
RELATIONSHIP OF TEACHING COMPETENCY OF STUDENT TEACHERS WITH ACHIEVEMENT IN PHYSICAL SCIENCE EDUCATION THROUGH BLENDED LEARNING APPROACH

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Abstract

Education is the knowledge of putting one's potentials to maximum use. The quality of a nation depends upon the quality of its citizens. The quality of the citizens rests upon the quality of their education; the quality of their education depends upon the quality of teachers. The quality of teacher education and teaching appear to be more strongly related to student achievement than class sizes, overall spending levels or teacher salaries. The effects of quality teaching on educational outcomes are greater than those that arise from student's backgrounds. Student teachers enter the initial teacher and teaching profession can play a significant role in developing competencies. The use of Blended Learning Approach in higher Education has increased significantly during the past decade. It reflects the changing nature of students' life with students facing many competing demands in their time and requiring flexibility in learning. The aim of this study was to find out the relationship between Teaching Competency and Achievement in Physical Science Education through Blended Learning Approach. This study investigates the influence of Teaching Competency on Achievement in Physical Science Education through Blended Learning Approach. The sample of this study was 135 student teachers based on Matching Technique matching the subjects within the five points of the entry behavior test scores. The investigator used the blended learning approach in delivering multimedia content of Physical Science Education using video conference, CD ROM SIM and Printed SIM to the student teachers in colleges of Education to serve the fast growing educational needs. This study showed that there was high positive relationship between Teaching Competency of student teachers with their Achievement in Physical Science Education through Blended Learning Approach.

Key Words: Teaching Competency, Blended Learning Approach, Achievement, Physical Science Education

Introduction

Education is the only instrument to make preamble true and only means for desirable social change. All human beings are born free and equal in dignity and rights. They are endowed with reason and conscience and should act towards one another in a spirit of brotherhood. The importance of education is quite clear. Education is the knowledge of putting one's potentials to maximum use. One can safely say that a human being is not in the proper sense till he is educated. Teachers shoulder the responsibility of shaping the future of the nation. The future of the nation depends upon the skills and efficiency of the teachers. Teachers are given the other name as creators they are the creators of philosophers, leaders, doctors, advocates and many more. Teachers work involves rigorous efforts in the classroom. Teaching competency refers to the right way of conveying units of knowledge, application and skills to students. The right way includes knowledge of content, process, methods and means of conveying content. Teacher's competency also refers to the ability of the teacher to help guide and counsel their students to achieve high grades. For this purpose teacher's need to be well trained and competent to perform their jobs. More fortunate development that has taken place over the past 10-15 years is the rapid advance in computer- and communications technology. Today, an advanced cell phone almost has the computing power and features of a desktop computer from a decade ago. The internet has developed very fast during the past decade and is today an important resource for research, learning and socialization for most students. This technological development has gradually opened up new instructional possibilities in colleges and universities and allowed administrators to seek greater educational cost-effectiveness similar to that which has been achieved by several corporate institutions. A growing body of literature on blended learning (BL) is documenting the fact that its use is clearly on the rise in higher education.

Teaching Competency

Competence has been used for the evaluation of teachers at different stages: student-teachers, beginning teachers and experienced teachers. These evaluations are conducted by different parties, including teacher educators, researchers and the government. As the public demand for accountability increases, schools of education are forced to identify the qualities of effective teachers and planned curricula to ensure that prospective teachers demonstrate those qualities prior to certification. According to Short (1985) can range from competence in a single behavior ~: competence as a quality of a person. The identification and determination of teacher competence are thus crucial in teacher education and development. First, teacher certification groups are using competence as an indicator. Secondly, teacher education institutes are planning their programmes which aim to maximize teacher competence. Thirdly, teacher educators are using teacher competence to reflect

various stages of teacher development. In addition, how competence is defined depends" also on other aspects: the length of time in teaching the conception of the teacher's role, the context for teaching such as the school characteristics and the geographic location. However, educators try to measure' competence as this proves to be an important indicator' on the achievement of teacher education programmes. Teaching competency will mean the competencies of student teachers before and after the teaching practice. This reveals a pattern of development along the course of study. It is a reflection of the students' teachers' abilities and skills.

Need of the study

Education is the key which helps to eradicate all kinds of social evils. The society makes an effort to provide conducive working environment for teachers. A committed employee is an asset of any organization and occupies the most important place in an educational institution because they are in charge of the future of the nation. Need of the nation is not only to attract but also retain committed teachers. A paramount factor in the teaching learning system is the teacher. The role of teacher in society is both significant and valuable. The teacher plays a lead role in determining the future of students. A sound educational system can flourish if two conditions are successfully met. First is the constant updating and refinement in knowledge and new skill in teaching and second one is equipping student teachers with competencies towards profession. Competencies are specific and demonstrable characteristics inevitable for teaching professionals to create a convincing and learner friendly environment. For this teacher educator is a role model for student teachers. Teacher educators are continually on the lookout for innovations to improve the effectiveness of their instruction and the educational outcomes of their student teachers. One such innovation is blended learning, an instructional approach that allows students to assume greater control and a more active role in their learning. This study is an effort to get a glimpse of student teachers' competencies and to provide differentiated instruction. Hence is this study.

Review of Related Literature

Stone, B.B., (2012) Genetic Diseases & General Biology Students watched short video lectures and went to f2f discussion classes. Students watched pre-recorded 7-15 minute video lectures prior to class and used assigned readings, animations, and simulations. Then they participated in an online quiz or brought a news story/ reflection/ other product to class to demonstrate completion of these assigned tasks. In class, students participated in various group activities, asked questions, or had the instructors explain difficult concepts. Students did better in the hybrid class compared to those in traditional class in previous semesters in the smaller Genetic Disease class in terms of raw scores on the first two exams. Students in the hybrid format did better than those in

traditional format in the previous semester in terms of raw scores in exam 2 and assignments, but not in exam 1.

AEA Iowa Area Education Agencies (2012): The work of AEA was commissioned by AEA Chief Administrators as the AEA Online Council in 2007 with the goals of establishing quality online education. Part of the work was development of the Iowa Online Teaching Standards. The Iowa Online Teaching Standards used the NACOL and SREB competencies as resources in the development of the instrument. Iowa Online Teaching Standards include eight areas of competence, which include: 1. Demonstrates ability to enhance academic performance and support the agency's student achievement goals; 2. Demonstrates competence in content knowledge (including technological knowledge) appropriate to the instructional position; 3. Demonstrates competence in planning, designing, and incorporating instructional strategies; 4. Understands and uses instructional pedagogy that is appropriate for the online environment and meets the multiple learning needs of students; 5. Creates and implements a variety of assessment that meet course learning goals and provide data to improve student progress and course instruction; 6. Incorporates social aspects into the teaching and learning process, creating a community of learners; 7. Engages in professional growth;

Teresa Guasch [a](#), Ibis Alvarez [b,*](#), Anna Espasa, (2009) Conducted a study on "University teacher competencies in a virtual teaching/learning environment: Analysis of a teacher training experience" The main objective of our analysis was to identify the achievements and difficulties in a specific formative experience in order to assess the suitability of this conceptual-methodological framework for the design of training proposals aiming to develop teachers' competencies for virtual environments in higher education. Method: We attempt to analyze a teacher-training proposal that was designed by taking into account methodological criteria that may assist in developing competencies from training onwards. The criteria were defined from a conceptual approach to teacher functions, specifically in relation to the competencies and tasks that both differentiate and specify teaching and learning in virtual environments. Sample The teaching training proposal consisted of a workshop for teachers from the Department of Psychology and Education at the Open University of Catalonia (UOC), a fully virtual university from scratch, in which these teacher training needs were taken into account. Twelve university teachers took part. The workshop was conducted by three trainers who all worked collaboratively throughout the process. All the participants were experts from the same subject area, and they had experience in virtual university teaching. Findings: As pointed out at the beginning of this paper, we intended to analyze a teaching training experience for university teachers in virtual learning environments, the objective of which was to develop competencies related to collaborative learning in virtual environments, with a view to identifying the

methodological aspects facilitated the development of the objectives set. We also intended to identify the aspects that hindered the execution of the objectives, taking into account the criteria identified as key elements in the design of a training practice. From our viewpoint, the methodological criteria presented and contrasted throughout the experience shed light on the process of planning and designing teacher training proposals to meet the current needs in higher education in terms of the development of competencies for teaching and learning in virtual environments.

The Problem

The problem of the study is stated in question form as under "To what extent is Teaching Competency of student teachers and Achievement in Physical Science Education through Blended Learning Approach related?"

Objectives

1. To find out the effectiveness of Blended Learning Approach by delivering Multimedia Instruction through Video Conferencing, CD ROM -SIM, Printed SIM in Teaching Physical Science Education to student teachers of College of Education.
2. to find out the Gap Closures in the Achievement of Physical Science Education in the Control and the Experimental Groups(I and II) student teachers .
3. to find out the relationship between Teaching Competency of student teachers and Achievement in Physical Science Education through Blended Learning Approach

Hypotheses

1. Gap closures in the Experimental Groups are greater than the Control Group in the Achievement of Physical Science Education.
2. There is a significant relationship between Teaching Competency of student teachers and Achievement in Physical Science Education through Blended Learning Approach

Methodology

The design of the Study is Pre-test /Post-test equivalent-groups Design. The Entry Behavior Test consisting of 150 multiple choice items was constructed and administrated by the Investigator on the content of the B.Sc. degree course (Chemistry) to 90 student teachers (20 to Yadava College of Education, 25 to Crescent College of Education, 30 to Nallamani College of Education and 15 to KSM College of Education, Madurai) of B.Ed degree course of previous year for the purpose of validation. 135 student teachers in three different colleges of education. The performance of the student teachers in the Entry Behavior Test was assessed. Based on their performance, the student teachers were divided into three groups-Control Group, Experimental Group I and Experimental Group II. The selection of the student teachers for Control Group and Experimental Groups was based on the 'Matching technique" matching the subjects (students' teachers) within the five points (Close

matching) of the Entry Behavior Test scores⁷. The investigator selected 135 student teachers (45 for Control, 45 for Experimental -I and 45 for Experimental -II) based on 'matching' out of 150 student teachers to whom the Entry Behavior Test was administered. A Teaching Competency scale was administered to assess the Teaching Competency of the student teachers. A teacher's teaching competence is well exhibited in the way in which he teaches the class. The teachers should show his ability in planning the lesson plan, presenting the matter effectively, closing and Evaluation of the lesson. Planning includes selection of content, organization of the content, objectives and audio visual material. Instruction includes introduction, subject competency, methods and techniques, learning environment, non-verbal behaviors, participation of students, communication, questions and answers, class management, personality. Closing includes summing up and assignment. Evaluation includes assessing students' progress. In order to measure the Teaching Competency of the student teachers, the investigator has constructed and validated Teaching Competency Scale. This scale is a five point rating scale namely weak, Average, Strong, Superior and Outstanding. The final validated tool was administered to 135 student teachers who had chosen Physical Science Education in their B.Ed degree course. The filled in proforma were collected and scored. Teaching competency will mean the competencies of student teachers before and after the teaching practice. This reveals a pattern of development along the course of study. It is a reflection of the students' teachers' abilities and skills.

Blended Learning Approach: Blended Learning Approach can be used to support face-to-face teaching, large group and small group learning, self-directed learning, communication between the teacher and individual students or groups of students, as well as between students themselves. We can "blend" time (e.g., face-to-face vs. recorded lectures), student teachers at geographically distanced sites (on campus vs. online), resources and activities (printed vs. CD ROM; in-class vs. online).

Video Conferencing (Multimedia Approach)

Video Conferencing is the ability of two or more face to face distant groups to communicate face to face in real time by



using a combination of Audio and Video equipment. The investigator at Mangayarkarasi College of Education for women, Paravai (main location) has taught student teachers who are sitting in front of her while simultaneously teaching student teachers who are sitting at geographically distanced sites of SAKTHI College of Education, Ottanchatram, KAPI college of Education and KAPI College of Education for women, Nagamalai using Video Conferencing Equipment.

Multi-Point Video Conferencing: Multi-point Video Conferencing is an expansion of classroom Video Conferencing to involve three or more communities.

Self Instructional Material: Self Instructional material is defined as an instructional process centering on such activities as assessing needs, securing learning resources, implementing and the process as individualizing instruction, a process focusing on characteristics of the teaching learning transaction.

CD ROM – SIM (Multimedia Approach): The investigator has developed the lesson - Audio Visual Aids on CD ROM by incorporating text, color diagrams, pictures, audio, video, graphics and animation. The instructional material on CD ROM is designed on the basis of Self Instructional Format. This multimedia CD ROM Self Instructional Material (SIM) is distributed to all student teachers. Each student teacher is allowed to play CD ROM in the computer and is learned independently. A main screen provided a content list that allowed the learners to select the module they wanted to study. They are asked to answer the given questions at the end of each subunit to assess their learning level.

Printed SIM (Multimedia Approach) The investigator has prepared two lessons namely Curriculum and Evaluation in the form of printed material based on Self Instructional Format. The Self Instructional Material (SIM) is presented in the form of easy explanations, sequential developments, illustrations, learning activities and pictures. This multimedia Printed SIM is distributed to all student teachers. Each individual is asked to work at his or her own best pace rather than at the pace of the group. . They are provided checklist at the end of each subunit for their self assessment.

Traditional Method The investigator has taught five lessons namely Taxonomy of Educational Objectives, Methods of Teaching, Audio Visual Aids, Curriculum and Evaluation in the classroom by lecture method using black board.

Procedure Academic Content in Physical Science Education was identified and sequenced. Lessons plans based on Traditional Method and lesson plans based on Multimedia Approach were prepared and proper teaching aids were developed. A validated Entry Behavior Test was administered for dividing the students 135 in number, into three groups namely Control Group and two Experimental Groups(I and II). Questions for Pre/Post-test were prepared, administered and validated. Preparation of lesson materials (two units) two units for Video Conferencing (Multimedia), one unit on CD ROM-SIM(Multimedia) and two units in the form of Printed SIM(Self Instructional Material). Each unit was taught through Traditional Method to the Control Group and two units were taught through Video Conferencing (Multimedia), one unit on CD ROM–

SIM (Multimedia) and two units using Printed SIM (Multimedia) were given to the Experimental Group I without discussion and to the Experimental Group II with discussion. A post-test for each unit was administered to all the three groups after teaching each unit. The final validated tool of Teaching Competency was administered to 135 student teachers who had chosen Physical Science Education in their B.Ed degree course. Statistical techniques used for analyzing data were gap closure and correlation.

Gap Closure: Gap is the difference between the mean score obtained by the Group and the maximum score, called perfect score. The gap closing score is the percentage into which the gap towards perfection gets closed for a Group. By meaning the Gap Closure, we washout any effects of differences in the knowledge of the subjects to the course. The formula for calculating gap is furnished below:

$$\text{Post-test Mean} - \text{Pre-test Mean}$$

$$\text{Gap Closure} = \frac{\text{Post-test Mean} - \text{Pre-test Mean}}{\text{Perfect Score} - \text{Pre-test Mean}} \times 100$$

Note: Perfect score = Maximum possible score.

This technique is used to compare the achievement scores of the two Groups. The perfect scores for each of the unit tests is 40 and global is 200.

Gap Closure - Control Group, Experimental Group I & II

The table 1 furnishes the data for the gap-closure of the Control Group and Experimental Group I & II

Table 1 Gap Closure (Control, Experimental I & Experimental II)

Unit. No	Control Group			Experimental Group I			Experimental Group II		
	Pre-test Mean	Post-test Mean	Gap Closure	Pre-test Mean	Post-test Mean	Gap Closure	Pre-test Mean	Post-test Mean	Gap Closure
1	7.02	15.91	26.96	6.91	26.96	60.59	7.13	33.40	79.92
2	6.73	15.84	27.38	6.69	27.00	60.97	6.67	33.87	79.21
3	7.02	16.38	28.38	6.76	22.69	47.92	7.09	26.20	58.07
4	5.96	15.40	27.73	6.09	18.60	36.89	6.31	22.73	48.74
5	7.04	15.24	24.88	6.73	19.16	37.36	6.71	21.20	43.53
Global	33.76	78.89	27.15	33.18	114.40	48.69	33.91	136.60	61.83

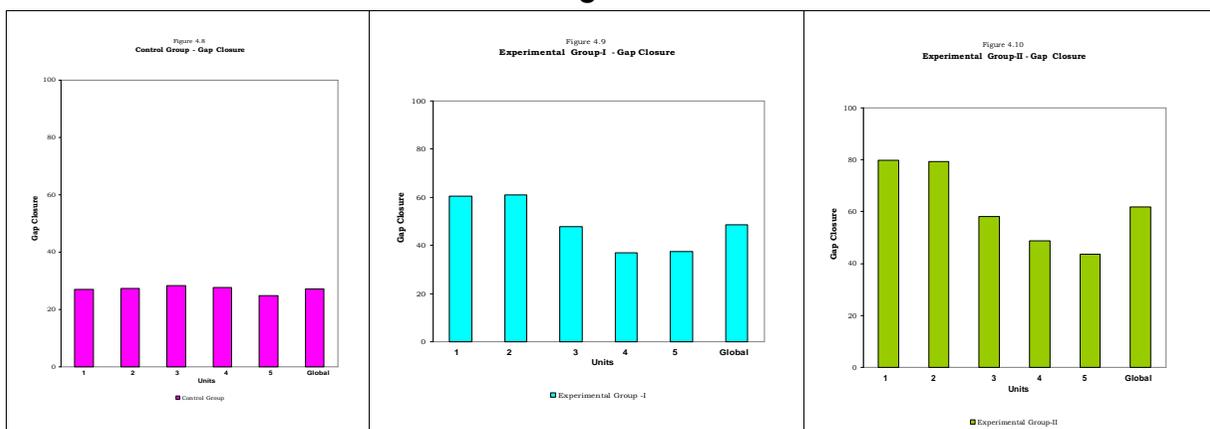
The table 1 reveals that the Gap Closure in the unit tests in Taxonomy of Educational Objectives, Methods of Teaching , Audio Visual Aids, Curriculum and Evaluation as well as in the global test are in the range of '24-29' for the Control Group '36-61' for the Experimental Group –I 43-80' for the Experimental Group –II student teachers. Figure 1 furnishes the data in a bar diagram indicating the size of the Gap Closure in each unit test as well as in the global for the Control Group, Experimental Group –I and Experimental Group –II student teachers. For control group the level of learning in all units are lower than Experimental Groups I & II.

Experimental Group I The Gap Closure in the Unit 1(Taxonomy of Educational Objectives) and in the Unit 2(Methods of Teaching) are 60.59, 60.97. The higher level of

Gap Closure is due to the implementation of Video Conferencing (Multimedia). In Video Conferencing, face-to-face instruction is crucial in enhancing interactivity given the situation where teacher and student teachers are separated by distance. Media richness included multiple interactivity. The Gap Closure in the Unit 1(Taxonomy of Educational Objectives) and in the Unit 2(Methods of Teaching) are 60.59, 60.97. The Gap Closure in the Unit 3 (Audio Visual Aids) is 47.92 which is lower than the Gap Closure of Unit 1(60.59) and Unit 2 (60.97). The difference in Gap Closure is due to the effectiveness of teaching Unit 1 and Unit 2 through Video Conferencing (Multimedia). The student teachers are provided CD ROM-SIM (Multimedia) for Unit 3. Even though CD ROM-SIM (Multimedia) could provide information in different forms but teacher is still important for student teachers. The Gap Closure for Unit 4 (Curriculum) and Unit 5 (Evaluation) are 36.89, 37.36 which are lower than the Gap Closure of other units 1, 2 and 3. The student teachers are provided Printed SIM (Multimedia) for Unit 4 and Unit 5. In this student teachers experienced isolated feelings and loss of motivation. There was no immediate feedback. The interaction in Printed SIM is less comparing to Video Conferencing (Multimedia) and CD ROM-SIM (Multimedia).

Experimental Group II The Gap Closure in the Unit 1 and in the Unit 2 and Unit 3 (Methods of Teaching) are 79.92, 79.21, 58.07, 48.74 and 43.5 The higher level of Gap Closure is due to the discussion in addition to implementation of Video Conferencing(Multimedia) – effective , CD ROM-SIM (Multimedia) - better than Printed SIM(Multimedia). H01 is accepted. Gap closures in the Experimental Groups are greater than the Control Group in the Achievement of Physical Science Education.

Figure 1



Gap Closure (Control, Experimental I & Experimental II)

Stanine Conversion for Raw Scores–Achievement in Physical Science Education and Teaching Competency

The investigator structured the table 2 for the stanine scale of the Achievement in Physical Science Education, Teaching Competency. Stanines are employed to draw

profiles. showing the difference between the Control and Experimental Groups based on the stanine values of post-test performance of Achievement in Physical Science Education (APSE) and Teaching Competency (TC)

Table 2 Stanine Scale – APSE & TC

Stanine	% of Score	Cum % Score for 100	Cum % score for 135	APSE	TC
1	4	4	5	71	105
2	7	11	15	75	117
3	12	23	31	80	132
4	17	40	54	103	155
5	20	60	81	119	177
6	17	77	104	131	205
7	12	89	120	144	226
8	7	96	130	160	236
9	4	100	135	168	248

Relationship of Teaching Competency with Achievement in Physical Science Education

The table 4 shows the Relationship of Teaching Competency with Achievement in Physical Science Education (APSE) Teaching Competency (TC) has low positive

relationship with Achievement in Physical Science Education (APSE) in control group, has high positive relationship with Achievement in Physical Science Education (APSE) in Experimental Group I & II at 0.01 level of significance.

Table 3 Stanine values for Control, Exp I & Exp II

Variables	Control Group		Exp Group-I		Exp Group-II	
APSE	78.89	3	114.40	5	136.60	6
TC	138.71	3	171.73	5	204.93	6

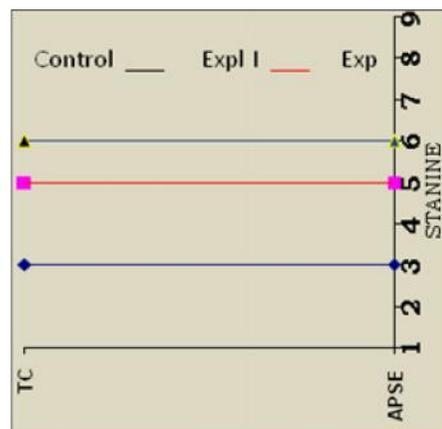
Table 4 Relationship of TC with APSE Control Group, Exp I & Exp II

Variables	Control	Exp - I	Exp II
TC	1.00	1.00	1.00
APSE	0.37	0.60	0.62

The inferences drawn from the profile show that Experimental Group – I & II student teachers have higher level in Achievement in Physical Science Education (APSE), Teaching Competency (TC), Control Group student teachers have lower level in Achievement in Physical Science Education and Teaching Competency (TC). H02 is accepted. There is a significant relationship of Teaching Competency with Achievement in Physical Science Education through Blended Learning Approach

Discussion

Teaching Competency (TC) has high positive relationship with Achievement in Physical Science Education (APSE) in Experimental Group I & II and low positive relationship in Control Group at 0.01 level of significance. It shows that Teaching Competency of student teachers has been improved by a Competent Teacher



Educator. From the statistical analysis of data, it has been observed that we very clearly and precisely came to know that the Blended Learning Approach in Physical Science Education by integrating face to face teaching with online is the best method of teaching. The step by step explanation of the instructor helped out the student teachers to view them as the gateways of comprehension of contents. It is learner – centered and cost effective. It provided immediate response from both instructor and student teacher. Multimedia Instruction through Video Conferencing provided three types of interaction namely learner-instructor interaction, learner-content interaction, learner-learner interaction within the college and from other colleges simultaneously. Traditional method of teaching has not been very effective consistently as student teachers failed to get interest in the subject and failed to have access to extra information. The traditional method has kept the student teachers as the passive listeners. Finally the student teachers could not achieve better. The student teachers were learnt the content by interacting with the interactive multimedia instructional information in CD ROM SIM (Multimedia). The student teachers like their freedom in their learning process and this learning process was interesting and engaging, useful and increased their understanding of the subjects. This study has successfully shown that student teachers enjoyed and self motivated in their learning when CD ROM-SIM (Multimedia) was used as a delivery method to communicate knowledge and information to them. They like the self-paced learning process and autonomy in determining their own learning path. Although this learning environment was technology based wherein the teacher's role was basically diminished, students suffered a lot in the absence of the teacher. It is not very much efficient compared to the Video Conferencing (Multimedia). The print SIM (Multimedia) is not effective comparing to CD ROM-SIM (Multimedia) and Video Conferencing (Multimedia). From the above analysis, it is evident that blended learning by integrating face to face discussion with Video Conferencing (Multimedia), CD ROM-SIM(Multimedia) and Printed SIM(Multimedia) is more effective than in Learning Physical Science Education of the Experimental group(without discussion) than the Lecture in the Control Group. The competency based approach lead in enhancing teaching competency of student teachers.

Scope for Further Research

All teacher educators must be provided with time to learn how the technology works as well as to integrate it into classroom. How communications will promote collaboration and higher level learning: How educators will be supported in their use of technologies for learning, professional development and their own collaboration: How future learners will improve their competency to achieve new levels of success and better prepare for academic or vocational future:

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