

Comparative Analysis of Physics Assessment Material and Forms in the Independent Curriculum for Senior High School and Cambridge A Level

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DOI : <https://doi.org/10.61796/ejheaa.v2i10.1390>



Sections Info

Article history:

Submitted: June 30, 2025
Final Revised: July 07, 2025
Accepted: July 22, 2025
Published: August 02, 2025

Keywords:

Independent curriculum
Cambridge a level
Physics
Assessment
Curriculum integration

ABSTRACT

Objective: This study aims to conduct a comparative analysis of Physics materials and assessment formats between the Independent Curriculum Phase F (Indonesia) and the Cambridge International A-Level Physics (9702). **Method:** A qualitative content analysis was employed to examine curriculum documents and official guidelines from both educational systems. **Results:** The findings reveal that both curricula follow a similar structural framework consisting of planning, implementation, and evaluation stages. While the topics covered in both curricula show substantial overlap, distinctive features were identified. The Independent Curriculum emphasizes a contextualized learning approach rooted in local wisdom, whereas the Cambridge Curriculum prioritizes critical thinking and global competencies. A notable divergence lies in their assessment models: the Independent Curriculum incorporates authentic, project-based, and portfolio assessments, while the Cambridge Curriculum adopts paper-based examinations aligned with international standards. **Novelty:** This study offers a unique insight into how culturally contextual and globally standardized physics curricula can be contrasted and potentially integrated to foster an adaptive, high-quality learning experience that meets both national and international benchmarks.

INTRODUCTION

The progress of a country's education system, both in conceptual terms and in its implementation in the field, is determined by institutional capacity in systematically designing, managing, and directing content and learning materials as part of quality education governance [1]. In Indonesia, the independent curriculum is currently used based on the Regulation of the Minister of Education, Culture, Research, and Technology No. 12 of 2024 [2]. This curriculum is a policy from the previous cabinet, for the current cabinet a new policy was created with the innovation of creating superior Garuda schools which aim to prepare students to continue to higher education abroad based on the Presidential Instruction of the Republic of Indonesia Number 7 of 2025 and public schools for affirmative category students with one of the requirements for teachers who will teach is to have active English language skills in accordance with the Announcement of the Ministry of Education and Elementary and Secondary Education Number 0652 / B.B2 / GT.00.02 / 2025. This policy directs the school curriculum to be more global, in other words globalization.

Globalization has exerted strong ideological and normative pressures, prompting many countries to implement educational policy reforms oriented toward efficiency, accountability, and global competitiveness. However, these reforms often fail to achieve the desired results due to a lack of adaptation to local socio-cultural contexts. Consequently, policies adopted from abroad often generate resistance and distortion in their implementation [3]. In Indonesia, one of the international curricula used is the Cambridge curriculum. This curriculum is implemented in educational institutions with the hope that students will be able to pass internationally standardized exams and then obtain certificates with the best results, enabling them to compete globally and obtain a Letter of Aid (LoA) at universities abroad. The selection of subjects on the exam is tailored to the student's chosen major. Mathematics and Physics are the most common science subjects required by universities abroad.

Scores on the Cambridge International Examination (CIE) utilize written and practical tests, with a different assessment format than the national curriculum [4]. Physics has a unique exam paper, which differs significantly from the physics questions found in the textbooks used under the Merdeka Curriculum. Thus, this study conducted a Comparative Analysis of Physics Assessment Material and Forms in the Independent Curriculum Phase F and Cambridge A Level.

RESEARCH METHOD

This study employed a descriptive qualitative approach with document analysis. This approach was chosen because it allowed the researcher to explore in-depth the curriculum content and assessments in physics across two educational systems: the Independent Curriculum Phase F implemented in Indonesia and the international Cambridge A-Level curriculum. The primary data in this study were official curriculum documents, such as learning outcomes, textbooks, and learning modules in the Independent Curriculum, as well as syllabus documents, past papers, and examiner reports from Cambridge A-Level Physics. Additionally, secondary data were obtained from various literature sources, such as journal articles, reference books, and relevant educational policy documents.

RESULTS AND DISCUSSION

The Merdeka Curriculum and the Cambridge Curriculum have high potential for integration [4]. The Merdeka and Cambridge Curriculums share three stages: planning, implementation, and evaluation [5]. During the planning stage, learning designs are tailored to the needs of each subject, aligning with the policies of the Indonesian curriculum development team for the Merdeka Curriculum and Cambridge University for the Cambridge Curriculum. Analysis of these two curricula was obtained from sources such as those in Table 1.

Table 1. Sources for comparative analysis of merdeka and cambridge curriculum materials and assessments.

No	Documents/Books	Additional Information
1	Science: Physics for Senior High School Grade X Independent Curriculum [6]	Author: Dr. Ni Ketut Lasmi Publisher: Erlangga
2	Physics for Senior High School Grade XI Independent Curriculum [7]	Author: Ni Ketut Lasmi Publisher: Erlangga
3	Physics for Senior High School Grade XII Independent Curriculum [8]	Author: Ni Ketut Lasmi Publisher: Erlangga
4	Learning Outcomes in Early Childhood Education, Elementary Education, and Secondary Education [9]	Decree of the Head of the Education Standards, Curriculum, and Assessment Agency, Ministry of Primary and Secondary Education, Number 046/H/Kr/2025
5	Cambridge International AS & A Level Physics 9702 Syllabus [10]	Cambridge Assessment International Education 2025
6	Cambridge International AS & A Level: Physics Third Edition [11]	Authors: Mike Crundell & Geoff Goodwin Publisher: Hodder Education
7	Learner Guide: Cambridge International AS & A Level Physics 9702 [12]	Cambridge Univeristy Press & Assessment 2022 v2
8	Assessment Framework for Academic Ability Tests at Senior High School/Equivalent and Vocational High School/Vocational Vocational High School Levels [13]	Regulation of the Head of the Education Standards, Curriculum, and Assessment Agency, Ministry of Primary and Secondary Education, Republic of Indonesia, Number 045/H/AN/2025

The planning process adapts the material/content to the source. The content analyzed was textbooks commonly used in the Independent Curriculum, covering grades 10, 11, and 12, and the Cambridge A-Level curriculum, comprising AS and A2 levels. Furthermore, analysis was conducted on learning outcomes and the Cambridge syllabus. For assessment comparison, the Cambridge Learner Guide was analyzed using the Academic Ability Test assessment framework.

Comparative analysis examined the material and assessment format, comparing Physics material in the Independent Curriculum with the Cambridge Curriculum. The comparison is shown in Table 2.

Table 2. Comparative analysis of independent curriculum material and the Cambridge curriculum.

Independent Curriculum		Cambridge Curriculum	
Fase E	Fase F	As Level Physics	A2 Level Physics
The Nature of Physics and the Scientific Method	Vectors	Physical quantities and units	Motion in circle
Measurement in Scientific Work	Kinematics of Motion	Kinematics	Gravitational fields
Energy Sources and Renewable Energy	Dynamics of Motion	Dynamics	Temperature
Global Warming	Work and Energy	Forces, density and pressure	Ideal gases
Two-Dimensional Motion	Momentum and Impulse	Work, energy and power	Thermodynamics
	Rotation		
	Dynamics and Equilibrium of Rigid Objects	Deformation of solids	Oscillations
	Fluids	Waves	Electric fields
	Harmonic Motion	Superposition	Capacitance
	Waves	Electricity	Magnetic fields
	Heat and Thermodynamics	D.C. circuits	Alternating currents
	Electric Dynamics and Statics	Particle physics	Quantum physics
	Magnetic Fields and Electromagnetic Induction		Nuclear physics
	AC Current Circuits		Medical physics
	Electromagnetic Wave Radiation		Astronomy and cosmology
	General Theory of Relativity		
	Quantum Physics		
	Nuclear Physics and Radioactivity		
	Digital Technology		

Materials with the same color represent those shared by the two curricula. This analysis of material is based on Cambridge Physics textbooks and coursebooks. Furthermore, adjustments were made to reflect the updated 2025 learning outcomes. This analysis reveals many similarities between the two curricula. Materials covered in the Merdeka curriculum, but not in the Cambridge curriculum, include the nature of physics and the scientific method, global warming, the general theory of relativity, and digital technology. Meanwhile, materials covered in the Cambridge curriculum, but not in the Merdeka curriculum, include particle physics, medical physics, and astronomy and cosmology.

After the planning stage, the curriculum implementation stage begins, with differences between the two curriculums but with clear goals for student character development. The Cambridge curriculum has a strong focus on developing global competencies, critical thinking skills, and cross-cultural understanding. In contrast, the Merdeka curriculum prioritizes a contextual approach that emphasizes local wisdom and flexibility in teaching [14].

The final stage is the evaluation stage. This evaluation stage provides different assessment methods for the two curricula. The differences in assessment formats between the Independent Curriculum and the Cambridge Curriculum are outlined in Table 3.

Table 3. Comparative analysis of assessments between the independent curriculum and the cambridge curriculum.

Aspects	Independent Curriculum Phase F	Cambridge A-Level Physics (9702)
Assessment Approach	Various formats: formative, summative, projects, and portfolios	Internationally standardized, paper-based exam
Assessment Type	Daily assessments, end-of-semester exams, projects and portfolios, simple experimental practicums	Paper 1: Multiple Choice; Paper 2/4: Structured Questions; Paper 3/5: Advanced Practical Skills; Paper 5/4: Planning & Analysis
Assessment Focus	Conceptual understanding, scientific thinking processes, scientific attitudes, Pancasila Student Profile	Mastery of concepts, quantitative analysis, experiments, and scientific planning
Practical Weighting	High in learning activities, but not yet nationally assessed	Significant weighting: Paper 3/5 assesses experimental and data analysis skills
Cognitive Taxonomy	C1-C4 (knowledge to analysis), habituation of evaluation and creativity	C1-C6, many questions require in-depth analysis and data synthesis

Aspects	Independent Curriculum Phase F	Cambridge A-Level Physics (9702)
Authentic Assessment	Yes, through projects based on local contexts and cross-disciplinary integration	Not directly assessed, with a focus on simulations and laboratory experiments
Evaluation Standards	Submitted to educational units; no single national standard	Internationally standardized; results are globally recognized
Question Format	Various: multiple-choice, descriptive, reflective essays, written/oral projects	Standard format: multiple choice, short and long essay questions, experimental analysis
Attitude/Social Assessment	Integrated in all aspects of learning and assessment	Not explicitly assessed
Language of Instruction	Indonesian	Academic English

The assessment differences reviewed in the Cambridge A-Level Learner Guide 9702 and the Academic Competency Test (TKA) Guidelines demonstrate the different assessment focuses in both. The Cambridge curriculum uses standardized papers with questions common to many Cambridge exam countries, while the Merdeka curriculum uses authentic assessments for national standards in the TKA [15].

Based on assessment analysis in the Erlangga and Holder book, the assessment characteristics of both curricula emphasize literacy and numeracy. A significant difference lies in the practical exams. The Merdeka curriculum allows teachers the freedom to create their own practical worksheets tailored to student characteristics, while the Cambridge curriculum has standards for students to analyze on paper 3 and plan practical work on paper 5.

CONCLUSION

Fundamental Finding : This comparative analysis reveals that the Independent Curriculum and the Cambridge International A-Level Physics Curriculum share a foundational structure in curriculum development—planning, implementation, and evaluation—yet differ significantly in content focus, pedagogical orientation, and assessment formats. These differences are not contradictory but rather complementary, offering opportunities for integrative curriculum design that bridges local contextual relevance with global academic rigor. **Implication** : The findings imply that integrating both curricula can enhance Physics learning at the high school level by fostering critical thinking and global competence while maintaining cultural identity and contextual adaptability. This synergy may support broader educational goals aligned with both national aspirations and international standards. **Limitation** : However, this study is limited to content analysis of official curriculum documents and textbooks without empirical validation in classroom settings, which restricts its ability to capture

implementation challenges and student learning outcomes. **Future Research** : Further empirical studies are needed to examine the practical application of an integrated curriculum model, including teacher readiness, student engagement, and learning effectiveness across diverse educational contexts.

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