Practicality Test of Teaching Material Models for the Philosophy of Science Course in Higher Education: An Integrative-Critical Study

Jufri[1], Misnah Mannahali[2], Agung Rinaldy Malik[3]
Universitas Negeri Makassar, Indonesia

Email: jufri@unm.ac.id

Abstract. The objective of this study is to explain the practicality of the integrated-critical model for Philosophy of Science teaching materials. The model is analyzed using an integrative-critical approach. This is a developmental research study that employs both qualitative and quantitative data. The model applied is the Four-D model by Thiagarajan, which consists of four stages: Define, Design, Develop, and Disseminate. The results of the study show that the Philosophy of Science teaching materials are considered practical in terms of relevance, quality, benefits, economic efficiency, presentation strategy, coherence, logical flow of ideas, consistency, and systematic presentation. Moreover, the materials demonstrate a logical structure, balanced content, clear organization of chapters, and a variety of exercises. The practicality is also reflected in the performance outcomes of the sample, which achieved grades of A or A-, categorized as good and very good. It is hoped that future relevant studies will consider aspects such as relevance, presentation, evaluation, presentation of philosophy books, and practicality, with performance results correlating to grades of A or A-. These results are considered good and very good in the development of Philosophy of Science teaching materials in higher education

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INTRODUCTION

The practicality of a theory is continuously examined from various perspectives, one of which is applied linguistics. The theory of language asserts that language is a tool for communication among humans, and this assumption is widely accepted. However, as the study of language has evolved, it is clear that the understanding of language should not be limited to just being a communication tool. Linguistic experts argue that language should also be viewed holistically, considering its entirety. The integration of various linguistic aspects represents the next step in viewing language as a unified whole.

Given this issue, a new perspective is needed to examine and study a theory that connects two theories based on the epistemological foundation of research. According to the referenced studies, both critical theory and communicative theory should be integrated to develop teaching materials for the Philosophy of Science course. Time continually progresses, accompanied by new innovations in the Philosophy of Science (Jufri, 2022). In other words, new theories emerge, often rejecting older ones that are perceived as ineffective in specific contexts. Furthermore, Jufri asserts that the inability of a theory to stand independently is due to its failure to accommodate diverse objectives, thus requiring a harmonious, synergistic, and interdependent theoretical partner to transform science and technology (IPTEK).

These two schools of thought integrative theory and critical theory are philosophically grounded and, when combined, can produce a comprehensive teaching material model for the Philosophy of Science course. The integrative approach to language learning prioritizes achieving competence through a holistic and comprehensive view of language. This view rejects the notion that language is merely a structured pattern. However, this approach goes beyond mere structure and emphasizes understanding language within its contextual framework.

Language learning, viewed through an integrative lens, is further enhanced by critical theory, which helps construct specific learning goals. Critical theory posits that language is an action that carries ideologies and power dynamics, and it should be considered in its contextual and historical framework. Consequently, the analysis of an integrative-critical language learning model reveals new insights into the development of teaching materials for the Philosophy of Science course, without disregarding earlier schools of thought, such as Bloomfield (1933), BF Skinner (1959), and Chomsky (1965).

The integration of integrative theory and critical theory aims to create an effective, practical, and beneficial teaching material model for the Philosophy of Science course. This integrative-critical theory is supported by earlier theories, such as structuralism, behaviorism, and functionalism.

In this context, language undergoes philosophical dynamics. Initially, language was categorized as a structured pattern, where the correctness of a text (or narrative) was determined by its syntactic or semantic correctness. Experts focused on ensuring sentences were formed correctly and appropriately. However, Jufri (2020) asserts that such an approach is rejected by functionalist theory, which views language primarily as a tool for communication.

Furthermore, language should be emphasized in terms of its function and the context of each linguistic event. While it is acceptable for a narrative to be structured according to correct linguistic forms, the priority should be the communication of meaning. If the message is not understood by the listener, even a well-structured sentence becomes less useful. Therefore, the primary focus of this theory is to ensure that the intended meaning is communicated effectively, regardless of the sentence structure (Jufri, 2020).

Bloomfield (1933) and BF Skinner (1959), as referenced by Jufri (2020), concentrated on creating linguistic structures based on 'stimulus-response psychology'. However, Chomsky (1965) disagreed with this view, arguing that language is not simply a habit formed through automatic responses. Instead, language is a mental phenomenon, innovative, innate (inherent), and universal. Chomsky introduced the concepts of competence and performance, emphasizing that while human linguistic competence is limited, it allows for the creation of an infinite number of sentences.

Both Bloomfield's and Chomsky's views, according to Jufri (2020), are challenged by Fairclough, who offers a different perspective on the nature of language. Fairclough (1985) argued that language is not merely a communication tool but a series of linguistic acts that conceal ideologies and power dynamics, constructed by individuals or groups to achieve specific goals. This view forms the theoretical foundation for the development of a model of teaching materials for the Philosophy of Science course in higher education (PT).

In relation to this, the results of this research are intended for the development of applied and critical linguistics, education, and language teaching in foreign language fields, including German, Mandarin, Arabic, and others. Additionally, the product of this model analysis will be facilitated through e-learning platforms, using both online (e-learning) and face-to-face (classroom) learning methods. This approach introduces a new dimension in language learning by utilizing teaching media as a supporting tool to achieve language learning objectives.

Therefore, a comprehensive study is necessary to explore the development of integrative-critical teaching materials for the Philosophy of Science course. Based on this background, the research problem is formulated as: "How practical is the integrative-critical model of Philosophy of Science teaching materials?".

The Relationship between Integrative Theory and Critical Theory

Integrative theory, often referred to as the "whole language" theory, is based on the idea of the completeness of language as its philosophical foundation. Experts argue that language should be viewed as a whole in communication, meaning that "completeness" encompasses various language skills, attitudes, and knowledge. In the holistic concept of language, this foundational idea refers to the meaning required in interactions (Jufri, 2017). The meaning and concept are conveyed through various forms of language, such as questions, statements, news reports, compound sentences, etc., so that the purpose is effectively communicated by utilizing different linguistic devices across various aspects.

Integrative theory asserts that the success of an individual or group in discussing or interacting using various linguistic tools is crucial in achieving the

desired goal. In other words, there is a "completeness" to be applied in language use (Jufri, 2017). This meaning and concept are expressed through various language skills and forms, as well as language attitudes concerning different issues.

Critical theory, on the other hand, is a theory from the social sciences further developed by experts in critical linguistics and discourse analysis. It has found its theoretical foundation in language education (language learning). Empirical findings have revealed the characteristics of the paradigm of language learning, examined through the Lontara Lagaligo, a product of local culture. The critical theory in question is explained as follows:

Positivism is a school of thought that emphasizes that in learning, human action is necessary to interact with the external world. Human experiences, knowledge, and beliefs are assumed to be directly expressed through language use without any hindrances. The expressions and statements must be logical, syntactically correct, and connected to empirical experience. The thinking behind this is based on distinguishing between thought and reality.

The logical consequence of this view is that one does not need to understand the subjective meaning or the values underlying a statement. What matters is whether the statement is logically correct. Therefore, the truth of a statement is determined by empirical experience. The development of critical learning models and teaching materials is intended to describe a learning pattern for the subject matter in question. The product of these learning models and teaching materials can be evaluated in terms of logical empirical correctness.

Positivism contrasts with constructivism, a theory inspired by phenomenology that rejects the positivist-empiricist view of the separation between subject and object in interaction. Constructivism assumes that an individual is not merely a medium or tool for understanding an external object and is not separated from the subject who expresses and conveys statements. Constructivist theorists believe that the subject plays a central role in the development of learning models and teaching materials. Learning actions or activities are seen as expressions and statements that are constructed and fought for with a specific goal in mind. Each expression and statement, in essence, builds critical meaning. Thus, actions or learning models represent identity formation. Therefore, the learning model and teaching materials reveal specific meanings. Language learning is seen as an effort to uncover ideas or thoughts hidden by an individual in a language event during communication.

Both positivist theory and constructivist theory differ from critical theory. Critical theory critiques constructivism for being less sensitive to the process of meaning production and reproduction that occurs historically and institutionally. Constructivist theory has yet to analyze the ideological and power factors inherent in each model of learning and teaching materials for specific courses in higher education (PT). The meaning of critical theory is to reconstruct thoughts, feelings, ideas, knowledge, and beliefs with a specific purpose in mind, incorporating local wisdom philosophies that are critically oriented towards language learning strategies.

This assumption emphasizes the ideology and power of language that shape the process of meaning production and reproduction. Individuals are not seen as neutral subjects who can freely interpret statements according to their own

thoughts. Rather, their interpretations are heavily influenced by the socio-cultural forces within the community. Thus, the actions in the learning model and teaching materials within the critical theory paradigm are understood as representations that shape a particular subject, theme, and strategy in order to achieve specific goals. Critical theory reveals the ideologies and power dynamics inherent in every interaction in the learning model and teaching materials in higher education (Jufri, 2017).

Critical theory assumes that its study does not only focus on the symbols discussed in the learning model and teaching materials, but also considers the context. Context refers to the goals and actions of specific learning tasks. Learning actions are directed towards the development of a dialectical learning model, navigating between particular discourse events and the situations, institutions, and social structures that shape them. Critical theory has distinctive features in critical educational studies, including: (1) individual actions, context, hegemony (ideology and power), historical factors, and (2) cultural taxonomy (philosophical values).

Cultural-Based Critical Approach

A critical approach assumes that language is an action constructed by an individual or team using language tools that embed ideologies and power dynamics, which are hegemonic, pragmatic, and context-dependent. The critical approach is a product of human action, which can be perceived as an expression of thought, the structuring of experience, and social identity (Jufri, 2016). Furthermore, the critical approach is used to express various language events that function as: (1) learning symbols, (2) symbols of pride, and (3) supporting tools to achieve desired learning goals.

The research found that the ideas, concepts, and values contained in critical discourse learning and teaching materials can be grouped into three categories: (1) personal values, (2) social values, and (3) religious values (Jufri, 2007). Scope (1) includes: bravery, intelligence, carefulness, honesty, patience, and perseverance. Scope (2) includes: generosity, loyalty, fairness, and communication skills. Scope (3) includes purity, nobility, greatness, strength, and immortality.

In the educational perspective, several principles of critical language learning were found. These components include: the Sipakatau (PS) approach as a local cultural model that emphasizes values in learning; the Sipakatau approach that focuses on engaging issues in learning; the Sipakatau approach that prioritizes interaction patterns as cultural symbols in learning; the Sipakatau approach that views training as a process of character development; and the Sipakatau approach that involves a conscious effort in learning. In the development of teaching materials, the sequence starts from local wisdom themes to global themes. In learning, lecturers facilitate students to choose materials with noble local cultural values while maintaining respectful attitudes.

If the PAL (positive approach to language learning) assumes that language is a habit, errors should be avoided; the PKK (traditional approach) assumes that language is a personal creation, shaped through trial and error, whereas the PS approach sees language as a form of wisdom, constructed cohesively and coherently. If PAL in language learning aims for formal self-expression, the PKK approach aims

for fluency in language that is accepted by society, while the PS approach emphasizes fluent communication with dignity and respect for cultural values (Sipakatau, Sipakalebbi, Sipakainge).

In the context of critical language learning, students are expected to interact with the language system in specific guided contexts, while the PKK approach encourages independent interaction in real-life situations. The PS approach encourages interaction according to the local cultural etiquette.

Based on these issues, the general aim of the research is to gain insights into the development of a critical-communicative model for the evaluation of teaching materials for the Philosophy of Science course. Specifically, the research aims to: explain the analysis of needs through individual work (Einzelarbeit) in developing an integrative-critical model of teaching materials for the Philosophy of Science course; explain the comprehensive group work (Gruppenarbeit) in developing an integrative-critical model of teaching materials; explain the concept development of the integrative-critical model of teaching materials; explain the comprehensive validation discussions of the integrative-critical model of teaching materials; explain the prototype development of the integrative-critical model of teaching materials; and explain the field tests (effectiveness and practicality) of the integrative-critical model of teaching materials for the Philosophy of Science course.

The findings of this research are beneficial both theoretically and practically: Theoretically, it contributes to the development of theories and knowledge regarding integrative-critical teaching materials for the Philosophy of Science course. Practically, it can serve as a reference for lecturers, teachers, and students in language learning based on the integrative-critical approach.

RESEARCH METHOD

This type of research is development research, using both qualitative and quantitative data. The model employed is the Four-D Thiagarajan model. The development process consists of four stages: (1) Define, (2) Design, (3) Develop, and (4) Disseminate. The design of the development research and its subcomponents are used and stated as a model for critical communicative analysis with the following stages of research: Einzelarbeit (individual work) to explore and identify the needs of the sample, and Gruppenarbeit (group work) for a comprehensive (deep and thorough) development of the teaching material model. Validation of content and procedures (testing both theory and results by experts and steps), Field Testing/simulation (practical application and review of the philosophy of science course material in an integrative-critical manner), and Publication, such as articles, intellectual property rights (IPR), and proceedings (outputs and outcomes).

Data collection in this research involves: (1) The research team developing the research instruments, (2) development guidelines as paper tools, (3) validation sheets, (4) observation sheets, (5) questionnaires, and tests on student learning outcomes. The tasks and functions of the research team include examining, compiling, and developing models for teaching materials to evaluate language learning. The evaluation of the course aims to collect data on students' mastery of competencies taught and the use of teaching models, including individual assignments and group tasks in class discussions.

Data analysis is conducted to assess the validity, practicality, and effectiveness. To analyze the validity of the teaching materials, the following steps, as quoted from Nurdin (2010), are used: calculating the average validation results from all validators for each criterion using the formula $\overline{\mathrm{K}}\, i = \frac{\sum_{j=i}^{n} Vij}{n}$, : This is followed by calculating the average for each aspect using similar formulas, and determining the validation category for each criterion or the overall aspect by comparing the average values with categories:

- 3.5 ≤ M ≤ 4: Very valid
- 2.5 ≤ M ≤ 3.5: Valid
- 1.5 ≤ M ≤ 2.5: Sufficiently valid
- M < 1.5: Invalid

The validity of the model is determined based on these criteria: (1) The overall average (X̄) must be at least in the "sufficiently valid" category, and (2) the average for each aspect (Āi) must be at least in the "valid" category. If any aspect does not meet the validity criteria, it will be revised and tested again until it meets the required validity.

The practicality of the teaching materials is analyzed by measuring the feasibility of the teaching materials in practice. The average score for each aspect is calculated based on observations during each session, as described in Nurdin (2007). The average is used to assess how well each aspect was implemented, and the following categories are used to determine practicality:

- 1.5 ≤ M ≤ 2.0: Fully implemented
- 0.5 ≤ M < 1.5: Partially implemented
- M < 0.5: Not implemented

If the average scores fall within the "partially implemented" category or higher, the teaching materials will not be revised. If they do not meet this criterion, revisions will be made and re-tested until the necessary standards are met.

The effectiveness of the teaching materials is determined through an analysis of (1) student learning outcomes, (2) student activity, (3) student responses to the materials, and (4) the instructor's ability to manage the class. The student responses are considered valid if more than 60% of students give a positive response to at least 70% of the aspects being tested.

The analysis of the implementation of teaching materials is based on data from two observers, and the average scores (KG1 and KG2) from each observer are calculated. The final KG score is confirmed with an interval scale for assessing the instructor's ability to manage the learning process:

- KG < 1.5: Very low
- 1.5 ≤ KG < 2.5: Low
- 2.5 ≤ KG < 3.5: Moderate
- 3.5 ≤ KG < 4.5: High
- KG ≥ 4.5: Very high

The teaching materials are considered adequately applied if the KG score falls within the "high" category. If the KG score falls into a different category, the instructor must improve their ability and address the areas that received lower scores. A re-assessment will then be conducted to ensure the required standards are

met. The criteria for determining the effectiveness of teaching materials are that at least three of the four standards must be achieved: (1) learning outcomes, (2) student activity, (3) student responses, and (4) the application of teaching materials.

RESULT AND DISCUSSION

Based on the table, it can be stated that overall, whether it is the alignment of the content with the SK (Standard Competency) and KD (Basic Competency), the accuracy of the teaching materials, and the up-to-dateness of the materials, as well as cultural relevance, the sample generally categorized these aspects as good and very good. Thus, it can be concluded that the content of the philosophy of science textbook can be implemented in the philosophy of science course at the university.

Based on the competency test results of the sample (students), it can be stated that their competencies, after engaging in class activities and undergoing oral tests at the end of the session, were assessed. Each student who was given an individual assignment presented orally in front of their peers. The assessment results show an average score of 96 (A). This means that the content or material of the Philosophy of Science can be used as a reference book for this course.

Philosophy of Science Learning Outcomes

Based on the analysis results, the average (mean) score of the sample was 72.3. This mean score is categorized as a B. This indicates that the philosophy of science teaching materials can be implemented as a reference book for the course. The distribution of student scores shows that out of 36 respondents, the majority of students were in the B category with 15 students (41.7%), followed by the A category with 8 students (22.2%). The C category included 10 students (27.8%), while the D category had only 2 students (5.6%), and the E category had one student (2.7%). This suggests that most students achieved good grades (categories A and B), but there are still challenges for some students in the D and E categories.

Minimum and Maximum Scores: The minimum score achieved was 38, while the maximum score was 95. This range of scores indicates variation in academic performance among the students. Average, Median, and Standard Deviation: The average student score was 72.3, with a median score of 75, indicating that most students scored above average. The standard deviation of 12.5 shows significant variation in scores, indicating differences in understanding and achievement among the students. A diagram of the distribution of student scores can be used to visualize the spread of scores, highlighting the dominance of category B, and illustrating the number of students in each category.

Students gave fairly positive responses to various teaching methods in the Philosophy of Science course. Teaching Material Model: For the first component, 60% of respondents agreed with the development of the teaching material model, while 40% strongly agreed. This shows a good acceptance of innovations in the teaching methods. Sub-Theme Search: Respondents favored the individual and paired approaches, with 55% and 65%, respectively. This shows that students felt more comfortable and productive in smaller, more collaborative work settings. Task Presentation: Responses showing that 55% to 65% of respondents agreed that presenting assignments in front of the class helped in understanding the material

indicate that the presentation activity positively contributed to student comprehension. Group Work and Discussion: Responses to individual, paired, and group work show that students felt assisted in understanding the Philosophy of Science material, with 50% supporting this idea. This highlights the importance of collaboration in the learning process.

Overall, the findings show that students responded positively to the interactive and collaborative Philosophy of Science learning approach. The good response to the development of teaching materials and the use of varied teaching methods suggests that the approach taken in this course is effective in enhancing students' understanding and engagement.

Discussion

The analysis of the Philosophy of Science book reveals that the practicality of the book, particularly in terms of content, was positively assessed by the majority of respondents. Most of the evaluation items, such as the completeness and depth of the material, scored quite high (points 3 and 4), indicating that the material presented is considered comprehensive and relevant to the required course objectives. Additionally, the accuracy of cohesion and the use of proper terminology also received high marks, reflecting that the material is organized coherently and employs accurate terms, thus supporting students' understanding. However, there is room for improvement, particularly in the areas of cultural coverage and vocabulary enrichment, which received relatively lower ratings.

These findings align with recent research on teaching materials development, where literature indicates that up-to-date and learner-relevant materials, including vocabulary and grammar enrichment, have a significant impact on enhancing students' understanding and skills (Alqahtani, 2022). The use of illustrations and practice-based evaluations also supports learning effectiveness, consistent with findings by Khoiriyah et al. (2021) that emphasize the importance of well-structured teaching materials oriented towards competency-based learning. Thus, the Philosophy of Science book demonstrates an adequate level of practicality, although further enrichment could enhance the book's quality.

The findings also show that the presentation of the Philosophy of Science book maintains a fairly good consistency in its presentation techniques. The majority of respondents rated the consistency of the systematic structure, logical flow, and balance between chapters with scores of 3 and 4. This indicates that the book succeeds in presenting the material logically and systematically, making it easier for readers to understand the concepts being presented. However, there is room for improvement, especially in the provision of audio materials, which were only considered somewhat helpful by some respondents. More optimal use of audio could provide additional support for students with auditory learning styles.

Recent research on the practicality of presentation highlights the importance of interactivity in teaching materials to support student engagement. According to Panigrahi et al. (2023), textbooks that adopt participatory approaches and facilitate independent learning tend to improve student outcomes. This is relevant to the finding that the interactive-participatory presentation strategy in the Philosophy of Science book was rated fairly well (55% on a scale of 3), but it can be further improved.

Efforts to encourage group discussions and promote critical and innovative thinking will further enrich students' learning experiences, in line with the growing trend of active learner-centered content delivery.

Based on the findings, the majority of students rate the Philosophy of Science book as practical and applicable in their learning process. This is reflected by high scores (3 and 4) in the aspects of consistency of the presentation structure (60% and 40%), logical flow of the material (55% and 45%), and balance of content between chapters (65% and 35%). The consistent and logical structure of the book enables students to more easily grasp complex topics. Additionally, elements such as introductions, glossaries, and bibliographies also support their understanding. However, there is still room for improvement in the presentation of audio material and interactivity, which, although rated positively, have not yet been optimized.

Recent research by Smith & Lee (2022) on the effectiveness of text-based teaching materials confirms that student engagement can be improved through more interactive and participatory material presentation. The students' assessment of the Philosophy of Science book, which encourages independent learning (65% on a scale of 3), underscores the importance of this approach. Although the book already supports the development of critical and creative thinking skills, there is potential to integrate more interactive elements, such as case studies or group discussions, which can further encourage active student participation and enhance their understanding of abstract concepts.

The findings also suggest that students give positive assessments to the quality, usefulness, and cost-effectiveness of the Philosophy of Science book. In terms of delivery quality, the majority of students rated the clarity of the wording and sentence structure, as well as the use of musical notations, images, and colored illustrations, as highly supportive of their understanding. Additionally, the presentation of numbers was considered relevant and helped in understanding more abstract concepts. Regarding usability, students appreciated the practicality of the book, particularly its lack of need for additional tools, its portability, and the quick accessibility of information. This shows that the book meets students' needs for efficient and flexible learning.

Recent research by Hargreaves & Sherin (2021) shows that teaching materials that effectively combine text, visuals, and graphics tend to enhance students' understanding in complex learning situations. This aligns with the finding that students appreciate the use of illustrations and diagrams in the book. Furthermore, the cost-effectiveness of the book, which was positively rated by students due to its affordable price and low shipping costs, supports the perception that the book is not only academically useful but also cost-efficient, making it more accessible to a wider range of students.

The findings also reveal that the majority of students positively assess the relevance of the Philosophy of Science book. One subaspect that received a high rating was the alignment of the material with the syllabus and basic competencies, where 70% of students rated the material and exercises in the book as supporting the achievement of learning objectives. This indicates that the book was successfully designed to meet learning needs, particularly in terms of the basic competencies

expected from students. Additionally, the focus on language skills and providing activities suited to students' characteristics shows that the book is relevant and contextual.

Research by Lucas & Villegas (2020) supports the importance of aligning learning materials with the context and needs of learners. They found that when learning materials align more closely with students' competencies and practical needs, learning effectiveness significantly increases. This aligns with the findings showing that students value material focused on language skills and activities relevant to their daily lives.

In terms of material selection and organization, the book is rated as providing an appropriate sequence, from simple to complex. This is important because a well-ordered material sequence can help students understand complex concepts gradually. The use of vocabulary relevant to students' experiences also enhances engagement, as students are more likely to understand and apply material related to their own lives. Research by Tomlinson (2019) indicates that personalizing material, including selecting vocabulary relevant to learners, promotes greater engagement and strengthens concept comprehension. Furthermore, the systematic and interactive presentation of teaching materials also received positive assessments from students. The integration of language skills, such as speaking and writing, helps students learn holistically. The use of teaching materials that require activities such as listening, speaking, and writing also supports deeper engagement. Recent research by Zhao & Liu (2022) found that learning involving interactive activities significantly enhances students' understanding and makes learning more meaningful. This confirms the importance of presenting materials that encourage active student engagement for mastering language skills.

The findings indicate that students give positive assessments to the assessment aspects of the book, particularly in terms of motivation and the sequence of information presented. Seventy percent of students rated the practice exercises provided in the book as highly effective in enhancing their skills, and the feedback given helped them understand their strengths and weaknesses. The inclusion of tests relevant to the material, as well as follow-up instructions, also supports students' self-directed learning process. This suggests that the book provides a structured guide, promotes practical skill development, and allows students to evaluate their progress.

Recent research by Brookhart (2021) emphasizes the importance of relevant and timely feedback in improving learning skills. The research underscores that feedback should focus on how students can improve and should be followed by clear instructions to ensure better understanding. Additionally, practice exercises relevant to the learning material have been shown to increase students' motivation to learn, as they can apply what they have learned directly. This is consistent with the survey results showing students' high appreciation for the exercises in this book.

Additionally, assessments of fundamental concepts, such as understanding concepts, principles, facts, and processes, also received positive responses. The majority of students felt that the explanation of concepts and principles in this book greatly helped in providing direction for thinking and building a solid knowledge base.

According to Marzano (2020), deep understanding of fundamental concepts and principles is key to facilitating more complex learning. When students master the basics well, they will be better prepared to understand and apply more advanced knowledge, ultimately strengthening learning outcomes.

Based on the analysis of the practicality test for the Philosophy of Science book, it can be stated that this book is generally rated positively by students. The practicality aspects, especially related to the completeness of material, accuracy of terminology, and orderly presentation of information, were highly appreciated. The book is deemed to have met learning needs by providing relevant practice exercises and helpful feedback. Moreover, the material is systematically designed, making it easier for students to understand more complex concepts. The emphasis on basic concepts and principles also provides a strong foundation for further knowledge development.

However, despite being considered practical, there are still some areas for improvement, such as the presentation of more interactive audio materials and broader vocabulary enrichment. Students noted that integrating more interactive and multimedia elements would further enhance the quality of learning. Thus, while the book meets practical standards, there is potential for improvement to make it more aligned with modern trends in learner-centered and interactive learning.

Based on the distribution of student grades, the majority of students achieved good results, with 41.7% in category B and 27.8% in category C. This shows variation in academic performance among students, with 22.2% of students achieving category A. The average score of 72.3 with a standard deviation of 12.5 indicates significant differences in student performance, which may be influenced by the teaching methods applied in class (Rahim et al., 2023).

Meanwhile, student responses to Philosophy of Science learning show that 60% of them feel they can develop the teaching material model. This reflects positive engagement in the learning process, where students feel they have a contribution to their own learning. Research by Smith and Lee (2022) shows that student involvement in material development can enhance motivation and understanding, which is important for instructors to consider.

The aspect of self-directed learning also received attention, with 55% of students expressing interest in exploring subtopics they found most engaging. This indicates that students value the opportunity to actively participate in shaping the direction of their learning. Recent research by Albrecht and Buehler (2023) confirms that teaching methods that allow students to choose topics of interest can enhance engagement and understanding.

Responses to paired and group learning also indicated positive feedback, with 65% of students feeling that these methods helped them understand the material better. This suggests that collaborative learning can improve student interaction and deepen their understanding of complex concepts. According to Zhao et al. (2023), group work in effective learning environments can build social skills and strengthen learning outcomes.

Additionally, students gave positive evaluations of the quality of material delivery, with 60% agreeing that faculty guidance significantly helped their

understanding. Research by Hargreaves and Sherin (2021) emphasizes the importance of instructors' support in explaining difficult material, which plays a crucial role in improving students' understanding. This highlights the importance of the instructor's role in creating a conducive learning environment and offering support.

Class discussions were also seen as important by 55% of respondents, reflecting the need for interaction and clarification of concepts in learning. Research by Brown (2023) shows that effective discussion can reinforce conceptual understanding and encourage students to think critically. Therefore, implementing discussion-based methods in lectures is expected to encourage students to participate more actively and engage in debates regarding the material being taught.

Overall, these findings indicate that while the majority of students achieved good results, there is still room for improvement in material presentation and teaching approaches. Recommendations for further development include enhancing the interactive elements of learning and adopting more collaborative teaching methods. These improvements would aim to create a more inclusive and effective learning environment for all students.

In summary, the findings suggest that the Philosophy of Science book is well-received by students for its practicality, clarity, and relevance. While students find the material comprehensive and logically organized, the integration of more interactive and multimedia elements could enhance its effectiveness, particularly in supporting students with different learning styles. Additionally, providing opportunities for active student involvement and fostering collaborative learning could further enrich the learning experience and improve academic outcomes.

Finally, it is recommended that instructors consider incorporating more interactive tools, such as multimedia content, group discussions, and independent learning projects, to better engage students and facilitate deeper learning. This approach would not only enhance the quality of the book itself but also contribute to more meaningful, student-centered learning experiences.

CONCLUSION

Based on the findings and discussion, it can be concluded that the Philosophy of Science teaching material is categorized as practical. The relevance of the material was positively received, including the alignment of content with the developed syllabus, the selection and organization of the material, and the integration of the teaching material with student comprehension. The presentation of learning objectives and skills was also positively evaluated. Furthermore, the presentation encourages active and creative student engagement, with readability assessed in terms of language simplicity, sentence structure, paragraph organization, and the inclusivity of content related to ethnicity, religion, race, and gender. The logical flow of information and motivation, as well as the sequence of content, also received favorable responses.

Several aspects of the teaching material were positively assessed, including quality, usefulness, and cost-effectiveness. The alignment of content with learning objectives, the accuracy of the teaching material, its up-to-date nature, and cultural relevance were also highlighted as strengths. The presentation of the Philosophy of

Science book received positive feedback, particularly in terms of the presentation techniques, supporting materials, presentation strategies, coherence, and the logical flow of ideas. Additionally, the consistency and systematic nature of the presentation, the logical progression of the content, the balance of the material, the chapter structure, and the variety of exercises were all appreciated.

Practicality, as reflected in the performance results of the sample, showed that the majority of students achieved high grades (A or A-), placing them in the "good" and "very good" categories. This suggests that the teaching material is effective in facilitating student learning and achieving the desired educational outcomes.

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