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Assessment Of Information Communication Technology (ICT) Usage In Sciences Education At Debre Tabor University, Ethiopia

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***Abstract*—Teaching learning process has been many challenges in the last decades. Quality of sciences education has been dismissed due to many factors. Scholars suggested that sciences education should be practical and ICT based, rather than talk and choke. Currently, the education system of Ethiopia is moving towards practical and innovative approaches using ICT support. Frequently usage of ICT in teaching learning process will enhance the quality of sciences education in Higher Education Institutions. However, there are different factors the push up and pull down the ICT usage time of instructors in Debre Tabor University. Moreover, there was usage variation within departments among faculties and between faculties. The instructors have a bulky of ICT usage variation due to care to computers, LCD projectors and other ICT supports than their skill. Internet usage, skill, external challenges and others show a significant positive effect while ability to use lab top, Excel and LCD projector usage skills have a significant negative effects on ICT usage time in teaching learning process of science. It is recommended that the university provide a basic training on time management, care and skill development in ICT usage for a better enhancement of quality sciences education.**

Keywords—Multilevel; ICT; quality education; Variation

I. INTRODUCTION

Education develops a student Physically, Socially, Mentally and spiritually by teaching various subjects like Science, Mathematics, Social Science, English, Drawing, Sanskrit, Physical Training and some more. Every subject develops Cognitive Domain, Affective Domain and Psychomotor Domain of students if taught properly. Every subject has unique importance like Mathematics develops Logic, Different languages develop Listening, Speaking, Reading and Writing abilities, and Science develops Observation Power and So on. Science as a subject is widely applied in our day to day life like Fan, Television, Telephone, Computer, Satellite etc. This means many things which we use in day to day life have been application of pure science. There are mainly three branches of Science, namely Physics, Chemistry and Biology. However mathematical sciences are the basic language on any science [1].

The new science of learning informs the debate concerning the "best" instructional practices by focusing attention on student learning rather than instructional methods. Instructional practices are considered effective to the extent that they support students' learning with understanding, preexisting knowledge, and active learning. Although laptops and digital resources acquired as part of technology immersion may enrich "traditional" practices, their greatest value lies in the provision of "new" student opportunities for more authentic and intellectually challenging school work [2].

Projected Aids are *Films, Filmstrips, Slides, Opaque Projections and Overhead Projections.* Thus, use of Projected Aids always needs Computer/Laptop, Over Head Projector, and LCD Projector, Television etc. Non-Projected Aids are *Graphic Aids, Display Boards, 3-D Aids, Audio Aids and Activity Aids.* Thus, use of Non-Projected Aids may or may not need Computer/Laptop, Over Head Projector, and LCD Projector etc. For Example, *Audio Aids* and Computer Assisted Instruction need help of technological tools. In many studies, researcher has used *Educational Videos* to teach concept of Universe in in Science, mathematics and Technology subjects. Educational Videos come under projected aids and it can also be called as Films [1, 2]. Other findings revealed that the attitude of most of the students and teachers to using ICT services for learning science at HEI is good and receptive. The use of ICT help in chalk-talk style for teaching and learning science were said to make learning more meaningful and encourages active student participation. However, there is very poor availability of resources, appropriate usages and a low

level of confidence in handling computers or projectors for this type of learning. The key factors were shortages in usage skills, carelessness and power (electric) fluctuations [3].

A. Background and Justifications

The findings other research reveal that there is no doubt that laptop and other ICT services have played an important role in teaching-learning as well as a powerful tool in helping the teachers discharging their daily duties such as preparing lessons, searching for resources and had consequently improved their proficiency in handling ICT tools. In short, teachers benefit a great deal from the implementation of the laptop initiative for the teaching of Mathematics subject [8].

However, problems and challenges in the daily duties of the teachers come in many forms. Lack of competency [7] on the latest technology, reconceptualization of teaching methods and scheduling problems may be hindering the full utilization of laptops by teachers. Apart from these, [6] reported that there are still teachers who are reluctant to use technology. [7] Indicated that teachers may be unwilling to use technology because they lack the skills to use such tools. Further [7] stated that teachers are not keen to advance their professional development although there are such training courses available. The research findings of studies found that professional development training programmes are quite limited, thus teachers have very little opportunity to acquire new knowledge and skills to use the laptops, projectors and other ICT services more effectively in the teaching-learning environments.

Debre Tabor University is one of the newly opened 10 third generation Ethiopian universities. DTU is trying to implement the student centered teaching practice with an innovative curriculum of problem based learning to achieve quality education, energetic and problem solver graduates of sciences. Besides, the university provided Laptop computers for each academic staff and LCD projector for each science departments. However, there is no appropriate usage of ICT services in time among instructors of the university; evenly instructors' attitude and perception on ICT supported education show a great variability from time to time.

This study addresses the following research questions:

- What are the motivating factors of poor/good handlings of ICT usage time in teaching practice?
- How much are Instructors ICT usage time variation at department and faculty levels for science teaching enhancement.

B. Objectives of the study

The main objective of the study is assessing ICT usage Time in Science education of Debre tabor University practice. Specifically:

- To identify the positive or negative liner effects of some factors on teachers ICT usage time for science education.
- To quantify the variability of teachers ICT usage Time among departments within a faculty and among faculties within the university.

II. METHDOLOGY

A. The study area and population

The study was conducted at Debre Tabor University, south Gondar zone, Amhara regional state, Ethiopia in 2014/2015. This is one of the third generation Ethiopian public universities. Currently, the university runs the teaching learning process within 6 faculties, 31 departments having a total of 13,000 students and 640 instructors. The target population for the study was instructors of science faculties (natural and computational sciences, engineering sciences and health sciences) in regular program of Debre Tabor University (DTU).

B. Data sources and data collection

The study uses primary data collected using the designed questionnaires for instructors. Besides, secondary data were gathered from documentations of the university ICT officers for triangulation of the collected primary data.

C. Sampling Procdure and Sample Size

Multistage Stratified random sampling and purposive sampling methods were used. Instructors were stratified based on their faculties then departments. A total of 113 samples were selected. Instructors were randomly selected form their departments. As shown in **table 1 below.**

Table 1: Sample size per faculty

Faculties	**Sample size**
Natural and Computional Sciences	51
Engineering Sciences	49
Health sciences	13

Table 2: Descriptive Statistics					
Usage time per week (average hrs.)	N	Minimum	Maximum	Mean	Std. Dev.
	113	2.00	24.00	12.98	5.82
Valid N (list wise)	113				

D. Statisticl Modeling and Analysis

Descriptive analyses of Instructors or staffs' perceptions were done. And a multilevel linear regression model showing the null, fixed and random effect parameters were applied to identify the significant factors and variability at each level. Current Teacher Proficiency of Technology Equipment and Applications indicate the level of proficiency for each of the following computer tools and applications in teaching learning process.

III. RESULTS AND DISCUSSIONS

The result of the analysis has a tabulated counts, percentages and pie-chart as descriptive analyses and multilevel (null, random intercept and random slop) models are fitted.

From the descriptive analyses (Fig.1), about 33% of the instructors' are excellent in basic computer skills as

From the result shown in Table 2 above, the average ICT usage time of instructors in a teaching learning process was about 13 hours. And from Table 3 shown above, about 47% of the teachers/instructors/ were disagree, 26% of the teachers/instructors/ were agree and 27% of the teachers/instructors/ were strongly agree that science education should be run with a general support of ICT. The reasons for this perception were large class size, few numbers of lab classes and lack of quality and access in ICT tools in the campus.

Table 3: Teachers perception on Education should b with ICT in general				
Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Disagree	53	46.9	46.9	46.9
Agree	29	25.7	25.7	72.6
Strongly Agree	31	27.4	27.4	100.0
Total	113	100.0	100.0	

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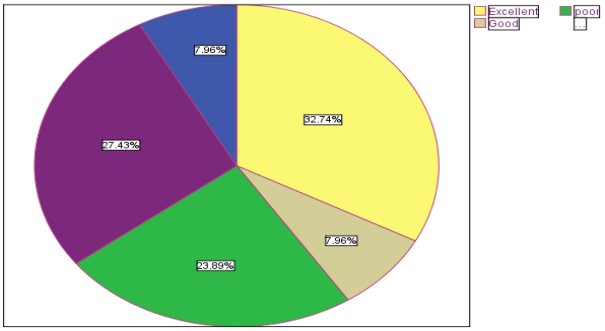

Fig 1: Pie-chart of Instructors' basic computer Skill.

$$\text{UsageT}_{ij} = \beta_{0j} + e_{ij}$$
$$\beta_{0j} = 13.309(0.657) + u_{0j}$$
$$u_{0j} \sim N(0, \sigma^2_{u0}) \quad \sigma^2_{u0} = 14.153(5.045)$$
$$e_{ij} \sim N(0, \sigma^2_e) \quad \sigma^2_e = 19.529(3.705)$$
$$-2*loglikelihood = 706.007(113 \text{ of } 113 \text{ cases in use})$$

Fig 2: Fitted Empty (null) model

$$\text{UsageT}_{ij} = \beta_0 + \beta_1\text{Skill}_{ij} + \beta_2\text{Care}_{ij} + 0.791(0.732)\text{challenges}_{ij} + 0.038(0.653)\text{Computer}_{ij} + 0.149(0.639)\text{Labtop}_{ij} + -0.304(0.585)\text{LCDprojector}_{ij} + 0.024(0.562)\text{MicroSoftword}_{ij} + 0.000(0.000)\text{Powerpoint}_{ij} + -0.045(0.779)\text{Internate}_{ij} + 0.150(0.573)\text{Email}_{ij} + -0.020(0.565)\text{Excel}_{ij} + -0.312(0.618)\text{ICTEduc}_{ij} + e_{ij}$$
$$\beta_{1j} = 1.353(0.352) + u_{1j}$$
$$\beta_{2j} = -0.275(0.363) + u_{2j}$$
$$\begin{bmatrix} u_{1j} \\ u_{2j} \end{bmatrix} \sim N(0, \Omega_u) : \Omega_u = \begin{bmatrix} 0.241(0.503) & \\ -0.030(0.515) & 0.668(0.653) \end{bmatrix}$$
$$e_{ij} \sim N(0, \sigma^2_e) \quad \sigma^2_e = 18.014(3.901)$$
$$-2*loglikelihood = 693.298(113 \text{ of } 113 \text{ cases in use})$$

Fig 3: Fitted Random intercept mode

$$\text{UsageT}_{ij} = 9.138(6.083) + 1.173(0.391)\text{Skill}_{ij} + -0.482(0.381)\text{Care}_{ij} + 0.976(0.767)\text{challenges}_{ij} + 0.008(0.719)\text{Computer}_{ij} + -0.130(0.733)\text{Labtop}_{ij} + -0.334(0.650)\text{LCDprojector}_{ij} + 0.238(0.653)\text{MicroSoftword}_{ij} + 0.000(0.000)\text{Powerpoint}_{ij} + 0.086(0.855)\text{Internate}_{ij} + 0.152(0.668)\text{Email}_{ij} + -0.159(0.640)\text{Excel}_{ij} + -0.174(0.715)\text{ICTEduc}_{ij} + e_{ij}$$
$$e_{ij} \sim N(0, \sigma^2_e) \quad \sigma^2_e = 29.830(3.968)$$
$$-2*loglikelihood = 704.372(113 \text{ of } 113 \text{ cases in use})$$

Fig 4: Fitted Random Slop model

From the fitted null model results, as **shown in Fig 2**, there is a bulky of ICT usage time variation among departments within faculties than the variations among faculties. From the random intercept model (**shown in Fig 3)** results show that users' skill, challenges to use, desktop computer, internet usage, Email usage and Microsoft word usage ability were significantly positive effect on ICT usage Time in

sciences education. However, users care, laptop usage ability, LCD Projector usage, Excel usage ability and ICT in all education system were significantly negative effect on Usage time of ICT in science education.

Moreover, the random slop model (**shown in Fig 4**) show that there was high care (0.668) variation than skill variation (0.241) of lecturers ICT usage time among faculties. However, 32.74% of the lecturers' have excellent skills. On average, instructors use ICT in teaching learning practice of the formal education system about 13 hours per week.

IV. Conclusion

This paper assesses the ICT usage time and related factors with the hierarchical variation among departments within/between/ faculties of Debrtabor University. Cross sectional survey analysis was done. More ICT usage variation (19.5) was observed within the faculties than between faculty's variation (14.1). Some factors show negative effect on ICT usage time in science education system while the others show positive effect for enhancing ICT supported education. On average, Instructors use 13 hours per week. This practice is relatively good since an instructor has a responsibility to work 12 hours per week. Most of the instructors have excellent basic computer skill but there is careful usage variation among them. Most of the instructors (47%) disagree on science education should be supported with ICT. This seems because of many challenges and low access to use ICT. Moreover, the ICT supporting science education application time show more variation between departments within faculty than between faculties. It is recommended that trainings on attitudinal changes, skill development and motivational awards based competency are provided for instructors for a better practice of ICT supported science teaching learning process.

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