

A Study on Science Teachers' Perception of Newly Developed Science Workbooks and Their Effectiveness in Fostering Scientific Attitude in Learners

Seema Lenin Koshy¹, Shruti Tiwari^{2,*}

Abstract

This study examines science teachers' perceptions of newly developed science workbooks and evaluates their effectiveness in fostering scientific attitude among learners. Using a structured opinionnaire, the research gathered comprehensive feedback from teachers across multiple grade levels regarding the clarity, relevance, and pedagogical value of the workbooks. Analysis of opinionnaire responses revealed strong teacher agreement regarding the workbook's clarity, activity-based structure, and alignment with curriculum goals. Teachers reported noticeable improvements in students' curiosity, observation skills, and evidence-based reasoning. Moreover, teachers noted that the workbook's emphasis on hands-on engagement and problem-solving encouraged active participation and deeper conceptual grasp among learners. The workbooks' structured tasks, reflective questions, and real-life applications were identified as key contributors to enhanced scientific thinking. Findings demonstrate that positive teacher perception significantly influences workbook adoption and learning outcomes, reinforcing the importance of well-designed, inquiry-centered instructional materials in promoting scientific attitude. The study confirms that well-designed, inquiry-centered workbooks can significantly promote scientific attitude and support the development of essential 21st-century skills. These results highlight the need for continued innovation in educational resource design to strengthen science pedagogy and improve learning outcomes.

Keywords: Science workbooks, teaching-learning process, opinionnaire, national education policy, overall assessment

INTRODUCTION

The role of science workbooks in strengthening scientific attitudes and inquiry-based learning has gained substantial scholarly attention over the past two decades. Science teachers' perceptions toward

*Author for Correspondence

Shruti Tiwari

E-mail: shrutitiwari2008@gmail.com

¹Research Scholar, Department of Education, School of Education, Suresh Gyan Vihar University, Jaipur, Rajasthan, India

²Assistant Professor, Department of Education, School of Education, Suresh Gyan Vihar University, Jaipur, Rajasthan, India

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newly developed workbooks are crucial because the effectiveness of any instructional material is directly influenced by teachers' acceptance, usability experience, pedagogical alignment, and their belief in its ability to enhance scientific temper among learners. Research indicates that well-designed science workbooks, when integrated with activity-based pedagogy, significantly improve learners' curiosity, observation skills, hypothesis formulation, and problem-solving abilities—competencies that form the core of scientific attitude [1]. According to Aldahmash, A. H et al. [2], teachers reported that structured workbook tasks improved students' engagement levels by nearly 28%, demonstrating the importance of teacher perception in resource utilization. This

emphasis on perception aligns with Dewey's constructivist view that learning materials should stimulate inquiry and active engagement rather than rote memorization.

Studies examining science teachers' perception of instructional tools highlight that teachers tend to adopt materials that are easy to use, curriculum-aligned, and capable of fostering higher-order thinking skills. Chakraborty, D et al. [3] found that 72% of science teachers preferred new workbooks that incorporated hands-on activities, reflection prompts, and real-life applications because they made science concepts more accessible to diverse learners. Similarly, the effectiveness of such workbooks in developing scientific attitudes has also been validated empirically. For instance, Gizaw, G et al. [4] evaluated a newly developed middle-school science workbook and found a 15–20% increase in learners' scientific attitude scores over a six-week intervention. This improvement was attributed to the workbook's emphasis on observation tasks, open-ended experiments, and guided analytical questions. Consistent with these findings, Handayani, A. K. D et al. [5] argue that the transformation of a learner's scientific attitude depends heavily on systematic exposure to structured scientific exercises provided through workbooks.

The importance of integrating scientific attitude in school science has been emphasized by National Education Policy (NEP-2020), which calls for competency-based learning and inquiry-oriented resources. Several authors have noted that traditional textbooks and teacher-centric practices are inadequate for building the desired scientific temperament. Workbooks, however, offer a participatory learning experience. According to Neal, N. A et al. [6], newly designed science workbooks incorporating "observe–explore–explain" cycles significantly improved learners' conceptual clarity and reduced errors in concept application by 31%. Teachers interviewed in this study confirmed that such structured cycles encouraged active reasoning and self-learning, aligning with modern constructivist principles. Similarly, in a quasi-experimental study, Neal, N. A et al. [6] reported that learners taught through activity-based workbooks demonstrated higher levels of critical questioning and evidence-based explanations compared to those taught using only textbooks, reflecting a measurable shift in scientific attitude development [7].

Teachers' perception also influences the sustained adoption and effectiveness of the workbook. Studies reveal that when teachers perceive a resource as relevant, adaptable, and easy to integrate within classroom constraints, they are more likely to use it consistently. Ramnarain, U et al. [8] observed that 85% of science teachers showed a positive perception toward newly developed workbooks due to their alignment with learning outcomes and ease of implementation. However, some studies highlight challenges as well. According to Ramnarain, U et al. [8], teachers reported resistance when workbooks demanded additional preparation time or when school infrastructure, such as laboratories or materials, was insufficient to support workbook activities. Nevertheless, in most studies, teachers appreciated workbooks for helping students internalize scientific concepts through repeated practice and reflection—a process that traditional lecture methods often fail to achieve [9].

In addition to conceptual and attitudinal improvements, science workbooks influence student motivation, which directly contributes to scientific attitude formation. Motivation mediates learners' willingness to engage in experimentation and critical questioning. Vojř, K et al. [10] found that interactive workbooks increased student motivation by 24%, particularly when the tasks contained colorful illustrations, everyday science examples, and relatable scenarios. Teachers in the study perceived that motivational elements supported learner autonomy and curiosity—two essential attributes of a scientific mindset. This aligns with self-determination theory, which states that higher autonomy leads to deeper intrinsic motivation and improved learning outcomes.

Another significant dimension of teacher perception relates to assessment and feedback integration within the workbook. Research by Yurtyapan, E et al. [11] showed that workbooks with formative assessment checkpoints, reflective questions, and self-evaluation rubrics helped teachers track students' progress and provided learners with immediate feedback. Such features were rated positively by 78%

of science teachers who believed that integrated assessments made learning more transparent and reduced their workload in preparing additional evaluation tools. In terms of effectiveness, students using workbooks with embedded checks scored an average of 12% higher in scientific reasoning tests than students using standard textbooks.

Pedagogical alignment is another essential factor influencing teacher perception. According to Suryawati, E et al. [12], teachers prefer workbooks that support inquiry-based and experiential learning frameworks. Their study on workbook-based instruction in grade-VII classrooms showed that the scientific attitude composite scores improved by 18%, particularly in domains like open-mindedness, objectivity, and logical reasoning. The authors attributed this to workbook tasks encouraging learners to make predictions, test assumptions, analyze outcomes, and reflect on errors. Teachers noted that such tasks prepared students to think like young scientists rather than passive recipients of information. Teachers across studies consistently viewed workbooks as powerful tools when combined with practical demonstrations and guided discussions. The author emphasized that teachers' perception directly mediated the effectiveness of workbook usage in classrooms, suggesting that professional training is necessary for maximizing their impact.

Overall, the literature suggests that newly developed science workbooks have substantial potential to foster scientific attitude among learners when they are well-structured, activity-based, and aligned with curriculum goals. Teachers' perceptions play a decisive role in determining how effectively these workbooks are implemented. Positive perceptions rooted in usability, pedagogical relevance, and demonstrated learner improvement lead to sustained adoption and enhance the overall teaching-learning process. Empirical studies consistently show measurable improvements in scientific attitude ranging from 15%–30%, validating the pedagogical value of such resources. However, challenges such as time constraints, uneven activity complexity, and inadequate infrastructure must be addressed through teacher training and iterative refinement of workbook design. The research collectively underscores that the synergy between innovative workbook development and supportive teacher perception is critical for fostering a scientific mindset in students, thereby contributing to the broader goals of scientific literacy and inquiry-oriented education.

Science, as a discipline, is rooted in exploration, observation, experimentation, and reasoning. It is not merely a subject to be memorized, but a dynamic process of inquiry that encourages learners to question, hypothesize, and draw conclusions based on evidence. For students, this process can be both fascinating and complex. To make the learning of science structured, interactive, and effective, science workbooks have become essential educational tools. A science workbook is a supplementary educational resource designed to help students reinforce and apply concepts learned in class. Unlike textbooks, which focus on theoretical explanations, workbooks are practical guides that encourage hands-on engagement through exercises, experiments, diagrams, and application-based questions. They are designed to complement classroom instruction, allowing students to practice scientific principles, assess their understanding, and build problem-solving skills. Science workbooks cater to learners across all levels—from elementary school students learning basic life sciences to university-level learners. They bridge the gap between theory and practice, helping students internalize complex scientific ideas through structured, guided, and repetitive practice. These workbooks serve as a bridge between traditional teaching and experiential learning. They promote curiosity, enable self-assessment, and foster a deeper connection between students and the subject matter. Whether digital or printed, workbooks are designed to nurture scientific literacy and stimulate critical thinking, making them indispensable learning companions in the study of science.

Types of Science Workbooks

Science workbooks are diverse, reflecting the wide-ranging fields within science and the different educational needs of learners and can be classified based on subject specialization, educational level, pedagogical approach, and format.

- *Subject-based workbooks*: These are based on subject areas like Physics Workbooks, Chemistry Workbooks, Biology Workbooks, Earth and Environmental Science Workbooks and General Science Workbooks.
- *Grade-level workbooks*: These workbooks are designed according to educational stages and are classified into Primary Level, Middle School, High School Workbooks and College level workbooks.
- *Skill-based workbooks*: Some science workbooks are built around the skills they develop like Laboratory Skills Workbooks, Critical Thinking and Problem-Solving Workbooks and Data Analysis.
- *Examination and assessment workbooks*: Many workbooks are specifically for exam preparation and follow national or international curriculums such as the CBSE, GCSE, IB, or AP systems. They include multiple-choice questions, practice papers, and review sections aligned with specific standards which serve as revision companions, consolidating classroom learning through repetition and feedback.
- *Interactive and digital workbooks*: Nowadays digital science workbooks have become increasingly popular. These are available as apps, e-books, or online platforms and include videos, simulations, quizzes, and instant feedback systems. They engage multiple learning styles like auditory, visual, and kinesthetics.

Uses of Science Workbooks

Their uses extend across different aspects of education, benefiting students, teachers, and even parents who wish to support learning at home, where the below Figure 1 shows design of workbook.

- Reinforcing Classroom Learning
- Promoting Active Learning
- Encouraging Self-Assessment and Reflection
- Supporting Differentiated Instruction
- Enhancing Problem-Solving and Analytical Skills
- Facilitating Laboratory Learning
- Providing Continuous Assessment for Teachers
- Encouraging Home and Remote Learning
- Fostering Lifelong Scientific Literacy

DESIGN OF WORKBOOK

The design of the workbook (Figure 1) consisted of the following steps: -

OPINIONNAIRE

There was a need to construct and standardize an Opinionnaire on the developed workbooks for improving the Scientific Attitude of students of upper primary classes. As the first step, variety of information regarding use of workbooks in the Teaching-learning process from Internet search were collected. Secondly the respondents for the Opinionnaire were identified. These were mostly Teacher Educators working in Schools in various places where the investigator had taught during her career. After a thorough study of the available information towards workbooks, total 30 items based on the following were drafted.

- Visual Presentation
- Layout and Organization
- Language and Readability
- Activity-Based Learning
- Comprehension and Understanding
- Overall Assessment

The draft was presented to 50 Teacher Educators and their suggestions were incorporated. Some of the items had to be deleted from the draft and finally 15 items were included in the final tool.

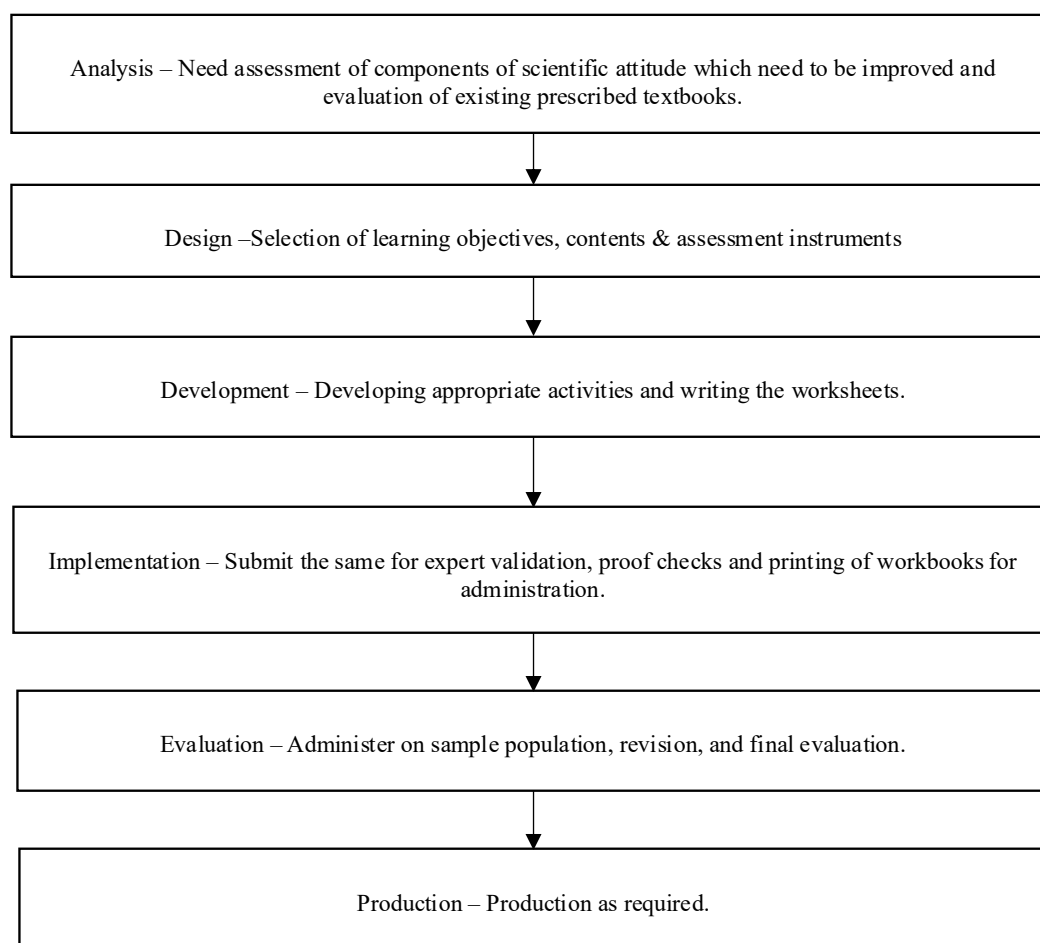


Figure 1. Steps in designing a workbook.

Validity of the Opinionnaire

The items were selected based on the intended content of development of scientific attitude of upper primary students. Therefore, the content validity for the tool was presumed to be present. The items selected for the tool were meant for the Teacher Educators having experience of teaching in upper primary classes. Therefore, this Opinionnaire was deemed to be valid. The unanimity of the Experts about the items will be taken to be an indicative of the internal consistency of the Opinionnaire.

Try out of the opinionnaire: The Opinionnaire of items/ statements intended for the study was administered to 244 Teacher Educators. Their responses were collected based on a google form. The items were finally limited to 15 and remaining statements were omitted based on the difficulty, vocabulary and relevance.

Scoring procedure: Each statement is set against Agree/ Disagree. A pie chart was proposed to be used to display the results. The given category indicated the Opinionnaire on developed workbooks. The following table presents the classification:

- 1-25% - Highly unfavourable Opinion towards developed workbooks.
- 25-50% - Favourable Opinion towards developed workbooks.
- 51-75% -.Average Favourable Opinion towards developed workbooks
- 76-100%-Highly Favourable Opinion towards developed workbooks.

Responses: In the present study responses obtained through the google form indicate that the workbook developed by the investigator was suitable for developing scientific attitude among the

students of upper primary. The same is indicated in the form of pie charts as under: -Figure 2, illustrating their perceptions, agreement levels, and feedback regarding the effectiveness of newly developed science workbooks in fostering learners' scientific attitude.

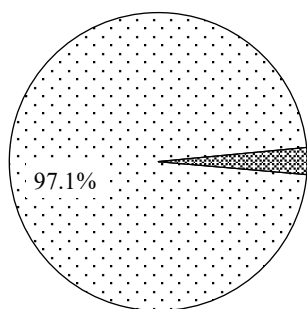
RESPONSES ON THE OPINIONNAIRE

- Finding- as all opinions found above 90% responses on each item therefore its strengthen the utility of the workbooks in schools by teachers will be positive towards the development of the workbooks by the researchers.
- Highly Favourable Opinion towards developed workbooks on all items.

Comprehension and understanding

The workbooks content is easy to comprehend

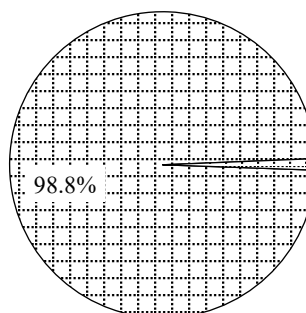
244 responses



□ Agree
▣ Disagree

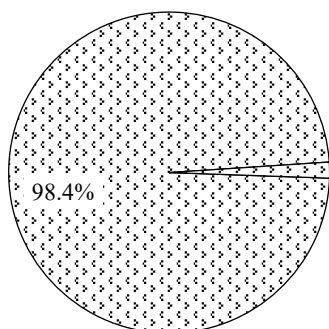
The exceries and question help reinforce understanding of concepts

244 responses



□ Agree
▣ Disagree

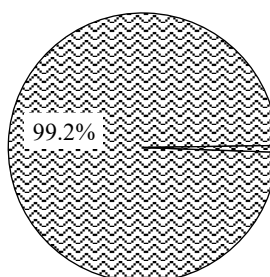
This workbook enables the schools to improve scientific attitude of the upper primary students. 244 responses



□ Agree
▣ Disagree

The use of images and illustrations enhances the learning experience

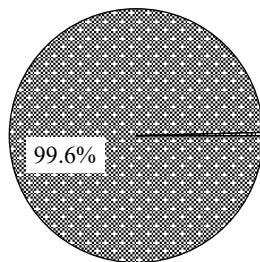
244 responses



□ Agree
▣ Disagree

Visual presentation

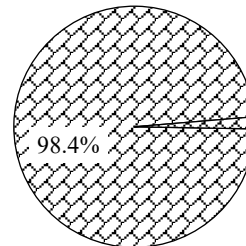
The workbooks cover page is visually appealing and engaging 244 responses



Agree

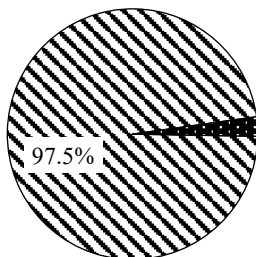
Layout and organization

The workbooks layout is well organized and easy to navigate 244 responses



Agree
Disagree

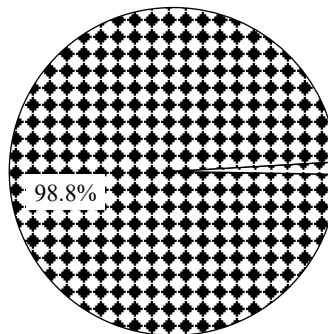
The section and chapters are clearly defined and logical 244 responses



Agree
Disagree

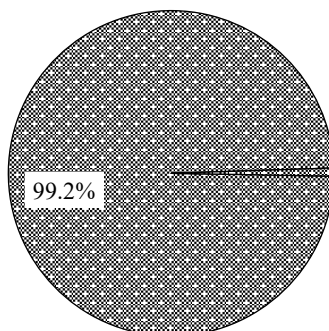
Language and readability

The language used is simple and easy to understand 244 responses



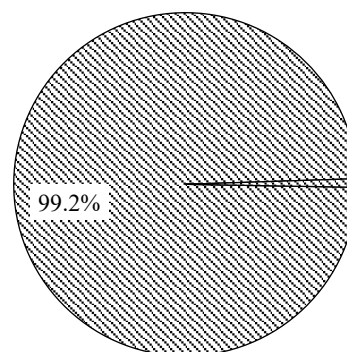
Agree
Disagree

The activities provided in the workbook engages the student to promote practical and hands on learning 244 responses



Agree
Disagree

The designed workbook in present study is useful to both teachers and students to encourage willingness to test conclusions 244 responses



Agree
Disagree

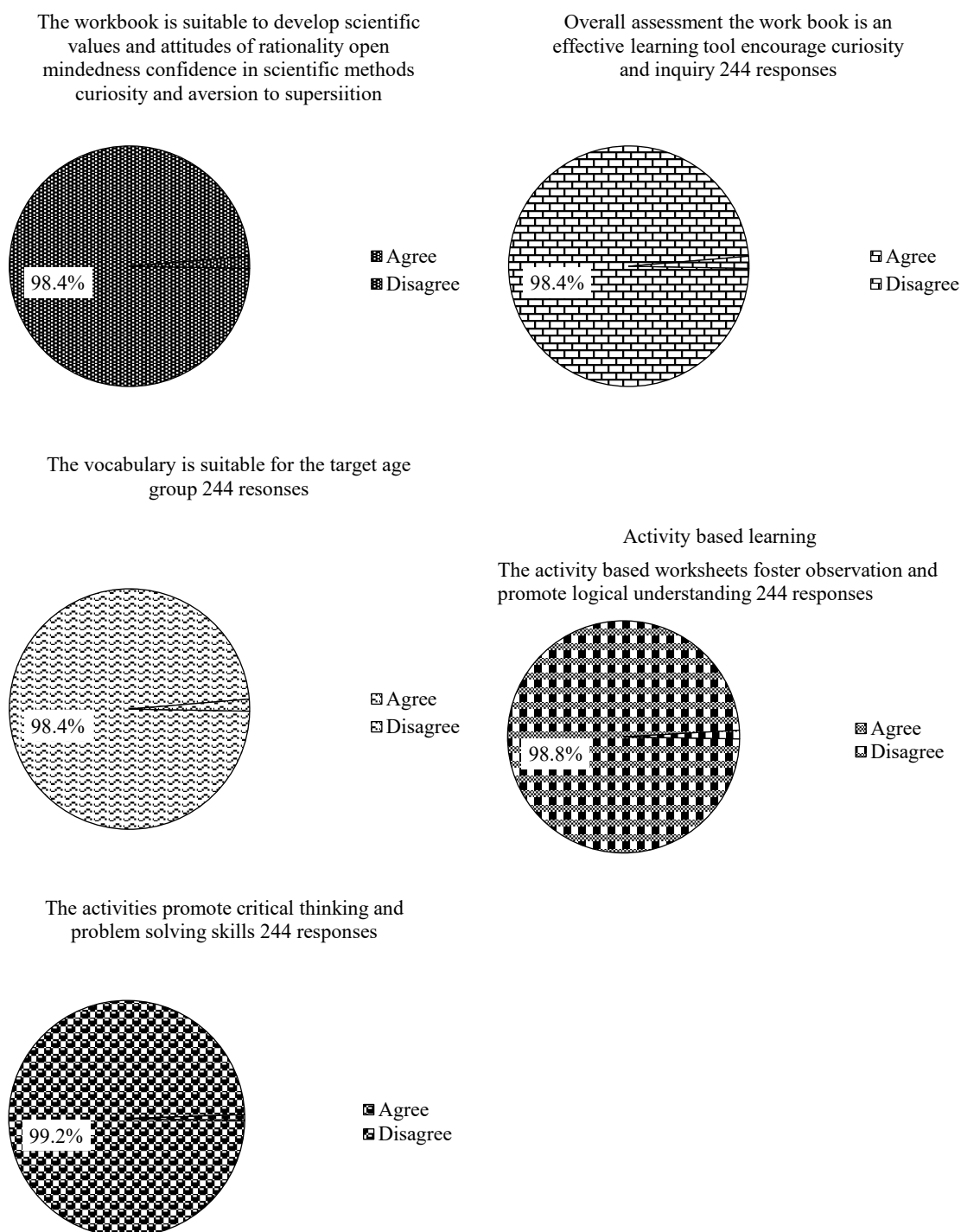


Figure 2. Opinionnaire responses showing perceptions of new science workbooks and their effectiveness.

CONCLUSION

The science workbook stands as one of the most effective educational tools for fostering scientific understanding. It bridges the gap between theory and practice, turning abstract concepts into tangible learning experiences. By offering structured exercises, interactive activities, and opportunities for reflection, science workbooks empower students to explore, analyse, and apply scientific principles with confidence.

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