# EFFECTIVENESS OF EDUCATIONAL TECHNOLOGIES IN HIGHER SECONDARY SCHOOLS: A CASE STUDY OF KV-IITM SCHOOL,CHENNAI

A REPORT

submitted by

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for the award of the degree

# **BACHELOR OF TECHNOLOGY**



# DEPARTMENT OF ELECTRICAL ENGINEERING INDIAN INSTITUTE OF TECHNOLOGY MADRAS

**MAY 2016** 

### CERTIFICATE

This is to certify that the report entitled "A STUDY OF EFFECTIVENESS OF EDUCATIONAL **TECHNOLOGIES IN SCHOOLS**" submitted by A.Praneeth Kumar Reddy to the Indian Institute of Technology Madras for the award of the degree of Bachelor of Technology (B.Tech) is a bonafide record for research work carried out by him under our supervision. The contents of the report, in full or in parts, have not been submitted to any other Institute or University for the award of any degree or diploma.

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Place: Chennai

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#### ABSTRACT

It is well established that Indian education system is not reaching its objectives. The reasons are plenty ranging from quality issues to corruption. Technology is one thing with minimum selectivity which can bring significant change. This is well established in other countries after being tried out extensively as a part of their policy. Also bearing in mind the importance of a transition from teacher-centred, lecture-based teaching to student-centred, technology-based learning, this study examined students' and teachers' interest to integrate educational technology (INTEREST) in terms of their computer attitude (ATTITUDE), level of proficiency in using technology (PROFICIENCY), their perception of utility of technologies for their academic curriculum (UTILITY) and the professional support to achieve this from school authorities, peers etc.(SUPPORT). Separate questionnaire for students and teachers was developed. The study used a sample of 522 students and 65 teachers from KV-IITM and G.H.S.S schools. The two groups differed on almost every variable. Extensive analysis is being carried out on KV-CLRI. Path analysis was done to know effective paths so that school authorities can invest on technologies for better results. Results and discussion and implications are extensively discussed.

### **CHAPTER 1**

### **INTRODUCTION**

### **1.1 Education Progress in India**

Education in India is provided by the public sector as well as the private sector, with control and funding coming from three levels: Central, State and Local. Under various articles of Indian Constitution, free and compulsory education is provided as a fundamental right to children between ages of 6 and 14. Considering India's long colonial past, this provision of free education as a fundamental right is an enormous achievement.



India has made progress in terms of increasing the primary education attendance rate and expanding literacy to approximately three-quarters of the population in the 7-10 age group, by 2011. As per the Annual Status of Education Report (ASER) 2012, 96.5% of all rural children between ages of 6-14 were enrolled in school. The overall literacy rate has grown from 12% in 1947 to 74.04% in 2011. The country has more than 1.4 million schools with over 227 million students enrolled. The ratio of public to private schools in India is 7:5. India's improved education system is often cited as one of the main contributors to its economic development.

At the primary and secondary level, India has a large private schools system complementing the government run schools, with 29% of students receiving private education in the 6 to 14 age group. It is important to clarify that while there are private schools in India, they are highly regulated in terms of what they can teach, and in what form they can operate. Hence, the differentiation of government schools and private schools can be misguiding.

### **1.2 Education System in India**

The central and most state boards uniformly follow the "10+2+3" pattern of education. In this pattern, study of 12 years in done in schools. This forms the most important, character and intellectual building time period of any child's life. The first 10 years is further subdivided into 5 years of primary education, 3 years of upper primary, followed by 2 years of high school. This pattern is originated from the recommendation of Education Commission of 1964-66.

## **1.3 School Education and issues**

While quantitatively India is inching closer to universal education, the **quality of its education** has been questioned particularly in its government run school system. States of India have introduced tests and education assessment system to identify and improve such schools.

Major issues/reasons:

- 1. Lack of Infrastructure: Although schools are built, they are not properly maintained so as to enable good education. Approximately 95.2% of schools are not yet compliant with the complete set of RTE infrastructure according to survey conducted in 2010.
- 2. Poor Global ranking: India ranked second last among the 73 countries that participated in the programme for International Student Assessment (PISA), conducted to evaluate education systems worldwide by OECD (Organisation for Economic Co-Operation and Development) Secretariat.
- 3. System of Education: Education is information based rather than knowledge based.
- 4. Social issues: Although not a case in urban areas, there are many rural areas where a lot of discrimination is made based on caste, gender etc.
- 5. Quantity and quality of teachers and teaching material/content
- 6. Lot of difference in quality between private and government run schools.

Technology could play a role in addressing some of the above issues.

## 1.4. Technology addressing key issues in School Education

Simple understanding of Indian school education system suggests that the present mode of teaching/learning is not working well or is not able to achieve its objectives. Broadly the issues are Availability of quality education (points 2, 3 and 5 above), Access to quality education (points 1 and 4 above) and Affordability of quality of education (point 6 above).

If we have to think of one thing which shows the least selectivity in terms of usage and benefits, technology is the first to come to mind. A person in the remotest of areas can access to quality education globally thanks to Internet. A person suffering with low understanding can learn concepts better, owing to many videos, presentations. There are many cases where technology was, is and will play a major role in shaping a child's career.

Although all technologies are not available, accessible and affordable to all, enormous amount of research is being carried out in technology so as to remove all kinds of selectivity (rich-poor, male-female, social class etc.) technology has. This gives us hope, motivation and direction to set things right. Many countries all over the world have gained very good results with the introduction of technology into their curriculums.

# 1.5 Motivation and Scope for the study

Now that it is established at least intuitively that technology can be helpful for Indian school education system, it is required to see if our intuition makes real sense.

There are many schools in India which are currently using or have previously used educational technologies. So it is necessary to conduct a primary study to know about the effectiveness of these technologies. This is necessary because to take any further steps in using technology, it is important to know of the Status-Quo.

The main purpose is to check for the factors which influence the integration of technology in schools and finding the relations between each of them.

The study is based out in Tamil Nadu and specifically in Chennai. The evidence or results provided from this research will provide directions to policy makers, school authorities and parents to invest more in technology.

# **1.6 Research Questions**

Broadly, this study addresses the following four research questions:

- What kinds of technologies are students using and with what levels of skill?
- How are these technologies used, with reference to specific class/ subject?
- What do students perceive to be the value and advantages of the use of technology?
- What are the barriers for effective technology implementation and usage?

# **1.7 Operational Definitions**

**Traditional method of teaching:** This refers to the method of teaching where the education is teacher centred i.e. teacher will be the controller of the learning environment.

- Giving Lectures
- Text book based teaching
- Using black/white/green boards
- On-paper Assessments

### Traditional method of learning:

- Student listens to lectures
- Make notes in notebooks
- Follows text book
- Clarification of subject doubts from peers and teachers through personal interactions.
- Personal feedback from teacher

**Educational Technology/ Technology:** Since the scope of technology is much more than that has already been covered and a lot of research is being carried out, we wish to define technology in negation. So all that

which helps teaching/learning in supplement to traditional way of teaching/learning is Educational technology/Technology.

Parents: This refers to parents of students studying in the school.

**School Management:** This refers to school authorities in the school of the respondent. The assumption is that they have the right to take key policy decisions concerning the school.

**Peers:** In the student questionnaire, this refers to all of respondent's class mates. In teacher questionnaire, this refers to respondent's teacher colleagues.

Subject: This refers to respondent's course subjects. They can be anything like Maths, Science etc.

### 1.7 Structure of the report

The report progresses as follows:

Chapter 1 deals with introduction so as to set the context for this study

Chapter 2 deals with Literature review which covers all the literature that has primarily been researched to set the context right.

Chapter 3 deals with Methodology which broadly explains the objectives, instruments development, sampling, data collection and data analysis

Chapter 4 deals with Results and Discussion which discusses results of various analyses.

Chapter 5 deals with Implications for Practice which consolidates all findings and makes conclusive observations.

### CHAPTER 2

### LITERATURE REVIEW

This chapter focusses on the key points/findings and overviews of literature I have read to set the context. Some of the literature was found by searching for key word 'Educational technologies' in website <u>www.sciencedirect.com</u>. A lot of filtering has been done based on the abstracts, its relevance to our basic objectives etc. Some of the literature was specifically chosen to set the context for Indian system in particular. (References and Sources are mentioned in Appendix 1.)

### 2.1 Connection between learning and Technology

- Students, Computers and Learning-Making the Connection by OECD (report is based out of OECD countries)
  - Despite the pervasiveness of Information and Communication Technologies (ICT) in our daily lives, these technologies have not been as widely adopted in formal education.
  - The foundation skills required in a digital environment can and should be taught.
  - To reduce inequalities in the ability to benefit from digital tools, countries need to improve equity in education first.
  - Using the computers more intensively than the current OECD average tends to be associated with significantly poorer student performance.

# 2.2 Investor<sup>2</sup>s<sup>2</sup> Perspective

- EDUCATION TECHNOLOGY IN INDIA: Designing Ed-Tech for Affordable Private Schools (Kim Campbell, Hila Mehr, Ben Mayer-2012)
  - A limited knowledge of technology's potential and specific capacities in schools leads to an underutilization of the technology that is present in schools. Clear learning goals for technology in classroom are to be established
  - Inconsistent cash flow from low-income parents makes it difficult for schools to acquire all resources necessary to maintain and maximize the use of educational technology tools.
  - Some implementations are halted because some schools leaders view technology as a marketing tool to be preserved rather than an educational tool to be used.
  - The key issue is lack of integration.
  - Discussed about the Hype Cycle of investment on educational technologies.



# 2.3 Pupils' Perspective

- Implementation of Educational Software in Classrooms-Pupil's Perspective (Zoria Stanisavljevic-Petrovic, Zoran Stankovic, Bisera Jetvic-2014)
  - Almost two-thirds of surveyed pupils prefer learning through educational software and believe that it is the best way of learning at school.
  - Schools should be advised to apply resources of information technologies for educational purposes to a far greater extent.
  - Starting from the attitude that the application of educational software in the process of teaching significantly contributes to the innovation of the teaching process
  - A change in the process of teaching, especially in the segment dealing with individualisation of teaching and learning process is required for which application of educational software can be extremely significant.

# 2.4 Teachers' Perspective

- Factors that influence student teacher's interest to achieve educational technology standards (Dj. Kadijevich, Lenni Haapasalo- 2006)
  - To improve interest in using educational technologies, we need to improve attitude towards technologies by means of experience.
  - A desired role of support (positive impact on experience and Attitude) can be achieved when support respects experience.
  - Teacher's understanding of why, when and how to use technology has to be promoted bearing in mind that computer skill should not be taught separately from knowledge structure and pedagogical thinking.
  - o A positive direct effect of experience on attitude
  - A positive direct effect of attitude on interest.
  - A positive indirect effect of experience on interest through attitude.

# CHAPTER 3 METHODOLOGY

## 3.1 Overview

Section 3.1 outlines the methodology adopted for this study. Section 3.2 provides the objectives of this study. An overview of methodology adopted is presented in section 3.3 and section 3.4 deals with the development of the instruments of Attitude, Experience, Interest, Utility and Support. Section 3.5 deals with the sampling used in different stages in selecting schools, student and teacher respondents. The data collection process used to collect data from schools is mentioned in section 3.6. Data analysis techniques are presented in section 3.7

### 3.2 Objectives of Study

Very broadly, the study attempts to:

- Examine the extent to which technologies are being used in middle level school educational institutions
- Identify the factors related to integration of educational technologies in teaching and learning activities.
- Identify factors that hinder or promote adoption of technologies in school education
- Provide recommendations to policy makers, school authorities and parents for effective use of technologies to enhance learning processes within and outside school environments

### 3.3 Conceptual Framework

This study utilized a similar method used by **Dj. Kadijevich, Lenni Haapasalo, 2006** to measure level of integration educational technologies by teachers. We used this because the logic is similar in both cases. There lies an assumption that most effective of using the technology is to completely integrate technologies in schools. So the logic goes as follows: In order to measure the effectiveness of educational technologies which is almost always synonymous with integration of technology in schools which is similar to that used by the above said article. The study was mainly carried out in three stages:



### Students' questionnaire:

(Questions for each ETD are presented here with respect to each sub-dimension)

Education Technology Dimensions (referred as ETDs from now) chosen are:

• **Proficiency:** How familiar you are with the use of technology and how often you use the technology in school

**Proficiency** was measured by two questions based on two dimensions. The two dimensions are Familiarity/Expertise in using the technology and Frequency of usage. The respondents were asked to rate their level of proficiency on a scale of 0-4 (Unfamiliar, Beginner, Average, Advanced and Expert) for the first question. For the second question, the respondents were asked to rate the usage of each of the technology on a scale of 0-4 (Never/Very rare, Monthly once, Weekly Once, Weekly Thrice, Daily)

### **Questions:**

Familiarity/Expertise:

For each technology listed below rate your proficiency/familiarity using it on a scale of 0 to
4. Mention the number in Table 1 based on Table 2.

Table 1

Computer/Laptop	
Mobile	
Tablet	
Mobile Apps	
Internet	
Programming	
Microsoft Excel	
Microsoft Power Point	
Microsoft Word	

Table 2

Unfamiliar	0
Beginner	1
Average	2
Advanced	3
Expert	4

Frequency of Usage:

• With reference to the **subject chosen above**, indicate **how often** you are using these technologies in **school** on a scale of 0 to 4. Mention the number in Table 3 based on Table 4.

Table 3	
Computer/Laptop	
Mobile	
Tablet	
Mobile Apps	
Internet	
Programming	
Projector	
Microsoft Excel	
Microsoft Power Point	

Table 4

Never/Very rare	0
Monthly once	1
Weekly once	2
Weekly thrice	3
Daily	4

Microsoft Word	

• Attitude: How do you feel about using the technology

Attitude was measured by 12 questions based on 3 sub-ETDs and 10 dimensions. The three sub ETDs are Technology importance, Technology enjoyment and Adaptability to new things. Out of 12 questions, 6 were presented as statements along a 5-point Likert Scale. Scores were obtained by allocating numerical values to student's responses: Strongly Disagree was scored as 0 and Strongly Agree as 4. Other 6 were presented as multiple choice questions where respondents were asked to pick one. Differential weightages were given for each option of each question.

### Questions:

Future Job Prospects:

- Keeping in mind your job prospects in future choose one of the following. [Tick one]
  - Technology in schools is irrelevant
    - Technology in schools might be relevant but might not play an important role.
    - Technology in schools is necessary

Extent of technology usage:

- Which of the following best describes your preference with regard to use of technology in your classes. [Tick one]
  - I prefer taking classes that use no technology
  - I prefer taking classes that use limited technology features (only for some classes).
- I prefer taking classes that use technology (every class makes use of technology).

### Alternatives to Traditional means:

### • When given a choice, I prefer

- Playing indoor/outdoor games [ ] or Playing on Mobile/Computer.[ ]
- Drawing on a paper [ ] or Drawing on a device (Computer/Tablet etc.) [ ]
- Using Social Media (FB, Twitter) [ ] or Participating in social events. [ ]

Reaction to new technology:

### • When I hear of a new technology [Tick one]

- I ignore
- I try to get some first-hand information
- I am curious about new technologies and look for trying them out

Learning new things

• I believe that knowledge of technology gives me opportunities to learn new things

Apart from curriculum

• I believe that knowledge of technical devices (Mobiles/Tablets/Computers) helps a lot in my daily activities. []

[ ]

Interpersonal skills:

• I believe that I can improve my language skills if I use Internet/Computers[ ] *Attraction:* 

- Classes became more interesting after technology is introduced since I could now see more images and videos which I could not have seen in traditional classes.[] *Application skill:*
- When I am presented with a new task, I am able to apply what I have learnt before for doing it.

Confidence to try out new things:

• I am confident to use technology in front of others without the fear of making any mistakes.

[ ]

• Interest: Willingness to use technology for academic purposes

**Interest** was measured by 6 questions based on 6 dimensions. All the questions were presented as multiple choice questions where respondents were asked to pick one. Differential weightages were given for each option of each question.

### **Questions:**

Doubt Clarification:

### • When in <u>doubt</u> about some topic [Tick one]

- I ask teacher/classmates in person
- I talk to classmates/teacher via emails/mobiles etc.
- Search online for the topic or use a mobile application.

Learning new things

### • To learn about new things/topics [Tick one]

- I prefer reading a book that contains the topic
- I prefer reading an e-book/pdf on a device like mobile/tablet/computer etc.
- I search for it online or use a mobile application.

### Notes making:

### • In class, to <u>make notes</u> [Tick one]

- I prefer doing it on a notebook
- I prefer doing it on devices like mobile/tablet/computer
- I prefer taking photocopies of my class mates' notes

Understanding a concept:

### • To visualize and better understand a concept [Tick one]

- I prefer to watch real demonstration like prototype/live experiment
- I prefer to watch video demonstrations

Mode of teaching:

- In class [Tick one]
  - I prefer teaching to be on black/white/green boards
  - I prefer to be taught using projectors(Power Point presentations)

Exam Process:

- I prefer to take <u>exams/assignments</u> [Tick one]
  - $\circ$  On paper
  - On devices like mobiles/tablets/computers etc.
  - Online (Internet)
- **Support:** Support you get from teachers, school management, parents and peers regarding technology usage.

**Support** was measured by 10 questions based on 3 sub-ETDs and 10 dimensions. Out of 10, 6 questions were presented as statements along a 5-point Likert Scale. Scores were obtained by allocating numerical values to student's responses: Strongly Disagree was scored as 0 and Strongly Agree as 4. Other 4 were presented as multiple choice questions where respondents were asked to pick one. Differential weightages were given for each option of each question.

### **Questions:**

School management's encouragement:

- With regard to <u>School Management's(SM) encouragement</u> in using technology, choose the best preference [Tick one]
  - I am allowed to use technology whenever I have free time.
  - I am allowed to use technology on my own but only during specific class hours/timings.
  - I am allowed to use technology, but only in the presence of a supervisor or teacher.
  - I am not allowed to use technology on my own

Teacher's encouragement:

- With regard to <u>Teacher's encouragement</u> in using technology, my teacher [Tick one]
  - o insists upon using technology
  - encourages using technology
  - is neutral about the use of technology
  - discourages from using technology

### Parents' encouragement:

- With regard to <u>Parents' encouragement</u> in using technology, choose the best preference [Tick one]
  - They insist upon using technology
  - They encourage using technology
  - They neither encourage nor discourage using technology
  - They advise me not to use technology but will not restrict me.
  - My parents refrain me from using technology

• My parents are very particular that I have close to 100% attendance in school. [] *Assistance:* 

### • When I make <u>mistakes</u> using technology [Tick one]

- My classmates mock me
- My classmates don't care
- My classmates assist me in using technology

*Technology maintenance:* 

- My parents keep technology updated at home by software upgrades, hardware repairs etc.
- My parents always search and install new technology at home.
- School Management keeps technology updated at school by software upgrades, hardware repairs etc.

[ ]

• School Management installs new technology at school whenever available.

### Sharing technology:

My class mates readily share technology (Mobiles/Tables/Other devices) or information on technology with me.

[ ]

• Utility: How do you perceive the use of technology w.r.t your academic excellence?

**Utility** was measured by 10 questions based on 9 dimensions. All the questions were presented as statements along a 5-point Likert Scale. Scores were obtained by allocating numerical values to student's responses: Strongly Disagree was scored as 0 and Strongly Agree as 4. **Ouestions:** 

### More time:

• I spend more time engaged in course activities in those courses/subjects that require me to use technology. [ ]

Subject Interest:

Teacher's use of technology has increased my interest in subject matter. Also mention the specific subject(s).

Outcome via marks:

• I get better grades/marks in subjects that use technology. Also mention the specific subject(s). [ ]

Comprehension:

• The use of technology in classes has helped me better understand complex/abstract concepts.

[ ]

#### Communication:

Use of technology has helped me better communicate with teacher and class mates through email, mobile or internet etc.

### Feedback:

• The use of technology has resulted in quick and accurate feedback of my learning.

### [ ]

#### Pace of learning:

- Technology enables me to learn at my own pace. [] Self-learning:
  - Technology enables me to learn on my own without any help from others.[ ]

Since the study is based out of India, we considered an extra dimension 'Utility' to fit the Indian context.

### **Teachers' questionnaire:**

Dimensions chosen are:

• **Proficiency:** How familiar you are with the use of technology and how often you use the technology in school

**Proficiency** was measured by two questions based on two dimensions. The two dimensions are Familiarity/Expertise in using the technology and Frequency of usage. The respondents were asked to rate their level of proficiency on a scale of 0-4 (Unfamiliar, Beginner, Average, Advanced and Expert) for the first question. For the second question, the respondents were asked to rate the usage of each of the technology on a scale of 0-4 (Never/Very rare, Monthly once, Weekly Once, Weekly Thrice, Daily).

### **Questions:**

*Familiarity/Expertise:* 

For each technology listed below, rate your proficiency/familiarity in using it on a scale of 0 to
4. Mention the number in Table 1 based on Table 2.

Table 1

Computer/LaptopMobileTabletMobile AppsInternetProgrammingMicrosoft ExcelMicrosoft Power PointMicrosoft Word

Unfamiliar	0
Beginner	1
Average	2
Advanced	3
Expert	4

Table 2

Frequency of Usage:

• With reference to your subject, indicate **how often** you are using these technologies in **school** on a scale of 0 to 4. Mention the number in Table 3 based on Table 4.

Table 3

Computer/Laptop	
Mobile	
Tablet	
Mobile Apps	
Internet	
Programming	
Projector	
Microsoft Excel	

Table 4

Never/Very rare	0
Monthly once	1
Weekly once	2
Weekly thrice	3
Daily	4

Microsoft Power Point	
Microsoft Word	

• Attitude: How do you feel about using the technology

Attitude was measured by 8 questions based on 3 sub-ETDs and 8 dimensions. The three sub ETDs are Technology importance, Technology enjoyment and Adaptability to new things. Out of 8 questions, 4 were presented as statements along a 5-point Likert Scale. Scores were obtained by allocating numerical values to student's responses: Strongly Disagree was scored as 0 and Strongly Agree as 4. Other 4 were presented as multiple choice questions where respondents were asked to pick one. Differential weightages were given for each option of each question.

### **Questions:**

### Future Job Prospects:

- Keeping in mind your job prospects in future choose one of the following. [Tick one]
  - Technology in schools is irrelevant
  - Technology in schools might be relevant but might not play an important role.
  - o Technology in schools is necessary

### Extent of technology usage:

- Which of the following better describes your preference with respect to use of technology in your classes [Tick one]
  - I prefer teaching in classes that use no technology
  - o I prefer teaching classes that use limited technology
  - I prefer teaching classes that use technology extensively.

### Reaction to new technology:

- When I hear of a new technology [Tick one]
  - o I ignore
  - o I try to get some first-hand information
  - I am curious about new technologies and look for trying them out

### Learning new things:

• I believe that knowledge of technology gives me opportunities to learn new things

### Apart from curriculum:

• I believe that knowledge of technical devices like Mobiles, Tablets, Laptops and others is very important in my day to day life. []

[ ]

[ ]

### Curriculum Planning:

• I believe that knowledge gives me Freedom and Flexibility to be creative in developing the curriculum, selecting activities and developing content.[ ]

Confidence to try out new things:

• I am confident to use technology in front of others without the fear of making any mistakes.

#### Integration:

- The available technology in school fits my style of teaching []
- **Interest**: Willingness to use technology for academic purposes

**Interest** was measured by 6 questions based on 6 dimensions. Out of 6, 4 questions were presented as multiple choice questions where respondents were asked to pick one. Differential

weightages were given for each option of each question. Other 2 questions were presented as statements along a 5-point Likert Scale. Scores were obtained by allocating numerical values to student's responses: Strongly Disagree was scored as 0 and Strongly Agree as 4. **Questions:** 

Doubt Clarification:

- I prefer to provide <u>clarification to student doubts</u> [Tick one]
  - In Person
  - Through emails/mobiles etc.
  - By asking them to refer to an online website.

### Preparation:

- In order to prepare myself for a topic, I prefer to [Tick one]
  - Read text book or other books
  - Read digital copies on some devices.
  - Search online

### Exam Process:

- I wish to conduct <u>exams/assignments</u> [Tick one]
  - $\circ$  On paper
  - On technology devices like mobiles/tablets/computers etc.
  - Online (Internet)

Mode of teaching:

- In class [Tick one]
  - I prefer teaching to be on black/white/green boards
  - I prefer to be taught using projectors(Power Point presentations)

### Alternatives to traditional means:

 To teach a topic in better way I prefer video presentations or simulations over conventional methods

Self-Learning Encouragement:

- I recommend students to lookup content online for better understanding.[ ]
- Support: Support you get from school management and peers regarding technology usage.

**Support** was measured by 7 questions based on 2 sub-ETDs and 6 dimensions. Out of 7, 6 questions were presented as statements along a 5-point Likert Scale. Scores were obtained by allocating numerical values to student's responses: Strongly Disagree was scored as 0 and Strongly Agree as 4. Other question was presented as multiple choice questions where respondents were asked to pick one. Differential weightages were given for each option.

School management's encouragement:

- School Management [Tick one]
  - Insists on use of technology
  - Encourages use of technology
  - Is neutral about use of technology
  - Discourages the use of technology

### Technology maintenance:

• School Management tends to keep technology updated and functional.[ ]

### Training:

• School Management offers necessary training to use and apply technology

[ ]

Sharing technology:

• Colleagues share their knowledge of technology with me. [] *Assistance:* 

• Colleagues readily assist in using new/unknown technologies [] Colleagues' Encouragement:

• Colleagues encourage me to use technology while teaching. [] Utility: How do you perceive the use of technology w.r.t your teaching?

**Utility** was measured by 8 questions based on 8 dimensions. Out of 8, 7 questions were presented as statements along a 5-point Likert Scale. Scores were obtained by allocating numerical values to student's responses: Strongly Disagree was scored as 0 and Strongly Agree as 4. Other question was presented as multiple choice question where respondents were asked to pick one. Differential weightages were given for each option.

### Productivity:

• I can teach more in given time if I use technology in classes [] *Control over student learning:* 

- I can track students' learning better with the use of technology [] *Better conveying of topics:* 
  - The use of technology has helped me to teach complex or abstract concepts in a better way.
     [ ]

Communication:

• The use of email, mobile and internet has helped me to communicate in a better way with my students. [ ]

Feedback:

• The use of technology has helped me in providing quick and accurate feedback.

[ ]

Preparation:

• The use of technology has made my class preparation easier as I can explore into different angles from different sources [ ]

Assessment:

- I feel I can assess my students in a better way with the help of technology.
  - [ ]

# **3.4 Sampling**

Extensive sampling was done for schools based on different parameters.

### 3.4.1 School categories chosen

- **Central Government Schools:** KV-IITM, KV-CLRI, KV-Ashok Nagar. This report talks about KV-IITM and its detailed analysis.
- State Government Schools: Schools under SSA

### **3.4.2 Logistics**

The permission for all the schools has been routed officially.

- Central Government Schools: A letter was sent to Assistant Commissioner via KV-IITM Principal by Prof. V. R. Muraleedharan through Dean, Academics, IITM requesting permission to conduct the survey in KV Schools. After getting the permission from AC-KVS, we sent letters to principals of each school to set the schedule of survey.
- State Government Schools: A letter was sent to the State Project Director-SSA requesting permission to conduct survey in SSA schools. After getting the permission, we went in person to meet the principal of G.H.S.S to set the schedule of survey.

### 3.4.3 Sample

The questionnaires were pilot tested at Vana Vani School-IITM for a sample of 15 students and 6 teachers.

The sample for the main study is from KV-IITM and G.H.S.S, Velachery Chennai. Actual surveyed number was high. These are the numbers after removing non-response sheets. The non-response rate is mentioned in brackets ().

School	Students				Teachers
	8 <sup>th</sup> Class	9 <sup>th</sup> Class	10 <sup>th</sup> Class	12 <sup>th</sup> Class	
KV-IITM	61	71	30	31	19
	(5)	(3)	(12)	(13)	(6)
G.H.S.S	143	144	-	-	48
	(25)	(20)			(5)

Two sections from each class have been surveyed in KV-IITM. Four sections from each class have been surveyed in G.H.S.S

# **3.5 Data Collection**

### 3.5.1 Logistics

After setting the schedule of survey, we went to the school and distributed questionnaires to the respondents. Respondents were allowed to take the sheets to their homes, fill and return on the next or the following day. No inconvenience to the regular teaching processes was caused.

### 3.5.2 Voluntary nature of Study

All the respondents were voluntary participants and no one was forced to take this study. Every respondent has to sign the consent form so as to ensure his/her consent for participation.

### 3.5.3 Data Entry

After collecting the questionnaires back from respondents, data has been entered in to Excel Sheets. The data has undergone several stages of filtering for robustness of data.

Firstly, non-response sheets have been removed based on condition that only those questionnaires will be considered which have at least 85% of questions answered. That is 35 questions in students' case and 26 questions in teachers' case.

After the removal of non-response sheets, a preliminary check of limits of answers on each of questions was done using simple functions in excel.

After this preliminary check, more than 40% of samples chosen at random were re-entered for robustness.

Removal of nonresponse sheets based on 85% criterion

Preliminary check of limits of answers on each of questions Re-entry of 40% of samples chosen at random.

### 3.6 Data Analysis

### 3.6.1 Reliability of Instruments/Data Set

The data were analyzed via SPSS 9.0 for Windows. Descriptive statistics were used to describe and summarize the properties of the mass of data collected from the respondents. Parametric statistics like ANOVA and t-test pair-wise comparison were conducted to analyze any differences between variables assumed to analyze the effectiveness of education technologies for teachers and students. Path Analysis was performed to analyze the level of dependencies between the assumed variables. A level of 0.05 was established a priori for determining statistical significance.

### 3.6.1.1 Cronbach's Alpha

Reliability of a measure is the ability of a construct to yield consistent results. Among the several techniques used to determine reliability (test-retest forms, equivalent forms, split-halves, internal consistency method), the internal consistency method was selected as it required only one administration and was considered to be the most effective in field studies (Bendig,1954; Nunnally, 1978). Internal consistency refers to the degree of inter-correlations among the items that constitute a construct. It is estimated using a estimation coefficient called Cronbach's Alpha. An alpha value of 0.60 or more is considered the criterion for determining internal consistency of a new construct and 0.70 for established constructs.

The Cronbach's Alpha is calculated for each instrument/variable and for the entire questionnaire. The results are discussed later

### 3.6.1.2 T-Test

The t-test assesses whether the means of two groups are statistically different from each other. This analysis is appropriate whenever you want to compare the means of two groups, and especially appropriate when the data sets are to be different from each other.

The T-Test is done for the entire data set of one school with other.

### 3.6.2 Variable Comparison

- Variable Comparison of each class within school.
- Variable Comparison of KV-IITM with G.H.S.S.
- Gender cut at each level

### 3.6.3 Path Analysis

Path Analysis is used to study direct and indirect effects among several dependent and independent variables simultaneously. This study used a five-variable path model which was an extension of a three-variable path model applied in Kadijevich, 2006. In order to estimate parameters in this model and its appropriateness, two parameters had to be made equal. A regression model was used to estimate the correlations among the four predictors (Attitude, Proficiency, Support and Utility) correlate, . However, such a model could not help us examine the indirect impacts of variables on Interest.

Path analysis is a straightforward extension of multiple regression. Its aim is to provide estimates of the magnitude and significance of hypothesized causal connections between sets of variables. This is best explained by considering a **path diagram**.



To construct a path diagram we simply write the names of the variables and draw an arrow from each variable to any other variable we believe that it affects. We can distinguish between input and output path diagrams. An **input path diagram** is one that is drawn beforehand to help plan the analysis and represents the causal connections that are predicted by our hypothesis. An **output path diagram** represents the results of a statistical analysis, and shows what was actually found.

To move from this input diagram to the output diagram, we need to compute path coefficients. A path coefficient is a **standardized regression coefficient** (**beta weight**). We compute these by setting up structural equations, in this case:

In this study Support is considered exogenous variable or variable as an input. Interest, Attitude, Utility and Proficiency are intermediate variables or endogenous variables while Interest is considered the output variable. The focus of this analysis is to find the correlations of other four variables with Interest.

```
Interest = b_{11}Support + b_{12}Proficiency + b_{13} Attitude + b_{14} Utility + e_1
```

Utility =  $b_{21}$ Support +  $b_{22}$ Proficiency +  $b_{22}$ Attitude +  $e_2$ 

Attitude =  $b_{31}$ Support +  $b_{22}$ Proficiency +  $e_3$ Proficiency =  $b_{41}$ Support +  $e_4$ 

Where  $b_{11}$ ,  $b_{12}$ ,  $b_{41}$  are path coefficients.

Values of  $e_1$ ,  $e_2$ ,  $e_3$ , and  $e_4$  are calculated as the square root of  $1-R^2$  from the regression equation for the corresponding dependent variable.

This study has Path Analyses at different levels.

- School level (KV-IITM and G.H.S.S, Velachery)
- Gender cut (male vs female in KV-IITM)
- Students with Technology at home vs Students without technology at home

The direct effect of one variable on other is determined by the value of path coefficient between those variables and the indirect effect between two variables is determined by multiplying the path coefficients of paths between both variables.

**Path coefficients** are standardized versions of linear regression weights which can be used in examining the possible causal linkage between statistical variables in the structural equation modelling approach. The standardization involves multiplying the ordinary regression coefficient by the standard deviations of the corresponding explanatory variable: these can then be compared to assess the relative effects of the variables within the fitted regression model.

Since there are 5 variables in our study with Support as Endogenous variable, 4 regression analysis were done in SPSS in order to determine all the path coefficients.

## 1<sup>st</sup> Regression:

First Regression is done between variables Support and Proficiency, where Support is taken as Independent variable and Proficiency is taken as Dependent variable. The values of variables Support and Proficiency are taken for the required sample and regression is done to determine the path coefficients.

The positive value of path coefficient greater than the significance value (5%) says that the increment of independent variable results in the increment of dependent variable. If path coefficient is less than significance level (positive or negative) the variables are independent. If path coefficient is negative then increment of independent variable will result in decrement of dependent variable.

### 2<sup>nd</sup> Regression:

Second Regression is done between variables Support, Proficiency and Attitude, where Support and Proficiency are taken as Independent variables and Attitude is taken as Dependent variable. The values of variables Support, Proficiency and Attitude are taken for the required sample and regression is done to determine the path coefficients.

### 3<sup>rd</sup> Regression:

Third Regression is done between variables Support, Proficiency, Attitude and Utility where Support, Proficiency and Attitude are taken as Independent variables and Utility is taken as Dependent variable. The values of variables Support, Proficiency, Attitude and Utility are taken for the required sample and regression is done to determine the path coefficients.

### 4<sup>th</sup> Regression:

Fourth Regression is done between variables Support, Proficiency, Attitude, Utility and Interest where Support, Proficiency, Attitude and Utility are taken as Independent variables and Interest is taken as Dependent variable. The values of variables Support, Proficiency, Attitude, Utility and Interest are taken for the required sample and regression is done to determine the path coefficients.

The relationship between the major output variable and all other variables is determined in this regression.

After all 4 Regressions the path coefficients values are used to determine the level of dependencies between variables.

Within a given path diagram, path analysis can tell us which are the more important (and significant) paths, and this may have implications for the plausibility of pre-specified causal hypotheses. But path analysis cannot tell us which of two distinct path diagrams is to be preferred, nor can it tell us whether the correlation between A and B represents a causal effect of A on B, a causal effect of B on A, mutual dependence on other variables C, D etc, or some mixture of these.

### 3.7. ETDs and their relationships

Class to Class trend refers to expected increase or decrease in ETD value with increase in class or standard. For example proficiency is expected to raise with class and hence Increase.

ETD	Class to	Relationship with other ETDs				
	Class	Utility	Proficiency	Interest	Support	Attitude
	trend					
Utility	Increase/	-	Reverse	Positive	Reverse	Reverse
	Decrease			High		
Proficiency	Increase	Positive	-	Positive	Reverse	Positive/
				High		Negative
Interest	Increase/	-	Reverse	-	Reverse	Reverse
	Decrease					
Support	Increase	Positive	Positive High	Positive	-	Positive
				High		High
Attitude	Increase/	Positive High	Reverse	Positive	Reverse	-
	Decrease					

Positive/Negative refers that either of the two relationships may occur.

Positive High refers that the relationship is a positive relationship and high correlation is expected between them.

### **CHAPTER 4**

### **RESULTS AND DISCUSSION**

### 4.1 Usage and Familiarity of Education Technologies in Schools by Students:

Questions were asked related to the usage of Education Technologies shown in Fig 4.1.1 and Fig 4.1.2.

The values on vertical axis represent the frequency of usage like

- 0(<0.5) Never/Very Rare
- 1(>0.5 and <1.5) Monthly Once
- 2(>1.5 and <2.5) Weekly Once
- 3(>2.5 and <3.5) Weekly Thrice
- 4(>3.5) Daily



Fig 4.1.1

The Graph in Fig 4.1.1 shows the average usage of various technologies in School overall

**Key Points:** Computer is mostly used in many school followed by software like Microsoft Word, Power point and Excel.



Fig.4.1.2

The Graph in Fig 4.1.2 shows the average usage of technologies for each class individually



The Graphs in Fig 4.1.3, Fig 4.1.4 and Fig 4.1.5 shows the comparisons of usages of technologies Computer, Internet and Mobile Apps respectively for 8<sup>th</sup> and 9<sup>th</sup> classes in KV-IITM and GHSS.

**Key Points:** It can be seen that usage of Computer and Internet is more for KV-IITM than G.H.S.S for both 8<sup>th</sup> and 9<sup>th</sup> classes, whereas usage of mobile apps for 8<sup>th</sup> GHSS students is more than 8<sup>th</sup> KV IITM.



Questions were asked to students in order to measure their proficiency in various Education Technologies that they use in School or at Home and results for 3 Very Important Technologies are presented below.

Fig 4.1.6,4.1.8 and 4.1.9 shows the Computer Familarity of KV-IITM students classwise, genderwise and as a whole respectively.

Fig 4.1.7 shows comparison of Computer Familiarity for students of KV-IITM and GHSS.



Fig 4.1.10,4.1.12 and 4.1.13 shows the Internet Familarity of KV-IITM students classwise, genderwise and as a whole respectively.

Fig 4.1.11 shows comparison of Internet Familiarity for students of KV-IITM and GHSS.



Fig 4.1.14

Fig 4.1.15

**Mobile Apps Familiarity** 



Fig 4.1.14,4.1.16 and 4.1.17 shows the Mobile Apps Familarity of KV-IITM students classwise, genderwise and as a whole respectively.

Fig 4.1.18 shows comparison of Mobile Apps Familiarity for students of KV-IITM and GHSS

## 4.2 Impact of Education Technologies Usage in Schools:

Some of the questions in questionnaire presented to students focused on finding the subject for which they use Education technologies relatively higher and also to find the influence of these Education Technologies on Interest and Grades for any subject in their curriculum.

Subject	8th	9th	10th	12 <sup>th</sup>
Computer	64.15%	75.36%	31.25%	56.66%
Science				
Science	33.96%	18.84%	50%	36.67%
Social	1.89%	5.80%	12.5%	0%
Maths	0%	0%	6.25%	0%
Others	0%	0%	0%	6.67%
		Fig 4.2.1		

The above table in Fig 4.2.1 shows the percentage of students who feels that Education Technologies are used relatively more for that particular subject.





The Pie diagrams in Fig 4.2.2 shows the percentage of Students who feels that the Interest towards that particular Subject has been increased due to intervention of Education Technologies class-wise.

For all classes in KV-IITM many students reported that they developed their interest in subject Science.





The pie chart in Fig 4.2.3 shows the percentage of Students who feels that the Interest towards that particular Subject has been increased due to intervention of Education Technologies taken as a whole.

### **Observations**:

From Fig 4.2.2 and Fig 4.2.3, it can be observed that the a very high percentage of students about 73% feel that their interest has been developed due to the usage of Education Technologies but in terms of usage, Science stands in second position.

Computer Sciences, the subject for which many students reported that education technologies are mostly used, about 17% reported that interest has been developed due to the usage of Education Technologies.



The Pie diagrams in Fig 4.2.4 shows the percentage of Students who feels that the Interest towards that particular Subject has been increased due to intervention of Education Technologies class-wise.



Subject grades



The Pie chart in Fig 4.2.5 shows the percentage of Students who feels that the Interest towards that particular Subject has been increased due to intervention of Education Technologies taken as a whole.

### **Observations:**

From the Figures 4.2.4 and 4.2.5, 75% students reported that their grades has been improved in Science due to Intervention of Education Technologies and above 15% Students reported that their grades in Computer Sciences has been improved due to Intervention of Education Technologies.

L							
2							
3	Count of S.No	Column Labels 💌					
ţ.	Row Labels 🂵	8	9	10	12	Grand Total	
5	TRUE	92.50%	92.31%	43.48%	96.15%	84.38%	
5	FALSE	7.50%	7.69%	56.52%	3.85%	15.63%	
7	Grand Total	100.00%	100.00%	100.00%	100.00%	100.00%	
3							
Э							
0							



The above table helps in analysing the percentage of students who reported same subject for both development of Interest and Improvement of Grades.

From the results, it can be seen that in 8<sup>th</sup>, 9<sup>th</sup> and 12<sup>th</sup> classes, more than 90% reported same subject and in 10<sup>th</sup> class almost 50% reported the same subject for both development of Interest and Improvement of Grades from which It can be said that Development of Interest implies and affects Improvement of Grades directly.

# **4.3 Variables and their relationships for KV-IITM Students:**

### 4.3.1 Cronbach Alpha:

For entire questionnaire Reliability Analysis was done using SPSS software and results are obtained as shown in below table

### **Reliability Statistics**

	Cronbach's Alpha Based on				
Cronbach's Alpha	Standardized Items	N of Items			
.86	.86	6			
Fig 4.3.1					

The value of .60 and above on Cronbach's Alpha is considered reliable. Values of .80 and above are considered very reliable in statistical analysis.

Reliability Analysis is done for each variable individually and results are obtained as shown in below table

Variable	Cronbach Alpha			
Proficiency	0.812			
Utility	0.779			
Interest	0.754			
Support	0.715			
Attitude 0.719				
Fig 4.3.2				

From above table, Cronbach alpha of each variable is greater than 0.6 and hence the data can be considered reliable.

### **4.3.2 Correlation Matrix:**

This is calculated based on Pearson Correlation method

General rule is that, positive correlation shows direction of relationship and number gives the strength of relationship between variables. But this is calculated based on the principle that all the other variables are kept constant or it shows only direct relationships between two variables without considering interdependence with other variables.

For KV-IITM Students, the Correlation Matrix is observed as

		Utility	Support	Attitude	Interest	Proficiency
Utility	Pearson Correlation		.444	.658	.353	.337
	Sig. (2-tailed)		.00	.00	.00	.00
	Ν	19	19	19	19	19
Support	Pearson Correlation	.444		.271	.253	.214
	Sig. (2-tailed)	.00		.00	.00	.00
	Ν	19	19	19	19	19
Attitude	Pearson Correlation	.658	.271		.425	.192
	Sig. (2-tailed)	.00	.00		.00	.00
	Ν	19	19	19	19	19
Interest	Pearson Correlation	.353	.253	.425		.13
	Sig. (2-tailed)	.00	.00	.00		.05
	Ν	19	19	19	19	19
Proficiency	Pearson Correlation	.337	.214	.192	.13	
	Sig. (2-tailed)	.00	.00	.00	.05	
	Ν	19	19	19	19	19

Correlations

\*\*. Correlation is significant at the 0.01 level (2-tailed).

The above Correlation matrix shows no '0's hence there are no two variables independent of each other.

# 4.3.3 Path Analysis:

### 4.3.3.1 Path Analysis for KV-IITM Students:

A 5 variable Path Analysis is done using SPSS software. Support variable is taken as exogenous variable while the remaining variables are taken as endogenous variables and Linear Regression was performed 4 times to find path coefficients.

## 1<sup>st</sup> Regression:

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.214	.04	.04	.1457		
Fig 4.3.3.1.1						

# Model Summary

		Unstandardiz	ed Coefficients	Standardized Coefficients		
Model		В	Std. Error	Beta	t	Sig.
1	(Constant)	.33	.04		7.59	.00
	Support	.23	.07	.21	3.02	.00

a. Dependent Variable: Proficiency

Fig 4.3.3.1.2

The "e" values (roughly error variance) are computed as  $\sqrt{(1-R^2)}$ 

Hence "e" value for Proficiency variable is equal to 0.976

# 2<sup>nd</sup> Regression:

### **Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.304	.09	.08	.1326		
Fig 4.3.3.1.3						

<b>Coefficients</b> <sup>a</sup>
----------------------------------

		Unstandardized Coefficients		Standardized Coefficients		
Model		В	Std. Error	Beta	t	Sig.
1	(Constant)	.42	.04		9.16	.00
	Support	.24	.07	.24	3.41	.00
	Proficiency	.13	.06	.14	1.97	.04

a. Dependent Variable: Attitude

Fig 4.3.3.1.4

"e" value for Attitude variable is equal to 0.952

# 3<sup>rd</sup> Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.733	.53	.53	.1110

Fig 4.3.3.1.5

### **Coefficients**<sup>a</sup>

		Unstandardized Coefficients		Standardized Coefficients		
Model		В	Std. Error	Beta	t	Sig.
1	(Constant)	01	.04		21	.83
	Support	.30	.06	.25	4.91	.00
	Proficiency	.19	.05	.17	3.43	.00
	Attitude	.64	.06	.55	10.68	.00

a. Dependent Variable: Utility

"e" value for Utility Variable is equal to 0.6856

Fig 4.3.3.1.6

# **Regression 4:**

Model Summary								
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate				
1	.452	.20	.18	.2374				

Fig 4.3.3.1.7

		Unstandardiz	ed Coefficients	Standardized Coefficients		
Model		В	Std. Error	Beta	t	Sig.
1	(Constant)	14	.09		-1.49	.13
	Support	.24	.14	.22	1.74	.08
	Proficiency	.04	.12	.02	.35	.72
	Attitude	.65	.16	.34	3.99	.00
	Utility	.10	.15	.34	.64	.52

### **Coefficients**<sup>a</sup>

a. Dependent Variable: Interest

Fig 4.3.3.1.8

"e" value for Utility Variable is equal to 0.8921

After	All 4 R	Regressions	the path	coefficients	are obtained	as shown	below
1 11 001		egrebbionb	me paul	coefficients	are octamed	ab biio mii	001011

Variable		Beta Coefficients								
	Utility	Jtility Proficiency Interest Support Attitude								
Utility	-	-	.341	-	-					
Proficiency	.146	-	.025	-	.140					
Interest	-	-	-	-	-					
Support	.256	.214	.227	-	.241					
Attitude	.555	-	.345	-	-					



From Path Diagram, we could note that

- 1. Support has direct effect Interest
- 2. Proficiency has no direct effect on Interest but has some indirect effect through Attitude
- 3. Attitude has direct effect on Interest.
- 4. Utility has direct effect on Interest.

# 4.3.3.2. Path Analysis for KV-IITM Students – Male vs Female

Variable	Beta Coefficients										
	Utility		Prof	Proficiency		Interest		Support		Attitude	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Fen	
Utility	-	-	-	-	.335	.344	-	-	-	-	
Proficiency	.224	.132	-	-	036.	.030	-	-	027	.26	
Interest	-	-	-	-	-	-	-	-	-	-	
Support	.213	.278	.202	.223	.234	.225	-	-	.239	.23	
Attitude	.559	.571	-	-	.208	.475	-	-	-	-	





Similarities	Differences
Positive Direct and similar effect of Support	Small negative direct(almost negligible)
on Utility, Attitude, Proficiency and Interest	effect of Proficiency on Attitude (found only
	for male students)
Positive direct and similar effect of Attitude	Small negative direct(almost negligible)
on Utility	effect of Proficiency on Interest (found only
	for male students)
Positive Direct and similar effect of Utility	High positive direct effect of Attitude on
on Interest	Interest for female students than male
	students
Positive Indirect and similar effect of	
Proficiency on Interest through Utility	

# 4.3.3.3.Path Analysis for KV-IITM Students- Technology at Home vs No technology at Home:

Except Mobile all others are considered as Technology for this particular Analysis. This analysis is aimed to see the perception differences between students who use any sort of technology and students who does not use anything at home.

Variable	Beta Coefficients									
		Utility	Pr	oficiency	In	iterest		Support	A	Attitude
	Tech.	No Tech	Tech	No Tech	Tech	No Tech	Tech	No Tech	Tech	No T
Utility	-	-	-	-	.342	147	-	-	-	-
Proficiency	.186	.020	-	-	.057	490	-	-	.059	.424
Interest	-	-	-	-	-	-	-	-	-	-
Support	.268	.190	.176	.194	.228	.131	-	-	.212	.373
Attitude	.565	.550	-	-	.305	.848	-	-	-	-





Similarities	Differences
Positive Direct and almost similar effect of	High Negative direct effect of Proficiency on
Support on Utility, Proficiency, Attitude and	Interest (found only for No-tech students)
Interest.	
Positive Direct and similar effect of	High Positive direct effect of Proficiency on
Attitude on Utility	Attitude (found only for No-tech students)
	and on Utility(found only for Tech Students)
	High positive direct effect of Attitude on
	Utility (found only for No-tech students)
	High positive direct effect of Attitude on
	Interest (found only for No-tech students)
	Negative direct effect of Utility on Interest
	(found only for No-Tech students)

### 4.3.4. T-Test:

T-Test was done for 8<sup>th</sup> and 9<sup>th</sup> classes and the results are observed as shown in table below

		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference			
Utility	Equal variances assumed	-1.18	13	.23	0316			
	Equal variances not assumed	-1.17	121.97	.24	0316			
Support	Equal variances assumed	50	13	.61	0116			
	Equal variances not assumed	49	113.09	.62	0116			
Attitude	Equal variances assumed	26	13	.79	0061			
	Equal variances not assumed	26	117.98	.79	0061			
Interest	Equal variances assumed	.91	13	.36	.0434			
	Equal variances not assumed	.92	129.94	.35	.0434			
Proficiency	Equal variances assumed	.19	13	.84	.0049			
	Equal variances not assumed	.19	127.87	.84	.0049			
		Fig 4.4.1						

#### **Independent Samples Test**

#### **Observations:**

The results from above table tells that mean of variables like Utility, Support and Attitude is greater for 8<sup>th</sup> class students compared to 9<sup>th</sup> class students, but mean for variables Interest and Proficiency is higher for 9<sup>th</sup> class students than 8<sup>th</sup> class students.

T-Test was done for 9<sup>th</sup> and 10<sup>th</sup> classes and the results are observed as shown in table below

#### **Independent Samples Test**

#### t-test for Equality of Means t df Sig. (2-tailed) Mean Difference .0683 Utility 1.91 9 .05 Equal variances assumed Equal variances not assumed 1.68 42.41 .0683 .10 9 Support Equal variances assumed 3.08 .00 .0798 Equal variances not assumed 3.03 52.55 .0798 .00 Attitude Equal variances assumed 1.20 9 .23 .0353 Equal variances not assumed 1.08 44.11 .28 .0353 Interest Equal variances assumed .24 9 .81 .0147 Equal variances not assumed .24 58.53 .80 .0147 Proficiency Equal variances assumed 1.32 9 .18 .0448 Equal variances not assumed 1.25 48.59 .21 .0448

Fig 4.4.2

### **Observations:**

The results from above table tells that mean of all variables Utility, Support, Interest, Proficiency and Attitude is greater for 9<sup>th</sup> class students compared to 10<sup>th</sup> class students.

T-Test was done for 9<sup>th</sup> and 10<sup>th</sup>

classes and the results are observed as shown in table below

#### **Independent Samples Test**

			t-test fo	test for Equality of Means		
		t	df	Sig. (2-tailed)	Mean Difference	
Utility	Equal variances assumed	-1.34	5	.18	0610	
	Equal variances not assumed	-1.33	53.94	.18	0610	
Support	Equal variances assumed	-1.33	5	.18	0470	
	Equal variances not assumed	-1.33	57.20	.18	0470	
Attitude	Equal variances assumed	-1.36	5	.17	0521	
	Equal variances not assumed	-1.36	57.18	.17	0521	
Interest	Equal variances assumed	95	5	.34	0607	
	Equal variances not assumed	95	56.92	.34	0607	

Proficiency	Equal variances assumed	59	5	.55	0233	Fig 4.4.3
	Equal variances not assumed	59	54.65	.55	0233	

**Observations:** 

The results from above table tells that mean of all variables Utility, Support, Interest, Proficiency and Attitude is greater for 12<sup>th</sup> class students compared to 10<sup>th</sup> class students.

T-Test was done for Male and Female Students of KV-IITM and the results are obtained as shown in the table below

		t-test for Equality of Means			
		t	df	Sig. (2-tailed)	Mean Difference
Utility	Equal variances assumed	.46	18	.64	.0111
	Equal variances not assumed	.47	185.87	.63	.0111
Support	Equal variances assumed	.36	18	.71	.0072
	Equal variances not assumed	.36	183.59	.71	.0072
Attitude	Equal variances assumed	.14	18	.88	.0028
	Equal variances not assumed	.14	184.79	.88	.0028
Interest	Equal variances assumed	.45	18	.65	.0174
	Equal variances not assumed	.45	183.26	.65	.0174
Proficiency	Equal variances assumed	60	18	.54	0132
	Equal variances not assumed	60	185.59	.54	0132

#### Independent Samples Test

Fig 4.4.4

### **Observations:**

The results from above table tells that mean of all variables Utility, Support, Interest and Attitude except Proficiency is greater for Male students compared to Female students, whereas mean of Proficiency is higher for Female students.

T-test was done for the Students of KV-IITM and GHSS and the results are obtained as shown in the table below

		t-test for Equality of Means				
		t	df	Sig. (2-tailed)	Mean Difference	
Utility	Equal variances assumed	4.80	47	.00	.0737	
	Equal variances not assumed	4.83	420.00	.00	.0737	
Support	Equal variances assumed	1.65	47	.09	.0211	
	Equal variances not assumed	1.66	413.99	.09	.0211	
Attitude	Equal variances assumed	3.25	47	.00	.0410	
	Equal variances not assumed	3.23	400.22	.00	.0410	
Interest	Equal variances assumed	6.77	47	.00	.1607	
	Equal variances not assumed	6.70	396.31	.00	.1607	
Proficiency	Equal variances assumed	15.12	47	.00	.2288	
	Equal variances not assumed	15.54	447.58	.00	.2288	
Fig 4.4.5						

#### Independent Samples Test

### **Observations:**

The results from above table tells that mean of all variables Utility, Support, Interest, Proficiency and Attitude is greater for KV-IITM students compared to GHSS students.

# 4.3.5. Variable Comparison

4.3.5.1. Class vs Class in KV IITM:





### Key Findings:

- All variables mean drop from 9<sup>th</sup> to 10<sup>th</sup> classes
   All variables mean raise from 10<sup>th</sup> to 12<sup>th</sup> standards.

### 4.3.5.2. Male Students vs Female Students. KV-IITM:



Fig 4.5.2.1

### 4.3.5.3. KV-IITM vs GHSS:



Fig 4.5.3.1

Key Factors:

- 1. All Variables are higher for KV-IITM students than GHSS students
- 2. Support and Attitude variables difference is very less when compared to difference of other variables between these two schools.



4.3.5.4 Tech at Home Students vs No-Tech at Home Students, KV-IITM:



Key Findings:

1. All Variables are higher for Tech at home students than No-Tech at home students

### 4.3.6 Technology Score Comparison

Technology Score is defined as sum of all variables as a special variable which can actually get the entire questionnaire's data in variable. The 'sum' might not represent the actual value as fundamentally by taking sum of variables, we are equating the weights of each variable. The score calculation is debatable and open for further tweaking. Broadly, higher the technology score, higher is the respondent's inclination towards using technology.



### 4.3.6.1 Class vs Class within KV-IITM:



Key Findings:

1. Technology score for all classes in KV-IITM lies between 2.5 to 3



### 4.3.6.2 KV-IITM vs GHSS

Key Finding:

1. Technology Score for GHSS is less than KV-IITM

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# 4.4 Analysis for Teacher responses KV-IITM:

### 4.4.1 Cronbach's Alpha

For entire questionnaire Reliability Analysis was done using SPSS software and results are obtained as shown in below table

#### **Reliability Statistics**

Cronbach's Alpha	N of Items		
.95	4		
Fig 4.7.1			

Reliability Analysis was done for each variable individually and the results are obtained as shown in the table below

Variable	Cronbach's Alpha			
Interest	.841			
Proficiency	.775			
Utility	.785			
Support	.819			
Attitude	.866			
Fig 4.7.2				

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### 4.4.2 Path Analysis:

Path coefficients are obtained as below

Variable	Beta Coefficients				
	Utility	Proficiency	Interest	Support	Attitude
Utility	-	-	-0.354	-	-
Proficiency	.282	-	.312	-	.348
Interest	-	-	-	-	-
Support	.106	.370	.162	-	.742
Attitude	.631	-	.760	-	-



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From path diagram, It can be said that

- 1. Support has direct effect on Interest
- 2. Proficiency has direct effect on Interest
- 3. Attitude has direct effect on Interest
- 4. Utility has negative effect on interest.

# 4.5. <u>Barriers for using Education Technologies:</u>

Students were asked to choose the barriers they face in using Education Technologies by providing them a list of potential and possible barriers they could face in their classroom as well as at home. Students were given a chance to select more than one barrier and the results obtained are as shown below

Barriers	Frequencies
It feels like extra work with little connection to course	48
It deviates me from my academic curriculum	36
I don't have necessary skills	15
It's too expensive	44
I don't have technical support I need	32
I don't have sufficient access to technologies	38
The applications don't run on my computer/tablet/mobile	12
I don't have reliable access to Internet	26
Slow internet/computer speed	49
There are no barriers	34

Fig 4.8.1

### Key Points:

- 1. From above Table it is clear that many people feel that Slow Internet/Computer speed Hence, School authorities might check their Computer specifications and update if possible so that this cannot be a barrier to students anymore.
- Second highest set of students feels that these Education Technologies feels like extra work with little connection to course.
   Education Technologies must be used as aid to assist students in process of learning. Hence School authorities might recheck the purpose of using Education Technologies and make sure that Education Technologies are more connected to course work and assist them in process of learning.
- 3. Third highest set feels that students have no sufficient access to technologies. This barrier needs to be addressed by School Management as well as Parents.

# **CHAPTER 5**

## **IMPLICATIONS FOR PRACTICE**

The chapter deals with possible recommendations to key stake-holders in school education

The Key Stake-holders are:

- 1. Students
- 2. Parents
- 3. Teachers
- 4. School Authorities
- 5. Policy makers

### 5.1. Recommendations to School Authorities:

- School Authorities must make sure that the Education Technologies that they introduce in academic curriculum must not act as burden to students in addition to regular work load but must assist them in learning process and development of interest towards certain topic. School authorities may focus more upon integration of technology. Technology shows more benefits of used as a facilitator to learning rather than as a subject.
- School Authorities must make sure to update technology and avail them to students whenever they need it and make sure to present video demonstrations to complex topics which students find difficult to understand.
- School Authorities might help students with no technologies at home to improve their proficiency as they perceive Technology as something which has negative impact on interest. Hence special efforts must be made to those students.
- School authorities may put in efforts so as to let students know about their Utility in using educational technologies since it has direct effect on Interest. Hence there must be a system in school which helps students to perceive their growth in interest due to these education technologies.

### **5.2 Recommendations to Parents:**

- Parents could help their children to maintain a positive attitude towards technology by providing them with necessary technologies since attitude has a direct and highest effect on Interest
- Parents are the key support system to children since support have positive direct effect on interest they should support students in every way possible like keeping tech updated at home or suggest new ways and tech to help their students in their academic learning.

### 5.3. Conclusive Observations for Policy makers

- Policy makers may include the introduction and installation of technologies in schools as a part of their policy, only then can schools, particularly government schools can have significant development.
- Policy makers may make sure that availability and accessibility of technologies in school is no more a concern. G.H.S.S, an SSA school is low on all variables owing mainly to the lack of availability of technologies at school.
- Policy makers can improve the use of technologies at school by providing subsidies on some of the technologies so that school authorities can install them.
- Policy makers can also help teachers by providing sufficient training with latest technologies that can help them to teach more effectively to students.

### **5.4 Further Research**

• This study tried to first apply a theoretical framework (hypothesis) relating Interest, Attitude, Proficiency, Utility and Support. The framework can be made more robust. Also, the questionnaire can be improved by including more dimensions covering all the heterogeneity of students and teachers. The scope of the study can be improved by increasing the geographical area and categories covered. Further research can also be done so as to check for any potential variables missed out in this study but have strong correlations with other variables. Also after implementing the recommendations as a pilot project, a new study can be designed so as to measure any change in effectiveness. A strong feedback loop can be formed with schools for refining the study.

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#### APPENDIX

#### 1. Students Questionnaire.

🔅 Which of the following devices do you have at home? Check all that apply. [Multiple Choices]

1)	Computer	[]	
2)	Mobile		[]
3)	Tablet		[ ]
4)	Laptop		[]
5)	Other. Mention		

☆ Do you have internet access at home? (Yes/No)

☆ With regard to school system in general, I personally don't believe/like to come to school and study. I can even study at home (Strongly Agree/Agree/Neutral/Disagree/Strongly Disagree)

Choose your preference with regard to studying/learning in general

- a) I study by myself without anyone forcing me.
- b) I will study only when my parents or teachers force me to study.
- c) I am not too keen on studies even when forced to study.

#### **Questionnaire:**

1) Which of the following technologies do you have (or) use at school? Tick all that apply. [Multiple Response]

🜣 Computer	[ ]	
🌣 Mobile		[]
🌣 Tablet		[]
🌣 Mobile Apps	[ ]	
🌣 Projector		[]
🌣 Internet Access		[]
🌣 Programming	[]	
🛱 Computer Software		
<ul> <li>Microsoft Excel</li> </ul>	[]	
<ul> <li>Microsoft Power Point</li> </ul>	[]	
<ul> <li>Microsoft Word</li> </ul>	[ ]	
🜣 Others. Mention below		

<sup>2)</sup> For each technology listed below rate your **proficiency/familiarity** using it on a **scale of 0 to 4**. Mention the number in Table 1 based on Table 2.

Table 1

Computer/Laptop	
Mobile	
Tablet	
Mobile Apps	
Internet	
Programming	
Microsoft Excel	

Table 2

Unfamiliar	0
Beginner	1 <sub>Page</sub>   60
Average	2
Advanced	3
Expert	4

Microsoft Power Point	
Microsoft Word	

3) Mention a subject with the highest technology usage in your curriculum.

4) With reference to the **subject chosen above**, indicate **how often** you are using these technologies in **school** on a scale of 0 to 4. Mention the number in Table 3 based on Table 4.

Table 3	r	Table 4
Computer/Laptop		
Mobile		
Tablet		
Mobile Apps		
Internet		
Programming		
Projector		
Microsoft Excel		
Microsoft Power Point		
Microsoft Word		

Never/Very rare	0
Monthly once	1
Weekly once	2
Weekly thrice	3
Daily	4

# Read the following statements and rate it on a scale of 0 to 4 regarding the technologies you ticked in Question 1. Write number in the box.

	D' 1	NT / 1 O		
Strongly Licograp ()	110000000	Nontrol 7	$\Lambda \alpha r \Delta \Delta A$	Strongly Agree /
	171542100-1	$1 \times 10^{11} \text{ m}^{-2}$	A g (U = .)	

- 5) When I am presented with a new task, I am able to apply what I have learnt before for doing it.
- 6) I believe that knowledge of technology gives me opportunities to learn new things.
- 7) I believe that knowledge of technical devices (Mobiles/Tables/Computers) helps a lot in my daily activities.

1

[ ]

[ ]

[ ]

[ ]

1

- 8) I believe that I can improve my language skills if I use Internet/Computers. []
- 9) Classes became more interesting after technology is introduced since I could now see more images and videos which I could not have seen in traditional classes.
- 10) I am confident to use technology in front of others without the fear of making any mistakes.
- 11) My parents keep technology updated at home by software upgrades, hardware repairs etc.
- 12) School Management keeps technology updated at school by software upgrades, hardware repairs etc.

#### ĺ

- 13) My parents always search and install new technology at home.
- 14) School Management installs new technology at school whenever available. [
- 15) My parents are very particular that I have close to 100% attendance in school.[ ]
- 16) My class mates readily share technology (Mobiles/Tables/Other devices) or information on technology with me.

17) I spend more time engaged in course activities in those courses/subjects that require me to use technology. [ ] 18) Teacher's use of technology has increased my interest in subject matter. Also mention the specific subject(s). [ ] 19) I get better grades/marks in subjects that use technology. Also mention the specific subject(s). [ ] 20) The use of technology in classes has helped me better understand complex/abstract concepts. ſ 1 21) Use of technology has helped me better communicate with teacher and class mates through email, mobile or internet etc. ſ 22) The use of technology has resulted in quick and accurate feedback of my learning. [ ] 23) Technology enables me to learn at my own pace. [ ] 24) Technology enables me to learn on my own without any help from others. [ ] 25) Keeping in mind your job prospects in future choose one of the following. [Tick one] Technology in schools is irrelevant a. Technology in schools might be relevant but might not play an important role. b. Technology in schools is necessary c. 26) Which of the following best describes your preference with regard to use of technology in your classes. [Tick one] I prefer taking classes that use no technology a. I prefer taking classes that use limited technology features (only for some classes). b. c. I prefer taking classes that use technology (every class makes use of technology). 27) When given a choice, I prefer Playing indoor/outdoor games [ ] or Playing on Mobile/Computer. [ ] a. Drawing on a paper [ ] or Drawing on a device (Computer/Tablet etc.) [ ] b. c. Using Social Media (FB, Twitter) [ ] or Participating in social events. [ ] 28) When I hear of a new technology [Tick one] a. I ignore b. I try to get some first-hand information c. I am curious about new technologies and look for trying them out 29) When in doubt about some topic [Tick one] a. I ask teacher/classmates in person b. I talk to classmates/teacher via emails/mobiles etc. Search online for the topic or use a mobile application. c. 30) To learn about new things/topics [Tick one] a. I prefer reading a book that contains the topic I prefer reading an e-book/pdf on a device like mobile/tablet/computer etc. b. c. I search for it online or use a mobile application.

### 31) In class, to <u>make notes</u> [Tick one]

- a. I prefer doing it on a notebook
- b. I prefer doing it on devices like mobile/tablet/computer
- c. I prefer taking photocopies of my class mates' notes

#### 32) To visualize and better understand a concept [Tick one]

- a. I prefer to watch real demonstration like prototype/live experiment
- b. I prefer to watch video demonstrations
- 33) In class [Tick one]
  - a. I prefer teaching to be on black/white/green boards
  - b. I prefer to be taught using projectors(Power Point presentations)

#### 34) I prefer to take exams/assignments [Tick one]

- a. On paper
- b. On devices like mobiles/tablets/computers etc.

c. Online (Internet)

# 35) With regard to <u>School Management's(SM) encouragement</u> in using technology, choose the best preference [Tick one]

- a. I am allowed to use technology whenever I have free time.
- b. I am allowed to use technology on my own but only during specific class hours/timings.
- c. I am allowed to use technology, but only in the presence of a supervisor or teacher.
- d. I am not allowed to use technology on my own
- 36) With regard to <u>Teacher's encouragement</u> in using technology, my teacher [Tick one]
  - a. insists upon using technology
  - b. encourages using technology
  - c. is neutral about the use of technology
  - d. discourages from using technology

#### 37) With regard to <u>Parents' encouragement</u> in using technology, choose the best preference [Tick one]

- a. They insist upon using technology
- b. They encourage using technology
- c. They neither encourage nor discourage using technology
- d. They advise me not to use technology but will not restrict me.
- e. My parents refrain me from using technology

#### 38) When I make mistakes using technology [Tick one]

- a. My classmates mock me
- b. My classmates don't care
- c. My classmates assist me in using technology

#### 39) What do you think of overall utility of technology for academic curriculum [Tick one]

- a. The use of technology has reduced my performance
  - b. It has no effect on my overall performance
  - c. It has helped me improve my overall performance.

#### 40) Rate the following <u>benefits</u> from using technology on a scale of 0 to 4

- a. Improves my learning
- b. Saves my time
- c. Convenience
- d. Helps me manage my class activities (planning, time management etc.)
- e. Others (describe)

#### 41) What are the <u>barriers</u> for you (if any) to use a technology in your class? Check all that apply. [Multiple Response]

[ ]

- a. It feels like extra work with little connection to course
- b. It deviates me from my academic curriculum
- c. I don't have the necessary skills
- d. It's too expensive
- e. I don't have the technical support I need
- f. I don't have sufficient access to technologies.
- g. The applications don't run on my computer/mobile/tablet.
- h. I don't have reliable access to internet
- i. Slow internet/computer speed
- j. There are no barriers
- k. Others. Describe briefly

#### 2. Teachers Questionnaire

☆ Which of the following devices do you have at home? Check all that apply. [Multiple Choices]

6) Computer

1

[ ]

[ ]

[ ]

[ ]

[ ]

- 7) Mobile
- 8) Tablet
- 9) Laptop
- 10) Other. Mention

O you have internet access at home? (Yes/No)

#### Questionnaire

1) Which of the following technologies do you have (or) use at school? Tick all that apply. [Multiple Response]

🔅 Computer	[ ]
🔅 Mobile	[ ]
🗘 Tablet	[ ]
🌣 Mobile Apps	[ ]
🔅 Projector	[ ]
☆ Internet Access	[ ]
🔅 Programming	[ ]
🔅 Computer Software	
<ul> <li>Microsoft Excel</li> </ul>	[ ]
<ul> <li>Microsoft Power Point</li> </ul>	[ ]
<ul> <li>Microsoft Word</li> </ul>	[ ]
🔅 Other. Mention below	

2) For each technology listed below, rate your **proficiency/familiarity in** using it on a **scale of 0 to 4**. Mention the number in Table 1 based on Table 2.

Table 1

Table 2

Computer/Laptop	
Mobile	
Tablet	
Mobile Apps	
Internet	
Programming	
Microsoft Excel	
Microsoft Power Point	
Microsoft Word	

Unfamiliar	0
Beginner	1
Average	2
Advanced	3
Expert	4

3. With reference to your subject, indicate **how often** you are using these technologies in **school** on a scale of 0 to 4. Mention the number in Table 3 based on Table 4.

TC 11	2
Laple	1
1 4010	~

Computer/Laptop	
Mobile	
Tablet	
Mobile Apps	
Internet	
Programming	
Projector	
Microsoft Excel	
Microsoft Power Point	
Microsoft Word	

Table 4

Never/Very rare	0
Monthly once	1
Weekly once	2
Weekly thrice	3
Daily	4

### Read the following statements and rate it on a scale of 0 to 4 based on the technologies you ticked in the Question 1

S	trongly Disagree- 0	Disagree- 1	Neutral- 2	Agree – 3	Strongly Agree- 4
4.	I believe that knowledge of T	Fechnology devices lil	ke phones, Tablets,	Laptops and others is	s very important in my day to day life
5.	I believe that knowledge of T	Fechnology helps me	and gives me an op	portunity to learn man	ny new things
6.	I believe technology gives m	e Freedom and Flexib	ility to be creative	in developing the cur	riculum, selecting activities and develo
7.	I am confident to use technol	logy in front of others	without the fear of	making mistakes	
8.	The available technology in s	school fits my style of	teaching	[]	1
9. 10.	School Management offers r	necessary training to u	se and apply techno	ology [	]
11) 12)	Colleagues share their knowle	dge of technology wit	h me hnologies	[	]
13)	Colleagues encourage me to u	se technology while to	eaching	[	]
14)	To teach a topic in better way	I prefer video present	ations or simulatior	is over conventional	methods
15)	I recommend students to look	up content online for l	better understanding	g [	]
10)	I can track students' learning b	better with the use of t	echnology	[]	]
18)	The use of technology has help	ped me to teach comp	lex or abstract conc	epts in a better way.	
19)	The use of email, mobile and i	internet has helped me	e to communicate ir	a better way with m	y students.
20)	The use of Technology has he	l J lped me in providing	quick and accurate	feedback [ ]	
21)	The use of technology has made	de my class preparatio	on easier as I can ex	plore into different a	ngles from different sources
22)	I feel I can assess my students	in a better way with t	he help of technolo	gy [ ]	
23) S	chool Management [Tick one	e]			
	a) Insists on use of technol	logy			
	b) Encourages use of techr	iology			
	<ul><li>d) Discourages the use of t</li></ul>	echnology			
24) Ii	n order to prepare myself for	a topic. I prefer to [	Tick one]		
.,	a) Read a text book or othe	er books	Tien onej		
	b) Read Digital copies on s	some devices			
<b>35</b> )	c) Search online				
25)	a) In Person	ation to student doub	ots [Tick one]		
	<ul><li>b) Through e-mail/mobile</li></ul>				
	c) By asking them to refer	to an online website.			
26)	In class [Tick one]				
	a) I prefer teaching to be o	n black/white/green b	oards		
	b) I prefer teaching using p	projectors(Power-poin	t Presentations )		
27)	What do you think of over	all utility of technolo	gy for your acade	mic curriculum [Tic	k one]
	a) The use of Technology	has reduced my overa	II performance		
	c) The use of Technology	has no effect on my p	hing performance		
28)	Keening in mind your care	er stability nick one	of these [Tick one]	1	
<i>20)</i>	a) Technology in schools i	s not of significant rel	evance for me to b	e a good teacher	
	b) Technology in schools i	s relevant but will pla	y only a marginal r	ole	
	c) Technology in schools i	s necessary and will p	lay a very importar	nt role	
29)	Which of the following bet	ter describes your pi	eference with resp	pect to use of technol	logy in your classes [Tick one]
	a) I prefer teaching in class	ses that use no techno	logy		
	b) I prefer teaching classes	that use limited tech	nology		
	c) I prefer teaching classes	that use technology e	extensively.		

#### 30) When I hear of a new Technology [Tick one]

- a) I ignore
- b) I try to get some first-hand information
- c) I want to learn and try out by myself
- 31) What are the barriers for you (if any) to using a computer or technology in your class? Check all that apply.[Multiple Response]
  - a) It feels like extra work with little connection to course
  - b) I don't have the necessary skills
  - c) It is too expensive
  - d) I don't have the technical support I need
  - e) I don't have sufficient access to computer/tablet
  - f) The applications don't run on my computer
  - g) I don't have reliable access to Internet
  - h) There are no barriers
  - i) Other. Describe briefly