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Efficacy of Modern Instructional Technologies on Student-Teacher's Teaching Behaviour

Abstract

Educational Systems around the world are under increasing pressure to use the new Information and Communication Technologies (ICTs) to teach students the knowledge and skills they need in the 21st century. The 1998 UNESCO World Education Report, "Teachers and Teaching in a Changing World" describes the radical implications of the new information and communication technologies for the conventional teaching and learning. It predicts the transformation of the teaching-learning process and the way teachers and learners gain access to knowledge and information.. Since learning is concerned with teaching and instruction in its different forms including the recently used e-technology, it is obviously related with educational technology in general and Information Communication Technology (ICT) in particular. With the advent of the 21st century, we have entered the age of ICT and thereafter, e-learning has become a part of teacher- education programmes at all levels. The pre and in-service level of teachers as well as teacher-educators are thus expected to be well versed with e-learning technology to make its proper use of enrichments of their communication ability in all walks of teaching-learning processes (Bhattacharje, 2010- p. 1).At present Computer-Assisted Instruction(CAI) and Modular Approaches of teaching have got an immense position in the entire epitome of education and teaching culture in general and teacher education in particular. In this context, therefore the present paper intends to highlight the effectiveness of the modern approaches of teaching i.e. Computer-Assisted Instruction (CAI) and Modular Approach on the immediate performance of pupil-teachers in the method of teaching of geography in an experimental manner. The present study was based on Three Groups Randomized Pre and Post -test True Experimental Equivalent Group Design of experimental method of educational research by consisting of 60 sample of pupil-teachers. The experimentation was done for measuring the interactive effects these three groups towards CAI and Modular Approach by administering the criterion test before and after exposition of the instructional materials in the experiment. The study revealed that the pupil-teachers exposed to CAI did perform better in terms of effectiveness as compared to the Modular teaching group.

Keywords: Technology, Approach, Paradigm Shift, Computer- Assisted Instruction (CAI).Module.

Introduction

In true sense when we encompass the real concept of Computer-Assisted Instruction (CAI), it is nothing, but CAI is a form of individualized instruction where a student works at his / her own pace through written material displayed usually on the computer terminal. Written material used on the computer is sequenced logically according to the structure of the subject. Here computer assists the learner as a means or as an aid to the instruction which involves a set of programming instructions which is used in the teaching- learning process to develop certain skills among the learners. It not only displays materials, but also re-enforces learning, simulates environmental conditions, provides drill and practices and administer tests and so on. At present, the terminology of computer-assisted instruction is in a constant flux. Terms frequently used to describe this area are parts of it Computer- Assisted Learning (CAL), Computer-Based Education (CBE), Computer-Managed Instruction (CMI), Computer-Based Instruction (CBI), Computer-Enriched Instruction

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(CEI), e-Learning Technology (eLT) and many others. The term computer-assisted instruction is used here as a generic term encompassing the full spectrum of computer application in teaching.

In contrast to Computer-Assisted Instruction (CAI) modular approach is another part of individualized pattern of learning which has taken a prominent place in the modern approaches of teaching. In modular approach we can say that, a module is a self-contained and independent unit of instruction with the primary focus on a few well-defined objectives. The substance of a module consists of materials and instructions needed to accomplish these objectives. A glance in to the trend report on the area of educational technology of fifth and sixth survey of educational research (1988-92 and 1993-2000) reveals this area of educational research as a potential thrust area which is still at infant stage. And this area of educational technology is divided into different major sub-areas such as mass and multi-media, programmed learning, mastery learning strategy, models of teaching, micro teaching, computer-assisted instruction, where Computer-Assisted Instruction (CAI) as a sub-area comes at the end. A look into the areas of educational technology in that trend report; CAI is one of the areas which imply the effectiveness of teaching in relation to different subject concerns than other conventional approaches of teaching. Although Computer-Assisted Instruction (CAI) is not a novel area of research work on different subjects at school level and many professional institutions. But a few studies have done in the area of teacher education basically in its pedagogical part. So its necessity is still wanting in relation to research work in general as well as pedagogy of teacher-education in particular, because the emerging learning society needs 'quality' teachers. Otherwise quality schooling or education will remain as a far reaching goal and a distant dream for all times to come. And it is known to every human element which is directly or indirectly linked with teaching job in particular and other job in general that Computer-Assisted Instruction (CAI) as an innovative approach of teaching is the basic hallmark of every quality teacher. That is why teacher-training institutions must play very strategic role in development of modern approaches of teaching skills among the pre-service and in-service B.Ed. trainees. The investigator after examining several studies ascertained the type of researches done in the field of school education and preferred to do research on pedagogy at the teacher-training level.

Review of Literature

It is also an indicative view that most of the effort at present is invested in providing computers, training teachers and producing softwares. Few research studies have been conceived to investigate its actual use or effect on teaching-learning process. Considering the money that is being or planned to invest in computers to the school systems, research need to be undertaken regarding the use of this costly technology. Because as the present emerging learning society needs quality teachers for quality

education. The concerned organizations, bodies and agencies should be alert on the attributes of are of new teaching methodologies and using technologies in class room instruction. No doubt, the recent educational document developed by NCERT on school education namely as "National Curriculum Framework for School Education (NCFSE – 2005) and assigned the role of the teacher as guide, facilitator and helper. So that in order to facilitate the teaching-learning more effective, the present day teacher has to adept new ways of teaching in the classroom, otherwise if the trend which is going on in the ongoing educational system, the time will come soon to be with zero percent quality teachers at the levels of school education. Out of different attributes or areas of educational technology Computer-Assisted Instruction (CAI) and Modular Approach are the most challenging and demanding areas in the contemporary period. The research studies conducted abroad so far on Computer-Assisted Instruction (CAI) as a variable reveals the fact that Computer-Assisted Instruction (CAI) induces significantly higher academic achievement as compared to traditional class-room instruction reported by Kulik (1983); Wright (1983); Bangert Drowns (1985); Levy(1985); Grady(1986); Kinzie (1988); Abraham(1989); Hall, et al. (1989); Sassev (1989; Barnard, et al. (1990); Schott (1991); Gao (1992); Isbell (1993); Alcade, et al. (1998); Mann (1999); Moore and Calvert (2000); Traynor (2003); Ahuja and Yainva (2006); Carmelita (2008); Collins (2008); Similarly the studies conducted by Tagg (1980); Wilder Berg(1981); Lewis and Tagg(1982); Higgins(1984); Self(1985); Johns and Shea(1987) also observed that Computer-Assisted Instruction (CAI) is more effective tool in the field of education in terms of academic achievement with great advantage. On the other hand in the Indian context, studies conducted on (CAI) reveals that the teaching by CAI as better than the traditional method by Das Gupta (1988); Singh (1988); Odud(1989); Jayamani (1991); Singh, et al. (1991); Verma(1991); Rose (1992); Mahajan (1994); Aggarwal (1995); Meera (2000); Thillaka and Pramilla (2000); Malliga (2003); Bhubaneswari (2004); Subbaiah (2005);. And some studies conducted by Lalitha and Shailaja (1986); Stella (1989); Padma and Chakraborty (1990); Palaniappan(1990); Singh and Ahluwalia (1992); Meera and Balasubramanian (2000); Jayanthi and Arul (2001), Dange (2009) Lhungdim (2010), Suman (2010) Subramanyum(2011) Rao(2011), Yaboo(2016) show that computer assisted instruction is more effective in terms of academic achievement and attitude than traditional teaching method. Similarly it is revealed that modular approach of teaching is a more effective teaching strategy as compared to conventional teaching method by King (1978); Sharma (1980); Rabindra (1984); Dhamija (1985); Chopra (1988); Mishra (1990); Elmore (1991); Gulik (1992); Khan(1993); Trehen (1994); John (2003); Lhungdim (2004); Pazhanivel (2004); Ali(2005) Kapoor (2005); Kapoor and Lhungdim (2005) .Nandi (2010), Gulurukh(2010), Kapoor, et. el.(2013). The investigator after examining the above stated studies ascertained

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the type of researches done in the field of school education and preferred to do research on pedagogy at the teacher-training level. Considering the educational backwardness on educational technology of the North East India in general and Arunachal Pradesh in particular, the researcher determined to carry out a study on the effectiveness of Computer-Assisted Instruction (CAI) and Modular Approach (MA) on the performance of B.Ed. trainees in the teaching of geography which has been envisaged in the statement of problem step.

Aim of the Study

In the present study, as per the nature of the research problem, the researcher formulated and divided the objectives into two categories i.e., Primary Objectives and Secondary Objectives and those objectives are stated as under:

Primary Objectives

The primary objectives of the study were;

1. To investigate the effectiveness of Computer – Assisted Instruction (CAI) and Modular Approach (MA) on the immediate performance of pupil-teachers in the segments of teaching of geography.
2. To investigate the effectiveness of Modular Approach (MA) and Conventional Method of Teaching (CMT) on the immediate performance of pupil-teachers in the segments of teaching of geography.

Secondary Objectives

The secondary objectives of the study were;

1. To develop the instructional materials in the form of modules on the teaching of geography for Computer-Assisted Instruction (CAI) and Modular Approach (MA) as prescribed by Rajiv Gandhi University.
2. To develop the formative tests for finding out progress and problems faced by the pupil-teachers in the learning of geographic education.
3. To develop the criterion-test for testing the effectiveness of new approaches of teaching on the performance of pupil-teachers in geographic education.

Hypotheses of the Study

The researcher formulated the following hypotheses in view of the primary objectives of the study.

1. There will be significant difference in the immediate performance of the two groups of pupil-teachers on the criterion- test: one following the Computer-Assisted Instruction (CAI) and the other following the Modular Approach (MA) for the learning of teaching of geography.
2. There will be significant difference in the immediate performance of the two groups of pupil- teachers on the criterion-test: one following the Modular Approach (MA) and the other following the Conventional Method of Teaching (CMT) for the learning of teaching of geography.

Methodology

Since the basic purpose of the study was to investigate the “Effects of Computer-Assisted Instruction (CAI) and Modular Approach (MA) On The

Performance of Pupil-Teachers In the Segments of Teaching of Geography”, in the light of the nature of this study, it was felt necessary to develop a suitable research methodology and design for accomplishing the primary and secondary objectives of the study. For the completion of this present piece of work, the investigator adopted the following steps in the section of methodology. They were;

1. Selection of the Method.
2. Plan of the Experimental Design.
3. Selection of Population and Sample.
4. Selection and Preparation of Tools.
5. Administration of the Tools, and Description of the Experiment.
6. Analysis of Data

Selection of the Method

Since the study was to investigate the effects of three types of instructional strategies i.e., Computer-Assisted Instruction (CAI), Modular Approach (MA) of Teaching and Conventional Teaching Method. Henceforth, the researcher felt necessary to adopt the experimental method of educational research.

Plan of the Experimental Design

The study was a ‘Three Groups Randomized True-Experimental, Pre-test and Post-test Equivalent Group Design based on a sample of 60 Secondary Education Pupil-Teachers under training at B.Ed.level of Rajiv Gandhi University, Arunachal Pradesh, who opted one of the Methods of Teaching as Geography. A sample of 60 Pre-service Secondary Education Pupil-Teachers was drawn by adopting the technique of matching and randomization. This paradigm represented three levels of treatment groups designated as: Computer-Assisted Instruction Group (CAIG – Experiment Group – 1), Modular Approach Group (MAG – Experiment Group – 2), and Conventional Teaching Group (CTG – Control Group).

Selection of Population and Sample

The target population of this research was the first semester pupil-teachers of secondary teacher- education programme (B.Ed.) during the session 2010-11 of the Department of Education, Rajiv Gandhi University, Itanagar, Arunachal Pradesh. However, the researcher selected the sample of (60 pupil- teachers) by adopting purposive sampling technique on the basis of the nature of the study.

Selection and Preparation of Tools

Instructional materials on the teaching of geography for Computer-Assisted Instruction and Modular Approach and tools for collection of required data used in this study are stated as under:

1. Instructional Materials in the form of modules concerning to teaching specialization geography as prescribed in the B.Ed. curriculum by Rajiv Gandhi University.
2. Formative Tests for finding out progress and problems faced by pupil-teachers in the learning of geographic education.
3. Criterion -Test for testing the effectiveness of new approaches of teaching, i.e., Computer-Assisted Instruction (CAI) and Modular Approach (MA) on

the performance of pupil-teachers in the teaching of geography.

- Intelligence Test developed by Dr. S. Jalota for Adults. All the above tools were prepared by the researcher himself which are self-developed in nature except the Dr. S. Jalota's Intelligence Test for the Adults, and the syllabus of teaching of geography of B.Ed. curriculum.

Preparation of Modules

Since the experiment was based on Computer-Assisted Instruction (CAI), and Modular Approach (MA) on the performance of pupil-teachers in the method of teaching of geography, Henceforth, the researcher divided the whole content of method of teaching geography into 7 units and developed one module for each unit title by formulating the specific instructional objectives with the use of action verbs. The size of each module was kept in such a way that it was possible to be covered-up and mastered with in 15 hours. Therefore, the duration of the experiment for a treatment group was about 3 months on the entire packages both through the use of computer and self-learning modular group learners.

Preparation of Formative Tests

In the present study, the researcher constructed seven (07) number of formative tests. For each module, there was a corresponding formative test. The formative tests consisted of unequal number of items in each module. The reliability co-efficient of the unit test was computed with the help of the KR – 21 formula of estimation of reliability co-efficient for every module. The content validity of the formative test was also established by relating the tasks to the objectives of the modules. The correspondence between the contents and objectives was determined by the experts in this subject area.

Construction of Criterion – Test

The researcher also constructed the criterion-test in order to measure the sum total effects of the treatment and control groups on the performance of pupil-teachers in the teaching of geography before and after the experiment. In this piece of experimental research study, the researcher prepared the criterion-test by adopting the following procedures

- Construction of Preliminary Draft of the Criterion- Test
- Try-out of the Preliminary Draft of the Criterion - Test:
- Evaluation of the Final Draft of the Criterion – Test. The final draft of the criterion- test was evaluated in respect of the following criteria:

- Difficulty of the Test Items.
- Criterion Estimation of Reliability and,
- Determination of Validity.

Description of the Experiment

Since, the present piece of research work was an experimental study, therefore, the researcher have completed the experiment in three phases and those three phase of the experiment are stated as under:

Phase – I

In the first phase of the experiment, the researcher first administered the Dr. S. Jalota's Intelligence Test on the pupil-teachers of B.Ed. programme in the Department of Education of Rajiv Gandhi University in order to form three groups for the experiment. Before starting the experiment process, the researchers administered the criterion- test on all the three group of pupil-teachers for obtaining the pre-test scores on the performance of Computer-Assisted Instruction (CAI), Modular Approach (MA) and Conventional Teaching in the teaching of geography and attitude towards Computer-Assisted Instruction (CAI) and Modular Approach (MA) of Teaching.

Phase – II

In the second phase of the experiment the researcher dealt with imparting of instruction in the class-room to each group as per the prescription of different approaches of teaching such as Computer-Assisted Instruction Group (CAIG), Modular Approach Group (MAG), and Conventional Teaching Group (CTG). At the end of the completion of the instruction materials in the experiment on the method of teaching of geography without any delay, the criterion- test was administered by the researchers on all the three groups of pupil-teachers for obtaining the post-test scores.

Analysis of Data

Keeping in view the nature of the study for the analysis and interpretation of results, the researcher used 'Analysis of Co-variance – ANCOVA as the inferential and parametric statistical technique along with 'Histogram' for graphical representation of the same data in order to investigate the effect of Computer-Assisted Instruction (CAI) and Modular Approach (MA) of Teaching on the performance of pupil-teachers. For testing of assumptions of 'ANCOVA', the researchers adopted the Bartlett's Test. In addition to Analysis of Co-variance – ANCOVA.

Major Findings of the Study

The main findings of the study are given in the following sections in the light of the interpretation of the results.

Findings Based on the Immediate Performance of the Pupil-Teachers after the Experiment

Table - 1

Summary of Results of Analysis of Co-variance (ANCOVA) For the Immediate Performance of Pupil-Teachers On the Criterion – Test of Computer-Assisted Instruction Group (CAIG) and Modular Approach Group (MAG)

Components of Variability	Sum of Squares(SS)	Degree of Freedom(df)	Variance (V)	Computed F – Value	Critical F- Ratio	Remarks
Between samples or Treatments (D)	678.61	1	678.61	11.99	4.08 at .05 Level of Significance	Significant P > .05
Within samples of Errors (E _w)	2104.15	37	56.87			
Total (E _t)	2782.76	38				

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Table- 2
The Summary of the Post-ANCOVA 't' Value, Means, 'N' of the Pre-test and Post-test Scores on Criterion-Test of Computer-Assisted Instruction Group (CAIG) and Modular Approach Group (MAG)

Groups	N	M _y	M _x	Adjusted Mean M _y . M _x	S _{E_D}	Obtained 't' Value	Criterion 't' Value	Remarks
CAIG	20	88.20	39.90	87.51	1.95	4.19	2.02 at .05 Level of Significance with df 38	Significant P >.05
MAG	20	78.65	36.45	79.34				

Result

The table- 1.indicates that the computed F – value came out to be(11.99) which is greater than the criterion F-ratio (4.08) at .05 level of significance for 1/37 df. As the obtained F-value (11.99) is significantly greater than the Criterion F – Value 4.08 at .05 level of significance, therefore, the formulated hypothesis H1: “There will be significant difference in the immediate performance of the two groups of pupil-teachers on the criterion-test: one following the Computer-Assisted Instruction (CAI) and the other following Modular Approach (MA) for the learning of teaching of geography” has been accepted. From this, it is interpreted that the Computer-Assisted Instruction Group (CAIG) and Modular Approach Group (MAG) of pupil-teachers really differ significantly on their performance immediately after the completion of the two modern approaches of teaching. So far the Post-

ANCOVA 't'test is concerned, the table- 2. also depicts that the adjusted mean score of Computer-Assisted Instruction Group (CAIG) found to be (87.51) which is greater than the adjusted mean score of Modular Approach Group i.e., (79.34) of pupil-teachers. And the Computed Post-ANCOVA't' value came out to be (4.19) which is also greater than the criterion 't' value (2.02) at .05 level of significance for 38 df. Henceforth, at both the cases of testing, it is interpreted that the hypothesis is significant and there is true difference between the immediate performance of the two groups of pupil-teachers i.e., CAIG and MAG. It is also understood that Computer-Assisted Instruction (CAI) is much more effective and efficient approach of teaching as compared to the Modular Approach (MA) of teaching on the pupil-teachers under B.Ed programme in the method of teaching of geography.

Table – 3
Summary of Results of Analysis of Co-variance -ANCOVA for the Immediate Performance of Pupil-Teachers on the Criterion-Test of Modular Approach Group (MAG) and Conventional Teaching Group (CTG)

Components of Variability	Sum of Squares (SS)	Degree of Freedom (df)	Variance (V)	Computed F – Value	Critical F- Ratio	Remarks
Between samples or Treatments (D)	1690.79	1	1690.79	41.87	4.08 at .05 level of significance	Significant P >.05
Within samples of Errors (E _w)	1479.92	37	40.38			
Total (E _t)	3170.71	38				

Table – 4
The Summary of the Post-ANCOVA't' Value, Means, 'N' of the Pre-Test and Post-Test Scores on Criterion-Test of the Modular Approach Group (MAG) and Conventional Teaching Group (CTG)

Groups	N	M _y	M _x	Adjusted Mean M _y . M _x	S _{E_D}	Obtained 't' Value	Criterion 't' Value	Remarks
MAG	20	78.65	36.45	78.93	1.95	6.78	2.02 at .05 Level of Significance	Significant P >.05

Result

The table-3 depicts that computed F-value came to be (41.87) which is greater than the criterion F-value (4.08) at .05 level of significance for 1/37 df. As the computed F-value (41.87) is significantly greater than the criterion F-value (4.08), henceforth, the formulated hypothesis H2: “There will be significant difference in the immediate performance of the two groups of pupil-teachers on the criterion-test: one following the Modular Approach (MA) and the other following the Conventional Method of Teaching (CMT) for the learning of teaching of geography” got retained. It signifies that there is true significant difference between the two groups i.e., The Modular Approach Group (MAG) and the Conventional Teaching Group (CTG) in the immediate performance after completion of the instructions in the experiment. Further, so far Post-ANCOVA't' test is concerned, the table- 4. reveals that the adjusted mean score of Modular Approach Group (MAG) found to be (78.93)

which is higher than the adjusted mean score of Conventional Teaching Group (CTG) i.e., (65.70) and the computed Post-ANCOVA't' value came out to be (6.78) which is also greater than the criterion't' value (2.02) at .05 level of significance for df 38. Hence, at both the cases of testing, it is interpreted that the hypothesis is significant and there exists a real difference between the immediate performance of the two groups of pupil-teachers i.e., MAG and CTG. It is immensely understood that the Modular Approach (MA) of Teaching is very effective as compared to the Conventional Method of Teaching (CMT) on the pupil-teachers under B.Ed. Programme in relation to teaching of geography.

Discussion of the Results

In view of the statistical analysis and findings of the study pertaining to the immediate performance of pupil-teachers of Computer-Assisted Instruction Group (CAIG), Modular Approach Group (MAG) and the Conventional Teaching Group (CTG) in the

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learning of geographic education at B.Ed. level, it is to be noted that the group of pupil-teachers exposed to Computer-Assisted Instruction (CAI) did better results than those exposed to Modular Approach and Conventional Method of Teaching in term of performance on criterion-test immediately after the completion of instructions.. However, from this analysis, it is to be concluded that Computer-Assisted Instruction (CAI) was found more effective method of teaching as compared to other approaches of teaching such as Modular Approach and Conventional Teaching Method in relation to immediate performance of pupil-teachers for the learning of teaching of geography. These findings agree with the earlier findings of Burn & Bozeman (1981), Bangert, et al (1985), Kulik, et al. (1985), Bernard (1990), Jeyamani (1991), Singh (1991), Rose (1992), Meera (2000), Traynor (2003), Ruttanathumnee (2004), Subbaiah (2005), Carmelita (2008), Collins, et al. (2008), Dange (2009), Behera (2010), Suman (2010), Jojo (2010), Kyaw, et al. (2010), Lungdim (2010), Subhramanyam and Rao (2011), so on. On the other hand, it was also observed that, the group of pupil-teachers exposed to Modular Approach of Teaching (MAT) has shown better results in terms of performance on the criterion-test immediately after the completion of instructions than the group of pupil-teachers taught through Conventional Teaching Method (CTM). From this, the notion can be drawn that, Modular Approach (MA) of teaching was found equal effective as like as Computer-Assisted Instruction as compared to the Conventional Method of Teaching (CMT) in the perspective of immediate performance of pupil-teachers for the learning of geographic education at B.Ed programme. The finding is also supported by Rabindra (1984), Dhamija (1985), Chopra (1988), Elomore (1991), Gulik (1992), Khan (1993), Lungdim (2004), Pazhanivel (2004), Ali (2005), Kapoor (2005), Kapoor and Lungdim (2005), Sharma (2009), Gulrukh (2010), and so on.

Educational Implications of the Study

In the light of the analyses of the present study, the researcher have recommended some important educational implications in reference to the use of Computer-Assisted Instruction (CAI) and Modular Approach (MA) of teaching situations worldwide and those have been stated as under:

1. Since the present study found that the Computer-Assisted Instruction (CAI) has positive effects on the immediate performance of the pupil teachers on the criterion-test in the learning of geographic education at B.Ed level as compared to Conventional Method of teaching, therefore, the teacher-educators / teachers who teach teaching of geography as a method of specialization of B.Ed curriculum in the teacher-education institutes of Arunachal Pradesh or other states of India and abroad, may incorporate Computer-Assisted Instruction (CAI) as modern approach of teaching for enhancing the performance of student-teachers in the method teaching of geography or other areas of learning in the curriculum.
2. The findings of the study also showed that the pupil-teachers who worked on computer performed better than those who work on the Modules. Hence, the B.Ed. trainees should be encouraged to develop social interaction in the use of computer.
3. Necessary attention should also be accorded for computer literacy and operation in the teacher-education colleges, University Departments and different educational institutions and relevant Computer-Assisted Instructional software packages should be developed and facilitated for the learning and teaching of several subjects by the teachers in the whole teaching-learning process.
4. It is another concerning area that, most of the training institutes and educational institutions are in a problem of dearth of geography pedagogy teachers. In such circumstances, Computer-Assisted Instruction (CAI) might suffice the problem and the students can learn effectively the subject- matter at mastery level at their own pace and rate so far this individualized pattern of instruction is concerned. Therefore, more number of computers to be procured by the teacher-training institutions or the institution should be well-equipped with necessary ICT facilities to leverage the potentials of Computer-Assisted Instruction (CAI) in the educational institutions.
5. No doubt, multimedia is needed in any field where access to electronic information is required. Its implementation has been widely spread. Hence, it seems that the decision to use multimedia Computer-Assisted Instruction (CAI) will be based on the needs of the students and their different learning modalities. For this, Computer-Assisted Instruction (CAI) is an approach of teaching only to complement and supplement traditional methods of teaching. It is not intended to supplant or replace teacher-educators and instructors but to serve as a tool to actively engage and stimulate students by enhancing the learning process.
6. Another interesting finding of the study proved that the Modular Approach (MA) of teaching is also more effective on the immediate and three weeks delayed performance of the pupil-teachers on the criterion-test in the learning of geographic education at B.Ed level as compared to Conventional Method of teaching. Hence the teacher-educators and instructors who teach method of teaching as geography in B.Ed. curriculum in the teacher-education institutes of Arunachal Pradesh or other states of India and abroad; should use Modular Approach (MA) of teaching to improve the academic achievements of the pupil-teachers on the learning of geography.
7. Modular Approach (MA) like Computer-Assisted Instruction (CAI) is a modern approach of individualized pattern of learning, so the geography subject teacher-educators and instructors should be provided necessary training

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for the development of skills in the preparation and design of modules.

8. There is need to transform the text-books and course materials of various subjects in modular form. Because the traditional text-books or the curriculum do not meet the criteria of Modular Approach.
9. Sometimes, it is found that there is acute shortage of trained and competent teacher-educators especially in the geography subject and in other subjects at the teacher-education institutes. For this, module is a self-learning instructional package and through Modular Approach of teaching such problems can be mitigated.
10. All the learning and instructional materials should be supported by Modular Approach. Efforts should be made to provide such materials to all teachers of all subjects in all the institutions.
11. Since the present piece of research work was based on the effect of Computer-Assisted Instruction (CAI) and Modular Approach (MA) on the performance of pre-service pupil-teachers in the segments of teaching of geography, but the In-service training of school-teachers can be arranged for Computer-Assisted Instruction (CAI) and Modular Approach (MA) of teaching in different subjects of teaching.
12. The CAI and MA of teaching have shown positive effects on the performance of B.Ed. trainees in geographic education, and these may also be used in imparting the training of teachers and intended beneficiaries of environmental education, human-right education, value-oriented and peace education, etc.
13. The present era is an era of Information and Communication Technology (ICT), globalization and internationalization of education and a knowledge-based society, and there is a momentum taking place for quality education everywhere in the world. The quality in education is possible when the teachers are well equipped with the different modern approaches and styles of teaching. Therefore, in this context, the Computer-Assisted Instruction (CAI) and Modular Approach (MA) of Teaching ensure quality in the whole realm of teaching-learning process.
14. The study is quite educative for the curricularists, experts, and other agencies who are involved in the process and designing of curriculum such as National Council for Teacher Education (NCTE), National Council For Educational Research and Training (NCERT), State Council of Educational Research and Training (SCERT), University Grants Commission (UGC), Central Board of Secondary Education (CBSE), Indian Council of Secondary Education (ICSE), the State Board of Secondary Education (SBSE) and the like in working out and developing curriculum in the light of different education levels, Computer-Assisted Instructional Software or CD-ROMs and modular form of teaching and learning which can provide

the scope to develop performance of students at mastery and individual level.

15. Above all, the Higher Authorities of the State Governments, Central Educational Apex Bodies, and Universities should take positive initiative to provide good number of computers for its installation in the institutes for Computer-Assisted Instruction (CAI) and direct different curriculum implementing bodies to devise the study materials in modular forms.

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