# Augmentation of Technology Enhanced Learning in 21st Century Education System

## A Survey Report on Schools in New Delhi

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**Abstract**

*Learning is a process of expanding one's knowledge in a desired sphere. "System" here is a premeditated mechanism which facilitates learning to be more efficient and meticulous. A system which is adequately potent to assist the escalation in learner's knowledge would be considered as an eloquent learning system. In the 21st century, there has been a noticeable augmentation of "Technology Enhanced Learning" or learning through "Multimedia Learning System" which has modified the conventional learning methodologies and systems to a great extent. With an aim to study and evaluate the potential of the latest prevailing learning systems in the country, a survey has been carried out in six different schools of New Delhi, India, all belonging to diverse categories. A part of the analysis of this survey is presented in this paper.*

### Introduction

The whole process of teaching and learning revolves around "learner" and his/her holistic development. To make the process of learning fruitful, it is necessary to focus on the learner the most and make it an inclusive and meaningful experience for the

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child. The curriculum should allow a child to ask questions, explore, share and integrate the knowledge gained in school with his/her own day-to-day experiences.

Learning is a creative process of expression, management of concrete knowledge and cerebral exemplifications, rather than just memorising, storing and retrieving of information, merely for the purpose of examination and results. The child should be enjoying the course of studies and be satisfied with what he/she achieves.

Gone are the days of conventional Indian education system, where a classroom was categorised by elongated hours of students sitting in the classrooms attending to teacher's epilogues. Now-a-days, teachers are the facilitators of learning. In the current set-up, the students' favourite class includes teacher's lectures, experiments, solving MCQs and watching video clips or movies. Students work in groups, interact, indulge in healthy competitions, compile their works and ripen their skills and knowledge. They also use role-play to act out different scenarios and go for field trips during their regular classes and formative assessments.

These are all learning activities. One or more of these activities certainly match an individual learning style and information processing preferences. We all are capable of learning, but we all cannot learn in the same manner or in equal expanse. Where learning is concerned, there is no one tactic or methodology that fits all people. If instruction is designed and implemented with consideration of different styles of learning, all students will be able to increase concentration, process information and retain more difficult material both in terms of quantity and quality.

## Learner-Centred Pedagogy

The education process must be learner-centred. The curriculum design proposed by a learning system (NCERT, 2005) should be likely to: (i) develop the basic capabilities of a student as a human being, (ii) expansion of knowledge followed by practice, and (iii) advancement of critical thinking in learners. It should provide opportunities and favourable environment to a learner to develop basic capabilities like language, understanding to form and sustain relationships with oneself and with the social world; and the capabilities of work and action which involve coordination of bodily movements and thoughts to achieve some purpose or create something. Similarly, knowledge of a practical discipline must also find a substantial place in formal curriculum.

Next, a promising learning system also puts the learner forward to gain the knowledge of a formal discipline, be it science, mathematics, art, philosophy or anything else, which involves understanding of a special vocabulary, concepts, theories, descriptions and methodologies, and

applying one's own critical thinking and creation. Appropriate design and successful implementation, both the factors are equally important when we examine the effectiveness of the prevailing learning systems.

## The Evolution of Learning Systems

Even though the learning systems which exist today seem to be new in terms of technology and usage, still, they have their origin deep rooted in the years' old customary models of learning styles. Models are the prototypes that help us to make sense of our world by providing a background and a framework to help us understand a huge or multifaceted concept, and break it down into diverse, manageable units. Learning models provide teachers with an organised system for creating an appropriate learning environment, and planning instructional activities. Learning models influence what the teacher does in the class, what a student is expected to do in the class, the organisation of the classroom, the nature of the procedures, materials, the instructional tasks, and even the evaluation system.

## (i) Classification of Learners and Learning Styles

Every individual has diverse learning capabilities and a preferred learning style. A learning style can be defined as an individual's natural or habitual pattern of acquiring and processing information in the given learning situations. The most widely accepted classification of learners and their learning styles, owing to the diversity in human nature, are elucidated in the following popular models.

### (a) Kolb's Model

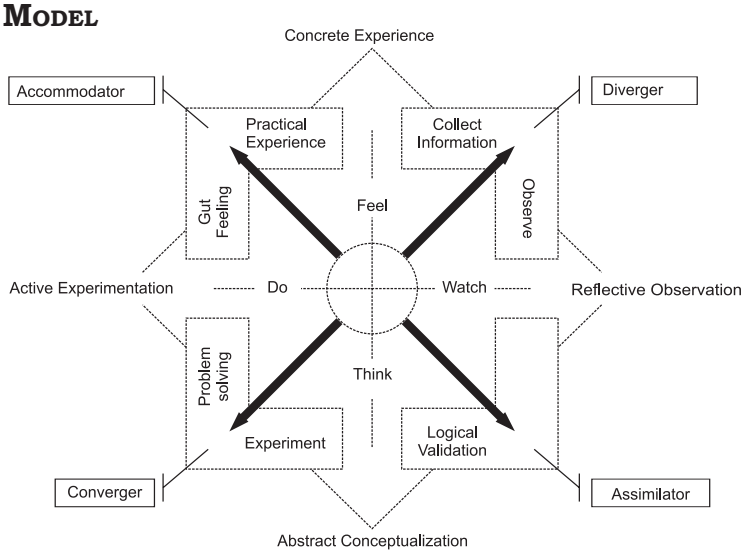


*Figure1: An illustration designed on the basis of Kolb's Model.*

David A. Kolb's model of learning styles, as re-illustrated in Figure 1 is a four-staged cyclical theory of experiential learning (ELT), where experience is known to be the source of learning and development. On the basis of this model, learners are classified into four categories according to their techniques of learning — *Diverger, Assimilator, Accommodator and Converger.*

Kolb proposed that an individual learner (Diverger) moves through a cycle of immediate experience which leads to observations and reflections on the experience (Assimilator). These reflections are then absorbed and linked with previous knowledge and translated into abstract concepts or theories (Accommodator), which result in new ways and actions to adjust to the experience that can be tested and explored (Converger).

This theory is a holistic approach that combines experience, perception, cognition and behaviour of the learner. The aim of ELT (Kolb, 1984) is to create, through a synthesis of the works of the foundational scholars, a theory that explains how experience is transformed into learning and reliable knowledge. The most direct application of the Kolb's model (Atherton, 2013) is to use it to ensure that teaching and tutoring activities give full value to each stage of the process. This may mean that for the tutor or mentor, a major task is to "chase" the learner round the cycle, asking questions which encourage "Reflection", "Conceptualisation", and ways of testing the ideas. The "Concrete Experience" itself may occur outside the tutorial/mentoring session.

### (b) Felder-Silverman Model

Felder-Silverman model is a learning style model that classifies students according to their learning preferences (Felder and Silverman, 1988). It puts forward that different students learn in different ways they find themselves at ease. It categorises students' learning inclinations into four learning style magnitudes with two categories each. Table 1 shows illustration of stimulating correlation between the categories and learning preferences proposed on Felder-Silverman model. These correlations are based on the identification of a learner by means of:

(i) The nature and organisation of information a student is comfortable with (Sensory or Intuition).

(ii) The sensory modality which helps a student to receive the information (Visual or Verbal).

(iii) The techniques in which a student likes to process the received information (Active or Reflective).

(iv) The manner in which a student proceeds to comprehend the information resulting in the expansion of her/his knowledge (Sequential or Global).

**Table 1**
**An Illustration Designed on the basis of Felder-Silverman Model**

| **Sensing vs Intuitive Learner** | | **Visual vs Verbal Learner** | |
|---|---|---|---|
| Detailed practical work<br>Prefer concrete facts and real world applications | Creative<br>Prefer theoretical and abstract concepts | Learn through images like charts, graphs, pictures, etc. | Remember written or spoken words |
| **Active vs Reflective Learner** | | **Sequential vs Global Learner** | |
| Interact with Material<br>Communicate in a group | Think about material<br>Individual/very small group communication | Learn linearly with logical steps | Learn randomly by fitting pieces together into a big picture |

In general, different students are found in any one of the above mentioned categories of learners within all the respective dimensions. The learning styles reflect preferences and tendencies of the variety of students (Felder and Spurlin, 2005), they are certainly not the dependable gauges of their perfections or imperfections. Instead, they help the mentors making them aware of the diversity of learners within their classes and inspire them to design the information that can address the learning prerequisites of all their students. The learners in return can also be benefited with the insight of their unique category and learning styles.

### (c) Fleming's VARK Model

Fleming's VARK model as re-illustrated in Table 2 explicates that an individual's learning style is her/his very own characteristics and choice of assembling, consolidating and processing the learning content. This model talks about our four perceptual modes or senses, where individuals have choices along each of the four perceptual modes for adopting any of the ways to obtain and give information. These modes are namely V=Visual, A=Aural, R= Reading/Writing and K = Kinesthetic. The only senses that are excluded in this model are taste and smell. No individual can use just one of his senses for learning, rather a blend of most of all is required for perfect learning (Fleming, 2001). The proportion of the different components in this blend is unique for all individual learners. Fleming here also indicates that students perform better where the instructors plan the learning activities in accordance with the students' learning styles determined by the VARK model.

**Table 2**
**An Illustration Designed on the basis of VARK Model**

| | |
|---|---|
| **Visual Learners:** Learn through pictures, videos and diagrams, written texts, spatial arrangements, etc. | **Aural:** Learn through lectures, discussions, music, etc. |
| **Reading and Writing:** Learn by making lists, taking notes, reading textbooks, etc. | **Kinesthetic:** Learn by touching and doing, real life examples, working models and experiments, role-plays, hands-on activities, etc. |

## (ii) Multimedia Learning: From Natal to Matured

Though multimedia technology, as we see today is an amalgamated digital experience of various media like images, text, audio, video and animation, yet all these technologies were born separate and evolved on their own pathways for their own drive and practice. The multimedia technology thus evolved, tells a tale of the advent and juxtaposition of these technologies. Long ago, even before the humans knew terms like "science" and "technology", even in the pre-historic period around 15,000 BC, human beings used to depict the ideas and information on the walls of caves. That was the first ever formation of graphics and code. But only after thousands of years later, the various forms of technologies started emerging. Each one of them grew out of the other and fused well. But we necessarily want them all, as one as well as separate entities.

## (iii) Multimedia Learning Systems in 21st Century

Learning systems today, grant access to learning through multimedia, which is more of a technique of mediated human–human communication instead of just human–computer interaction. Here, technology does not only play the role of the teacher, it is also equipped with several tools of teaching. If, at one end, it allows a specific learner to learn on her/his own pace, by repeatedly viewing the multimedia teaching content, give feedback to the system, take tests and get evaluated; it also facilitates learning by thinking, doing, analysing, etc., at the other end. It is self-sufficient to encompass all the traditional models of learning styles taking care of a variety of learners. Table 3 presents the consolidation of various activities and relevant experiences a student attains in the due course of learning. It also indicates how multimedia learning systems of the 21st century carve out their space among all the traditional models of learning.

**Table 3**
**Traditional Models of Learning VS Multimedia Learning Systems**

| Multimedia learning systems in 21st century | Kolb's Learning System | Felder-Silverman Learning System | Fleming's VARK Learning System |
|---|---|---|---|
| **Feel** | Concrete | Sensing | |
| **Think** | Abstract | Intuitive | |
| **Do** | Active | Active | Kinesthetic |
| **Observe** | Reflective | Reflective | Reading & Writing |
| **Watch** | | Visual | Visual |
| **Hear** | | Verbal | Aural |
| **Follow** | | Sequential | |
| **Random Generation of Knowledge** | | Global | |

## (a) The Studied Learning Systems

Today, it has become a prerequisite for the developing countries like India to cope up with the ever-growing demand of high quality education. Most of the middle class families are turning to private schools ("Smart! But can it make...", 2012), and enrolment has grown tremendously in the recent years. With the evolving efforts, technology is brought to Indian classrooms as well so that the slit between the education system of developing and developed countries starts to fade and people get equal opportunities globally.

Here comes the role of "Technology in Education", which gave birth to education companies that could make technology an integral part of a student and teacher's daily life. The point of concern here is that how far these systems are placed rightly in the scenario of Indian education system. To get a better understanding of their access and worth, a few prevailing multimedia education solutions are hereby studied by means of a survey in a few Delhi schools (private as well as government schools).

### *Educomp*

Educomp Solutions Limited, founded in 1994, is an education solutions provider and known as the largest education company in India. Educomp group reaches out to over 65,000+ schools and 30 million learners and educators across the world. Educomp Smart Classes is a flagship brand of Educomp Solutions.

It offers a huge digital content library of more than 20,000 modules with curriculum-mapped and multimedia-rich 3D content. It has

a good range of teacher resources, which include tools like Virtual Laboratory of Simulations, ready Work Sheets, Mind Maps, Teaching Ideas, Real Life Applications, Topic Synopsis, MCQs, Weblinks and Diagram Maker (Educomp Annual Report 2013–2014).

Educomp also offers a popular test preparatory chain for IIT-JEE exam preparation. It is a leading corporate infrastructure provider in Kindergarten to 12th standard (K-12) schools ("A Digitalised Version…", 2013). It also owns a huge pre-primary schools chain having 280 pre-schools across the country. The other important Educomp services and solutions include IT-enabled learning for government schools, Vocational Skill Development Education, Online Learning Solutions and Supplemental Learning Solutions. New upgraded version of Educomp Online "Fliplearn" provides teachers and students a learning and sharing platform with online resources and tools for better communication and problem solving.

***TeachNext***

TeachNext is a multimedia learning system for the K-12 segment, a solution from Next Education India Pvt. Ltd. Next Education won the "Best Digital Multimedia Content – K-12 Segment" award at the India eLearning Summit 2011. The records state ("TeachNext solution for…", 2012) that the content is created and designed for all CBSE, ICSE, IGCSE, ICSE and various state boards in eight different languages.

Over 5000+ schools and 5 million+ students across India have already implemented this solution. They also affirm that the content is 100 per cent aligned to the NCERT syllabus. The TeachNext system is controlled with a remote that works like a normal TV or a DVD remote. Almost 95 per cent of required operations can be done within five keystrokes with the TeachNext remote.

The other key features of TeachNext are audio-visual content, voice-overs recorded by Indian artists, question banks, advanced interactive tools like NextTools, NextDictionary, NextStudio to ensure that the teacher is able to explain and illustrate the concepts using life-like interesting animations. On the spot evaluation for student performance by using student answering system is another interesting feature.

The TeachNext Project has further launched after-school learning centre, called Next Learning Centre ("Next Education: Creating a Brighter…", 2014). Next Education has also launched a user-friendly school community mobile application, "LearnNext" for free. Lesson summaries, references and project ideas are available on the application.

A series of Next curriculum books for the pre-primary and primary classes are integrated with digital learning platform of TeachNext. Next books are based on the CCE framework recommended by CBSE and NCF, and impart Higher Order Thinking Skills (HOTS) among students.

### *CAL Lab*

CAL Lab is set up as a component of *Sarva Shiksha Abhiyan*, a flagship programme of the Government of India to support the state governments in the creation, development and solidification of the formal primary and upper primary school systems to achieve the goals of UEE (Universal Elementary Education) Mission.

Under this umbrella, CAL (Computer Aided Learning) Labs were set up in government schools in Delhi and other states to equip them with curriculum mapped interactive multimedia-based animated educational content, so as to make classroom teaching more interesting and effective. All the government schools and around 400 MCD (Municipal Corporation of Delhi) schools in Delhi are targeted to be equipped with CAL Labs, so that the children studying in government schools get an equal opportunity to be at par with children studying in private schools (Government of India, 2007).

The efforts are being made to ensure the effective utilisation of the CAL Labs in schools and also to develop useful material based on the NCERT syllabus in the CAL development labs of the Department of Education. According to the minutes of the 199th meeting of the Project Approval Board for considering the Annual Work Plan and Budget 2013–14 for SSA Delhi held on 10 April 2013, 969 schools under the Department of Education were approved to be updated with CAL learning content with hardware upgrade, and the process of functioning/strengthening of CAL units in 314 MCD schools was also sanctioned (PAB Meeting, 2013).

## The Survey

In order to investigate the levels of usage and educational efficacy of the 21st century learning systems, a questionnaire survey was done in which 1,755 students from three government and three private (total six) schools of Delhi participated. Given the access to use popular multimedia learning systems pioneering today's Indian education system, the purpose of the survey was, therefore, to determine comprehensively the various ways and extent of use; and didactic effectiveness of these learning systems in the learning process.

Table 4 presents the count of all students participated from each type of school (government or private) in this survey. Not only this, it also indicates the name of the Learning System(s), each type of school has adopted respectively.

**Table 4**
**Samples**

| Type of School | No. of Schools | No. of Students Participated | Adopted Learning System |
|---|---|---|---|
| **Private** | 3 | 1,363 | Educomp, TeachNext |
| **Government** | 3 | 392 | CAL Lab |
| **Total** | **6** | **1,755** | **3** |

## Objectives of the Study

- To judge the manner and extent of using multimedia technology in classrooms by the students.
- To gauge the ease of use of the subscribed learning system by the students.
- To observe the students' beliefs and circumstances persuading their acceptance to the technology.
- To note the students' views on the didactic effectiveness of multimedia technology and its influence on student performance (both negative and positive).
- To understand the barriers in acceptance of subscribed learning systems by the students.

## Data Collection

Utmost care has been taken in the selection of the data resources, i.e., schools. The most stimulating part in this data collection is that all these students form a heterogeneous group, representing essence of varied educational standards and infrastructure prevailing today in the Indian education system. Data is collected from co-educational schools, only girls' schools and only boys' schools as well. In the following sections, this questionnaire used for the survey is briefly introduced and afterwards the results of this study are presented.

## Design of the Questionnaire

The various important aspects of the questionnaire design (Sudman *et al.,* 1982) were taken into consideration while designing the questionnaire. All questions were either open-ended with one word answer or close-ended with multiple choice questions or rating scales. Care was taken so that the time required to fill the questionnaire and hitches in comprehension could be reduced to a large extent.

The Students' Questionnaire comprised two parts A and B, including one and five sections respectively. It contained two printed pages. Table 5 shows the division of sections and arrangement of questions in the students' questionnaire.

**Table 5**
**Design of the Questionnaire**

| Part | Section(s) | Total No. of Questions | Type of Questions | No. of Questions (section-wise) | Most Representative Questions in Each Section |
|---|---|---|---|---|---|
| ***A*** | 1 | 8 | Open-ended with one word answer/ close-ended with multiple choice questions | 8 | Section-I<br>Questions based on the general background information of the student like gender, grade, age, class strength, favourite subject and if they have any experience of using computer technologies. |

| | | | | | |
|---|---|---|---|---|---|
| ***B*** | 5 | 28 | Open-ended with one word answer/ close-ended with multiple choice questions/ rating scales | 6 | Section-I<br>Questions based on the access and use of the multimedia system subscribed by the respective school. |
| | | | | 2 | Section-II<br>Questions based on the students' overall acquaintance with the multimedia system subscribed by the respective school. These questions focused not only on the tools of multi-media system a student is acquainted with, but also on the type of assignments students do using those tools. |
| | | | | 8 | Section-III<br>Questions based on the respective students' views about the necessity and ease of use with multimedia technologies available at school. |
| | | | | 4 | Section-IV<br>Questions based on the respective students' view on the impact of muti-media technologies on his/her academic and overall performance. |
| | | | | 8 | Section-V<br>Comprised questions based on the respective students' views on the didactic effectiveness of multimedia technologies. |

## Data Analysis

Statistical analysis of the above data set indicated a number of challenging results.

### (a) Average Class Size

Table 6 shows a cross tabulation between the type of schools studied and their respective class sizes. The data collected from students' questionnaire for class size varied from 28 to 62 per class. The study clarified that there were no government schools with a minimum class size ranging from 25–30 or having a class size between 36–40 students. The class size in government schools either lie between 31 and 35, or it is more than 40 and goes up to 62. It is very interesting to note here that there were no private schools having a class size more than 45 students. The maximum distribution of students in private schools is within the range of 31–45, which is quite a manageable size. Whereas, in case of government schools, the maximum range lies between 31 and 35, which is a small count, or it is variedly distributed between 41 and 65 students per class.

### (b) Access to Computer at School

Table 7 presents a cross tabulation between the type of schools studied and the students' access to computer at school. The results very clearly indicate that still all government schools in Delhi are not equipped with computer labs. Approximately three-fourth of the student population studying in government schools is deprived of computer education whereas, in case of private schools, almost all students have access to computers at school.

**Table 6**
**Average Class Size**

(Percentage within Type of School )

| | | Average Class Size | | | | | | | | Total % |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 25–30 | 31–35 | 36–40 | 41–45 | 46–50 | 51–55 | 56–60 | 61–65 | |
| Type of School | Govt School | | 73.5 | | 7.4 | 3.6 | 11.2 | 2.3 | 2.0 | 100 |
| | Private School | 2.6 | 25.9 | 48.2 | 23.3 | | | | | 100 |
| Total | | 2.1 | 36.5 | 37.4 | 19.7 | 0.8 | 2.5 | 0.5 | 0.5 | 100 |

**Table 7**
**Type of School Using Computers**

(Percentage within Type of School)

| | | Do you use computer at school? | | Total (%) |
|---|---|---|---|---|
| | | No (%) | Yes (%) | |
| Type of School | Govt School | 74.5 | 25.5 | 100 |
| | Private School | 1.8 | 98.2 | 100 |
| Total | | 18.1 | 81.9 | 100 |

### (c) Acquaintance with Interactive Boards and Projectors at School

Provided that all schools considered under this study are subscribers of at least one of the popular Multimedia Learning Systems prevailing today in India, still, the question arises, whether the schools are equipped with the required tools for using those systems effectively. Are the students getting acquainted with the basic tools of Multimedia Technology? Table 8 presents a cross tabulation between the type of schools studied and the students' access to interactive boards to run subscribed multimedia system at school. The collected data clearly indicates that none of the government school students under study is acquainted with interactive boards, whereas more than 95 per cent of the private school students are acquainted with interactive boards.

As presented in Table 9, the data also shows that more than half of the students studying in government schools are not acquainted with projectors, and on the other hand, more than 90 per cent of the students studying in private schools are acquainted with projectors.

### (d) Using Multimedia Systems for Assigning Homework and Online Interaction among Teachers and Students

Tables 10 and 11 depict the extent of use of available Multimedia Learning Systems for assigning homework

**Table 8**
**Acquaintance with Interactive Boards**

(Percentage within Type of School)

| | | Do you have acquaintance with Interactive Boards? | | Total (%) |
|---|---|---|---|---|
| | | No (%) | Yes (%) | |
| Type of School | Govt School | 100 | | 100 |
| | Private School | 4.5 | 95.5 | 100 |
| Total | | 25.8 | 74.2 | 100 |

**Table 9**
**Acquaintance with Projectors**

(Percentage within Type of School)

| | | Do you have acquaintance with Projector? | | Total (%) |
|---|---|---|---|---|
| | | No (%) | Yes (%) | |
| Type of School | Govt School | 56.4 | 43.6 | 100 |
| | Private School | 9.3 | 90.7 | 100 |
| Total | | 19.8 | 80.2 | 100 |

to students and online interaction among teachers and students via its online applications. The data presented in Table 10 clearly indicates that the students who study in government schools do not get any home assignments using a multimedia application subscribed by their schools. About 1.3 per cent of population which has said yes to this question, is quite negligible. Whereas in case of private schools, it shows that more that 58 per cent of the students get homework through multimedia applications.

Similarly, Table 11 presents that not even a single student of the studied government school has the facility to interact online with their teachers and peers via multimedia application subscribed by their school. In case of private schools, it shows that they do have this facility but only 41 per cent of the students use this system.

### (e) Acceptance of Multimedia Learning System: Students' views

A new methodology of teaching and learning when introduced in an age-old system needs to be accessed on the basis of three very important dimensions which directly leave impact on the students. These three dimensions are:

**Table 10**
**Home Work is given using Multimedia Learning Systems**
(Percentage within Type of School)

| | | Homework is given using Learning Systems | | Total |
|---|---|---|---|---|
| | | No | Yes | |
| Type of School | Govt School | 98.7 | 1.3 | 100 |
| | Private School | 58.8 | 41.2 | 100 |
| Total | | 67.7 | 32.3 | 100 |

**Table 11**
**Online Interaction with Teachers and Friends**
(Percentage within Type of School)

| | | Online interaction with teachers and friends is done using Learning Systems | | Total |
|---|---|---|---|---|
| | | No | Yes | |
| Type of School | Govt School | 100.0 | | 100 |
| | Private School | 62.4 | 37.6 | 100 |
| Total | | 70.8 | 29.2 | 100 |

### (i) Ease of Use

A learning system is accepted wholeheartedly, if it is easy to implement and makes the user feel comfortable within the learning environment. Table 12 shows the multiple views of all the students (both government and private schools) related to ease of use of the subscribed learning system. Though different students feel differently and not all strongly agree for its ease of use, still the results indicate that nearly 50–70 per cent students agree (or strongly agree) that the system is easy to use and allow them to learn in a comfortable learning environment. Nearly 40 per cent students feel that teachers are now learning facilitators instead of information providers.

### (ii) Didactic Effectiveness

Educational efficacy of a system is judged on the basis of how much it motivates the learners, help them in understanding critical concepts and ideas and give a boost to the competency level of the students. Table 13 shows that more than 60 per cent students accept the didactic effectiveness of multimedia technology in learning on the basis of their own personal experiences at school.

**Table 12**
**Ease of Use of Multimedia Learning System (Students' Views)**
(Percentage of total students)

| Survey Questions asked from students | Strongly disagree | Disagree | Neither disagree nor agree | Agree | Strongly agree | Total |
|---|---|---|---|---|---|---|
| I can implement MMLS successfully | 4.8 | 7.1 | 16.4 | 48.7 | 23.1 | 100 |
| MMLS eases the pressure on me as a student | 12.6 | 18.3 | 19.7 | 33.7 | 15.7 | 100 |
| MMLS allows me to learn at my own pace and style | 8.0 | 13.5 | 19.7 | 45.0 | 13.8 | 100 |
| Teachers are now learning facilitators instead of information providers | 7.6 | 19.4 | 30.0 | 31.8 | 11.2 | 100 |

**Table 13**
**Didactic Effectiveness of Multimedia Learning System (Students' Views)**
(Percentage of total students)

| Survey Questions asked from students | Strongly disagree | Disagree | Neither disagree nor agree | Agree | Strongly agree | Total |
|---|---|---|---|---|---|---|
| MMLS motivates me to get more involved in learning activities | 6.5 | 8.4 | 15.8 | 46.4 | 23.0 | 100 |

| | | | | | | |
|---|---|---|---|---|---|---|
| MMLS improves my learning of critical concepts and ideas | 5.0 | 6.9 | 17.1 | 45.5 | 25.5 | 100 |
| MMLS makes me feel more competent as student | 7.0 | 8.0 | 20.3 | 39.5 | 25.2 | 100 |

### (iii) Students' Achievements

The education system of all the times persists as a result-oriented system. A student's achievement is not judged just on the basis of how students feel about the comfort level or effectiveness of the prevailing learning environment. Achievement has to be reflected in her/his acquired skills, knowledge and grades. Table 14 shows that 40–60 per cent students saw improvement in their achievement in terms of development of their communication skills, interpersonal skills, skills to work in a collaborated environment with their peers and a direct progress in the grades after they started using multimedia learning systems at school.

### Barriers in Acceptance of Multimedia Learning System: Students' Views

During this survey, a few factors acting as barriers in the acceptance of multimedia learning system were also considered and understood. These factors deal with both the technical and non-technical issues which may interfere in the process of learning. The data is received from students of different schools with diverse scholastic backgrounds with varied exposure to technology and relevant practices. Even the students of the same school have stated dissimilar views on most of these questions as their answers to these questions are not only influenced by the common

**Table 14**
**Achievements of Multimedia Learning System (Students' Views)**

(Percentage of total students)

| Survey Questions asked from students | Not at all | Marginal | Fair | Up to good extent | Excellent | Total |
|---|---|---|---|---|---|---|
| After starting to use MMLS, I have developed my communication skills | 8.1 | 9.9 | 23.5 | 36.8 | 21.7 | 100 |
| After starting to use MMLS, I see development of my interpersonal skills and collaboration with peers | 8.4 | 11.6 | 29.2 | 31.4 | 19.4 | 100 |
| After starting to use MMLS, I see my academic achievement (e.g., grades) | 7.0 | 7.9 | 21.0 | 32.6 | 31.5 | 100 |

facilities they are exposed to at school level but also by their personal interests and family backgrounds. All these factors together justify the attainment of varied results. Table 15 depicts the results observed by means of a few listed questions asked from students through questionnaire.

### (a) Divergence in Students' Access to Computers at Home and School

In answer to the question that Multimedia Learning System is successful only if a student has access to a computer at home, the results are very distributed. As depicted in Table 15, 10.7 per cent of the total number of students strongly disagreed with this statement. About 28 per cent disagreed and 19.5 per cent students neither agreed nor disagreed it. Whereas, 27.7 per cent students agree and 14.1 per cent students strongly agree that multimedia education at school is successful only if they have computers at home.

### (b) Technical Constraints

With respect to the data collected in response to the questions about the technical conditions of multimedia system, Table 16 indicates that 8.3 per cent of the students strongly agreed and 21.6 per cent students agreed that the multimedia system does not work regularly in their school. Whereas, 18.2 per cent students strongly disagreed and 30.7 per cent students disagreed with the statement. About 21.2 per cent neither agreed nor disagreed about the same.

Apart from the results collected from these schools where multimedia system was considered as working, a few other government schools either denied having a multimedia system or stated that the system is in non-working condition since years.

**Table 15**
**Non-availability of Computers as a Barrier in the Acceptance of Multimedia Learning System**

(Percentage of total students)

| Survey Questions asked from students | Strongly disagree | Disagree | Neither disagree nor agree | Agree | Strongly agree | Total |
|---|---|---|---|---|---|---|
| MMLS is successful only if I have access to computer at home | 10.7 | 28.0 | 19.5 | 27.7 | 14.1 | 100 |
| MMLS is effective only when extensive computer resources are available at school | 12.1 | 28.4 | 24.3 | 24.6 | 10.7 | 100 |

**Table 16**
**Technical Constraints: A Barrier in the Acceptance of Multimedia Learning System**

(Percentage of total students)

| Survey Question asked from students | Strongly disagree | Disagree | Neither disagree nor agree | Agree | Strongly agree | Total |
|---|---|---|---|---|---|---|
| MMLS does not work regularly | 18.2 | 30.7 | 21.2 | 21.6 | 8.3 | 100 |

### (c) Variance in the Familiarity with Computers Skills

In response to the question, if implementing Multimedia Learning System is difficult, because some students know more about computers than others, 62.6 per cent of the students disagreed in total, where 27 per cent students strongly disagreed and 35.6 per cent disagreed, to be precise. About 20.2 per cent of the total students participated in the survey neither agreed nor disagreed with the statement.

Table 17 clearly indicates that most of the students do not consider knowledge of computers as a pre-requisite to learn through multimedia. The students even if they have less technical knowledge of computers, find it easy to use multimedia for learning. Most of the government schools admitted that they do not have computer labs but the students learn through multimedia systems since long.

**Table 17**
**Variance in Familiarity with Computer Skills: A Barrier in the Acceptance of Multimedia Learning System**

(Percentage of total students)

| Survey Question asked from students | Strongly disagree | Disagree | Neither disagree nor agree | Agree | Strongly agree | Total |
|---|---|---|---|---|---|---|
| MMLS is difficult because some students know more about computers than me. | 27.0 | 35.6 | 20.2 | 13.7 | 3.6 | 100 |

### (d) Convention of a Teacher's Help During Study

A teacher has always been the most important resource of knowledge and skills. Even today, the idea of a class studying without teacher's help is difficult to conceive. Still, the data was collected to gauge whether the conception of such a class that successfully learns via multimedia lessons without a teacher's help is possible or not. The study gave very interesting results as shown in Table 18. In all, 38.7 per cent students agreed (10.3 per cent strongly agreed, 28.5 per cent agreed) that multimedia system is successful only if the teacher helps them in class, whereas 38.8 per cent, a very close percentage of students gave exactly opposite responses by showing their disagreement (27.4 per cent disagreed, 11.3 per cent strongly disagreed). This indicates that teachers were, they are and will always remain an integral part of the classroom in Indian education scenario. If not as a resource person, they are revered as facilitators of the system where multimedia provides them with the knowledge pools.

### (e) More Time Required to be Spent on Problems by Students

It is a point of concern if learning through multimedia learning system requires more time to be spent on problems. When asked, 49.8 per cent students strongly disagreed with the statement (14.0 per cent strongly disagreed, 35.8 per cent disagreed); 24.6 per cent students neither disagreed nor agreed with the statement; and 25.6 per cent students agreed (18.4 per cent agreed, 7.2 per cent strongly agreed) that they spent more time on problems if they study through multimedia system in comparison with books and class notes. The higher percentage of students' disagreement with the statement clearly states (depicted in Table 19) that learning through multimedia system can be done within the prescribed time, unless the students get themselves lost in the startling world of multimedia learning material.

**Table 18**
**Convention of a Teacher's Help during Study: Is it a Barrier in the Acceptance of Multimedia Learning?**

(Percentage of total students)

| Survey Question asked from students | Strongly disagree | Disagree | Neither disagree nor agree | Agree | Strongly agree | Total |
|---|---|---|---|---|---|---|
| MMLS is successful only if the teacher helps me. | 11.3 | 27.4 | 22.5 | 28.5 | 10.3 | 100 |

**Table 19**
**Convention of a Teacher's Help during Study: A Barrier in the Acceptance of Multimedia Learning**

(Percentage of total students)

| Survey Question asked from students | Strongly disagree | Disagree | Neither disagree nor agree | Agree | Strongly agree | Total |
|---|---|---|---|---|---|---|
| MMLS demands that too much time be spent on problems. | 14.0 | 35.8 | 24.6 | 18.4 | 7.2 | 100 |

### (f) Students' Negligence of Important Traditional Learning Resources

With the inclusion of computers, internet and multimedia technologies in teaching-learning, it is presumed that students would now neglect the use of important traditional learning sources like prescribed text-books, library, etc. When asked, the results (Table 20) which came out, were very satisfactory. About 74.5 per cent students disagreed (61.9 per cent strongly disagreed and 12.6 per cent disagreed) that they have neglected any important traditional learning resources. About 14.3 per cent students neither agreed nor disagreed and only 12.1 per cent students agreed (6.4 per cent agreed and 4.7 per cent strongly agreed) that they neglect using library and textbooks while studying with the help of multimedia learning systems subscribed by their school. The results clearly indicate that as per students' views, multimedia learning system does not interrupt the traditional ways of learning and is an additional learning resource to them.

**Table 20**
**Neglecting Important Traditional Learning Resources by Students' Involvement in Multimedia Learning**

(Percentage of total students)

| Survey Question asked from students | Strongly disagree | Disagree | Neither disagree nor agree | Agree | Strongly agree | Total |
|---|---|---|---|---|---|---|
| After starting to use MMLS, I have started neglecting important traditional learning resources (e.g., library, compulsory textbooks, etc.) | 61.9 | 12.6 | 14.3 | 6.4 | 4.7 | 100 |

### (g) Increase in Amount of Stress and Anxiety on Students due to Multimedia Learning

Exposure to technology may increase the amount of stress and anxiety on the students who are not at ease with it. But, in answer to the same question, as depicted in Table 21, 64.4 per cent students disagreed (30.6 per cent strongly disagreed and 33.8 per cent disagreed). About 18.1 per cent students neither agreed nor disagreed to the statement. Whereas, 17.5 per cent students agreed (10.8 per cent agreed and 6.7 per cent strongly agreed) that exposure to multimedia learning system has increased their stress and anxiety levels.

### (h) Is Multimedia Learning System an Overburden on Students?

Apart from the textbooks prescribed by the school, their class lecture notes, reference books suggested by the teachers, library books, etc., students have no limits to the learning material that they are all the time engaged in studying for better academic records and learning. In this setup, the point of concern is, whether they feel overburdened when they are also exposed to multimedia learning system as a part of their study? The results of the study as depicted in Table 22 indicate that 58.5 per cent students disagree (25 per cent strongly disagreed and 33.5 per cent disagreed) with the statement. They do not consider classes run on the subscribed multimedia system as an overburden. Whereas, 18.2 per cent of the total strength agreed (11.5 per cent agreed and 6.7 per cent strongly agreed) with it. About 23.4 per cent neither disagreed nor agreed to consider multimedia learning system as an overburden.

**Table 21**
**Neglecting Important Traditional Learning Resources by Students' Involvement in Multimedia Learning**

(Percentage of total students)

| Survey Question asked from students | Strongly disagree | Disagree | Neither disagree nor agree | Agree | Strongly agree | Total |
|---|---|---|---|---|---|---|
| MMLS has increased the amount of stress and anxiety in me. | 30.6 | 33.8 | 18.1 | 10.8 | 6.7 | 100 |

**Table 22**
**Learning through Multimedia System an Overburden on Learners (Students' Views)**

(Percentage of total students)

| Survey Question asked from students | Strongly disagree | Disagree | Neither disagree nor agree | Agree | Strongly agree | Total |
|---|---|---|---|---|---|---|
| MMLS is overburdening me as there is no limit to study material. | 25.0 | 33.5 | 23.4 | 11.5 | 6.7 | 100 |

## Findings

(a) Multimedia lessons are available only for the core subjects like Mathematics, Science and Social Studies. Only a few lessons for English and Hindi are available. No multimedia lessons are available for Sanskrit and foreign languages being taught in schools.

(b) Regular content updating to make multimedia lessons at par with NCERT syllabus is not found.

(c) No multimedia lessons are available for the subjects like Arts and Physical Education. Subject-based approach to organise the curriculum has completely neglected these areas of knowledge and they just remain as co-curricular activities. Though, these areas of knowledge have rich potential for the expansion of skills, aesthetics, imagination, creativity, resourcefulness and team work. Hence, reasonably good possibilities for the creation of excellent quality multimedia content to teach art, craft and physical education is there. Here arises a need for curricular reform.

(d) Schools have not subscribed all available tools of Educomp and TeachNext learning system.

(e) Instead of projectors and big screens, CAL lab programmes run on TV sets in government schools. It is difficult for a class of 40–50 students to watch the programme properly and understand the critical concept at the same time.

(f) Even there is a major loss in terms of time during each CAL lab class, as the students are required to be moved to CAL labs for every lesson they learn via multimedia. Hence, there is an urgent need to provide government schools with projectors having USB support in each class for which there is an availability of multimedia content. This way, the students of government schools can learn in equivalence to the students of private schools.

(g) The electricity supply in government schools also stands as a barrier in running regular CAL lab classes. Though the generators are provided, they remain non-working, once gone wrong.

(h) A number of government schools approached admitted that multimedia system was installed in the schools earlier but due to some technical issues, the system is no more working.

(i) Most of the government schools indicated absence/non-working condition of computer labs for students. It also raises a question on the technical support system which is required for the regular functioning of machine sets. The levels of knowledge and understanding of computer and multimedia technology differ in students of government and private schools because of lack of access to computers at home as well as at school. With reference to Table 7 (depicted in this paper), nearly 75 per cent of the students studying in government schools, do not have access to computer at school, whereas 98 per cent private school students use computer at school.

## Conclusion

Teachers and parents both play equally important role in engaging children productively with the education system and make their journey of knowledge acquisition enjoyable and fruitful. The key to its success is to recondition the system and make the process of learning a "Heart's Work" instead of just hard work. It is very much necessary that we, as teachers and parents do not just equip our kids with hi-tech futuristic learning gadgets and turn them into machines handling other machines, having no social engagements at school and home. Rather, we should encourage them to do and learn from every activity in day-to-day life.

The learning technologies are helpful but would never replace the teacher "The Guru" in Indian education system. A multimedia lesson can be designed extremely well, can be paused and replayed again and again to understand a critical concept but it can never deal with each and every individual and her/his problem in a customised way like a human. Still as per the educational settings and ever-growing competition which students have to face, amalgamation of technology in teaching-learning is the need of the hour. The point of focus here is that whatever resources we have for this fusion of technology with learning in Indian education system, we need to make them available and equipped with technical support so that every user of the system is benefited equally.

Technology, if used properly as a support, can really make a difference in terms of involvement of the students with learning process. Not only increment in grades of students, it can also help in building their confidence, development of inter-personal skills, communication and social relationship with peers. All these qualities make a student a perfect learner. To accomplish this

task, it is necessary that not only problems are identified at ground level but the process to solve these problems should be initiated at the ground level itself. Every single student, teacher, technical staff and school authorities must feel themselves equally accountable to make this difference.

## Future Work

A similar kind of study can be done along with the other two important ends of the flow called "Education". These are teachers and parents. Teachers are the source, that can help in assessing the ease of use and level of acceptance of fusion of multimedia in teaching practices, their exposure to technical training opportunities to perform well in the technology enhanced classrooms and barriers in their acceptance of the same. Similarly, parents will be able to provide us the revelation of a few very important strings which we might have left to hold while enquiring students about views and experiences about multimedia learning systems. Parents might be able to share the variations in behavioural patterns (if any), study habits, changes in knowledge levels and academic records of their kids after they started using multimedia for learning. Both the sources might share their own views and suggestions for the overall development.

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