**EFFECTIVENESS OF BLENDED LEARNING STRATEGY ON ACHIEVEMENT IN PHYSICS OF STANDARD   
VIII STUDENTS**

**SAMEEHA MOHAMED E.K.**

Dissertation submitted to the   
University of Calicut for the partial fulfillment   
of the requirements for the Degree of

**MASTER OF EDUCATION**



**FAROOK TRAINING COLLEGE**

**UNIVERSITY OF CALICUT**

**2013**

**DECLARATION**

**I, SAMEEHA MOHAMED.E.K,** do hereby that this dissertation entitled “**EFFECTIVENESS OF BLENDED LEARNING STRATEGY ON ACHIEVEMENT IN PHYSICS OF STANDARD VIII STUDENTS”,** has not been submitted by me for the award of any degree ,diploma, title or recognition before.

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I, Dr .HASSAN KOYA .M.P., do here by certify that this dissertation, **“EFFECTIVENESS OF BLENDED LEARNING STRATEGY ON ACHIEVEMENT IN PHYSICS OF STANDARD VIII STUDENTS”** is a record of bonafide study and research carried out by Ms. SAMEEHA MOHAMED.E.K, under my supervision and guidance .The report has not been submitted by her for the award of a degree diploma, title or recognition before.

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.10.2013

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At the very outset the investigator was very thankful to God, the most Merciful and Most Gracious, who enabled her to complete the task successfully.

The investigator wishes to express her deep indebtedness to **Dr. Hassan** **Koya M.P.,** Assistant Professor, Farook Training College, Calicut who has supervised his research work. His constant encouragement, generous help and valuable suggestions combined with his expert criticism and deep knowledge of the subject helped the investigator in successful completion of this work.

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**Sameeha Mohamed. E.K**

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**EFFECTIVENESS OF BLENDED LEARNING STRATEGY**

**ON THE ACHIEVEMENT IN PHYSICS OF**

**STANDARD VIII STUDENTS**

###### SAMEEHA MOHAMED E.K

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**CHAPTER I**

**INTRODUCTION**

* Need and Significance
* Statement of the problem
* Definition of the key terms
* Variables
* Objectives
* Hypotheses
* Methodology
* Scope and limitations of the study
* Organization of the report

**INTRODUCTION**

Quality Education is a universal goal and traditionally associated with strong teachers having high degrees, conventional instructional methods using chalkboard and teaching aids. According to National Policy of Education (NPE) 1986 ‘the status teacher reflects the socio-culture ethos of the society; it is said that quality of education will never be superior to its teachers. The quality education helps to empower the nation in all aspects by providing new thoughts, the way of implementation of various technologies.

Integrating technology into education can help to bring quality education ubiquitously as a key goal of the education for initiative of the 21st century. The sole aim of technology is advancing and enhancing the classroom teaching-learning situation especially to enhance group collaboration among students and instructors.

Nowadays, the role of Information and Communication Technology (ICT) especially internet in education sector plays an important role, especially in the process of empowering the technology into classroom activities in science. Different types of equipments and media such as projectors, computers etc. are being largely used for educational purpose .Educational Technologies are being refined to meet the specific needs of science teachers. National Curriculum Framework (2005) draws its policy basis from earlier government reports on education as Learning without Burden & NPE (1986-92) mainly focus on group discussion. Kerala Curriculum Framework (2007) accepted the educational perspective as learner centered, activity oriented constructivist pedagogy. The students can do   
self-learning using enormous potentials of internet and providing them with on-line exercises. The main focus should be on learning rather than on technology. It has been widely recognized that harnessing the power of ICT requires appropriate learning strategies to harmonize the effectiveness in learning with technology (Keams &Papadopoulous, 2000).On the other hand, the significance of face-to-face (F2F) learning instruction can’t be ignored since the live human interaction in teaching can’t be denied to large extend.

It was observed that in most of the schools, the science subjects is being taught without the help of audiovisual aids, experiments are not performed and demonstration are not given. Physics is not only vast and complex but also needs high level of updating and modification. No single strategy or method is earmarked for ensuring expected behavioural changes in the global scenario especially in the realm of science learning. And hence the need for combining many practices especially technology mediated approaches, live classroom teaching and self learning methods which comes under the umbrella of blend-in-practice.

Blended-Learning describes an approach where teachers use technology, usually in the form of web-based instruction, in concert with and as a supplement to live instruction or perhaps utilize components of a   
learner-centered course with components that require significant instructor presence and guidance. By conducting this study, the investigator tries to find out the Effectiveness of Blended Learning Strategy on students achievement in Physics. This strategy represents a repertoire of proven instructional process for potential links between stored knowledge & incoming information which facilitates learning and problem solving.

**Need and Significance**

The excessive use of technology has created much disintegration in teacher-student relationship, student-student relationship and social relationship. It tends to make them lazier & lazier. But at the same time if, face-to-face teaching is only included in classroom without technology it may result in teacher dominancy and makes the students mere listeners. It lessens the ability to construct knowledge. Keeping all these side by side a consensus have emerged among educationists working in the area that there is a need for tapping the wide applicability of technology with face-to-face instruction & then evolved strategy Blended- Learning.

After exploring and evaluating various ways in using of ICT for teaching and learning, we decided to pilot an innovative pedagogy for teaching and learning Physics. We hope that the new approach will make a real positive difference to learning. The innovative approach that will be used is known as "Blended Learning", which is a combination or blend of face-to-face instruction, individual instruction and technological instruction.

Blended learning is realized in teaching and learning environment where there is an effective integration of different modes of delivery, models of teaching and styles of learning as a result of adopting a strategic and systematic approach to the use of technology combined with the best features to face-to-face instruction. It enriches student experiences and learning outcomes. With combination of various delivery modes, blended learning not only offers more choices but is also more effective.

In recent years, educators around the world have already embraced blended learning as one of the most promising pedagogical approaches that can transform teaching and learning. There is an increasing need and demand to respond to diverse student’s needs and provide engaging and meaningful learning experiences in the field of education. Compounded with new technologies, this inevitably draws information and communication technology into traditional learning environments. The blended learning strategy enhances increase student access and participation in the teaching learning process. In the present study, the investigator applied the blended learning so that it can be used effectively and maximum output can be secured. Therefore, the investigator made an attempt to enquire into effect of blended learning strategy on achievement in physics.

**Statement of the Problem**

The present study is titled as “EFFECTIVENESS OF BLENDED LEARNING STRATEGY ON ACHIEVEMENT IN PHYSICS OF STANDARD VIII STUDENTS”.

**Operational Definition of Key Terms**

The definition of key term in the statement of problem is given in the following part

**Effectiveness**

Effectiveness is the quality of being a power to produce consequences in the achievement. The term Effectiveness stands for the outcome of the study when the influence of one factor is dependent on the presence or absence of another factor.

**Blended Learning Strategy**

Blended learning strategy is a strategy which integrates face-to-face instruction, electronic support system and self-paced learning in equal proportion.

**Achievement in Physics**

Achievement is defined by Gora (1971) as the overall accomplishment that students achieve in a specific course measured by their scores. In this research, the achievement referred to the outcome of learning a specific unit measured by the points scored by learners in the test in the subject of physics given to them immediately at the end of teaching the unit.

**Variables**

This study is aimed at finding the Effectiveness of Blended Learning Strategy on Achievement in Physics.

**Independent Variable**

Blended Learning Strategy and Existing Method of Teaching.

**Dependent Variable**

Achievement in Physics

**Control Variable**

The variable controlled for the study was the initial status of students in terms of Achievement in Physics as a measured by a Pre-test.

**Objectives**

The following are the objectives formulated for the study

1. To compare the mean pre-test scores of experimental and control group for total sample.
2. To compare the mean post-test score of experimental and control group for total sample and sub sample based on gender.
3. To compare the mean gain scores of students belonging to experimental and control group for total sample and sub sample based on gender.
4. To study the Effectiveness of Blended Learning Strategy on Achievement in Physics of Standard VIII students.

**Hypotheses**

i. There will be significant difference in the mean pre-test scores of the experimental and control group.

ii. There will be significant difference in the mean scores of the post-test of the experimental and control groups for total sample and sub sample based on gender.

iii. There will be significant difference in the mean gain scores of the experimental and control groups for total sample and sub sample based on gender.

iv. There will be significant Effect of Blended Learning Strategy on Achievement in Physics of Standard VIII pupils.

**Methodology**

The purpose of the study is find out “EFFECTIVENESS OF BLENDED LEARNING STRATEGY ON ACHIEVEMENT IN PHYSICS OF STANDARD VIII STUDENTS”.

**Method**

Experimental method was used for the study

**Design of the study**

By taking the major objective of the study into account, the investigator formulated “Quasi Experimental design” in which the experiment involves a comparison of the Effectiveness of Blended Learning Strategy with that of Existing Teaching Method. The study was conducted using Pre-test, Post-test, Non equivalent group Design (Best 1992)

**O1 X O­2**

**O3 C O4**

**Where,**

**O1, O3 – pre-tests**

**O2 ,O4 – post-tests**

**X-**Application of Experimental treatment

**C**- Application of Control treatment

**Sample of the study**

The sample of the study consists of 38 students in Experimental Group and 36 in the Control Group. The sample for both Experimental and Control Group were two divisions of standard VIII students drawn from St.Pauls English Medium High School, Pattambi.

**Tools used**

The following tools were used in the study

1. The investigator developed lesson transcripts for teaching through “*Blended Learning Strategy*”
2. The investigator developed lesson transcripts for teaching through “*Existing Teaching Strategy*”
3. *Achievement Test in Physics*

**Statistical techniques used**

In the present study, the collected data were analyzed using the following statistical techniques.

1. **Test of Significance of Difference between Means for Large and Small Independent Samples**

For the present study, test of significance of difference between means for large and small independent samples were used to compare the relevant variables between the experimental and control groups.

1. **Single Factor ANCOVA**

To examine the Effectiveness of Blended Learning Strategy over the Existing Method of Teaching on the Achievement in Physics of Standard VIII pupils, single factor ANCOVA with pre-experimental status as covariate is used. Analysis of covariance serves the purpose of statistically removing the effects of extraneous variables from the dependent variable.

**Scope and Limitations of the Study**

The main purpose of the present study was to test the Effectiveness of Blended Learning Strategy on Achievement in Physics of standard VIII pupils. The study was conducted on a sample of VIII standard students of two divisions.

* Blended Learning Strategy is an instructional strategy which is designed to keep the pupil highly motivated and interested.
* It is expected that the new strategy will help to improve the achievement of whole class achievers.
* It provides an opportunity to blend different methods in teaching -learning process.
* It can be extended up to university level and will helpful for other subjects also.
* It is hoped that the result of the study and the lesson transcript prepared would be of immense help to all stakeholders in the field of education.
* It is expected that this study gives a chance of self paced learning in the classroom itself.
* The results of the present study will help to empower teacher competencies.
* Blended Learning Strategy can be extended to higher education level which makes it more fruitful.
* It is expected to understand the contents in Physics quickly.

**Limitations**

Even though the present study was conducted with maximum possible care and specificity, certain which could hardly be avoided, have crept into the study. They are

* The study was confined to a small sample of two class divisions of standard VIII as considered as the representative of standard VIII students.
* The topic selected was a small unit and study was limited to physics only.
* It was unable bring on-line teaching in the classroom.
* Shortage of time has necessitated the investigator to limit the study to one independent variable only, namely teaching method.
* The facilities were limited in the classroom.
* Requires resourceful teachers.
* It is very expensive.

**Organization of the Report**

The report of the present study is organized in the following way.

**Chapter I** includes a brief introduction need and significance of the study, definition of the key term, variable, objectives, hypotheses and scope and limitations of the study.

**Chapter II** includes a brief theoretical overview of the variable, studies related to the variables and a summary of review of related literature.

**Chapter III** presents methodology of the study in detail with description of tools used for measurement, sample for the study, data collection of data and the statistical techniques used for analysis.

**Chapter IV** describes the preliminary analysis, details of the major statistical analysis of the data, interpretation and discussion of the data.

**Chapter V** presents major findings, tenability of the study, educational implication and suggestion for further research.

**CHAPTER II**

**REVIEW OF RELATED LITERATURE**

* Theoretical Overview
* Review of Related Studies

**REVIEW OF RELATED LITERATURE**

Every piece of ongoing research needs to be connected with the work already done, to attain an overall relevance and purpose. A literature review is an evaluative report of studies found in the literature related to selected area.

As part of the planning process we have done a literature review, which is a survey of important articles, books and other sources pertaining to our research topic. The survey of related literature, though time consuming, is a fruitful phase as it serves the investigator as a preface to explain the background of work.

The present study is an attempt to find out the effectiveness of Blended Learning Strategy on Achievement in Physics. For this purpose the investigator made an intense effort to review almost all the accessible literature from different sources to get sufficient background for the study.

The literature reviewed in the present study has been classified into the following headings.

**THEORETICAL OVERVIEW OF BLENDED LEARNING STRATEGY**

**STUDIES RELATED TO BLENDED LEARNING STRATEGY**

**Theoretical Overview of Blended Learning Strategy**

This part throws light on the emergence of Blended Learning Strategy. It includes theory underpinning the acceptance of Blended Learning Strategy.

Learning is an active and dynamic process. In learning, the learners approach new tasks strategically, analyze the factors required for the fulfillment of the task, apply various mental processes and reflect on the success of their achievement. Classroom is the place where formal education is imparted. Learning in the classroom depends on many factors like student factor, teacher factor and contextual factors. Student factor include students ability, learning style, learning strategy, learning attitude etc. Among this learning strategy plays a very important role for approaching a task.

Learning strategies refers to the students general approaches to a variety of learning task or it may refer to their chosen way of tackling a particular task (Rowtree, 1981). Strategies are mental procedures that assist learning and may include overt activities. A strategy is essentially a method for approaching a task, or more generally attaining a goal (Kirby, 1984).

Blended learning systems combine face-to-face instruction with computer-mediated instruction. Blended learning is a student-centered approach to creating a learning experience whereby the learner interacts with other students, with the instructor, and with content through thoughtful integration of online and face-to-face environments. “The term blended learning is used to describe a solution that combines several different methods such as collaboration software, Web-based courses, EPSS ( Electronic Performance Support System) and knowledge management practices. Blended learning also is used to describe various event-based activities, including face-to-face classroom, live e-learning and self –paced learning” (Purnima Valiathan,2002). A well-designed blended learning experience thoughtfully organizes content, support materials, and activities via synchronous and asynchronous learning events, all of which are delivered in a variety of modes ranging from traditional lecture to online tutorials. Communication and collaboration are necessary functions of a blended approach. Because formative assessment is embedded throughout learning events, the learner assumes responsibility for his or her learning.

In contrast to teacher-centered, rote-learning approaches, blended learning environments provide multiple ways to access content and to demonstrate mastery. As a result, they lend themselves more readily to differentiation of content and process. A blended approach also gives the learner the opportunity to be more responsible for his or her learning, which creates a learning situation that may be more meaningful on an individual level. Because the learner comes to construct knowledge through personal effort, she or he is more likely to demonstrate understanding beyond rote memorization, and to transfer what she or he has learned to new settings.

**Historical perspectives of Blended Learning**

The concept of blended learning, in which multiple learning environments and activities are combined, has existed for quite some time. Long before the advent of computers and social networks, teachers created blended learning experiences using simple technologies like paper and pencil. Educators have always crafted learning experiences that incorporate a variety of activities in different environments for the purpose of reinforcing learning material.

Technologies like CD-ROM and later the internet made it possible to create new environments for learning, new opportunities for synchronous and asynchronous collaboration, and new modes of delivery for learning materials, self-directed guides, and tutorials. More recently, blended learning figures prominently in conversations about online learning. In this context, blended learning represents a convergence of EPSS and face-to-face experiences. Interactions across both environments are mitigated by space, time, fidelity, and personal interaction. While some research indicates that blended learning solutions have a positive impact on student learning.

**Blended Learning : A Conceptual Framework**

Blended learningis the combination of multiple approaches to learning like e-learning, face-to-face learning, collaborative learning ,inquiry based learning and individualized practices like programmed learning, personalized system of instruction and module based learning. Blended learning is learning that is facilitated by the effective combination of different modes of teaching and styles of learning. A teacher must keep in mind the nature and features of media while implementing the blended strategy. It supplement to live instruction, or perhaps utilize the components of a learner–centered technology course with components that require significant instructor presence and guidance.

The strength of a blended learning approach is that it provides a means to ensure learners are supported and guided as they undertake independent learning tasks. It combines different methods in response to learners’ needs and for the achievement of instructional objectives. This means that multiple approaches, methods and resources to teaching or to educational processes are combined and utilized by the teacher who now expects the students to learn not only from assigned self work and communication tools (discussion board and smart classrooms) but also from face to face lectures, tutorials, person to person discussions and seminars. Examples include combining technology-based materials and traditional print materials, group and individual study, structured pace study and self-paced study. It may also include CD-ROM courses, video, simulations and integrated learning systems.  Overall, the best mix of resources is used to provide an optimum learning experience for all the students.

**Blended Learning: Gagne’s view**

Gagne (1970),an American psychologist and educator, co-developer of “Instructional System Design” theorized that instruction can be analyzed and broken down into components part which can then be taught sequentially as Reception ,Expectancy, Retrieval, Selective Perception, Semantic Encoding, Responding ,Reinforcement, Retrieval and Generalization. Blended learning can be visualized as real application of Gagne’s (1999) idea of providing different instruction for different ‘learning outcomes’. Blended learning extends its scope in providing a close relationship between learner’s internal mental processes and external instructional activities.

**Components of Blended Learning Strategy**

A Blended Learning Strategy can be used as a guide in evaluating and integrating different components which typify an instructionally sound learning situation. In this strategy, the degree of integration is based upon evaluating each component’s specific attributes, resulting in the most appropriate blend to ensure attainment of the overall instructional goal.

The pictorial representation of components of blended learning strategy is shown in fig.1

**Figure 1** Pictorial representation of Components of Blended Learning Strategy

Each component’s specific contribution must be viewed as it relates to the sum total of all the parts, which results in a comprehensive blended learning solution.

**Face-to-face component**

The traditional classroom or face-to-face instruction is when the instructor and the students of an educational institution are in a place devoted to instruction and the teaching and learning take place at the same time. In this setting all [performances](http://www.lib.purdue.edu/uco/CopyrightBasics/definitions.html#perform) and [displays](http://www.lib.purdue.edu/uco/CopyrightBasics/definitions.html#display) of a work are allowed.

**Electronic component**

An electronic support system provides just-in-time, just enough training, information, tools, and help for users of a product or work environment, to enable optimum performance by those users when and where needed, thereby also enhancing better result in achievement.

**Self -paced component**

Self-paced component instruction is any kind of instruction that proceeds based on learner response. The content itself can be curriculum, corporate training, technical tutorials, or any other subject that does not require the immediate response of an instructor. Self-paced instruction is constructed in such a way that the learner proceeds from one topic or segment to the next at his/her own speed.

**Elements of blended learning strategy**

Bersin and Associates (2004) have identified the following elements related to blended learning.

1. Instructor Led Training /Lecture (ITL)

It is the practice of training or learning material between an instructor and learner. Instructor can be referred to as a facilitator, who may be knowledgeable and experienced in the learning material, but can also be used more for their facilitation skill and ability to deliver materials to learners.

2. Webinars

It is a short for web-based seminar, a presentation lecture, workshop or seminar that is transmitted over the web. A key feature of webinars is its interactive elements-ability to give, receive and discuss information.

3. Simulations

It is the imitation of the operation of real world process or system over time.

4. CD-ROM based Courseware

The CD-ROM is the most common means of delivering courseware that is not offered on-line. For teachers and trainers, courseware content may include set up information, a course plan, teaching note & exercises. Courseware is educational material intended as kits for teachers or trainers usually packaged for use with computer.

5. Rapid e-learning Courseware

It is traditionally referred to a methodology to built e-learning courses rapidly. The author will create slides in power point, record narration on top of the slides, and software to add test or even collaboration activities between the slides.

6. EPSS (Electronic Performance Support System):

It is an integrated electronic environment that is available to and easily accessible by each student and structured to provide immediate, individualized access to the full range of information, software, guidance and advice and assistance, tool& monitory system to permit effective performance with minimal support and invention by others.

7. Offline Videos

Offline is the condition of being capable of but currently not connected to network of computers or other devices.

8. Workbook

A booklet containing problems and exercises that a student may work directly on the pages.

9. Power Point Presentation

Power point presentation consisted of a number of individual pages or “slides”. Slides may contain text, graphics, sound, movies and other objects , which may be arranged freely. The presentation can be printed, displayed live on a computer, or navigated through at the command of the presenter. It provides numerous features that offers flexibility and the ability to create professional presentation.

11. Video conferencing

A Video conferencing is set of interactive telecommunication technologies which allow two or more location to communicate by simultaneous two-way video and audio transmission. It is called ‘visual collaboration’ and is a type of groupware.

**Benefits of Blended Learning**

One of the most specific advantage is the opportunity to quickly establish a sense of community amongst student learners (Garrison &Kanuka,2004).Within the Blended learning classroom, students meet in face-to-face instruction and then have opportunities to collaborate, communicate with the open dialogue ,to experience critical debate through an open platform which in turn facilitates greater reflection on the part of the learner. Self- pacing allows the engagement of every learners at a given time in blended learning. It optimizes the achievement of learning objectives by applying the right learning technologies to match the right personal learning style at the right time. Blended learning helps to increase learner’s competence and confidence and to develop critical thinking in learning environment. It integrates technology as an effective tool to deliver contents to learner provide a quality learning experience, flexibility and convenience to both faculty and students.

Among the electronic instructional strategies blended learning is fast picking up many benefits which enhance effective achievement in students. It addresses different learning styles and multiple methods of information delivery to reinforce the lesson. It offers improved pedagogy as it increases the level of active learning strategies, peer-to-peer learning strategies and learner centered strategies. It offers the benefits of self regulatory learning and ease of revision for self motivated learners. Blended learning is therefore a combination of approaches to teaching and learning.

**Making the Right Mix**

The success of blend largely depends on the right mix of the elements it posses. A good blend should provide optimum role of live interaction. It is essential to provide a good support and training model and should keep the cultural component also in mind. A blend which makes the right balance between innovation & mass utility as well as which bridge the digital divide will be the successful blended learning strategy.

**Studies Related to Blended Learning Strategy**

Literature review related to blended learning strategy are following :

Dowling , Godfrey & Gyles (2003) investigated a study in which the association between the learning outcomes of students and two teaching modules: traditional face-to-face and hybrid flexible delivery. Results indicated that the hybrid flexible delivery model is more positively associated with students’ final marks and improved learning outcomes.

MacDonald & Mcteer (2003) carried out a study which revealed generic tutoring strategies and describes factors influencing the use of media in blended learning environments. Results established that many of the principles underlying effective strategies apply in both distance and campus-based universities.

Riffell & Sibley (2003) pointed out the effect of a hybrid learning format on student perceptions in an Environmental Biology course. The hybrid instructional format included face-to-face classroom exercises and online homework. Results indicated that students experienced more student-instructor interaction in the hybrid course than in a traditional course format.

Ausburn (2004) conducted a study entitled as “ Course design elements most valued by adult learners in blended online education environments. The findings of the study identify differences in learning emphasis by gender, preferred learning strategies, and previous experience with technology and self-directed learning.

Rovai (2004) investigated the effect of traditional classroom, blended, and fully online course formats on sense of community. Results indicated that blended courses did, in fact, produce a greater sense of community than either traditional or fully online course.

Reasons, Saxon , Valadares, Kevin, & Slavkin (2005) designed a business course which could be delivered in three formats: face-to-face, blended and fully online. Results demonstrated that the blended course outperformed the other types of courses.

Alonso (2011) conducted a study using blended learning approach for evaluating instruction in a software engineering-related course unit computed in engineering degree program. The results shows that the grades earned by students under the new system, following the blended-learning courses ,are more compared to the grades attained in the traditional face-to-face classroom (lecture-based) learning.

Chandra (2012) carried out a study which revealed extensive uptake of ICT in the teaching of science ,a physics website ("Getsmart") was developed using the cognitive apprenticeship framework for students at a high school in Australia.The result revealed that it had a positive impact on their attitudes towards studying physics in a blended environment.

Isman & Aytekin (2012) done a research which aims to determine the effectiveness of using blended learning approach in developing student teachers teaching skills at King Saud University. The results indicated that Blended Learning helped them to improve their Teaching skills.

Olympion & Georgios (2012) conducted a study which aimed to investigate the effect of experimenting with physical manipulative (PM), virtual manipulative (VM), and a blended combination of PM and VM on undergraduate students' understanding of concepts in the domain of "Light and Color". Results revealed that the use of a blended combination of PM and VM enhanced students' conceptual understanding in the domain of "Light and Color" more than the use of PM or VM alone.

Thiyagu (2012) carried out a study to find out the effectiveness of educational blog in learning mathematics among secondary teacher trainees. The investigator concludes that there was significant difference between experimental and control group students in their gain scores.

Yang & Yu-Fen (2012) carried out a study to investigate how college students with English reading difficulties integrate their conceptions of and approaches to blended learning for enhancing their reading proficiency. Results of this study revealed that the blended learning was effective in enhancing students' reading proficiency in the experimental group and showed improvement in reading outcomes.

Yapici & Hasan (2012) aims to determine the effect of the blended learning model on high school students' biology achievement and on their attitudes towards the Internet. The research results revealed that the blended learning model contributed more to the students' biology achievement than traditional teaching methods.

Kadem (2013) conduct a study entitled as “Effectiveness of Blended Approach on the Achievement in Science of IX Standard Students”. The main objective was to find the effectiveness of Blended Approach on the student’s achievement in science. The results revealed that Blended Approach has a positive effect on the achievement of students in science.

Ram & Vipin (2013) investigated the effect of audiovisual aids on achievement in physics in relation to creativity. The result showed that the achievement scores in physics of students taught through audiovisual aids was significantly higher than those who were taught through conventional method.

Snodin (2013) focused the study to find out the effect of blended learning with course management system (CMS). The findings show that the course management system (CMS), help the learners to organize the resources in the system autonomously, took on new learning roles that were different from those in a traditional face-to-face classroom.

Susan (2013) examined a study in which the relationship between student perceptions in blended learning courses and their in-course achievement. Compared with low achieving students, high achievers were the most satisfied with their blended course, and preferred the blended format more over fully face-to-face or online.

Yang (2013) investigated a study, which examined the effectiveness of integrating Critical thinking (CT) into individualized English listening and speaking instruction using Moodle, a virtual learning environment. The results of the study showed that learners participating in the treatment significantly improved in terms of English listening and speaking.

**Conclusion**

The review of related literature indicates that limited studies have been conducted in Indian context. Majority of the studies on blended learning has been investigated in foreign language. The investigator could not locate any study related to Blended Learning Strategy in Physics. Physics is always a challenging subject of high school students. So being a promising method it is necessary to investigate the effectiveness of Blended Learning Strategy on Achievement in Physics.

**CHAPTER III**

**METHODOLOGY**

* Variables
* Objectives
* Hypotheses
* Design of the study
* Tool used for the study
* Sample used for the study
* Data collection Procedure
* Statistical Techniques used for Analysis

**METHODOLOGY**

Methodology is the technique or procedure adopted in a research study or investigation. The key factor for the success of research work depends largely upon the suitability of methods, tools and techniques that the researcher follow to gather adequate data .The method should always be appropriate to the problem under investigation, feasible, pre-planned and well understood.

The main purpose of the present study is to investigate the Effectiveness of Blended Learning Strategy over the Existing Method of Teaching on the Achievement in Physics of standard VIII pupils. This warrants the description of the variables, tools, selection of sample for the collection of data, experimental procedure and statistical technique for the analysis of data.

The methodology of the present study is described and presented in the following headings:

**VARIABLES**

**OBJECTIVES**

**HYPOTHESES**

**DESIGN OF THE STUDY**

**TOOL USED FOR THE STUDY**

**SAMPLE USED FOR THE STUDY**

**DATA COLLECTION PROCEDURE**

**STATISTICAL TECHNIQUE USED FOR ANALYSIS**

**Variables**

The experimental study consists of manipulating levels or amount of selected independent variables to examine their influence on dependent variables. The independent variable, dependent variables and control variable for the present study were as follows.

**Independent variable**

The independent variable selected for the study was two methods of teaching- Blended Learning Strategy and Existing Method of Teaching.

**Dependent variable**

Achievement in Physics of VIII standard pupil was treated as the dependent variable.

**Control variable**

The variable controlled for the present study was the initial status of the students in terms of Achievement in Physics as measured by a pre-test.

**Objectives**

The objectives formulated for the present study are presented below to get an idea regarding the nature and scope of the experiment. They are as follows:

i. To compare the mean pre test scores of experimental and control group for total sample.

ii. To compare the mean post test score of experiment and control group for total sample and sub sample based on gender.

iii. To compare the mean gain scores of students belonging to experimental and control group for total sample and sub sample based on gender.

iv. To study the Effectiveness of Blended Learning Strategy on Achievements in Physics of Standard VIII pupils.

**Hypotheses**

i. There will be significant difference in the mean pre-test scores of the experimental and control group.

ii. There will be significant difference in the mean scores of the post-test of the experimental and control groups for total sample and sub sample based on gender.

iii. There will be significant difference in the mean gain scores of the experimental and control groups for total sample and sub sample based on gender.

iv. There will be significant Effect of Blended Learning Strategy on Achievement in Physics of standard VIII pupils.

**Design of the Study**

The present study has been conducted by employing the True Experimental Design. Experimental Design is the blue print of the procedures that enables the researcher to test hypotheses by reaching valid conclusions about relationship between independent and dependent variables (Best and Kahn, 1996).

**Research Design Selected**

The design selected for the present study was the Quasi Experimental with Pre-test Post-test Non equivalent group design. Due to the inconvenience in random assignment of subjects in the experimental and control groups, intact classroom groups were selected for the study. The design of the study is illustrated as follows.

O1 X O2

O3 C O4

Where,

O1, O3 – pre-tests

O2, O4 – post-tests

X – Application of experimental treatment

C – Application of control treatment

Two class divisions from same school were treated as experimental and control groups. Experimental group was taught some lessons by Blended Learning Strategies for 15 periods and each period has duration of 40 minutes. The control group was taught the same lesson by the Existing Method of Teaching (Constructivist method) for 15 periods of the same duration.

Since the design selected for the present study was pre-test, post-test non-equivalent group design, prior to the introduction of the two teaching methods, both groups were administered the same achievement test.

**Tool Used for the Study**

The tools used for the present study and description of them are presented in this section. Tools used for the present study as follows:

1. The investigator developed lesson transcripts for teaching through “*Blended Learning Strategy*”
2. The investigator developed lesson transcripts for teaching through “*Existing Teaching Strategy*”
3. Standardized *Achievement Test*

**Description of tools**

***Lesson transcript for the instructional strategy in “Blended Learning Strategy”***

The Blended Learning Strategy was introduced as a new method of instruction. Based on Blended Learning Strategy the investigator prepared 15 lesson transcripts. The duration of each lesson transcripts was expected to be 40 minutes. Each lesson was prepared by following format.

**LESSON PLAN FORMAT OF BLENDED LEARNING STRATEGY**

**1. Focus**

Focusing on the theme of the lesson

**2. Learning objective:**

There are learning outcomes written in terms of pupil behavior which the teacher was supposed to realize within the given period of time for a particular lesson.

**3. Developmental stages**

**a) Phase I-Preparation**

In this phase the teacher prepare the lesson by keeping the learning objectives in mind. This section includes the facts, major concepts, input required and expected product

**b) Phase II –Presentation**

In this phase, the lesson plan undergoes in a blended way which is well organized. This phase includes the blending of different combination which comes under structured activities.

**Structural activities**

It includes face-to-face instruction, electronic component and self- paced learning.

There are two columns in each lesson plan. First column deals with blended activities and second column deals with response. Blended learning activities progresses through three segments.

1. **Face to face instruction**

In this type of instruction the teacher introduces the lesson to students and will have a direct interaction with students. It is an interesting session to initiate children’s attention. It may be in 3 forms such as teacher–whole class interaction, teacher–student interaction and student-student interaction.

1. **Electronics Performance Support System (EPSS)**

It is a integrated electronic environment that is easily accessible by each student and structured to provide individualized access to the full range of information, advice and assistance, data image that permits student performance with minimum support and invention by others .It include CD-ROM ,Tape recorder, PowerPoint presentation, Video recording, Short film etc.

**iii) Self Paced Learning**

It provides an environment for students to have a self pace learning. The students can learn at their own pace .This includes concluding activities to be performed in the class room .Work book exercises, preparation of chart, posters and models are included in this session.

**PHASE III- Evaluation**

Teacher evaluates the level of standard of students by asking questions or assessing performance in various situations

**PHASE IV -Follow-Up Activity**

The teacher gives one or two follow up activities based on content taught in the class .The follow-up activity is characterized by extension of content, supplementation to content. It utilizes the local resources available.

Lesson transcript based on blended learning strategy is shown in Appendix I.

**Different blends in lesson plan**

Blended Learning strategy involves combination of three components like face-to-face (F2F), self-paced and EPSS. The F2F instruction may be lecture, lecture cum demonstration, discussion etc. The EPSS component include a variety of items like CD-ROM, power point presentation etc. The third component is self-paced which is also divisible into different elements like workbook, chart preparation, cartoon making, poster designing etc.

Each lesson plan includes one item from F2F, one item from EPSS and one item from self paced component. Different combinations are possible. The pictorial representation of different combination is given fig. 2 and 3.

**Figure 2** Shows Three Main Elements of Blended Learning

**Figure 3** Shows six types of blended learning strategies using three different elements.

**LESSON PLAN OF EXISTING METHOD OF TEACHING**

Lesson plan of Existing Method of Teaching for the Control Group were prepared in English on the basis of newly introduced activity based curriculum of Kerala. Each lesson was prepared by the following format.

1. **Identification of curriculum objectives**
2. **Formation of curriculum competencies**
3. **Presentation of suitable learning activities**
4. **Recording the response of the student**
5. **Recapitulation and assignment**

The method of teaching an experimental group varied from topic to topic with different blends, the teaching method followed the control group was an existing one. Teaching aids available in the school were used for the control group. Model lesson plan of existing method of teaching in English is appended in the appendix II.

**ACHIEVEMENT TEST IN PHYSICS**

The Achievement test in Physics used as pre-test and post-test was constructed by the investigator with the help of supervising teacher. In the present study the achievement test was based on the topics selected for treatment. The major stages in the construction of Achievement test in Physics are described in this section.

***Planning of the test***

The preparation of any classroom test involves different stages. The most primary stage is the planning stage. For this, the investigator studied thoroughly the curriculum, syllabus, and text book of Science for the academic year 2013.For guidance the investigator consulted with subject experts and experienced teachers in Science. The investigator also referred available source book and text books for framing the items for the test. The books referred for the purpose are:

1. Taxonomy of Educational Measurement(Bloom,1979)
2. Essentials of Educational Measurement (Ebel and Frisbie,1991)
3. Educational Measurement and Evaluation(Nuhally,1972)

For the Achievement test in Science the investigator planned to prepare a test consisting of 50 items for time duration of 50 minutes.

***Preparation of the test***

Items for the Achievement test in physics were prepared on the basis of the major objectives of the taxonomy of cognitive domain. The first statement in measuring achievement is to establish a clear statement of objectives. The investigator while planning the test will bear in mind the following aspects.

1. **Weightage to objectives**

Objectives are broad goals and are stated in terms of desired change in student behavior. Items were prepared on the basis of Bloom’s taxonomy of educational objectives. The weightage given to the categories of objectives under cognitive domain were

1. Knowledge

2. Understanding

3. Application

4. Analysis

5. Synthesis

6. Evaluation

**Table 1**

***Weightage to objectives***

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. No.** | **Objectives** | **Marks** | **Percentage** |
| 1 | Knowledge | 5 | 10 |
| 2 | Understanding | 13 | 26 |
| 3 | Application | 13 | 26 |
| 4 | Analysis | 10 | 20 |
| 5 | Synthesis | 5 | 10 |
| 6 | Evaluation | 4 | 8 |
|  | Total | 50 | 100 |

**b. Weightage to content**

The investigator analyzed and divided the entire content in to 3 units and tried to give adequate weightage to each sub units. The weightage give to each subunit is given in table-2.

**Table 2**

***Weightage to content***

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. No.** | **Content** | **Mark** | **Percentage** |
| 1 | Force, contact and non-contact forces | 12 | 24 |
| 2 | Internal force, external force, balanced and unbalanced force | 13 | 26 |
| 3 | Newton’s I Law of motion, inertia, mass and inertia | 15 | 30 |
| 4 | Light, laws of reflection, different mirrors | 10 | 20 |
|  | Total | 50 | 100 |

**c. Weightage to difficulty level**

**Table 3**

***Weightage to Difficulty level***

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. No.** | **Difficulty level** | **Marks** | **Percentage** |
| 1 | Easy | 12 | 24 |
| 2 | Average | 25 | 50 |
| 3 | Difficulty level | 13 | 26 |
|  | Total | 50 | 100 |

**d. Weightage to form of questions**

**Table 4**

***Weightage to form of questions***

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. No** | **Form of questions** | **Mark** | **Percentage** |
| 1 | Objective | 50 | 100 |
| 2 | Short answer | 0 | 0 |
| 3 | Essay | 0 | 0 |
|  | Total | 50 | 100 |

**Blue Print of Achievement Test in Physics:**

The investigator prepared a detailed question wise distribution of marks over specific topics on the basis of the weightage for instructional objectives, content etc. This is called a blue print. The blue print for the Achievement Test in Physics incorporating weightage given to instructional objectives content area and difficulty level are presented.

Based on the Blue Print the investigator prepared 50 multiple choice items in English representing each objective and subjected to experts scrutiny and criticism.

**Table 5**

***Blue Print for the Achievement Test***

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Objectives** | **Knowledge** | | | | **Comprehension** | | | **Application** | | | **Analysis** | | | **Synthesis** | | | **Evaluation** | | | **Mark** | **No question** |
| Form of question  Content | O | S | E | | O | S | E | O | S | E | O | S | E | O | S | E | O | S | E |  |  |
| Force,contact force,Non contact force |  |  |  | | (3)3 |  |  | (1)1 |  |  | (4)4 |  |  | (2)2 |  |  | (2)2 |  |  | 12 | 12 |
| Internal,external force&Balanced& Unbalanced force | (1)1 |  |  | | (2)2 |  |  | (4)4 |  |  | (3)3 |  |  | (2)2 |  |  | (1)1 |  |  | 13 | 13 |
| Newton’s I law of motion,inertia,mass&  inertia | (2)2 |  |  | | (5)5 |  |  | (6)6 |  |  | (2)2 |  |  |  |  |  |  |  |  | 15 | 15 |
| Light,Laws of reflection,Mirrors | (2)2 |  |  | | (3)3 |  |  | (2)2 |  |  | (1)1 |  |  | (1)1 |  |  | (1)1 |  |  | 10 | 10 |
| Sub total | (5)5 |  |  | | (13)13 |  |  | (13)13 |  |  | (10)10 |  |  | (5)5 |  |  | (4)4 |  |  |  |  |
| Total | 5 |  | | 13 | | | | 13 | | | 10 | | | 5 | | | 4 | | | 50 | 50 |

Note: the No. outside the bracket indicate marks and inside the No. of marks .

***Item writing***

For item analysis the procedure suggested by Ebel and Frisbie (1991) was used .The selected response sheets were arranged in the descending order of the magnitude of scorers. The scores obtained by upper 27 subjects (27%) and lower 27 subjects (27%) were taken as the upper group and lower group respectively. For the selection of the items in the final test, Difficulty Index and Discriminating Power of each item were found out.

**(a) *Difficulty Index***

The following formula suggested by Ebel (1991) was used to calculate the Difficulty Index of each items.

Difficulty Index=

Where,

U = The number of correct responses in the upper group.

L = The number of correct responses in the lower group.

N = The number of subjects in each group.

**(b) *Discriminating Power***

The higher the average discrimination Index for items in a test the more variable the scores are likely to be and more reliable the scores are expected to be (Ebel, 1991)

Formula used for calculating the Discriminating Power is the following.

Discriminating Power = 

U = The number of correct responses in the upper group.

L = The number of correct responses in the lower group.

N = The number of subjects in each group

The difficulty index and discriminating power of each item are given in Table 6.

**Table 6**

***Item Analysis Data of Achievement Test in Physics with******Difficulty Index And Discriminating Power***

| **Item No.** | **Number of correct responses in upper groups (U)** | **Number of correct responses in lower groups (L)** | **D.I=U+L**  **2N** | **D.P=U-L**  **N** | **Remarks** |
| --- | --- | --- | --- | --- | --- |
|  | 27 | 26 | .9814 | .0370 | Rejected |
|  | 24 | 16 | .740 | .30 | Accepted |
|  | 26 | 13 | .72 | .48 | Accepted |
|  | 20 | 9 | .537 | .40 | Accepted |
|  | 24 | 12 | .666 | .446 | Accepted |
|  | 26 | 11 | .68 | .54 | Accepted |
|  | 25 | 20 | .83 | .18 | Rejected |
|  | 27 | 9 | .66 | .66 | Accepted |
|  | 26 | 13 | .72 | .48 | Accepted |
|  | 25 | 20 | .83 | .18 | Rejected |
|  | 27 | 25 | .96 | .074 | Rejected |
|  | 20 | 9 | .537 | .407 | Accepted |
|  | 25 | 5 | .55 | .74 | Accepted |
|  | 23 | 12 | .64 | .40 | Accepted |
|  | 22 | 10 | .59 | .44 | Accepted |
|  | 23 | 16 | .72 | .59 | Accepted |
|  | 23 | 12 | .64 | .40 | Accepted |
|  | 27 | 12 | .72 | .55 | Accepted |
|  | 27 | 13 | .74 | .51 | Accepted |
|  | 27 | 8 | .64 | .70 | Accepted |
|  | 23 | 12 | .64 | .40 | Accepted |
|  | 26 | 20 | .85 | .22 | Rejected |
|  | 12 | 4 | .296 | .296 | Rejected |
|  | 23 | 9 | .59 | .51 | Accepted |
|  | 26 | 12 | .70 | .51 | Accepted |
|  | 23 | 12 | .64 | .40 | Accepted |
|  | 24 | 5 | .53 | .70 | Accepted |
|  | 27 | 8 | .64 | .70 | Accepted |
|  | 24 | 16 | .74 | .30 | Accepted |
|  | 26 | 6 | .59 | .74 | Accepted |
|  | 27 | 10 | .68 | .62 | Accepted |
|  | 24 | 14 | .70 | .37 | Accepted |
|  | 22 | 10 | .59 | .44 | Accepted |
|  | 20 | 9 | .53 | .40 | Accepted |
|  | 24 | 7 | .57 | .62 | Accepted |
|  | 23 | 11 | .62 | .44 | Accepted |
|  | 26 | 9 | .64 | .62 | Accepted |
|  | 13 | 3 | .296 | .37 | Rejected |
|  | 22 | 10 | .59 | .44 | Accepted |
|  | 27 | 24 | .944 | .111 | Rejected |
|  | 25 | 11 | .66 | .51 | Accepted |
|  | 26 | 11 | .68 | .55 | Accepted |
|  | 16 | 7 | .42 | .33 | Accepted |
|  | 23 | 11 | .62 | .44 | Accepted |
|  | 19 | 5 | .44 | .51 | Accepted |
|  | 26 | 10 | .66 | .59 | Accepted |
|  | 18 | 5 | .42 | .48 | Accepted |
|  | 26 | 9 | .64 | .62 | Accepted |
|  | 22 | 8 | .55 | .51 | Accepted |
|  | 17 | 15 | .59 | .07 | Rejected |
|  | 25 | 14 | .72 | .40 | Accepted |
|  | 26 | 8 | .62 | .66 | Accepted |
|  | 24 | 14 | .70 | .37 | Accepted |
|  | 27 | 10 | .68 | .62 | Accepted |
|  | 26 | 11 | .68 | .55 | Accepted |
|  | 27 | 7 | .62 | .74 | Accepted |
|  | 26 | 7 | .61 | .70 | Accepted |
|  | 26 | 23 | .90 | .11 | Rejected |
|  | 24 | 4 | .51 | .74 | Accepted |
|  | 23 | 11 | .62 | .44 | Accepted |

**Selection of items for the final test**

Items having the difficulty level between 0.4 and 0.74(Lord,1952) and discriminating power more than 0.3 are readily selected .Thus the investigator prepared the final test with 50 multiple choice items from the draft test .The time duration fixed for the test was 50 minutes.

**Validity of the test**

A test said to be valid when it measures what it intended to measure. Validity is an in dispensable characteristics of measuring devices. The validity of attest may be defined as the accuracy with which it measures what it is intended to measure or as the degree in which it approaches in fallibility in measuring what it purports to measure. According to Ary (1972) there are four types of validity –content validity, predictive validity, concurrent validity and construct validity.

***Validity of the present test***

The investigator established the content validity by the proper analysis of the content and objectives and by the preparation of the Blue Print. The investigator ensured face validity by constructing with expert teachers and eliminating unnecessary item according to their suggestions. The investigator established the criterion related validity of the test by taking the external criteria as school marks of a unit test in physics. The validity co-efficient was found to be 0.64 indicating the test is valid.

**Reliability of the Test**

Reliability of the Achievement test in physics was established using the split half odd and even number method. To establish reliability, the scores obtained by the same sample upon which the validity established was used. For this purpose the 50 items in this test were divided into two equal halves. The first set of scores represents their performance is the odd numbered items 1,3,5,7 etc and the second set of scores , performance on even numbered items2,4,6,8, etc. Scores obtained by each subjects in each half were counted and correlated using Karl Person’s product Moment Method.

The reliability of the whole test obtained was 0.78.It suggest that the test was a reliable one. A final copy of the Achievement Test in Physics is presented in Appendix III.

**6. Sample used for the study:**

As it was an Experimental study the investigator felt that it would be difficult to conduct the experiment if the sample is too large. Therefore two intact class divisions of standard VIII pupil were selected as sample, one for the experimental and the other for the control group where the two different teaching method were employed. The school was St.Pauls English Medium High School, Pattambi ( Experimental and Control Group).

The Experimental Group consisted 38 students (19 boys and 19 girls) and Control Group consisted 36students(17 boys and 19 girls).

**Table 7**

***Details of Initial Sample Selected for the Study***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Experimental Group** | | | **Control Group** | | |
| Boys | Girls | Total | Boys | Girls | Total |
| 19 | 19 | 38 | 17 | 19 | 36 |

**Data Collection Procedure, Scoring and Consolidation of Data**

**a) Execution of the experiment:**

After obtaining the permission from the head of the respective school, arrangement was made to collect the data from schools. Before starting the experiment both Experimental and Control Group were given the same Pre test to measure the initial status of subjects. After that the Experimental Group was taught through Blended lessons for 15 periods (of duration of 45 minutes) and the Control Group was taught the Existing Method of Teaching for the same topic was selected from physics.

After completion of the lesson, both experimental control group was given the same achievement test as post test .The scores on these test was used for determining the Effectiveness of Blended learning over Existing Method of Teaching.

**b)** **Scoring and Consolidation of Data**

The answer sheets of the pre-test and post-test which are correct in all respects were scored according to the correct answer. Scores of pre-test and post-test of experimental group and control group were tabulated separately. The scores obtained for the selected variables were then consolidated for final analysis. The model of response sheet is in appendix IV.

**Statistical Techniques used for Analysis**

The present study demands the use of following statistical techniques**.**

1. **Test of Significance of Difference Between Two Means:**

For the present study, test of significance of difference between means for large and small independent samples were used to compare the relevant variable between experimental and control groups (Garret, 1981).

The statistical technique was mainly used to test whether the experimental and control groups differ in Pre-test, Achievement and Gain Scores without controlling the effect of the Covariates, for the large sample. The following formula suggested by Garret (1981) for large sample was used.



(Here M1, M2 are the Means, , , are the Standard Deviation and N1,N2 are the sample size of the group). The difference between Means is said to be significant, depending upon whether the ‘t’ value exceeds the table value set for 0.01 and 0.05 level of significance.

For small sample, the following formula suggests by Garret (1981) was used.



In the above formula, denoted the Means, are the Standard deviations and N1, N2 are the sample size of the groups.

The difference between the Means is said to be significant depending upon whether‘t’ value exceeds the tabled value of ‘t’ for N1 +N2 -2degrees of freedom at 0.05 level and 0.01 level of significance.

**ANCOVA**

1. **Analysis of Covariance (ANCOVA)**

To examine the Effectiveness of Blended Learning Strategy over the Existing Method of teaching on the achievement in Physics of standard VIII pupil, single factor ANCOVA with one co-variate is used. Analysis of covariance serves the purpose of statistically removing the effects of extraneous variables from the dependent variable. In the present study ANCOVA is employed to remove statistically the effect of confounding variables, the initial status of the subjects measured in terms of a pre-test.

Analysis of covariance uses the principle of partial correlation with analysis of variance. The effect of the relevant variables are partialed out and the resulting adjusted means of the post-test scores are compared. Analysis of covariance is a method of analysis that enables the researcher to equate the pre-experiential status of the group in terms of relevant known variables (Best and Kahn, 2001). ANCOVA serves the purpose of statistically removing the effect of extraneous variables from the dependent variables (Ferguson, 1986).ANCOVA is an important method of analyzing the experiments carried under condition that otherwise would be unacceptable (Ferguson, 1996).

Before proceeding to ANCOVA the data used for analysis is subjected to a thorough examination with a view to know whether the data is sufficient to satisfy the major assumption suggested by Winer (1977),Ferguson(1996)to carry over the ANCOVA procedure. It is examined that the data is seen satisfied with the following assumption.

* The Dependent Variable which is under measurement should be normally distributed in the population.
* The treatment groups should be selected at random from the same population
* Within groups ,Variances must be approximately equal
* The contribution of Variance in the total sample must be additive.
* The regression of the final scores on initial scores should be basically the same in all groups.

**CHAPTER IV**

**ANALYSIS AND INTERPRETATION**

* Preliminary Analysis
* Comparison of Means
* Analysis of Co-Variance

**ANALYSIS AND INTERPRETATIONS**

The main purpose of the present study was to find out the "Effectiveness of Blended Learning Strategy on Achievement in Physics of Standard VIII students". The statistical analysis of the data has been done to reflect on the specific objectives kept for the study. The collected and tabulated data were analyzed using the statistical technique of‘t’ test and Single Factor ANCOVA.

**Objectives**

i. To compare the mean pre- test scores of experimental and control group for total sample.

ii. To compare the mean post- test score of experimental and control group for total sample and sub sample based on gender.

iii. To compare the mean gain scores of students belonging to experimental and control group for total sample and sub sample based on gender.

iv. To study the Effectiveness of Blended Learning Strategy on Achievement in Physics of standard VIII pupils.

**Hypotheses**

i. There will be significant difference in the mean pre-test scores of the experimental and control group.

ii. There will be significant difference in the mean scores of the post-test of the experimental and control groups for total sample and sub sample based on gender.

iii. There will be significant difference in the mean gain scores of the experimental and control groups for total sample and sub sample based on gender.

iv. There will be significant Effect of Blended Learning Strategy on Achievement in Physics of standard VIII pupils.

Analysis of the data has been done, classified and presented in the following order:

PRELIMINARY ANALYSIS

COMPARISON OF MEANS

ANALYSIS OF COVARIANCE

**Preliminary Analysis**

The statistical properties of the variables in the study and the comparison of the mean scores of the relevant variables for the experimental and control group were done and presented in this section.

## *Important Statistical Constants*

As part of preliminary analysis important statistical constants like mean, medium, mode, standard deviation, skewness and kurtosis for the pre-test, post-test and gain scores were examined separately for experimental and control groups and is pointed in Table 8 and Table 9 respectively.

**Table 8**

***Statistical Constants of Achievement in Physics for Experimental Group***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | Variables | **Mean** | **Median** | **Mode** | **S.D** | **Skewness** | **Kurtosis** |
| 1. | Pre-test | 19.05 | 18.00 | 18.00 | 3.855 | 0.594 | .514 |
| 2. | Post-test | 37.71 | 38.00 | 38.00 | 8.0804 | -.178 | -.918 |
| 3. | Gain scores | 18.65 | 19.50 | 12.00 | 6.9914 | -.086 | -.943 |

##### Table 9

***Statistical Constants of Achievement in Physics for Control Group***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | Variables | **Mean** | **Median** | **Mode** | **S.D** | **Skewness** | **Kurtosis** |
| 1. | Pre-test | 17.88 | 18.00 | 15.00 | 4.85 | -0.347 | -0.386 |
| 2. | Post-test | 30.66 | 29.50 | 13.00 | 9.21 | -0.007 | -0.177 |
| 3. | Gain scores | 12.77 | 13.00 | 5.00 | 8.075 | 0.334 | -0.743 |

**Comparison of Means**

In this part of the Analysis, comparison of the mean scores of Achievement in physics for experimental and control groups, in the pre-test, post-test and gain scores for total sample were attempted. Also the mean scores of Boys and Girls for post-test and gain scores were attempted and presented below.

* 1. **Comparison of Mean Pre-test scores of Achievement in** **Physics for Experimental and Control Groups**

The mean scores of experimental and control groups on the pre-test were compared and studied using the test of significance of difference between means of large independent samples. The comparison was done for the sample in each of the experimental and control groups.

The mean and standard deviation of pre-test scores of both of the group were found out and subjected to the test of significance of difference between means. The data and results of the t-test are presented in the Table 10.

**Table 10**

***Test of Significance of the Mean scores of Pre test between Experimental and Control Group for Total Sample***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Experimental Group** | | | **Control Group** | | | **t-**  **value** | **Level of significance** |
| **M1** | **1** | **N1** | **M2** | **2** | **N2** |
| 19.056 | 3.8551 | 38 | 17.889 | 4.8567 | 36 | 1.145 | N S |

NS: Not Significance at 0.05 level

It can be seen from the table 10 that the obtained’t’ value is below the limit set of 0.05 level at significance. So there was no significant difference found in the mean pre- test scores of experimental and control group for the Achievement test in Physics.

It can be inferred from the’t’ test that the performance of the experimental and control groups are similar in case of their   
pre-experimental status of Achievement measured in terms of pre- test.

**b) Comparison of Mean Post test scores of Achievement in Physics for Experimental and Control Group**

The mean performance of the experimental and control groups on the post scores were studied and compared using the test of significance of difference between means of large independent sample. The comparison was done for the total sample in the experimental and control groups.

The Mean and Standard Deviation of the post test of both the groups were found out and subjected to the test of significance of difference between means. The data and result of’t’ test bare presented in Table 11.

**Table 11**

***Test of Significance of the Mean scores of post test between Experimental and Control Group for Total Sample***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Experimental Group** | | | **Control Group** | | | **t-**  **value** | **Level of significance** |
| **M1** | **1** | **N1** | **M2** | **2** | **N2** |
| 37.710 | 8.0804 | 38 | 30.667 | 9.214 | 36 | 3.501 | 0.01 |

It can be seen from Table 11 that the obtained’t’ value is above the limit set for 0.01 level of significance, so there exist a significant difference in the Mean Post -test scores of Experimental and Control Group.

It can be inferred from the result of the 't test that the performance of the experimental and control groups is different in the case of their post experimental status of Achievement in Physics measured in terms of a post-test.

**c) Comparison of the Mean Gain Scores of Achievement in Physics for Experimental and Control Groups**

The mean scores of experimental and control groups on the gain scores were studied and compared using the test of significance of difference between means of large independent samples. The comparison was done for the total sample in the experimental and control groups.

The mean and standard deviation of the gain score of both the groups were found out and subjected to the test of significance of difference between means. The data and results of t-test presented in Table 12.

##### Table 12

##### *Test of Significance of the Mean Scores of Gain Score Between Experimental and Control Groups*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Experimental Group | | | Control Group | | | **t-value** | **Level of significance** |
| **M1** | **1** | **N1** | **M2** | **2** | **N2** |
| 18.657 | 6.9914 | 38 | 12.777 | 8.075 | 36 | 3.354 | 0.01 |

The obtained t-value as shown in Table-12 for the mean gain scores is greater than the tabled value required for significance at 0.01 level. This suggests that there is significant difference in the mean gain scores of experimental and control groups. So the gain performance of the experimental and control groups are dissimilar.

High mean gain score for the experimental group over the control group for the total sample is noticed. This revealed the superiority of the experimental group over the control group in the case of gain scores.

**d) Comparison of Mean Post-test scores of Achievement in Physics for Boys between Experimental and Control groups**

The mean performance of boys of experimental and control groups in the post-test were studied and compared using the test of significance of difference between means of small independent sample. The data and results of the t-test are presented in Table 13.

**Table 13**

##### *Test of Significance of the Mean Scores of Post-test between Boys of Experimental and Control Group*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Experimental Group | | | Control Group | | | **t-value** | **Level of significance** |
| **M1** | **1** | **N1** | **M2** | **2** | **N2** |
| 37.89 | 8.259 | 19 | 29.29 | 9.655 | 17 | 2.88 | 0.01 |

The obtained ‘t’ value as shown in Table-13 for the mean post-test scores of Achievement in Physics for boys between experimental and control groups, is greater than the tabled value required for significance at 0.01 level.

This significant ‘t’ value indicates that the mean post-test scores of boys of the experimental and control groups are not similar. This revealed the boys of experimental group achieved more than the boys of control group in case of post-test scores.

**e) Comparison of Mean Post-test Scores of Achievement in Physics for Girls between Experimental and Control Groups**

The mean performance of girls of experimental and control groups in the post-test were studied and compared using the test of significance of difference between means of small independent sample. The data and results of the t-test are presented in Table 14.

##### Table 14

***Test of Significance of the Mean Scores of Post-test between Girls of Experimental and Control Group***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Experimental Group | | | Control Group | | | **t-value** | **Level of significance** |
| **M1** | **1** | **N1** | **M2** | **2** | **N2** |
| 37.52 | 8.119 | 19 | 32.00 | 8.8819 | 19 | 2.002 | 0.05 |

The obtained ‘t’ value as shown in Table 14 for the mean post-test scores of Achievement in Physics for girls between experimental and control groups, is greater than the tabled value required for significance at 0.05 level. It can be inferred from the table that the mean post-test scores of girls of the experimental and control groups are dissimilar. This indicates that the girls of the experimental group achieved more than the girls of control group.

**f) Comparison of Mean Gain Scores of Boys between Experimental and Control Groups**

The mean performance of boys of experimental and control groups in the gain scores were studied and compared using the test of significance of difference between means of small independent sample. The data and results of the test are presented in Table 15.

##### Table 15

***Test of Significance of the Mean Gain Scores between Boys of Experimental and Control Groups***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Experimental Group | | | Control Group | | | **t-value** | **Level of significance** |
| **M1** | **1** | **N1** | **M2** | **2** | **N2** |
| 20.21 | 7.59 | 19 | 13.17 | 8.72 | 17 | 2.59 | 0.01 |

The obtained ‘t’ value as shown in Table-15 for the mean gain scores of boys between experimental and control groups, is greater than the tabled value required for significance at 0.01 level. This indicates that the mean gain scores of boys of the experimental and control groups are dissimilar. This significant‘t’ value reveals the superiority of boys of experimental group over the boys of control group in case of gain scores.

**g) Comparison of Mean Gain Scores of Girls between Experimental and Control Groups**

The mean performance of girls of experimental and control groups in the gain scores were studied and compared using the test of significance of difference between means of small independent sample. The data and results of the test are presented in Table 16.

##### Table 16

***Test of Significance of the Mean Gain Scores between Girls of Experimental and Control Groups***

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Experimental Group | | | Control Group | | | **t-value** | **Level of significance** |
| **M1** | **1** | **N1** | **M2** | **2** | **N2** |
| 17.10 | 6.13 | 19 | 12.52 | 7.70 | 19 | 2.02 | 0.05 |

The obtained ‘t’ value as shown in Table -16 for the mean gain scores of girls between experimental and control groups, is greater than the table value required for significance at 0.05 level. This indicates that the mean gain scores of girls of the experimental and control groups are dissimilar. This significant‘t’ value reveals the girls of experimental group achieved more gain score than the girls of control group in case of gain scores.

## Summary of the Mean Comparison to Total Samples

The result of the t-test conducted for comparison of the mean pretest, post-test and gain scores for total sample between experimental and control groups were summarized and present in Table 17.

**Table 17**

***Summary of t-values for the Pre-test and Gain Scores for Experimental and Control Group (Total Sample)***

|  |  |
| --- | --- |
| Variable | **t-value** |
| Pre-test | 1.14 |
| Post-test | 3.50 |
| Gain scores | 3.35 |

Summary of t-value from Table-17 indicates the t-value obtained for pre-test is not significant. This implies that the experimental and control groups were similar in case of their performance in the pretest.

The t-value obtained for post-test is found significant. It can be inferred from the result that blended learning strategy differentiates the experimental group and control groups. From the comparison the advantage of the experimental group is evident.

Table -17 also suggests that the obtained ‘t’ value for the gain scores for the total sample is found to be significant.

**Analysis of Covariance**

One Factor ANCOVA was used to determine the effect of Blended Learning Strategy on achievement of Physics of standard VIII pupils. The procedures of ANCOVA, data and results are given in this section of analysis. Here it is made a comparison of effectiveness of blended learning strategies on the achievement in physics over the existing method of teaching.

To determine the effectiveness of blended learning strategies on the achievement in Physics at secondary school level, the pre-test and post-test scores of experimental and control groups were subjected to statistical analysis of covariance. For this single factor ANCOVA, two levels of method of teaching (blended learning strategies and existing method) as independent variable, is incorporated with one covariate namely the pre-experimental status of the sample measured in terms of a pre-test. Achievement in Physics is considered as the dependent variable.

Before proceeding to ANCOVA the data used for analysis is subjected to a thorough examination with a view to know whether the data is sufficient to satisfy the major assumptions suggested by Winer (1977), Ferguson (1996), to carry over the ANCOVA procedure. It is examined that the data is seen satisfied with the following assumptions.

1. The dependent variable, which is under measurement, should be normally distributed in the population.
2. The treatment groups should be selected at random from the same population.
3. Within groups, variances must be approximately equal.
4. The contributions of variances in the total sample must be additive.
5. The regression of the final scores on initial scores should be basically the same in all groups.

For this purpose the sum of squares variance along with the corresponding degrees of freedom and the 'F’-ratio were calculated. The summary of analysis of co-variance for achievement scores as dependent variables with pre test scores as covariate is given in Table18.

**Table 18**

***Summary of Single Factor ANCOVA for Achievement scores as Dependent Variables with Pre test scores as Covariate***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl. No** | **Source variation** | **Sum of squares** | **df** | **Mean square** | **F-value** | **Level of significance** |
| 1 | Teaching methods | 634.861 | 1 | 634.861 | 11.022 | 0.01 |
| 2 | Within group | 4089.657 | 71 | 57.601 |
|  | Total | 4724.518 | 72 |  |

The obtained F -ratio was tested for significance. Since the table value of F ratio for df (1,71) is 6.8 at 0.01 level of significance, the obtained F-ratio is highly significant (F = 11.022). The obtained F-ratio (11.022) is greater than the tabled value at 0.01 level of significance. The significant F- ratio shows that the means of post-test scores of pupils in the experimental and control groups differ significantly after they have been adjusted for difference in the pre-test scores. There exist a significant difference in the post-test score after adjusting pre-test score using pre-test score as covariate.

It reveals that from the covariance analysis that after a linear adjustment was made for the effect of variation due to the differences in the pre-experimental status in achievement in physics as measured by the Co-variant (Pre-test), there exists a statistical differences between the two groups of teaching methods.

***Comparison of Adjusted Mean****.*

Scores of achievements of experimental and control are compared by pre-test as covariate. Since the ‘F’ value was significant at 0.01level.Adjusted Mean Comparison were made.

**Table 19**

***Adjusted Mean Comparison of Experimental and Control Group***

|  |  |  |
| --- | --- | --- |
| **Adjusted Mean** | **Experimental Group** | **Control Group** |
| 37.161 | 31.247 |

Adjusted F-value is 11.022 is significant at 0.01 level with degrees of freedom1/71. Further, the adjusted mean score of achievement of experimental group is 37.161 is significantly greater than control group which is 31.24.The absolute difference between Adjusted Mean of Experimental and Control Groups is 5.92.Thus the hypotheses that there will be significant Effect of Blended Learning Strategy on Achievement in Physics of standard VIII pupils is accepted. Hence it can be concluded that the Experimental Group is superior in their Achievement in Physics over Control Group.

**CHAPTER V**

**SUMMARY, CONCLUSION AND SUGGESTIONS**

* Study in Retrospect
* Major Findings of the study
* Tenability of Hypotheses
* Conclusion
* Educational Implications
* Suggestions for further research

SUMMARY, CONCLUSION AND SUGGESTIONS

This chapter gives an overview of the significant aspects of the stages of conducting the study, the important findings, tenability of hypotheses their educational implications and suggestions for further research.

## Study in Retrospect

The various aspects related to the different stages of the present study like the problem, variables, objectives, hypotheses, and methodology are given in a nutshell.

**Restatement of the Problem**

The problem of the present study was stated as ‘**EFFECTIVENESS OF BLENDED LEARNING STRATEGY ON ACHIEVEMENT IN PHYSICS OF STANDARD VIII STUDENTS**’

**Variables Selected for the Study**

The independent, dependent and control variables selected for the present study are the following:

**Independent Variable**

Two method of teaching, Blended Learning Strategy and Existing Method of Teaching.

**Dependent Variable**

Achievement in Physics.

**Control Variable**

The variable controlled for the study was the initial status of the students in terms of Achievement in Physics as measured by a pre-test.

**Objectives of the Study**

The following are the objectives were formulated for the study

i. To compare the mean pre- test scores of experimental and control group for total sample.

ii. To compare the mean post- test score of experimental and control group for total sample and sub sample based on gender.

iii. To compare the mean gain scores of students belonging to experimental and control group for total sample and sub sample based on gender.

iv. To study the Effectiveness of Blended Learning Strategy on students’ Achievements in Physics of Standard VIII pupils.

**Hypotheses of the Study**

The following hypotheses were tested for the study

i. There will be significant difference in the mean pre-test scores of the experimental and control group.

ii. There will be significant difference in the mean scores of the post-test of the experimental and control groups for total sample and sub sample based on gender.

iii. There will be significant difference in the mean gain scores of the experimental and control groups for total sample and sub sample based on gender.

iv. There will be significant Effect of Blended Learning Strategy on Achievement of Physics in Standard VIII pupil.

**Methodology**

The methodology of the present study is briefly discussed in this section.

* **Design of the Study**

The present study has been conducted by employing the quasi-experimental design. The design used is the present study was the pre-test post-test non-equivalent group design. The notation of the study is as follows.

O1 X O2

O3 C O4

Where,

O1, O3 – pre-tests

O2, O4 – post-tests

X – Application of experimental treatment

C – Application of control treatment

The experimental group was taught through Blended Learning strategies and control group was taught through existing method of teaching.

**Sample of the study**

The sample of the study consists of 38 pupils in the experimental group and 36 in the control group. The sample for both experimental and control groups were two divisions of standard VIII students drawn from the St.Pauls English Medium High School, Pattambi.

**Tools used for the study**

1. Lesson Transcript Based on Blended Learning Strategy
2. Lesson Transcript Based on Existing Method (Constructivist Method) of Teaching
3. Achievement Test in Physics

**Statistical Techniques Used for the Study**

The analysis was done using the following statistical techniques.

1. Test of significance of difference between means for large and small independent samples, were used to compare the relevant variables between the experimental and control groups.
2. Single factor ANCOVA- To examine the effectiveness of blended learning strategy over the existing method of teaching on the Achievement in Physics of standard VIII pupils, single factor ANCOVA with one covariate is used. Analysis of covariance serves the purpose of statistically removing the effects of extraneous variables from the dependent variable.

## Major Findings of the Study

The major findings of the study are given briefly in this section. For analysis seven comparisons of means and one ANCOVA were done

* 1. **Comparison of Mean Pre-test Scores of Achievement in Physics for Experimental and Control Groups**

No significant difference between mean pre-test scores of experimental and control groups were noticed. Both of the groups were found equivalent in terms of pre-test scores. t-value of test of significance for pre-test scores is given in the Table 20.

##### Table 20

***t-value of the Test of Significance of Difference between Experimental and Control Groups for Pre-test Scores***

|  |  |  |  |
| --- | --- | --- | --- |
| Sl. No. | **Variable** | **Sample** | **t-value** |
| 1. | Pre-test | Total | 1.14 |

* 1. **Comparison of the Mean Post-test Scores of Achievement in Physics of Experimental and Control Groups for Total Sample, Boys and Girls**

Significant difference in the mean post-test scores between experimental and control groups for total samples, boys and girls were obtained. The obtained t-values are presented in Table 21.

##### Table 21

**t*-values of the Test of Significance of Difference between Experimental and Control Groups for Post-test Scores***

|  |  |  |  |
| --- | --- | --- | --- |
| Sl. No. | **Variable** | **Sample** | **t-value** |
| 1. | Post-test | Total | 3.50 |
| 2. | Post-test | Boys | 2.88 |
| 3. | Post-test | Girls | 2.00 |

* 1. **Comparison of the Mean Gain Scores of Achievement in Physics of Experimental and Control Groups for Total Sample, Boys and Girls**

The obtained t-value for the gain scores of total sample, boys and girls are found to be significant. The t-values of this test are presented in Table 22.

##### Table 22

***t-values of the Test of Significance of Difference between Experimental and Control Groups for Gain Scores***

|  |  |  |  |
| --- | --- | --- | --- |
| Sl. No. | **Variable** | **Sample** | **t-value** |
| 1. | Gain scores | Total | 3.35 |
| 2. | Gain scores | Boys | 2.59 |
| 3. | Gain scores | Girls | 2.02 |

## Analysis of Covariance for Achievement in Physics

Single factor ANCOVA was used to study the effectiveness of blended learning strategy over the existing method of teaching. From the covariate analysis it can be inferred that when linear adjustment is made for the effect of variation due to difference in the pre-experimental status of the subjects, there is statistically significant difference between two groups. The ‘F’ value obtained by covariate analysis is presented in the Table 23.

##### Table 23

## *Summary of ANCOVA for Achievement in Physics*

|  |  |  |  |
| --- | --- | --- | --- |
| Sl. No. | **Dependent Variable** | **Sample** | **F-value** |
| 1. | Achievement in Physics | Total | 11.022 |

**Comparison of Adjusted Means:**

After the significant ‘F’ value is obtained, to examine the Effectiveness of Blended learning strategy over the existing method of teaching, adjusted means comparison were used. ‘t’ value for adjusted means is presented in the Table 24.

##### Table 24

***Summary of Adjusted Mean Comparison***

|  |  |  |
| --- | --- | --- |
|  | **Experimental Group** | **Control Group** |
| Adjusted Means | 37.161 | 31.247 |

From the adjusted means comparison, it can be concluded that there exists a significant difference between two methods of teaching-Blended learning strategy and existing method of teaching. By the comparison of adjusted means we can clearly say that Blended learning strategy is highly effective than the existing method.

## Tenability of Hypotheses

Tenability of the hypotheses was examined in the light of the major findings of the study.

* **The first hypothesis states that, there will be significant difference in the mean pre-test scores of the experimental and control group.**

It was found that the difference in the mean pre-test scores of experimental and control groups is not significant. Thus the first hypothesis is rejected.

* **The second hypothesis states that, there will be significant difference in the mean scores of the post-test of the experimental and control groups for total sample and sub sample based on gender.**

Significant difference between the experimental and control groups in mean post-test scores for total sample and subsample based on gender were noticed. Hence the second hypothesis is fully substantiated.

* **The third hypothesis states that, there will be significant difference in the mean gain scores of the experimental and control groups for total sample and sub sample based on gender.**

The difference in the mean gain scores of experimental and control groups for total sample, boys and girls were found to be significant. Thus the third hypothesis is accepted completely.

* **The fourth hypothesis states that, pupils taught through blended learning strategy will significantly differ in Achievement in Physics than pupils taught through the existing method of teaching.**

The ‘F’ value is found to be highly significant between experimental and control groups for total sample. From this we can conclude that the blended learning strategy is more effective than the existing method of teaching physics of VIII standard pupils. Hence this hypothesis is fully substantiated.

## Conclusions

Among seven mean comparisons, six values were found to be significant. Only the mean comparison between pre-test scores of experimental and control groups was not significant. The values obtained by test of significance of difference between means of experimental and control groups for post-tests and gain scores for total sample and sub sample formed on the basis of gender were highly significance. Hence, we can conclude that the pupils taught through the new method of teaching- Blended learning strategy have achieved more than that of the control group.

The result of analysis of covariance also indicates the high performance of experimental group. The obtained t-value after the adjusted mean comparison was highly significant. From the above objectives we can safely conclude that Blended learning strategy is an effective method of teaching over existing method of teaching on achievement in physics.

This study investigated the students’ learning outcome from blended learning has made a change in achievement and attitudes towards these approaches. The results showed significant differences in the achievement test scores in favour of blended learning. In addition, the results indicated that there is a significant difference in the students’ achievement in favour of blended learning over the conventional method of teaching. These results imply some suggestions to teacher educators and instructional designers in using different teaching approaches as students may prefer one over the other.

## Educational Implications

The present study reveals that the using of Blended learning strategy in learning is effective for the proper understanding and meaningful learning of the students. It also holds several implications for instructional interventions such as teaching students how to be more aware of their learning processes and products as well as how to regulate those processes for more effective learning. As students become more skilled at using blended learning strategies, they gain confidence and become more independent as learners. Independence leads to ownership as students realize they can pursue their own intellectual needs and discover a world of information at their fingertips.

Even though the investigation is carried out on a small sample, the finding throw light on the current educational practices in secondary school classes especially in the instruction of Physics.

**Blended Learning as a Promising Method**

With the advent of technology, the instruction is dominated with technical assistance. Some of the institution adopted conventional method like chalk and talk, lecturing etc. In the present study, the investigator shows that a blend of face-to-face teaching as well as ICT (Information and Communication Technology) is the need of the hour. The boredom of the classroom is a regular feature in the present context. Blended Learning Strategy is an alternate method which can motivate the student and provide a variety on the other hand.

**Blended Learning Strategy-Easy Attainment of Multifaceted Objectives**

It enhanced the goal of attainment of higher order objectives. In the conventional methods, the content is achieved in cognitive domain. The new curriculum envisages attainment of multifaceted objectives such as concept domain, process domain, attitude domain and creativity domain. Blended learning strategy sharpens all the three domains.

**Integrate Blended Learning Strategy in Curriculum**

Blended learning strategy consists of three important components such as face-to-face component, electronic component and self-learning component. The integration of the three components should be included in curriculum for making learning an effective and interesting process.

**Blended Learning Strategy-Foster Multidimensional Evaluation**

Differentfacets of Blended learning enhance evaluation in more than one dimension in the classroom. It helps to develop and foster the hidden abilities in students and bloom their effectiveness in the teaching-learning process. This learning strategy is in tune with modern vision of evaluation. Since the period is divided into three sections, we can evaluate the multifaceted development of students. Moreover, we can test multiple intelligence like linguistics, numerical, spatial etc.

**Blended Learning –in classroom of 21st century**

The study focuses on innovative and democratic classroom where the child is given freedom to discover, ask question, etc. A variety of learning experiences can be provided in this approach where the child learns to construct his own knowledge though ‘hands-on-experience’ activities earlier experience and so on. Pupil preferred group activities in which they had a scope to share their knowledge among peers and constructed and reconstructed their knowledge related to the concepts under the study.

In this rapidly changing world, the challenge of teaching is to help students to develop the skills which will not become absolute. Blended strategies are essential for the 21st century. They will enable students to successfully cope with new situations. Teachers and school library media specialists capitalize on their talents as well as access a wealth of resources that will create a hybrid environment which fosters the development of good thinkers who are successful problem solvers and lifelong learners.

In short, this study proves that blended learning strategy equips the teacher to face and solve the problem that encounter in any subjects especially in Physics at secondary school level.

**Suggestions for Further Research**

Every educational research has its own limitations and shortcomings, and the current research is no exception as it focuses on the use of blended learning methods in relation to teaching Physics in Secondary School level. However, for the continuation of the current study the researcher puts forward the following proposals:

* Studies similar to the current study need to be conducted by potential researchers in other subjects like Mathematics, Language and Social Studies, bearing in mind that these studies should integrate different components of blended learning.
* The sample for the present study was restricted to the rural sample. The experiment can be tried out on CBSE schoolchildren.
* Further experimental studies need to be conducted to establish the effectiveness of e-learning and blended learning on student’s attitudes. Also, the effectiveness of synchronous virtual classrooms on student’s achievement and attitudes featuring physics as well as other science subjects needs to be investigated.
* It is recommended that further studies need to be conducted to determine the extent to which faculties of education to undertake their role with regard to updating student’s knowledge to enable them cope with modern technology.
* Finally, it is recommended that further studies need to be carried out to determine the extent to which e-learning centers to undertake their role with regard to training staff members to take advantage of modern technology in the teaching process as to develop their skills to levels that enable them to design their courses electronically. It helps to examine the role of teachers in Blended classroom.

In conclusion planners should take advantage of the modern technological advance to cope with the challenges associated with higher education in particularly the increasing demand and the shortage of qualified staff. To be more precise the well equipped classroom is only a partial solution to the problem as both students and staffs need to be provided with the appropriate training to gain the required skills to deal with modern technology. This is where educational institutions such as e-learning centres and university research centres become important as to provide training in this area.

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**APPENDICES**

**APPENDIX-I**

**LESSON TRANSCRIPT BASED ON BLENDED LEARNING STRATEGY -1**

Name of the Teacher : Sameeha Mohamed E.K Standard: VIII

Subject : Physics Duration: 40min.

Unit : Force Strength: 38

Topic : Inertia

Name of the School : St Pauls Eng.Med.High.School, Pattambi

**Focus : Inertia**

**Learning objectives :** To know about the term ‘inertia’.

To know about inertia of rest.

To know about inertia of motion.

To understand the difference between

inertia of rest &inertia of motion.

**Developmental stages**

**a) Phase I-Preparation**

**Facts**

* An object cannot by itself change its speed or direction.
* In Inertia of rest, the object continues to be in a state of rest.
* In Inertia of motion, the object continues to be in a state of motion.

**Major concepts**

* An object cannot by itself change its state of rest or its uniform motion along straight line. This is inertia.
* An object in a state of motion has the tendency to continue in that state. This is called inertia of motion.
* An object in a state of rest has the tendency to continue in that state. This is called inertia of rest.

**Inputs required: CD-ROM, videos, workbook.**

|  |  |  |
| --- | --- | --- |
| **Structured activities** | **Responses** | |
| **Phase II-Presentation**  1.**Face-to-Face teaching(Lecturing)**  Teacher: Good morning.  Students: Good morning ,teacher.  Teacher : Have you all travelled in bus? |  | |
| Students: Yes.  Teacher: Today I am going to tell a story about Ramu and his family. Ramu was a clever 11 year old boy residing in hostel.In the time of vacation, his family and relatives decided to go go for a picnic to Shimla. They started from early morning from home. When the bus started suddenly, ramu and others sitting inside the bus fall backward. Later he stood and danced, at that time the driver stopped the bus suddenly and he moved forward. In this story we can see two situation , can you find cause behind it.  Students : Ramu move forward because he was standing without any balance.  Teacher : No. when the bus stops suddenly, the lower part of our body comes to rest while the upper portion continues to be in motion. An object cannot by itself change its state of rest or its uniform motion along straight line is called inertia. An object in a state of motion has the tendency to continue in that state. This is called inertia of motion. But when the bus starts suddenly, we fall backward. This is due to inertia of rest.  2. **EPSS(Animations)**  Teacher shows the animated videos to the students and asks them to answer. Inertia of rest and motion are shown to the students. Teacher consolidates each figure.  C:\Users\user\Downloads\i2.jpg---**Teacher describes the definition of inertia through a story.**   1. C:\Users\user\Downloads\i1.jpg      1. C:\Users\user\Downloads\inertia of motion.jpg   3.**Self –paced learning(workbook)**  Answer the questions given in the workbook from the classroom itself Students  I. Fill in the banks  1.Inertia of rest-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  2.Planet revolving sun-\_\_\_\_\_\_\_\_\_\_\_  II. Observe the situations, answer the questions.  Flicking a play card having a coin  placed over a tumbler. what happened to coin .write your findings  C:\Users\user\Downloads\imagesrest.jpg  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_      **4.**What do you observe in this figure. which type of inertia ?Write your findings in the space provided.  **C:\Users\user\Downloads\motion2.jpg** | |  |
| **Phase III-Evaluation**  Teacher evaluates the whole class by asking questions  1.Define inertia.  2.Give an example of inertia of rest.  3.What is the difference between inertia of motion & inertia of rest. | |  |

**Phase IV-Follow –Up Activities**

1.A dog chased by a rabbit saves himself by running in a zig-zag manner.Why

**APPENDIX-II**

**LESSON TRANSCRIPT BASED ON CONSTRUCTIVIST METHOD**

Name of the Teacher : Sameeha Mohamed E.K Standard:VIII

Subject : Physics Duration:40min.

Unit : Force Strength : 36

Topic : Inertia

Name of the School : St Pauls Eng.Med.High.School, Pattambi

**Curricular Objectives:**

* To understand about inertia, different types of inertia .

**Facts**

* An object cannot by itself change its speed or direction.
* In Inertia of rest, the object continues to be in a state of rest.
* In Inertia of motion, the object continues to be in a state of motion.

**Concepts**

* An object cannot by itself change its state of rest or its uniform motion along straight line. This is inertia.
* An object in a state of motion has the tendency to continue in that state.This is called inertia of motion.
* An object in a state of rest has the tendency to continue in that state.This is called inertia of rest.

**Learning aids:** Chart, Task Card, Models

**Process competencies:** Observing, inferring, experimenting

|  |  |
| --- | --- |
| **Process** | **Evaluation** |
| Introduction  Teacher enters the classroom and the students wishes the teacher. the teacher asks the students about the story of Newton. The teacher divides the whole class into different groups.  Activity No.1  Teacher takes a tumbler, a play card and a coin. Place the playcard having coin over the tumbler. Flick the playcard .then answer to the questions given in the task card.  1.What happen to playcard?  2.Does the coin remain in the same position?  Concept to be consolidated  By flicking the play card,coin has fell into the tumbler whereas the playcard moved away.the coin was in rest on the playcard.from this we can infer that object in a state of rest has the tendency to continue in that state is called inertia of rest. |  |
| Activity No.2  Teacher asks the students to observe a rotating fan. Then she switch offs the fan. Then answer to the questions given in the task card.  1.What happen to fan,when it is switched off?  2.Does the fan rotate slowly?  Concept to be consolidated  Initially the fan was rotating ,but when it is switched off,it continued to remain in motion. An object in a state of motion has the tendency to continue in that state.This is called inertia of motion. |  |

**Review Questions**

1.What is inertia ?

2.Give an example for inertia of rest

3.What is inertia of motion?

**Home assignment**

1. Classify inertia of rest and inertia of motion from the given examples.

a. Planets revolving around sun

b. Beating the carpet with a stick

c. Mangoes fall when a branch of the tree is shaken.

d. The fan continues to rotate for some time even switched off.

e. When an elephant chases people escape by running through a zig-zag direction.

**APPENDIX-III**

**FAROOK TRAINING COLLEGE**

**CALICUT**

**ACHIEVEMENT TEST IN PHYSICS-STD VIII**

**FINAL FORM**

**Dr. M.P. HASSAN KOYA**

**Assistant Professorin Natural Science SAMEEHAMOHAMED E.K**

**Farook Training College Farook Training College**

**Instructions:**

* This is a test on physics. In this test there are altogether 50 questions. Each question is given with four options, of which only one is correct. Put a tick mark (🗸) against the right choice from A, B, C and D.
* Separate response sheet is given to mark the answers.
* If you happen to mark a wrong answer, to change the answer, draw a rectangle ⬜ and put a tick mark against the right choice.
* Nothing should be written on the question paper.

Class:VIII Maxmark:50

Time:50min

(Each question carries one mark)

1. Choose the correct answer from the given option

1. The sending back of light from a mirror by an object is called\_\_\_\_\_\_\_

a. reflection b. refraction c. dispersion d. scattering

2. \_\_\_\_\_\_type of force make the object move.

a. external b. internal c. balanced d. zero

3. \_\_\_is an example of contact force

a. strong force b. gravitational force c. muscular force

d. magnetic force

4. \_\_\_\_is a measure of inertia of a body

a. length b. mass c. force d. velocity

5. Which statement indicate Newton’s Ist law of motion

a. Every body continues to be in a state of rest or of uniform motion until an unbalanced external force is applied on it.

b. Every body continues to be in a state of rest until a unbalanced force is applied on it.

c. Every body continues to be in a state of rest or of uniform unless an unbalanced internal force is applied on it.

d . Every body continues to be in a state of rest or of uniform unless an un balanced contact is applied on it.

6. Angle of incidence is equal to Angle of reflection

a. always b. sometimes c. under special condition d. never

7. Inertia is a property of a body by virtue of which the body is

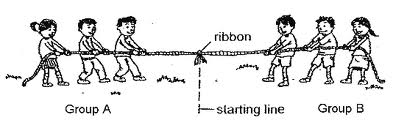
a. unable to change by itself the state of rest

b. unable to change by itself the state of uniform motion in a straight line

c. unable to change by itself the direction of motion

d. unable to change by itself the state of rest or uniform motion in a straight line

8. “In the game of tug of war, when two teams pull the rope with equal force, the rope and the team remain stationary”. This is related to ……



a. Unbalanced force b. Balanced force

c. Nuclear force d. Frictional force

9. By obeying Law of Reflection, if angle< i = 40°, what is angle <r=?

a.50° b.60° c.40º d.20°

10. Qualitative definition of force is given by

a. Newton’s first law of motion

b. Newton’s second law of motion

c. Newton’s third law of motion

d. Law of gravitation

II

11. An archer stretches her bow while taking aimed at the target. She then releases the arrow, which beings to move towards the target. Based on this information fill up the gaps in the following statements using the following terms.

12. To stretch the bow the arches applies a force that causes a change in its \_\_

a. shape b. colour

c. material d. nothing

13. The force applied by the archer to stretch the bow is an example of \_\_force.

a. magnetic b. muscular c. frictional force d. none of these

14. The type of force responsible for a change in the state of motion of the arrow is an example of \_\_\_\_ force

a.net force b. non-contact force c. attractive force d. contact force

15. Angle between incident ray and normal is \_\_\_

a. angle of reflection b. angle of incidence

c. angle of refraction d. angle of coincidence

16 . A body is said to be under balanced force when the resultant force

applied on that body.

a.1 b. 0 c. infinite d. none of these

17. Newton’s first Law of motion give us the definition of \_\_\_\_

a. acceleration b. velocity c. force d. mass

18. To draw water from well we have to \_\_\_\_rope

a. push b. pull c. pick d. kick

19. Match the following

1.internal force --- i)moves an object

2unbalanced force --- ii)does not move object

3.balanced force --- iii)muscular force

4.external force ---- iv)net force zero

---- v)pushing car from outside

1 2 3 4

1. iii i iv v
2. ii i v iv
3. i iii iv v
4. ii i iv v

III Fill in the blanks and find the relation

20. Frictional force : contact force ; \_\_\_\_\_\_\_\_\_: gravitational force

a. muscular force b. non-contact force

c. zero force d. balanced force

21 Rear view mirror : convex mirror; shaving mirror :\_\_\_\_\_\_\_\_\_\_

a. concave b. convex c. plano-convex d. none of these

IV .Analyze the situation and find which force are experienced

22. Lift a bucket filled with water from well

a. zero force b. net force c. balanced force d. unbalanced force

23. Hold a bucket filled with water above the water level

a. zero force b. internal force

c. balanced force d. unbalanced force

V .Find the correct answer

24. “A porter lifting the luggage”. Critically evaluate & find the force

a. muscular force b. pseudo force c. strong force d. magnetic force

25. Compared to a plane mirror, the reflecting surface of a convex mirror will be \_\_\_\_\_\_

a. bulged b. flat c. curved inward d. curved outward

26. \_\_\_\_\_force is zero, compared to an unbalanced force.

a. pseudo force b.net force c. balanced force d. frictional force

27. To see the inner part of ear & other parts, E.N.T doctors use a type of mirror with what specialty

a. concave mirror; Image will be big, small,or same size.

b. convex mirror; Image same size.

c. concave mirror; Image same size.

d. convex mirror; Image big size.

28. Find the odd one out

a. Push forward a table

b. strike a football

c. nail move towards a magnet

d. pull a cart

29. Autorikshaw pushed from inside does not move. why?

a. unbalanced external force b. unbalanced internal force

c. internal force d. contact force

30. Analyse when an elephant chases a man is running in zig-zag motion.why?

a. Mass zero, Inertia increases.

b. Mass decreases, Inertia increases

c. Mass increases, Inertia increases

d. Mass increases , Inertia decreases

31. Ordinary mirror is a \_\_\_\_\_\_\_\_\_ mirror.

a. convex b. concave c. plane d. plano-convex

32. An athlete runs some distance before taking a long jump because

a. He gains energy to take him through long distance.

b. It helps him to Apply large force.

c. By running action and reaction forces increases.

d. By running the athlete gives himself larger inertia of motion.

33 .Find out the combination in which non-contact force exists

a. gravitational, muscular b.magnetic,gravitational c.frictional, magnetic d. frictional, gravitational

34. Which of the following changes is not brought about by force

a. changes the direction of moving body

b. increases or decreases the speed of a moving body.

c. brings a moving body to rest.

d. changes the mass of moving body

35. A rider on a horse fall back when horse starts running all of a sudden because

a. rider is taken back

b. rider is suddenly afraid of falling

c. Inertia of rest keep the upper part of the body at rest where as the lower part of the body moves forward with the horse.

d. None of these

36. Find out the odd one

a. Mangoes fall when a branch of the tree is shaken

b. the fan continues to rotate for some time even switched off

c. when an elephant chases people escape by running through a zig-zag direction.

d. An athlete runs some distance before making a long jump.

37. Maya looking through a convex mirror, saw her image was not clear. critically evaluating find the characteristics of convex mirror.

a. Reflecting surface curved outward & diminished image.

b. Reflecting surface curved inward & real image.

c. Reflecting surface plane & same size.

d. Reflecting surface bulged & projected.

38. Place a number of coins one over the other & strike the lowest coin suddenly using knife, what happens

a. all the coin get scattered.

b. the lowest coin is driven out & the pile of coins remains intact which is due to inertia of rest.

c. the lowest coin is driven out & the pile of coins remains intact which is due to inertia of motion.

d. there is no change to the coins.

39. A gang of 4 boys were playing hide & seek. After sometime 2 boys on each side of the table pushed the table with equal & opposite force. This is an application of\_\_\_\_\_\_\_\_\_\_\_\_\_ force.

a. pseudo force b.net force c. balanced force d. unbalanced force

40 Fill in the blanks & find relation

A cycle locked with key : balanced force;

A cycle moved on a floor: \_\_\_\_\_\_

a. internal force b. balancedforce

c. pseudo force d. unbalanced force

41. In the figure, which force is shown



a. internal force b. external force

c. zero force d. nuclear force

42. The main characteristics of concave mirror are\_\_\_\_\_\_\_\_\_\_\_

a. Image formed same size of the object& reflecting surface plane.

b. Image formed diminished& reflecting surface curved outward

c. Image formed same size or big or small size of the object& reflecting surface curved inward.

d. Image formed same size of the object& reflecting surface curved outward

43. If mass of a toy car is 10kg moving with an acceleration a=10m/s .what is the force applied?

a.200N b.100N c.20N d.10N

44. The force that cannot move a body

a. internal b. external c. gravitational d. frictional

45. Which of the following have more inertia?

a. rubber ball b. plastic ball c. metallic ball d. tennis ball

46. \_\_\_\_\_\_\_\_\_force is required to push a breakdown car.

a. unbalanced external b. balanced external

c. unbalanced internal d. balanced internal

47. If a bus stops all of a sudden, what happens to the passenger standing inside it?

a. the passenger tends to continue its body in the state of rest, so he falls backward.

b. the passenger fall sideward.

c. the passenger tends to continue its body in the state of motion, so he falls backward.

d. the passenger tends to continue its body in the state of motion ,so he falls forward.

48. If mass increases, inertia \_\_\_\_\_

a. increases b. no change

c. decreases d. becomes zero

49. Sitting on a chair without letting your legs touch the floor and try to lift the chair. this statement is agreed with

a. non-contact force b. external force

c. zero force d. internal force

50. The force involved in the falling of apple from a tree is

a. magnetic b. gravitational

c. electrostatic d. contact

**APPENDIX IV**

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