

Evaluation of the Strengths and Weaknesses in Teaching Physics through Competency-based Approach

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Background

Traditional teaching methods such as the lecture method have been used in the school education, up to G.C.E. (A/L) classes in Sri Lanka for a long time. In 2007, the National Institute of Education in Sri Lanka introduced the competency based approach (CBA) for the first time for grade 6 and 10 (NIE, 2009). It was extended to other grades progressively in the later years. The G.C.E. (A/L) curriculum was reformed in 2009 and CBA was introduced in teaching-learning process. In the CBA, the teacher acts as a resource person and provides the students the required reading material, equipment, other inputs and it is carried out according to the 5E model (Ginige, 2008). It involves five stages of learning phases namely, engagement, exploration, explanation, elaboration, and evaluation (Ginige, 2008).

An evaluation of the process development and implementation of curriculum has been carried out for grades 6 and 10 in 2008 (Perera, 2008) and for grades 7 and 11 in 2009 (Perera, 2009) and the strengths and weaknesses have been discussed. The present study evaluates strengths and weaknesses of CBA against the traditional lecture method, focussing on students' understanding of selected lessons in physics and to identify the difficulties in teaching physics in the school-based environment through CBA.

Methodology

Lesson plans were prepared according to the 5E model for selected six physics lessons in the Thermal Physics unit of the G.C.E. (A/L) syllabus: namely, thermal expansion of solids and liquids, behaviour of gas, gas laws and related problem solving and transfer of heat. Three schools in Kurunegala district namely, Kuliypitiya CC, Saranath MV, Kuliypitiya, and Mayurapada CC, Narammala were considered. Two groups of students with same educational level were selected from each school based on their G.C.E. (O/L) results and through an examination in physics. A selected group of students were taught through CBA and the other with the lecture method. At the end of each lesson an identical question paper was given to each group to evaluate them. The students who study physics in G.C.E. (A/L) classes and physics teachers in government schools were given separate questionnaires in order to get the outcome of learning through CBA.

Data Analysis and Discussion

Comparing the success of CBA with lecture method in teaching physics

The calculated arithmetic mean \bar{X} and standard deviation σ of marks for each lesson for students in Group A and Group B are tabulated below.

Lesson	Group A (Lecture Method)		Group B (CBA)	
	\bar{X}	σ	\bar{X}	σ
1	12	3.34	10.27	3.21
2	11.67	3.49	10.07	3.04
3	10.33	2.77	9.73	3.15
4	11.80	3.31	10.73	3.80
5	10.40	2.79	11.73	3.43
6	11.47	3.67	9.67	3.36

The calculated average of the arithmetic mean of marks is 11.3 ± 0.7 and 10.5 ± 0.7 for Group A and Group B respectively. It could be seen that the arithmetic mean of marks obtained for written tests by the students who have learned by the lecture method and through CBA are the same within the standard deviation of the mean values of marks.

Evaluation of questionnaire given to students

Responses were received from 2,324 students in Kurunegala, Puttalam and Gampaha districts for the questionnaire given to students. 52% of students think that their knowledge in subject matter is enhanced and 86% believe that motor skills, speaking skills, working corporately are developed through CBA. However, 69% of students consider that it is not an effective method in preparing for G.C.E. (A/L) examination, and 89% assume it is not an alternative for private tuition. Furthermore, 54% of students still prefer lecture method in learning physics to CBA.

Evaluation of questionnaires given to teachers

Responses were received from 148 physics teachers islandwide for the questionnaire relating to student progress of learning physics through CBA and preparation of school based-environment to conduct CBA.

Evaluation of student progress of learning physics through CBA

The percentage of teachers' view on student participation is either good or satisfactory on activity-based teaching is 67%, student discipline in class students' is 66%, reaching the relevant competency level is 63%, and completing the students' activities during the allocated time period is 50%. Therefore teachers' view on students' performance on CBA has many positive aspects.

Implementation of CBA in school based-environment

The positive aspects are that 66% and 62% respectively believes that there are sufficient teachers available and selected lessons of the syllabus can be covered using CBA. Conversely, 96%, 72% and 54% respectively states that the whole G.C.E. (A/L) syllabus cannot be covered, the classroom environment is inadequate and labs/teacher assistants are insufficient. Furthermore, 57% of teachers and 59% of students express that standard instruments for these activities are insufficient.

Conclusions

The results obtained for the written tests indicate that the lecture method and the CBA are the same within the standard deviation of mean values of marks. Responses of students indicate approximately equal percentages of positive and negative aspects of CBA.

Responses of teachers on the student progress indicate a higher percentage of positive to negative aspects of CBA. Responses of physics teachers on preparation of school based-environment to conduct CBA are mostly negative. From the present study, it was not possible to conclude whether the same conclusions hold for group of “average” students.

References

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