Four Phases to Construct Problem-Based Learning Instructional Materials

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Abstract *Constructivism has resulted in the development of a wide variety of learning environments in the last decade of 20th century. One of the most ideal and most popular areas that implement the theory is the problem-based learning (PBL). PBL emphasizes a "real-world" approach to learning: a student-centered process that is both constructive and collaborative. It involves the use of complex, real-world problems as the stimulus and framework for learning. PBL also based on the promise that students will be motivated to "want to know" and solve the problem posed because it is presented in a context that simulates real situations. As an effective learning environment for improving students' critical problem-solving and self-directed learning skills, the PBL has been successful applied in many disciplines especially in higher education.*

The rapid changes in technology, information and economy call for the new competences such as the skills of critical thinking, problem solving, decision making, team working, etc. Thus, how to equip our students with the requirements for graduate competence has become the most crucial responsibility in engineering education. This article is trying to address some strategies for instructional materials design. By way of inductions, experiments and revisions, the author s found that some strategies in lesson planning could be applied to achieve the results we expected. These strategies invovle Four phases as described follow.

Phase 1: Select the appropriate unit titles, which is attracting students with a great deal of attention, and describe the frequent problems occuring in daily life, favorably with a touch of urgency, danger, and task orientation. Phase 2: Divide the unit into different activities through these steps: (1) the use of concept map to describe the core knowledge; (2) the application of problem solving skills after having acquired the ability to employ the core knowledge; and (3) the formulation of development plans for core knowledge expansion and enhancment. Phase 3: Decide on the learning objectives (from teachers' version), specifying things that must be learned, should be learned, and nice to learn for each specific activity. Phase 4: Use keywords and transitions to connect the contents of activies.

To ensure the instructional materials have been constructed effectively, the article also developed a checklist by using the learning contents, the available resources, the question description, the motivation booster design, and focused question as assessemnt benchmarks.

Index Terms *Engineering Education, Instructional materials, Instructional method, Problem -Based Learning*