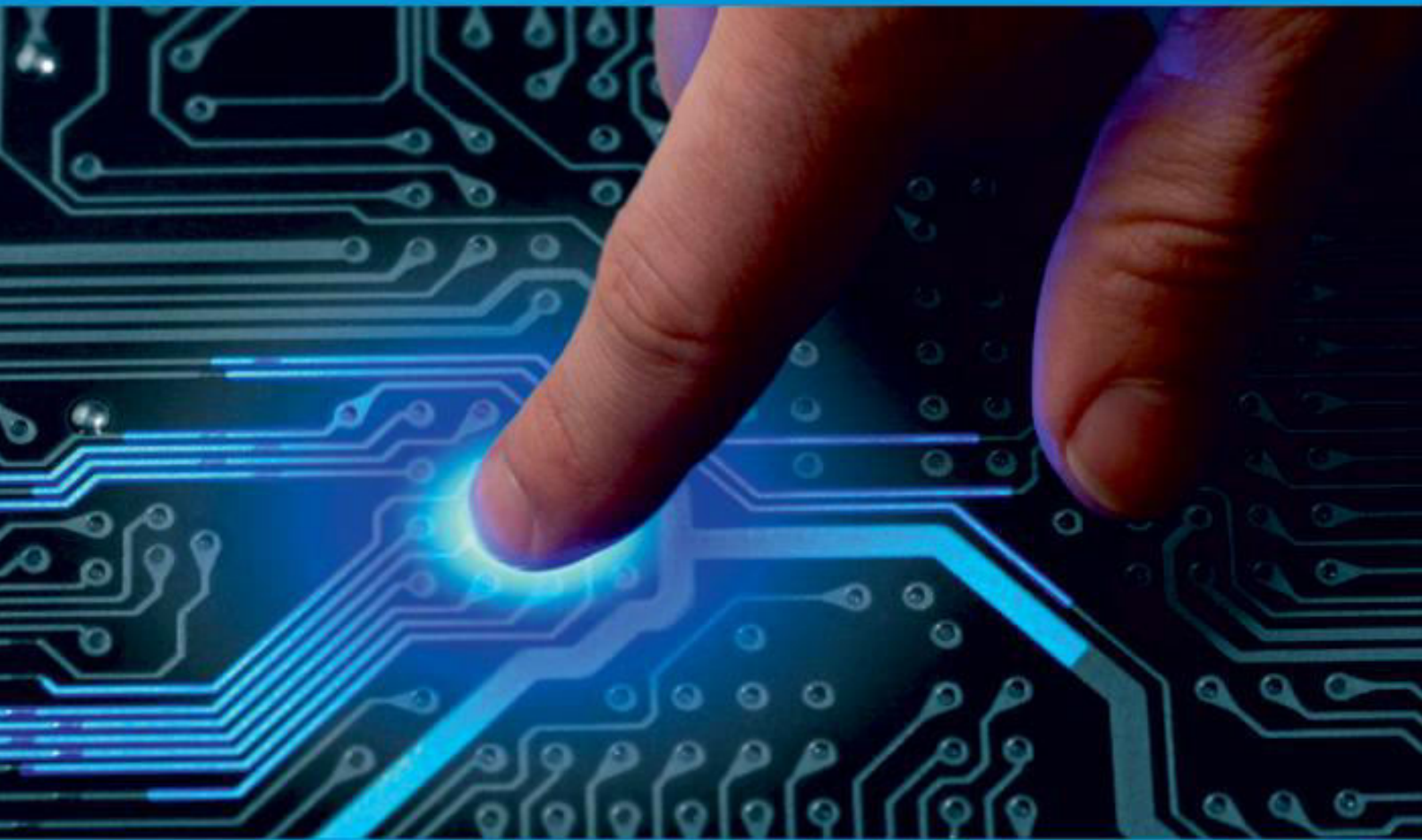




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# Semi-autonomous Lecture Capturing System; Learning Process Emphasized with ICT

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**ABSTRACT.** In the current educational scenario, a number of new trends are evolving in teaching and learning due to emergence of innovative technologies. Education now uses the most modern applications of technology. Latest instructional design includes many tools of Information and Communication Technology (ICT) as well as an advanced technology assisted plan of teaching. The effective use of ICT enabled knowledge forums not only improves the learning process but allows millions of new learners around the world to acquire new skills and abilities. Through continual quality improvement in teaching and learning, the academic sector seeks to enable students to apply their knowledge in socially relevant challenges and transform human life into one that is more enjoyable. In this paper, the proposal for semi-autonomous lecture capturing system that effectively utilizes ICT is proposed. The proposal consists of capturing the presenter's image, presenter's voice, white board, projector, audience voice, specimen, micro phone output etc. using different media capturing apparatus permanently and is stored in the media server. This media server will be accessible to learners/ students through internal/local network. This approach is expected to increase the learning potential of the students as the lecture resource is available to review until the concept is understood.

**KEYWORDS:** Educational system, ICT, media server, classroom learning, teaching aids, self-directed learning.

## I. INTRODUCTION

Every nation in the globe has its own educational system, however it varies widely. The facilities used are main factors which influence the educational system. Education is not solely concerned with basic academic concept that a student learns in the classroom [1]. System of Educational is divided as per the International Standards Classification of Education (ISCED) to specific types as formal and non-formal education [2]. Formal education is systematic, teacher-directed curriculum-based learning that takes place inside a classroom of college or university. The design for a semi-autonomous lecture capturing system that effectively utilizes ICT in education is presented in this study. This paper is structured as mentioned next. Section II presents various types of available teaching-learning approaches in educational system to educate students. Section III presents methodology of proposed semi-autonomous lecture capturing system. Results and Discussion are part of Section IV.

## II. DIFFERENT APPROACHES IN TEACHING-LEARNING

In a classroom, the teacher gives pupils face-to-face instructions, and the teacher and students communicate face to face. Classroom teaching promotes collaborative learning and teaching style can be modified according to the student's issue. In classroom teaching, learner can ask questions to instructor and can discuss issues with fellow students. Learner has ample of opportunities for social interaction and support. By sharing classroom with peer and by interacting with a tutor, essential interpersonal talents are developed in learners. These talents are handy in other situations of student's personal and professional lives. In creating a meaningful learning environment for students in the classroom, the instructor is key. In classroom teaching, each student's social and psychological reactions and pursuits impact the content he or she learns [3]. In a traditional classroom setting, learners would be restricted to a small number of course options. A class conducted at a fixed location and at a scheduled time. In classroom teaching with fixed teaching time table, deadlines for assignments and fixed exams on pre-scheduled days student's flexibility is compromised. Now students are forced to have discipline to prioritize time on every single day to focus for uncovering course content.

In digital teaching, course lessons that are digitally saved can be made available to students for watching later at their convenient time. Class notes can be made digitally available to students for use at any time. Customization and enhancement of reading material can be done as needed by the target audience to aid learning. It is quick and simple to add fresh or more pertinent content to digital resources as and when needed to provide the latest information to students

in their subject. Student participation is essential in digital learning to be successful and digital learning is far more effective than classroom learning as it removes time and space barrier. Digital learning is dependent on a variety of factors, including the student, the technology infrastructure, and the subject being studied.

In career education, training about particular profession is given to adult learners. Teaching aids that make learning more exciting and time efficient are necessary in profession training [4]. Several aids are applied in teaching to make lessons more engaging and to produce a remarkable teaching-learning experience for adult learners. Innovative teaching aids make learners to comprehend even the most complex and complicated things. Teaching aids concretize learning experiences of the learners if we employ technology in meaningful and pertinent ways to prepare lessons [5]. Proposed semi-autonomous lecture capturing system supports modules that are built to provide skilful professional training.

Teaching aids that involve learning through eyes, ears as well as through hands-on are successfully employed in many educational systems [6]. Teaching aids like audio aids, visual aids, audio-visual aids and activity aids provide inspiration and curiosity among learners about the subject. Proposed semi-autonomous lecture capturing system uses several such teaching aids. Audio technique based tools like transistors, recorder, etc. help the learner to aqunt the information through their auditory senses. Visual technique based tools like figures, charts, filmstrips, images, epidiascope, models, small-projectors etc. help learners in acquiring understanding experiences via their senses of visibility. Audio-Visual aids like animation, motion pictures, television, living objects, video films etc. utilize both their listening and seeing senses for getting the required learning experiences. In aids of activity, learners learn by engaging in some useful activities using personal digital assistants that even provide virtual touch and feel aspects.

Experiential learning is a broad word that encompasses a wide range of techniques of learning by doing. Design modules of experiential learning in proposed semi-autonomous lecture capturing system focus on methods used for planning and delivering experiential learning. A particular focus is on the use of technology that helps in developing the knowledge and skills needed in the digital age [7]. There are situations where online learning can be highly useful in supporting or developing experiential learning in all of its forms. Instructors are increasingly discovering that experiential learning can be fully implemented online, using a combination of synchronous and asynchronous tools. Proposed semi-autonomous lecture capturing system can be seamlessly integrated with web conferencing, discussion forums and social media for group work.

In education, ICT means incorporation of computer-enabled information exchange into the everyday classroom teaching methods. In case of ICT integration aim is to improve the quality, reliability, speed, versatility and cost-effectiveness of instruction dissemination to students, it also means to the have benefits of connecting peer learners to tackle the barriers of present day globalization issues [8]. ICT is highly appreciated and regarded by teachers at three primary stages: integration, enhancement, and complimentary [9]. Several content development tools are used in given semi-autonomous lecture capturing system. Pedagogy tools and software that help in content capturing, content editing and content management are also used to enhance teaching-learning experience. An integration strategy enables the appropriate use of ICT in subjects involving complex concepts and has the potential to raise student outcomes and achievement. It is recommended to revise the curriculum so that only connected ICT materials and appropriate software are installed to achieve the aim and objectives of the curriculum. Several ICT tools of proposed semi-autonomous lecture capturing system aid and support a student's learning process. For example, a Power Point presentation shall present a topic in an innovative way that supports healthy discussion and exchange of thoughts and critical remarks. The different methods of the proposed system allow learners to be more organized and efficient, because they can take notes using personal digital assistants, complete their assignments from anywhere until they meet the deadline, and search for supportive information from several Internet sources to complete assigned work.

By the end of year 2023, the global number of Internet of Things (IoT) linked devices are expected to rise to 43 billion, nearly tripling from 2018 [10]. The introduction of cutting-edge technology has brought several changes in the computing devices which are now generating tremendous amount of data at all times. Researchers are trying to apply big data in education system in different ways [11]. Due to introduction of big data, teachers may now access their students' academic achievement, learning patterns, and provide immediate feedback. Students are motivated and satisfied by quick and constructive feedback, which has a beneficial impact on their performance [12]. Several open educational resources from open textbook, open courseware, repositories and directories are adapted with appropriate attribution in this proposed system.



The majority of the curriculum in the present day education system is dominated by teacher-centered culture, as the number of teachers still retains significant authority over the learning process [13]. Self-directed learning (SDL) is an effective and preferred method of preparing students for lifetime learning in their fields and keeping them updated. Proposed learner- centered teaching allows subject expert to develop lessons that are free to read and download using campus intranet. This learner- centered approach does not abolish the instructor, while being a fundamental departure from a conventional classroom.

Proposed learner- centered atmosphere is expected to encourage students to work together to learn. The teacher’s roles are like a facilitator to model instructions and provide corrective feedback and reply to questions being asked [14]. It is up to the students to decide way of learning, reason for learning that way, and from whom they want to learn. Students assist one another by answering questions and providing feedback. This procedure is set up so that students can study in the way that works best for them. Taking into account that what works for one person may not work for another, and that at the end of the day, what matters is what was learnt rather than what was taught [15]. Diversity between Teacher-based and Learner-based Learning are shown in Table 1.

**Table 1.** Diversity between Teacher-based and Learner-based Learning.

<b>Teacher-Centered</b>	<b>Learner-Centered</b>
Half duplex conversation Frequently Instructor talks but not students	Full duplex conversation; models created by Instructor; students interact both with one another and Instructor
Instructor is base	Learners are base with support of instructor
Study topics are chosen by Instructor	Choice of topics is student based
Individual work by learners	Based on aim of assignment students work in groups or pairs.
Learning by student is evaluated by Instructor	Peers evaluate their own learning; Instructor also evaluates if needed
Corrects student by constant monitoring	Students exchange ideas without monitoring by instructor ; If question raised instructor provides feedback

The plan of semi-autonomous lecture capturing system call for permanently recording the presenter, presenter's speech, white board, projector, audience voice, specimen, and microphone output, using various media capturing gears and storing them in a media server. Students will have access to this media server via an internal network. Because the lecture resource is available for review until the subject is mastered, this strategy is predicted to improve student’s learning potential.

The semi-autonomous lecture capturing system that integrates ICT is expected to see a paradigm shift from governed to interactionist learning and teaching approach to achieve several advantages [16]. Few of these advantages are that are depicted in Table 2.

Table 2. A paradigm shifts from governed to interactionist learning and teaching approach.

		Governed	Interactionist
Roles	Student	All learners learn from common material and competence is judged using same yard stick.	Possibility of learning different materials and competence measured from all angles
	Teacher	Push knowledge; Teacher dependent skill development.	Facilitates to generate their own knowledge; collaborative resource to develop skill
Environment	Materials in Teaching and learning	Exercises are text based and uses direct instruction method	Computer-based materials to encourage self-directed learning
	Attributes of Curriculum	Skills taught one after the other in structured way to ensure hierarchy in skills.	Project based skill development
Methods	Outcomes of Learning	Reflects learner's mastery of learning and behavioral competence in a scope	Reflects learners growth from where he / she began and increased ability to work independently
	Activity types	Lecturing, demo, practice, discussions, testing	Projects based on Groups, hands-on training, practical oriented

Traditionally, instruction was primarily a half duplex flow of information from the teacher to the learner. Now, the Interactionist method to learning and teaching emphasizes problem-solving and exploring potential solutions. The emphasis is on both group and individual efforts. Self-motivated and self-paced learning are benefits of this ICT enabled learning semi-autonomous lecture capturing system. As a result, the teacher's function must shift from "sage on the stage" to "guide by the side". A transition from a primarily "teacher-based" paradigm to one that empowers learners to be more engaged and independent learners is encouraged in this proposed semi-autonomous lecture capturing system.

### III. METHODOLOGY

In the current investigation, information from specific people with relevant knowledge is obtained using random sampling methods. Thereby, such a level of knowledge was vital during this quantitative investigation. The participants in this study are students of the College of Agriculture, Mandya campus, which is constituent College of University of Agricultural Sciences Bangalore, Karnataka, India.

There are 120 participants in the study, and primary data are used to collect information. The use of closed-ended questionnaires allows for the measurement of a number of characteristics that demonstrate how ICT has improved student learning. The gathered information is analyzed using a percentage distribution and shown in pie and line graphs.

This work of semi-autonomous lecture capturing system considers the architecture as described in Figure 1, where sensors and different media capturing apparatus are connected for capturing the presenter, presenter's voice, whiteboard, projector, audience voice, specimen, and micro phone output etc.

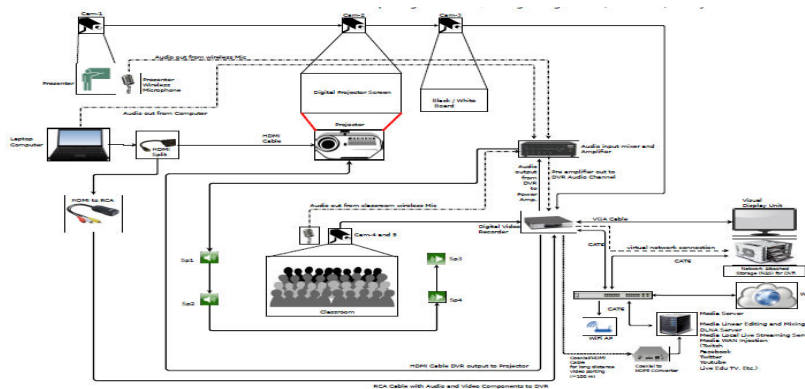


Fig. 1. A view of Lecture Capturing System themes, sub-themes, and themethodologies

High level architecture of live streaming of Lecture Capturing System that connects to various locations of campus under study is shown in Figure 2.

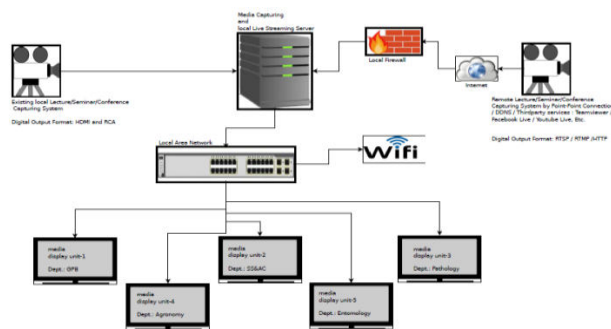


Fig. 2. High level architecture of live streaming of Lecture Capturing System contents to various locations of campus.

The captured data is stored in the media server. This media server will be accessible to the students through internal network and also through the Internet. Students will get an access to their subject of interest using credentials (user id and password) provided by system administrator.

#### IV. RESULTS AND DISCUSSION

Responses or replies of the participant students to some questions asked are as follows:

1. In your opinion which of the following methods of learning has given best learning experience?
  - a. ICT based Teaching/Learning
  - b. Teaching that is traditional based onchalkboard
  - c. Mix of both methods

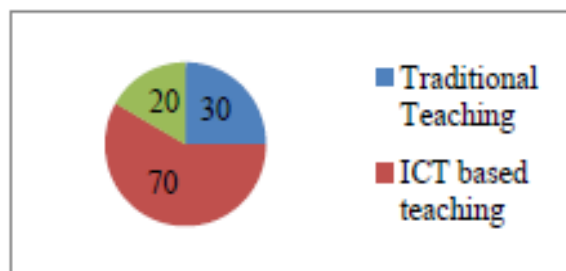


Fig. 3. Effective learning methods

According to Fig. 3, 30 students expect learning in a traditional manner using a chalkboard, 20 anticipate a mix of traditional and ICT-based instruction, and 70 anticipate entirely ICT-based coaching.

2. Better understanding of the subject is attained from which of the following ICT tool?
- a. Presentation (Live given in Classroom)
  - b. Video (Stored lectures in media server)
  - c. Both of the above

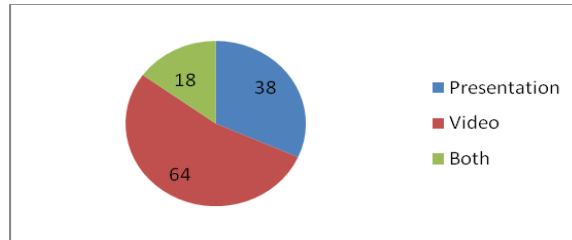


Fig. 4. Better method of understanding the subject matter

According to Fig. 4, 38 students say presentation is better to know subject contents, 18 anticipate a mix of presentation plus videos, and 64 anticipate entirely towards the videos that are being stored in media server

3. Do you opine that quality of teaching and learning is enriched by technology?
- a. Yes
  - b. No

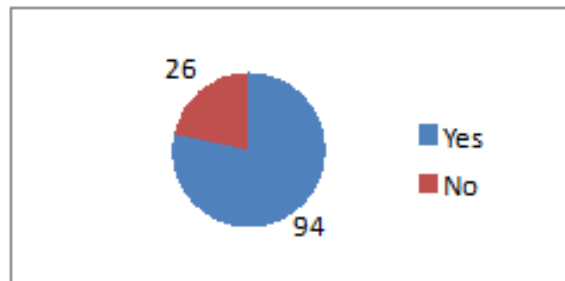


Fig. 5. Teaching and Learning improvement by technology

According to the Fig.5, about 78% learners supports and give the opinion that technology enabled teaching plus learning activities to do enhance the quality of the learning process.

4. In our opinion do quality of Teaching reflects on Teaching Resources
- a. Yes agree
  - b. Disagree
  - c.

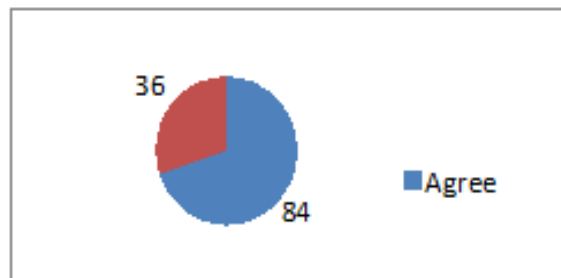


Fig. 6. Impact of resources on quality of Teaching

According to reflections of Fig.6, minimum of 70% of the students believes that quality of teaching and learning process experienced by learners is dependent on resources used during teaching.

5. What percentage of ICT (Lecture capturing) and Traditional-Blackboard learning blend would you favor?

- | Traditional | ICT enabled (Lecture capturing) |
|-------------|---------------------------------|
| a. 60.0 %   | 40.0%                           |
| b. 20.0 %   | 80.0%                           |
| c. 40.0%    | 60.0%                           |
| d. 80.0%    | 20.0%                           |

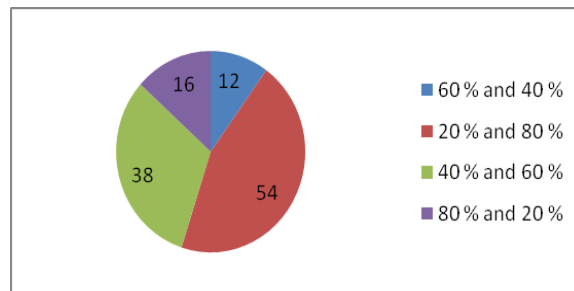


Fig. 7. Preference on combination of methods

From the above data shown in Fig.7 we can infer that approximately 23.0 % of student learners like blackboard method of learning plus teaching and approximately 77.0 % student learners appreciate ICT based learning.

6. Whether all learners are reachable to ICT enabled learning?

- Yes
- No

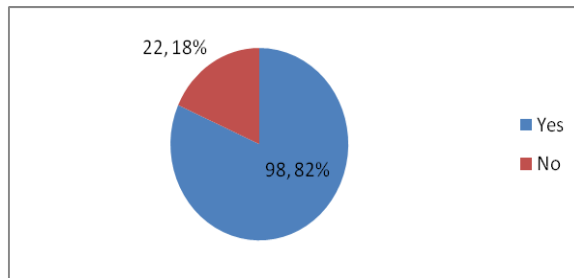


Fig. 8. Accessibility to ICT learning.

From the Fig. 8, we can conclude that nearly 82.0% students do have ICT enabled learning reachable hence ICT learning process is found to be technically feasible for implementation.

Data generated on hourly, daily and monthly bases in the server is collected for analysis and results obtained are shown in Figures [9-14]. The following parameters indicate the effectiveness on ICT enabled learning:

**Hits** - The total count of requests generated to the server throughout the specified time (may be day, hour, month, etc.) is treated as hits. The requests could be made to server for anything, which includes audio file, CGI scripts, visual images, and HTML pages.

A **page** is made up of the page text, the images on that page, the style sheets etc. counting all of these gives the page count.

**Files** -The total hits (requests) that actually resulted in data being provided back to the user by the server is represented here as files. Files are the items that are returned to the client that requested them; they can be graphic images, HTML

pages, etc. Not every hit will convey information, including 404-Not Found requests and requests for pages that are already cached by the browser.

**Visit-** A Visit is a single website visitor who enters the site and stays to peruse. No matter how many times a visitor may have visited the site, each visit counts all visitors.

**Site** is a distant machine that queries server based on the machines IP address or hostname. It should simply be used as a rough measure of server traffic.

The list of Uniform Resource Locators (URLs) gives you information about which pages in your site are getting the most attention. If most of the people are getting to common site by typing its URL into the browser then it is the top URL.

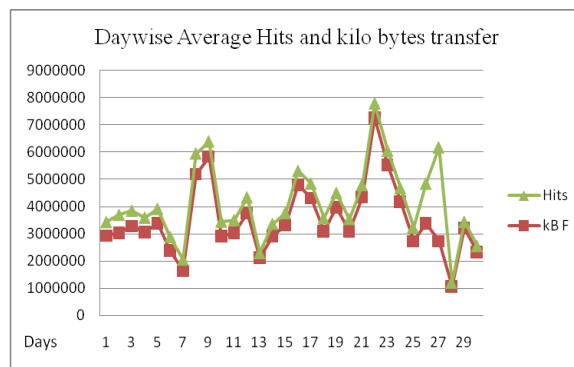


Fig. 9. Average number of hits and data transfer in kilo bytes over a month’s period

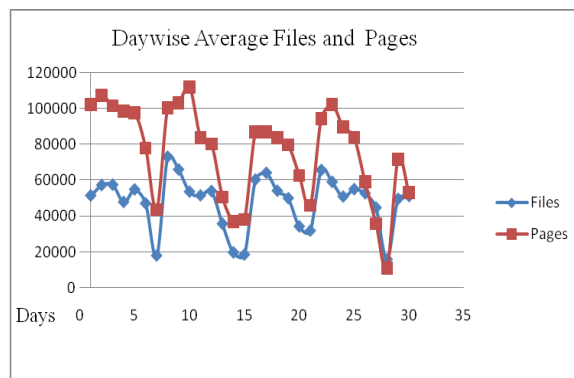


Fig. 10. Average number of file and Pages over a month’s period

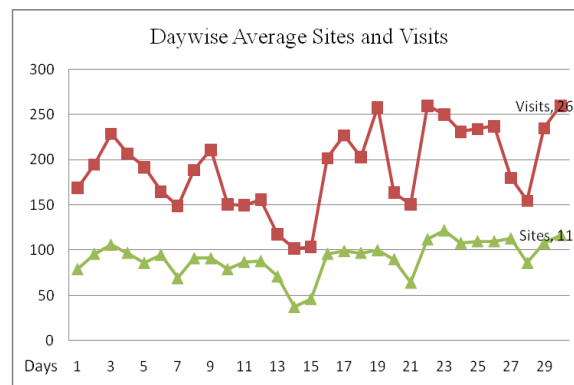


Fig. 11. Average number of visits and sites over a month’s period

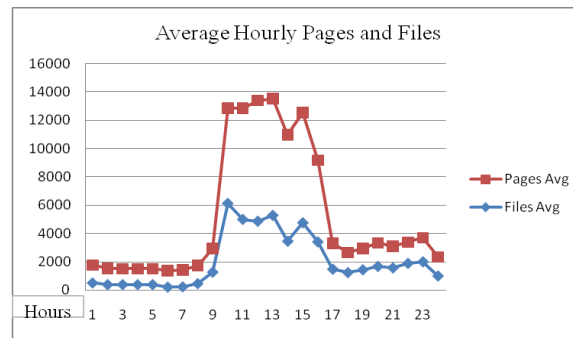


Fig. 12. Average number of Pages and Files in a single day

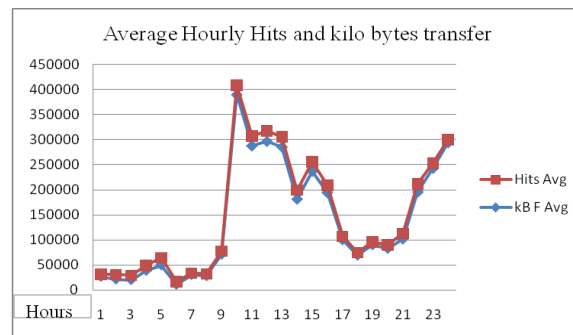


Fig. 13. Average number of hits and data transfer in kilo bytes in a single day

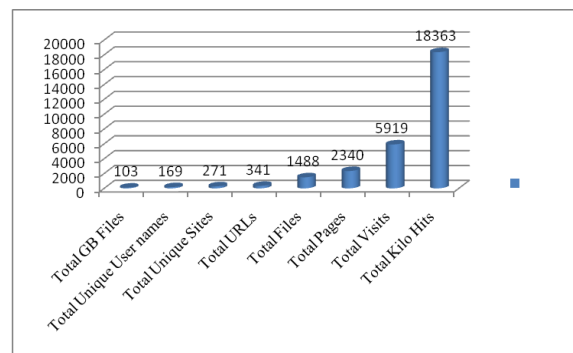


Fig. 14. Average monthly statistics

As shown in Table 3, data from questionnaire and data collected from server indicates that students were often self-indulgent (mean = 4.12). Students were sometimes able to unite and team up in combined work and projects (mean = 3.25). Also learners are found to be effective learners (mean = 4.10) and are autonomous learners (mean = 4.18).

Table 3. Student’s role in learning with ICT enabled recourses.

Whether students are...?	N	Mean	Std. Dev.
Self-indulgent learners	120	4.12	0.780
Able to unite and team in combined work and projects	120	3.25	0.653
Effective learners	120	4.10	0.814
Autonomous learners	120	4.18	0.712
Approved N (list wise)	120		
1= No way; 2= rarely; 3= sometimes; 4= frequently; 5= almost all the time			

## V. CONCLUSION

The findings of this study suggest that in comparison to traditional classroom learning, semi-autonomous lecture capture system based learning is more effective. This is due to the fact that use of media server eliminates distance plus time barrier and creates a more engaged learning environment for students. Students learn better with the use of recorded lessons that are designed to make students engaged throughout the learning session. Accordingly, the students agreed that integrating ICT in education can foster student's learning.

ICT makes students to be more innovative, gifted and imaginative when understanding level expands and lecture capture systems help students to possess all skills in learning when they are able to gain vital information and knowledge. The changes taking place in teaching are driven by ICT devices available to on or off campus students. To advance successful learning and to fulfill the necessity for 21<sup>st</sup> century teaching aptitudes, teachers must be ICT proficient and ought to have ICT abilities to progress their teaching methods, procedures and approaches.

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