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DEVELOPING QUESTION LIBRARIES FOR NEWTON RAPHSON'S METHOD USING QUESTION MARK PERCEPTION

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ABSTRACT

The use of computer-aided assessment in mathematics is now widespread, particularly in formative assessment of routine skills [1]. This project generates some questions and describes some issues involved in the development of question libraries for Newton Raphson's method using Question Mark Perception. The questions developed are in the form of multi choice, numerical input, responsive numerical input, and numerical input with error range type. It is hope the questions that have been built can help students to improve their understanding and skills of a subject extensively at quick impact .

CONTENTS

CHAPTER 1: INTRODUCTION TO COMPUTER AIDED ASSESSMENT (CAA)

1.1 What is Computer Aided Assessment?

Computer Aided Assessment (CAA) is commonly described simply as "CAA" and is the new "buzz" word taking over from "CAL" (Computer Aided Learning). The term itself refers to the use of computers in assessment. In this context the role of the computer is to deliver tests, mark students' responses and present the data to the participating staff member [2].

Assessment in Mathematics and related subjects has traditionally been carried out using examination style question papers presented in a formal setting to the students enrolled on a particular course [3]. Computer testing ranges from straightforward multiple choice tests which may be submitted on-line for marking and returned via the WEB to more sophisticated assessment engines which offer a variety of question types, includes interaction, an immediate marking system, help and result service [3].

CAA has been on the brink of revolutionizing education since the early seventies, if not before. There exist many different CAA package, from freeware and shareware to expensive and sophisticated systems [4]. How effective they are depends, to a large extend, on the role they are intended to play.

CAA is starting to be used very widely in schools and even in the work place. The level of interest in CAA in the Higher Education sector has increased because of the increasing number of students entering Higher Education in the UK, the increased sophistication of education software and because of the increased number of computer terminals in UK universities [5].

1.2 How is CAA being used?

There are four different ways in which CAA can be used to access students.

- To determine a student's prior knowledge of a subject, a diagnostic test may be used.
- To check a student's understandings of a particular concept or terminology, a self-assessment test may be used.
- To assist students in learning by giving feedback, and to indicate the progress of knowledge and skills developments, and of understanding level of a subject, formative methods of assessment may be used. In CAA, objective questions with feedback are purely used for self- assessment.
- To give quantitative grading of module examination can be added to the course work, a summative form of assessment may be used.

1.3 The Advantages of CAA

The main advantage of CAA is that, once the questions have been produced, it cuts out the preparation and marking time that tutors would have to spend for paper-based assessments. Some of the other advantages are:

- Lecturers can monitor their students' progress and students can monitor their own potentials.
- Students can get instant feedback during or after the test.
- A wide range of topics and skills on a subject can be assessed.
- Formative assessments can be repeated to help students with learning.
- Students with different abilities and standards can be tested accordingly.
- The IT skills can be developed.
- CAA can be linked to other computer based materials.

1.4 The Disadvantages of CAA

There are some advantages of CAA:

- To construct good objective questions is slow and time-consuming.
- To avoid any failures during assessment, both hardware and software of the computers have to be continuously monitored.
- To install CAA systems, is not only time-consuming but can be costly.
- To sit for the test or supervise it respectively, IT skills are required from students to assessors and invigilators.

1.5 Classification of Learning Outcomes

In mathematics field a skill is a "*practiced ability*". Students are required to practice questionnaires to develop skills. In1956, Benjamin Bloom stated his famous *Taxonomy of Educational Objectives* [6] which classified forms of learning into three categories: cognitive, affective and psychomotor domains.

Within the cognitive domain, Bloom identified six levels of learning which represented increasing levels of cognitive complexity from the lowest level namely Knowledge through Comprehension, Application, Analysis, Synthesis and Evaluation.

Figure 1.1 below shows the Bloom's Taxonomy. The three lowest levels have been described as 'foundation thinking' which is used as a basis for the higher learning levels [7]. Associated with each level are certain learning outcomes expressed as 'verbs' such as recall, draw, calculate, categorise, design, or assess.

The demonstration of higher learning outcomes would be a reflection of the attainment of learning at more cognitively complex levels. It is often assumed that objective testing with its need to provide a correct answer is only applicable to the lowest learning levels.

While this has never been true, with advances in CAA, the applicability of testing objective to the three highest levels of Analysis, Synthesis and Evaluation can now be more appropriately considered.

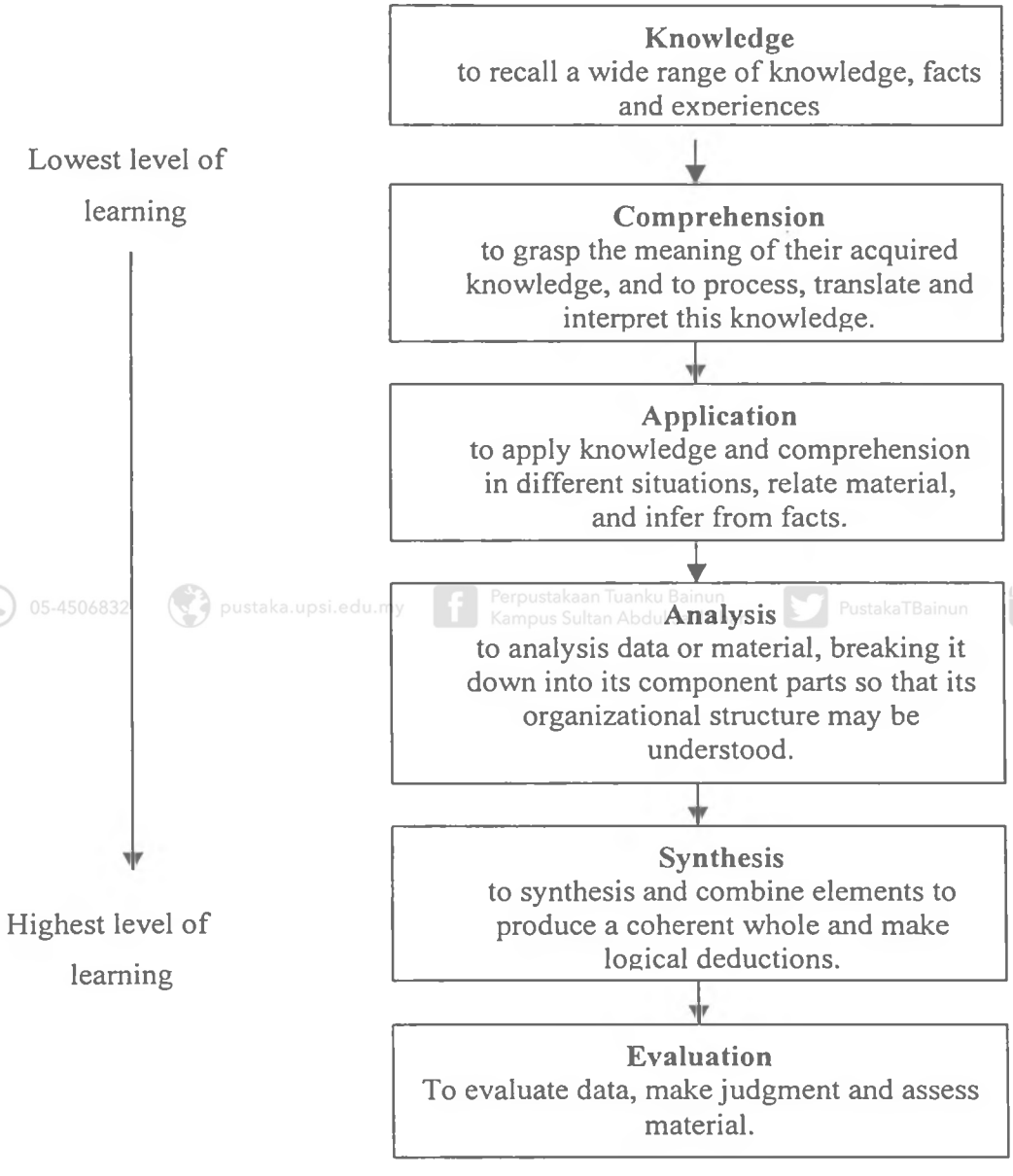

FIGURE 1.1: Bloom's Taxonomy

In Mathematics, the levels of learning are sequential. Referring back to FIGURE 1.1, a student would have to fully comprehend the lowest level of learning before moving towards the highest levels. Each level encompassed those below it, so, for example, analysis could only occur after the ability to apply understanding of factual or other knowledge had been accomplished.

1.6 Developing Computer Aided Assessment

Assessment should have two purposes within Higher Education. The first is to determine which areas in education system are effective and which areas are not effective and thus need modification. The second purpose is to assist learning. To achieve this, the assessment is designed so that it is can meet the overall goals of the unit and consequently be parts of the learning process.

A number of assessment elements must be considered such as:

- basic knowledge
- skills
- higher cognitive skills

Students can be assessed while they are working out through the levels of learning. The forms of assessments that can be used are diagnostic, formative and summative.