

Development of PBL-HOTS Teaching Materials for Pre University Economics Based on a Conceptual Framework and Research Design

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Abstract

This study presents a conceptual framework and research design for developing teaching materials that integrate problem-based learning with higher-order thinking skills (PBL-HOTS) for Malaysian pre-university Economics, focusing on Macroeconomics. The problem concerns the mismatch between the analytical demands of the curriculum and candidates' difficulties in explaining concepts and economic diagrams. The examination figures compiled in this study show Macroeconomics subject in Malaysian Higher School Certificate (STPM) full pass rates below 50% throughout 2018–2024. Previous research supports the potential of PBL, but evidence from other subjects and educational levels does not establish how materials should be designed and evaluated for Macroeconomics subject. Reviews also identify inconsistent definitions and measurement of higher-order and critical thinking. This study addresses that design and evaluation gap by linking authentic macroeconomic problems, explicit cognitive prompts and reasoning-based assessment within the analysis, design, development, implementation and evaluation (ADDIE) process. The proposed development study will integrate document analysis with expert, teacher and student input, followed by content validation and classroom piloting for usability and feasibility. Its contribution is a context-specific design framework and evaluation plan that teachers and researchers can use to develop and refine materials.

Keywords: Problem-Based Learning, Higher-Order Thinking Skills, Critical Thinking

Introduction

Economics education at the pre-university level should enable students to interpret evidence, explain relationships between economic variables and justify policy decisions. These abilities matter when students encounter issues such as inflation, unemployment and changes in national income, where an appropriate response depends on the source of the problem and

the assumptions of the model used. The Form Six Economics in Malaysia syllabus emphasises economic knowledge and the analysis of issues affecting society and the nation (Malaysian Examinations Council [MPM], 2012). Malaysia's guidance on cultivating higher-order thinking skills (HOTS) similarly provides a rationale for learning activities that require students to reason beyond the recall of facts (Curriculum Development Division [BPK], 2021).

Teaching Macroeconomics therefore requires opportunities to connect verbal explanations, numerical evidence and diagrams. For example, identifying inflation is different from evaluating whether demand management or measures addressing production costs are appropriate. Students need to explain the transmission mechanism, recognise assumptions and consider policy trade-offs. Problem-based learning (PBL) offers a way to organise these activities around an authentic problem, with students identifying learning needs, investigating information and defending a proposed solution (Hmelo-Silver, 2004; Hmelo-Silver & Eberbach, 2012). Its suitability nevertheless depends on how the problem, teacher guidance and assessment are designed.

The motivation for this study is to translate these demands into teaching materials that are usable within the Macroeconomics subject in Malaysian Higher School Certificate (STPM) context. The article establishes the conceptual and methodological foundations for that development by explaining the educational problem, synthesising relevant research and specifying an ADDIE-based design and evaluation process. Its focus is the connection between curriculum content, PBL activities, explicit HOTS prompts and observable evidence of reasoning. As a conceptual and research-design article, it reports neither completed module validation nor intervention effects.

Problem Statement

The phenomenon investigated is a persistent difficulty in demonstrating the conceptual understanding and explanatory reasoning required in STPM Macroeconomics (for Economics 944/2). In the examination data compiled in Table 1, the full pass rate for Economics 944/2 ranges from 42.56% to 47.69% across 2018–2024, remaining below the rates for the other two Economics papers in every year shown. The official 2024 report records a Macroeconomics full pass rate of 45.27% and identifies weaknesses among some candidates in factual accuracy, elaboration, and drawing and explaining diagrams (MPM, 2024). These observations justify attention to learning support, but examination pass rates are not direct measures of critical thinking and do not establish that a particular teaching method caused the performance pattern.

Table 1

Percentage of Candidates Achieving a Full Pass in Malaysian Higher School Certificate (STPM) in Economics Subject from 2018 to 2024

Subject	2018	2019	2020	2021	2022	2023	2024
Economics 944/1 (Microeconomics)	55.19	58.42	60.64	60.14	57.96	47.63	59.82
Economics 944/2 (Macroeconomics)	42.56	44.15	45.54	43.28	47.69	45.30	45.27

Subject	2018	2019	2020	2021	2022	2023	2024
Economics 944/3 (Malaysian Economy)	48.87	50.53	52.04	51.05	60.43	58.02	53.18

Source: Malaysian Examinations Council (MPM), 2018-2024.

These performance concerns are closely related to teaching practices. Teachers have been reported to interpret HOTS differently, to lack clarity about how to integrate these skills into teaching, and to retain lecture-based or “chalk-and-talk” approaches (Irma-Ain Mohd Md. Som & Zolkepli Haron, 2017; Norshuhada Jusoh & Kamisah Osman, 2018; Toresingam et al., 2019). Although lectures efficiently convey information to large groups, limited cognitive engagement may reduce students’ opportunities to apply their knowledge to real-world problems (Alaagib et al., 2019; Kaeedi et al., 2023).

The practical gap involves both limited awareness of HOTS and a shortage of ready-to-use materials that integrate learning outcomes, authentic problems, collaborative activities, questioning, assessment and guidance on facilitation questions. Teachers are better prepared to implement HOTS-oriented instruction when they are provided with suitable, accessible modules (Irma-Ain Mohd Md. Som & Zolkepli Haron, 2017). Teaching materials specifically designed for Macroeconomics are therefore needed to translate the principles of PBL and HOTS into a clear, consistent and assessable sequence of teaching and learning activities.

Literature Review

Problem Based Learning

PBL is a student-centred approach that uses complex problems to initiate learning. Students activate their prior knowledge, identify knowledge gaps, undertake self-directed learning and return to their groups to develop evidence-based solutions. Teachers act as facilitators by providing prompting questions, feedback and scaffolding, rather than serving as the sole source of answers (Hmelo-Silver, 2004). These characteristics distinguish PBL from conventional problem-solving exercises, which are typically assigned after concepts have been explained.

Research indicates that PBL can promote knowledge application, reasoning and metacognitive awareness when problems, facilitation questions and assessments are carefully designed (Gijbels et al., 2005; Loyens et al., 2023). However, labelling an activity as PBL does not guarantee higher-order thinking. Activities may become routine when problems are overly structured, answers are readily available or students are not required to evaluate evidence. Teaching materials must therefore specify the intended cognitive processes and the evidence of learning expected from students.

Higher Order Thinking Skills and Critical Thinking

HOTS encompass the ability to apply, analyse, evaluate and create, whereas critical thinking emphasises the clarification of issues, evaluation of sources and arguments, formulation of inferences and justification of decisions. These concepts are interrelated but should not be treated as interchangeable without clarification. In Economics subject, students demonstrate HOTS when they apply models to unfamiliar situations, compare policy implications or

formulate proposals. Critical thinking is evident when students examine a model's assumptions, evaluate data quality and consider the consequences for stakeholders.

In their systematic review, Loyens et al. (2023) found that higher-order thinking and critical thinking frequently overlap in PBL environments. Nevertheless, engagement with problems and collaborative learning creates conditions conducive to these processes. Yu and Zin (2023) emphasise the importance of adapting PBL to strengthen critical thinking through structured questions, discussions that require students to justify their views, and clear teacher guidance. Accordingly, PBL–HOTS materials should include explicit prompts for cognitive engagement and rubrics that assess reasoning, evidence and reflection, rather than focusing solely on final answers.

Integrating PBL and HOTS in Economics Education

Macroeconomic issues provide a natural context for PBL because they often involve competing objectives and more than one plausible solution. For example, students can evaluate policy packages for addressing cost-push inflation, compare fiscal policy options during periods of weak growth, or interpret changes in unemployment rates using labour market data. Each problem should specify its context, relevant data or sources, stakeholder roles, decision constraints and a clearly defined learning product.

The proposed integration comprises five actions: understanding the problem; identifying what is known and what needs to be learned; obtaining and evaluating information; developing and defending a solution; and reflecting on the learning process. At each stage, HOTS questions are aligned with learning outcomes and assessment. This alignment reduces the risk of PBL becoming an engaging activity that is disconnected from syllabus requirements or examinations.

Conceptual Framework

The framework in Figure 1 connects the ADDIE development process with the proposed learning mechanisms of PBL–HOTS. Needs analysis identifies curriculum priorities and learning difficulties. Design and development translate these needs into authentic problems, cognitive prompts, learning resources and assessment criteria. Expert review and classroom piloting will inform iterative refinement. Within the proposed learning sequence, inquiry and discussion create opportunities for students to examine evidence, defend explanations and reconsider conclusions. These are hypothesised mechanisms to be investigated, rather than demonstrated effects. Content validity concerns the appropriateness of the materials; reliability concerns the consistency of questionnaire or rubric scores; usability concerns the experience of using the materials.

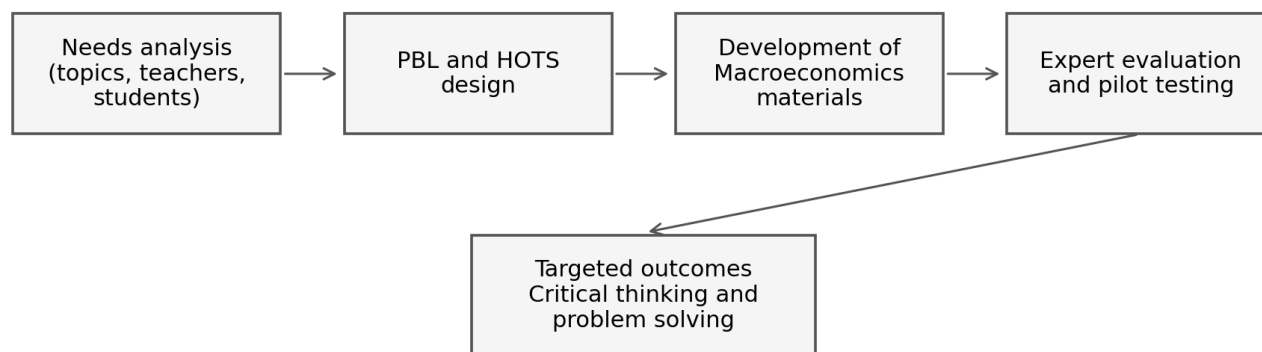


Figure 1. Framework for Developing PBL–HOTS Teaching Materials

Source Developed by the researchers based on the ADDIE model and the PBL–HOTS

Literature

Research Questions and Objectives

This development study is guided by the following research questions:

1. Which macroeconomic content and topics should be prioritised in PBL–HOTS teaching materials, based on document analysis and input from experts, teachers and students?
2. How can PBL–HOTS teaching materials for pre-university Economics be systematically designed and developed?
3. What evidence supports the content validity of the materials, the reliability of the evaluation instruments and the usability of the materials?
4. How do teachers and students evaluate the benefits, limitations and feasibility of using the materials in teaching and learning?

In line with these questions, the study aims to:

1. identify appropriate content and topics for PBL–HOTS materials in Macroeconomics;
2. design and develop teaching materials based on the ADDIE model;
3. evaluate the content validity and usability of the materials and the reliability of the evaluation instruments; and
4. explore teachers' and students' assessments of the benefits, limitations and feasibility of the materials.

Research Methodology

Research Design

The study adopts a research and development design using a mixed-methods approach. The qualitative component supports needs analysis, content generation and material refinement through document analysis, interviews or discussions with experts, teachers and students. The quantitative component summarises expert assessments, estimates instrument reliability and evaluates the usability of the materials. Both forms of evidence are integrated during each cycle of prototype improvement.

The ADDIE Development Process

The ADDIE model is selected because it provides a systematic sequence while allowing iterative revision across phases. Its application is summarised in Table 2.

Table 2

Phases in the Development of PBL–HOTS Teaching Materials

Phase	Main activities	Output
Analysis	Analyse the syllabus, examination reports and literature; identify teachers' and students' needs.	Needs profile and priority topics
Design	Align learning outcomes, authentic problems, HOTS activities, resources, time and assessment.	Storyboard and material specifications
Development	Produce prototype materials, a teacher guide, student worksheets and rubrics.	Draft PBL–HOTS materials
Implementation	Conduct a pilot study in selected classrooms and document feedback and implementation issues.	Usability and feasibility data
Evaluation	Conduct formative evaluation in each phase and an overall evaluation; refine the materials through triangulation of evidence.	Refined materials and evaluation documentation

Participants and Sampling

The proposed participants include experts in Economics education, pedagogy or module development, Economics teachers of Form Six, and students taking the subject at selected schools in Perak state. Experts will be purposively selected based on their expertise and experience. Teachers and students will be selected from schools offering Form Six Economics, with their suitability considered in relation to each development phase. The final protocol should specify the number of participants in each phase, inclusion criteria, response rates and sample size justifications to ensure that the research procedures can be replicated.

Instruments and Data Collection Procedures

The instruments comprise a document analysis protocol, an interview guide, an expert evaluation form, a usability questionnaire and a critical thinking rubric. Expert evaluation will examine the accuracy of the Economics content, alignment with learning outcomes, problem quality, appropriateness of cognitive demand, clarity of instructions, feasibility within the available time and assessment. Rating scales should include space for comments so that quantitative scores can be interpreted alongside qualitative suggestions.

Before data collection, the instruments will be reviewed for face and content validity. A pilot study will assess the comprehensibility of the items, the duration of activities and the functionality of the materials. Classroom implementation requires the relevant ethical approval, institutional permission and informed consent. The participation of students who are minors requires appropriate consent procedures. Participants' identities must remain confidential in the datasets and reports.

Data Analysis

Interview data and open-ended comments will be analysed thematically through coding, categorisation and theme development. Quantitative data will be summarised using descriptive statistics. Content validity may be assessed using item-level and scale-level content validity indices, while the internal consistency of the questionnaire may be estimated using an appropriate coefficient after examining its construct structure. Decisions should not rely on a single threshold value. Scores should be interpreted alongside expert comments, response patterns and usability evidence. Triangulation across experts, teachers, students and documents will inform prototype revisions.

Anticipated Contributions and Implications

The practical contribution is a proposed sequence for translating STPM Macroeconomics content into teachable and assessable PBL–HOTS activities. Each unit will connect a curriculum outcome to a triggering problem, relevant information, facilitation questions, a student learning product and a rubric. This gives teachers a basis for planning inquiry while retaining attention to the economic concepts and explanations required by the syllabus. For students, the intended value is repeated practice in connecting economic representations, comparing options and defending conclusions. These benefits are anticipated and will require evaluation.

The academic contribution is the explicit connection between design decisions and evaluation evidence in a defined educational context. The framework distinguishes PBL as the learning approach, HOTS as the intended cognitive demand and critical thinking as the quality of reasoning to be assessed. It then links these distinctions to content review, instrument checks and classroom feedback within ADDIE. This provides a basis for studying how particular features of the materials support or constrain reasoning. The study's present contribution is the framework and research design; a validated prototype, evidence of classroom feasibility and any effects on learning will be contributions of subsequent empirical work.

Limitations and Future Research

This framework does not yet establish the causal effects of the materials on critical thinking or examination performance. Pilot studies generally assess clarity and usability and do not replace impact evaluations. Once the materials have been refined, quasi-experimental or experimental studies may be conducted using pre-test and post-test measures, comparison groups and controls for teacher-related factors. Further research should also examine the extent to which the materials are implemented as intended, the time required by teachers and their suitability for use across different schools. Such evaluation is necessary to determine whether the materials can be adopted more widely.

Conclusion

The development of PBL-HOTS materials for pre-university Economics addresses two interrelated needs: students' continuing moderate mastery of Macroeconomics and teachers' need for practical guidance on integrating HOTS. The ADDIE-based framework provides a process extending from needs analysis to evaluation, while the integration of authentic problems, higher-order questioning, collaboration, argumentation and reflection specifies the intended learning mechanisms. The value of the materials must be established through transparent assessments of validity, reliability and usability, followed by impact evaluation. With systematic development and testing, these materials have the potential to support more meaningful Economics teaching and learning that promotes critical thinking.

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