Hambatan Pengajaran, Motivasi Siswa, Pencapaian Siswa, Cambridge Primary Science Checkpoint

## Abstract

This study aims to identify the challenges in preparing for the Cambridge Primary Science Checkpoint exam, particularly in science education, and to find solutions to enhance the effectiveness of student learning and exam results. The main issues identified include the mismatch between the questions in workbook available and the actual exam questions, with the questions in workbook being generally easier and not reflective of the complexity of the real exam questions. Additionally, the format of the questions in workbook does not align with the exam format, which requires a deeper understanding of concepts and their practical application. The study also revealed that using the same workbooks for both regular and Extra Classes limits the variety of practice materials that students can use in their exam preparation. Based on these findings, the study recommends developing a supplementary workbook specifically designed to complement the existing workbook materials. This supplementary book is expected to provide more challenging and diverse questions, better aligned with the actual exam format. By doing so, students will be better prepared for the exam and will be able to develop critical thinking skills and apply scientific concepts more effectively. The results of this study offer valuable insights for educators and educational institutions to improve exam preparation by providing more suitable workbook materials that meet the challenges of the exam and create a more effective and comprehensive learning experience.



**Keywords**: Science Teaching, Teaching Barriers, Student Motivation, Student Achievement, Cambridge Primary Science Checkpoint


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## 1. Introduction

Effective teaching plays a crucial role in improving the quality of education, especially at the primary education level. Effective teaching involves designing inclusive curricula and assessments that enhance the teaching and learning process while also serving as a powerful tool to eliminate educational barriers and ensure that all students are included **(Munna & Kalam, 2021)**. To improve the effectiveness of learning, the curriculum needs to be carefully designed and the assessments must be appropriate, so that barriers in education can be overcome. Effective teaching can give maximum impact on the learning achievement **(Zhao et al., 2023)**. So, to give impact, right learning method should be applied. One subject that is often considered challenging to teach is science, as it requires an approach that blends theory with practice and encourages direct student engagement with the material. In contexts such as the Cambridge Primary Science Checkpoint exam, science education is critical in building a strong foundational understanding of complex scientific concepts, which will later support students' ability to tackle more advanced topics in higher education. According to **Anderson (2007)**, effective science teaching should be interactive, involving students actively through experiments and problem-solving, rather than just passive reception of information. Instead, it emphasizes an interactive learning environment where students are actively engaged in the learning process. This includes hands-on experiments, inquiry-based activities, and collaborative problem-solving tasks that encourage critical thinking and deeper understanding of scientific concepts. By involving students directly in the process of discovery, teachers can foster curiosity, enhance

motivation, and help students develop essential skills such as analysis, reasoning, and scientific communication. This approach not only makes learning more meaningful but also prepares students to apply their knowledge in real-world contexts.

Despite the importance of effective science teaching, many students face several challenges when preparing for exams like the Cambridge Primary Science Checkpoint **(Munawwarah & Alqadri, 2023)**. Cambridge Checkpoint tests evaluate students' progress in Mathematics, English, and Science, and are generally taken at the end of Cambridge Primary (ages 10–11) or Lower Secondary education (ages 13–14). These tests are assessed by Cambridge examiners, and each school receives a detailed diagnostic report. The feedback helps schools monitor both individual and group performance, allowing them to better understand their students' needs and compare their achievements with those of learners in Cambridge International Schools worldwide **(Antara, 2025)**. The student achievement in the Cambridge Primary Science Checkpoint exam has not been optimal in recent years. The fact is that the international average score for Science in 2023 was only 32 out of a total of 50 points—equivalent to 64% **(CIE Direct, 2023)**. Similarly, in 2024, the international average dropped slightly to 31, or 62% **(CIE Direct, 2024)**. Based on the data, it can be concluded that both students and teachers face difficulties in preparing themselves to achieve better scores in the Cambridge Primary Science Checkpoint exam. It can be causes by several factors. **Hattie (2009)** emphasized that the gap between classroom workbook and assessment challenges often undermines student preparedness for exams, resulting in lower-than-expected performance during actual assessments. In other hand, **Osborne et al. (2003)** point out, students need to be encouraged to engage with scientific concepts in a way that emphasizes deep understanding and real-world applications, which is typically what the exam questions require.

Teaching resources can be another issue. According to Tharp and Gallimore (1988), differentiated learning resources are essential for reinforcing and extending student knowledge outside of regular instructional settings, especially when preparing for important assessments. While **Hattie (2009)** argues that providing students with tasks that challenge their thinking and understanding leads to better performance in assessments. This idea is supported by **Anderson (2007)** suggests, engaging students with complex, real-world problems enhances their ability to think critically and apply knowledge effectively, which is essential for success in exams that test deeper understanding. This idea is aligning with the perspectives of experts who argue that providing targeted and varied practice opportunities is the key to improving student outcomes **(Tharp & Gallimore, 1988)**.

To make sure all issues above, this research is therefore conducted to identify the challenges encountered by both students and teachers.

## 2. Methodology

### Research Approach

This study adopts a qualitative research approach to explore and understand the challenges faced in science teaching at the primary education level, particularly in preparing for the Cambridge Primary Science Checkpoint exam. A qualitative method is chosen because it provides an opportunity to understand the phenomena in real-life contexts through the interactions and experiences of students, teachers, and other relevant stakeholders. Qualitative research is a contextual activity that places the researcher within the environment being studied. It involves a range of interpretive and tangible practices aimed at making the world more visible. These practices reshape how reality is understood by turning it into various forms of representation, such as field notes, interviews, conversations, photographs, recordings, and personal reflections. At its core, qualitative research adopts an interpretive and naturalistic approach to understanding the world **(Roulston & Halpin, 2022)**. This research will analyze the experiences of both students and teachers in using the current workbooks and assess how well these books support preparation for the exam.

### Research Design

The research design for this study includes case studies and in-depth interviews. The data collected is analyzed to identify the issues related to the mismatch between questions in workbook and exam questions, as well as the challenges students face in preparing for the Cambridge Primary Science Checkpoint exam. Through this approach, the study aims to gain a deeper understanding of students' needs and find ways to improve the effectiveness of workbooks in supporting exam preparation.

### Location and Participants

The participants of this study are the students and science teachers from ICS Pekanbaru and Sekolah Putra Batam. Both school use Cambridge Curriculum and run Cambridge Primary Science Checkpoint examination. The participants of this study consist of two main groups:

1. **Students**: 10 Students from each school that are preparing for the Cambridge Primary Science Checkpoint exam and using workbooks as part of their learning process.
2. **Teachers**: 2 Teachers from each school who teach science at the primary level and play a role in selecting and using workbooks in the classroom.

### Data Collection

Data will be collected through the following methods:

1. **In-depth Interviews**: Interviews will be conducted with teachers and students to gather their perceptions of the workbooks used, the challenges they face in

exam preparation, and whether they feel the workbooks reflect the level of difficulty of the exam questions. The interviews will also explore their views on the need for an additional workbook that is more challenging and aligned with the exam format.

2. **Classroom Observations**: Observations will be made in classrooms to see how workbooks are used in regular and extra classes . This observation will also note the dynamics between students and teachers when working on questions in workbook and how they prepare for exams.
3. **Document Analysis**: The analysis of the workbooks will be conducted to evaluate the alignment between the questions in workbook and the actual exam questions. The study will also analyze the structure of the questions to determine whether they focus more on testing conceptual understanding or are geared towards simpler, direct answers.

**Research Procedures**

1. **Preparation Phase**: Schools and participants will be selected for inclusion in the study. Arrangements will be made for in-depth interviews with teachers and students, and the observation tools will be prepared.
2. **Data Collection Phase**: In-depth interviews will be conducted with both teachers and students, and observations will take place in both regular and extra classes . The workbooks used will also be analyzed to assess their alignment with the actual exam questions.
3. **Data Analysis Phase**: The data from interviews, observations, and document analysis will be analyzed using thematic analysis techniques. The researcher will identify key themes related to the challenges in science teaching and exam preparation, as well as the gap between questions in workbook and exam questions.
4. **Results Presentation Phase**: The findings will be presented in a research report that describes the challenges faced by students and teachers, and provides recommendations for developing a more effective supplementary workbook.

**Data Analysis**

The data collected from interviews, observations, and document analysis will be analyzed using qualitative thematic analysis techniques. The analysis process will begin with reading and coding the data, followed by grouping the codes that relate to the issues observed in science teaching and exam preparation. The main findings will be organized into themes that reflect students' and teachers' perspectives on the current workbooks and the need for supplementary materials.

**Problem Identification**

There are spaces that need to be filled up in maximizing the student's achievement in Cambridge Primary Science examination by teachers and students. The fact is that the international average score for Science in 2023 was only 32 out of a total of 50 points—equivalent to 64% **(CIE Direct, 2023)**. Similarly, in 2024, the international average dropped slightly to 31, or 62% **(CIE Direct, 2024)**. The data shows that the achievement

is low for a final examination. So that, this study is conducted to answer these questions:

1. What are the barriers to effective science teaching that impact student achievement in the Cambridge Primary Science Checkpoint?
2. What student-related factors hinder success in the Cambridge Primary Science Checkpoint?

## 3. Research Findings

This section presents the findings from the qualitative research conducted to explore the challenges faced by students and teachers in preparing for the Cambridge Primary Science Checkpoint exam.

**1. Misalignment Between Questions in workbook and Exam Questions**

One of the most significant findings from this study was the mismatch between the questions in the current workbooks and the actual exam questions. Cambridge Checkpoint questions differ from the typical multiple-choice questions found at the junior high school level. In the Checkpoint exams, students are required to provide written responses within a relatively short time. These descriptive questions encourage students to think critically, express creativity, and support their answers with reasoning. As a result, thorough preparation by both teachers and students is essential for success **(Munawwarah & Alqadri, 2023)**. Both students and teachers expressed concerns that the questions in the workbooks were generally too simple and did not reflect the level of difficulty of the Cambridge Primary Science Checkpoint exam.

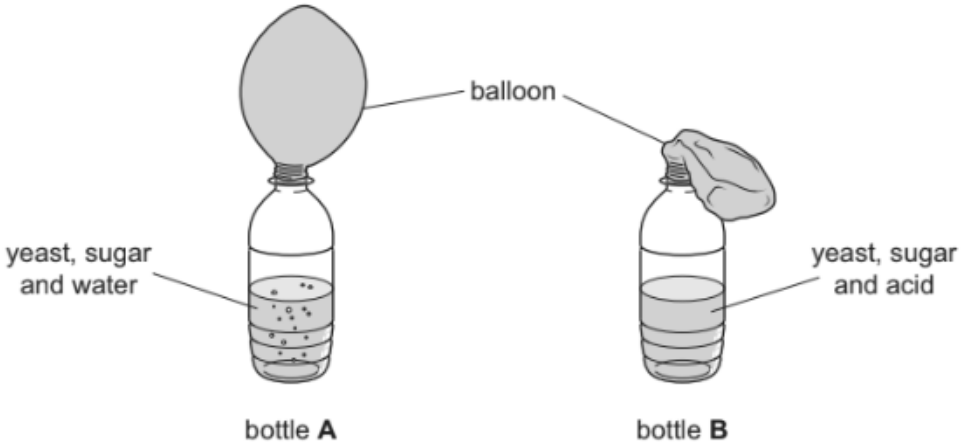
**Picture 1: The Questions in a Cambridge Primary Science Examination Paper 1**

**5** Ahmed investigates the growth of a fungus called yeast.

Ahmed:

- puts the same mass of yeast into two bottles, **A** and **B**
- puts the same mass of sugar in each bottle
- puts 50 $cm^3$ of water into bottle **A**
- puts 50 $cm^3$ of acid into bottle **B**
- puts a balloon over the top of each bottle
- measures the circumference of each balloon every 15 minutes.

The diagram shows his investigation after 60 minutes.




**(a)** The circumference is the distance around the outside of the balloon.

Ahmed uses a piece of string and a ruler to measure the circumference of the balloon.

Describe how Ahmed uses the string **and** ruler to measure the circumference.

.....

.....

..... [2]

**(b)** Ahmed records his results in a table.

| time | circumference of balloon in cm | |
|---|---|---|
| | bottle A | bottle B |
| 0 | 8 cm | 8 cm |
| 15 | 10 cm | 8 cm |
| 30 | 14 cm | 9 cm |
| 45 | 16 cm | 9 cm |
| 60 | 18 cm | 10 cm |

Ahmed has made **two** mistakes in his results table.

Write down the **two** mistakes Ahmed has made.

1 .....

.....

2 .....

.....

[2]

**(c)** Acid is a defence mechanism in the human body.

Which organ in the human body uses acid as a defence mechanism?

Circle the correct answer.

**brain** **intestine** **lungs** **mouth** **stomach**

[1]

**Picture 2: The Questions in the existing science workbook**

# 1.4 Diseases

**Focus**

1 Mark each one of these statements about diseases as true (✓) or false (✗).

a All infectious diseases are caused by viruses. ☐

b A parasite lives on or in the body of another living thing. ☐

c Living things that spread diseases always get the disease themselves. ☐

d Diseases can be spread when we cough or sneeze. ☐

e Washing hands with soap and water will stop germs spreading. ☐

f Adding salt to water will make it safe to drink. ☐

The topic addressed in the two questions above is about parasites that spread disease. Parasites can be viruses, bacteria, or fungi. One example of a fungus is yeast. Yeast is not considered a harmful fungus to the human body.

Comparing the two sets of questions above, we can see how inconsistent the content of the Checkpoint exam questions is with the existing workbook questions, as well as the significant gap in the level of difficulty between the two. This discrepancy is one of the reasons why students did not perform well on the Checkpoint exam.

Students reported that they often scored perfectly on the workbook but struggled when faced with the more challenging, conceptually demanding questions in the actual exam. One of the students said:

> "My score was very good when working on the workbook because the questions were easy to answer. However, when answering the Checkpoint exam questions, I found it difficult. The questions were hard to answer, and many of them had long texts."

Teachers also noted that while the workbooks were useful for reinforcing basic knowledge, they did not help students develop the critical thinking and application skills required for the exam. As one teacher stated:

> "The workbooks give students confidence, but they don't prepare them for the type of questions they'll see in the actual exam. The exam focuses more on conceptual understanding."

**Hattie (2009)** argued that effective learning depends on students' ability to face challenges that align with the exam's difficulty level. A mismatch between questions in workbook and actual exam questions can lead students to feel unprepared, even if they appear to do well in workbook. **Bransford et al. (2000)** also stated that workbook that is too easy will not help students develop the higher-order thinking skills needed for exams. They emphasized the importance of challenging questions that encourage students to think critically and apply knowledge in-depth.

**2. The Need for Challenging and Exam-Aligned workbook**

A clear theme that emerged from the interviews and observations was the need for more challenging practice materials that are aligned with the format and difficulty of the actual exam. Students and teachers alike indicated that the current workbooks do not sufficiently push students to think critically or engage with higher-level scientific concepts. Several students expressed frustration over the ease of questions in workbook and wished for more complex problems that would better prepare them for the exam. One student mentioned:

> "I always get 100% on the workbooks, but the exam is much harder, and I find myself unsure about how to answer."

Teachers also emphasized that the questions in workbook needed to focus more on conceptual understanding and problem-solving, which are the key areas tested in the Cambridge Primary Science Checkpoint. One teacher mentioned:

> "We need questions that require students to explain their reasoning, apply their knowledge, and think critically, not just recall facts."

**Anderson (2007)** argued that to develop critical thinking skills in science, questions in workbook must be designed to encourage students to think more deeply and apply the concepts they have learned. Simple or uniform practice materials do not adequately

prepare students for the challenges they will face on the exam. **Osborne et al. (2003)** added that student motivation increases when they are confronted with challenging questions. According to them, questions that require the application of concepts and problem-solving are much more effective in preparing students for exams.

**3. The Role of Extra Classes in Exam Preparation**

The study revealed that extra classes, which are designed to provide additional support for exam preparation, are an essential part of the learning process for many students. However, teachers pointed out that the same workbooks used during regular classes cannot be used in Extra Classes because they have already been completed. This creates a gap in students' learning, as there are no additional resources available to bridge this gap.

Students in Extra Classes reported that they were often left with little to no new material to work with, which impacted their ability to engage with more challenging content. As one student noted:

> "In extra classes, we don't have new books to practice with, so we just repeat the same questions we did in normal classes, and that doesn't help us get ready for the real exam."

**Tharp & Gallimore (1988)** stated that effective learning involves varied materials that are suited to students' ability levels. They argued that using different materials in Extra Classes allows students to practice new skills and deepen their understanding. **Vygotsky (1978)**, in his Zone of Proximal Development (ZPD) theory, also emphasized the importance of providing students with greater challenges in the learning process. Extra Classes that offer more challenging practice materials can push students further and help them develop the necessary skills.

**4. Lack of English proficiency**

English is not the first language in Indonesia. It can be the third of forth one. The limitation to the access to quality English resources varies, especially in rural areas, and pronunciation challenges arise from differences between Bahasa Indonesia and English. Motivation also plays a role, as some students see English as merely an academic subject rather than a valuable skill. Inconsistent curriculum policies further hinder proficiency, as English is not compulsory in early education.

**5. Importance of Varied Practice Materials**

The research also highlighted the importance of varied practice materials. Teachers mentioned that in order to effectively prepare students for the Cambridge Primary Science Checkpoint, practice materials needed to be diverse, offering both conceptual and application-based questions. Students reported that they felt more confident when they were exposed to different types of questions that challenged their understanding and made them think critically. As one student put it:

> "When I see different types of questions, I feel like I am really learning. It helps me understand science better."

This theme aligns with expert research by **Anderson (2007)**, who emphasized that effective science teaching should engage students with diverse problem-solving opportunities that encourage critical thinking and knowledge application.

**Hattie (2009)** revealed that variation in question formats and teaching methods is crucial for improving students' understanding. Questions that require students to apply knowledge in different contexts will help them develop higher-order thinking skills, which are necessary for exams. **Piaget (1973)** also emphasized the importance of varied learning experiences. In the context of science, a variety of questions in workbook that involve applying concepts in different situations can help students develop a deeper understanding of the material.

**6. Recommendations for Improving Science Exam Preparation**

Based on the findings of this study, several key recommendations were identified:

- **Development of a Supplementary Workbook**: It is crucial to develop a supplementary workbook that provides more challenging questions aligned with the format and difficulty of the Cambridge Primary Science Checkpoint exam. This book should focus on testing conceptual understanding, problem-solving, and critical thinking skills.
- **Integration of Supplementary workbook into Extra Classes**: Teachers should integrate the use of this supplementary workbook into extra classes, providing students with additional opportunities to practice with more challenging questions.
- **Increased Focus on Conceptual Understanding**: Both students and teachers emphasized the need for questions in workbook that go beyond rote memorization and focus on assessing students' ability to apply scientific concepts in new contexts.
- **Encouraging Active Engagement**: Students should be encouraged to actively engage with challenging questions and focus on the reasoning behind their answers rather than just memorizing facts.

**Bransford et al. (2000)** recommended providing students with opportunities to questions in workbook that test their conceptual understanding, rather than simple memorization. This approach will help students think more deeply and prepare them for more challenging exams. **John Dewey (1938)** emphasized the importance of student-centered learning, which allows students to actively engage in their learning and explore ideas critically. Therefore, developing a workbook that is both challenging and appropriate will enable students to learn in a more active and engaged manner.

This study has explored the challenges faced by students and educators in preparing for the Cambridge Primary Science Checkpoint exam, particularly in the context of science education. The research identified key issues that hinder effective exam preparation, such as the mismatch between questions in workbook and actual exam questions, the lack of alignment between practice materials and the exam's question

format, and the limitations of using the same workbook for both regular and extra classes.

A significant finding from the study is that the existing practices materials are often too simple and do not adequately reflect the difficulty level of the actual exam. As a result, students may appear to perform well in practice but still struggle during the actual exam. This highlights the need for practice materials that are more challenging and align better with the exam's structure, which tests not only knowledge but also the application of scientific concepts in various contexts.

Furthermore, the study underscored the importance of Extra Classes in preparing students for the exam. However, the use of the same workbooks for both regular and Extra Classes created a gap in the learning process, as these books had already been exhausted in the regular curriculum. The development of a supplementary workbook that offers more complex and varied questions is recommended to address this issue.

The research also emphasized that students face difficulty in English. That is why it is not easy for them to understand the exam questions.

## 4. Conclusion

The findings of this study suggest that the development of a supplementary workbook, alongside a more diversified approach to exam preparation, can improve student readiness and performance in the Cambridge Primary Science Checkpoint exam. By addressing the identified challenges and incorporating expert recommendations, educators can create more effective and engaging learning experiences for students, fostering a deeper understanding of science and preparing them for future academic success.

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