

Institutional Digital Environment (IDE), Teacher Digital Competency (TDC) & their Learnability Preparedness (TLP)

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Article Info

Volume 83

Page Number: 98- 103

Publication Issue:

July - August 2020

Article History

Article Received: 06 June 2020

Revised: 29 June 2020

Accepted: 14 July 2020

Publication: 25 July 2020

Abstract

The paper aims to understand the influence of digital environment of the institution (IDE) & digital competency of teachers(TDC) on the learnability preparedness of teachers (TLP) in that institution with case study of teachers in non-professional colleges in Goa. The study revealed that the digital infrastructure of an institution has more impact than that of teacher digital competency on the learnability preparedness of teachers in that institution.

Introduction

In the fast emerging higher education scenario, every stakeholder is putting in their best efforts to be onboard the 'Learning 4.0'. Towards the goal, higher educational institutions throughout the country have been investing huge amount money for improving their digital footprints. Similarly the push and pull factors have contributed towards Teacher Digital Competency(TDC). Teacher Learnability Preparedness(TLP) shows the extent to which teachers are ready to improve their learnability quotient in the age of disruptive technologies.

The objective of the study is to understand how learnability preparedness of teachers (TLP) is influenced by digital environment of the institution (IDE) & their digital competency(TDC). There are no major studies available on the relationship between TLP and IDE & TDC.

The remainder of the paper is organized as follows. Section 2 presents the literature survey and related work. The methodology is described in section 3. The observations are presented in section 4 while section 5 concludes the paper.

Related Work

With the emergence of Learning 4.0 to complement and support the Industry 4.0, the teacher has to integrate in technology into classroom teaching. Such integration will create an environment of cooperative learning. The role of the teacher transits from a facilitator to that of a learner (Mashhadi et al. 2011) in the technology enabled learning process (Kirkwood & et al. 2016). There is a need for the coherent use of educational technologies and the digital classroom by the teacher for creating an asynchronous learning environment (Mayadas, 1997). The existing research provides only some information about the competencies which teacher should have in order to teach digital skills to students (Claroa et al. 2018 & Siddiq et al. 2016).

Currently the digital institutional environment is being used to replicate, reinforce or supplement teacher focused teaching practices with no impact assessment about students learning outcome. What is important is not merely the technology but the ways in which the teacher plans his/ her teaching activities to keep students engaged and to ensure smart learning (Kirkwood & et al. 2016).

In the available literature there are no major

studies especially in India to understand how the Learnability Preparedness of Teachers (TLP) is influenced by their digital competency (TDC) and Institutional Digital Environment (IDE).

Methodology

The main objective of the study in this paper is to analyse the relationship between the dependent variable Learnability Preparedness and the independent variables Institutional Digital Environment and Teacher Digital Competency. The calculation of all the three variables is described in subsections 3.1, 3.2

and 3.3.

Institutional Digital Environment

This section describes about the process of measuring the digital infrastructural strength of the institution in the form of Institutional Digital Environment(IDE). IDE depends on several factors such as computer student ratio, computer faculty ratio, internet bandwidth, etc. Each of the factors is measure by analysing the responses of the probe pertaining to the factor. The list of probes for Institutional Digital Environment is given in table 3.1.

The value of IDE is calculated using the expression 1.

$$\Sigma_{n} \frac{\sum_{i=1}^n W_i IDE_i}{\sum_{i=1}^n W_i}$$

where, W_i is the weight of the i th factor affecting IDE.

Sr.No	Probe	Weight
1	Number of Computers available to Students	1
2	Total number of students	1
3	Number of Computers available to Staff	1
4	Total number of Staff(Regular+Contractual+Lecture Basis)	1
5	Number of Computers with Internet Facility?	1
6	Internet Bandwidth of the College(MBPS)	1
7	Is there Internet Center in the Campus?	1
8	Does the College have LMS(MOODLE, JOOMLA,etc)	1
9	Does the College have website?	1
10	Number of updates to website in a week	1
11	Number of processes computerized.(Examination, Result Generation, Attendance, Admissions, etc)	1
12	Mention the processes computerized	1
13	Internet usage per day (MB/day)	1
14	Number of in-house Software/Applications developed(including website if developed in-house)	1
15	Mention the software/applications developed in-house	1

Table 1: Probes for Institutional Digital Environment

Teacher Digital Competency

This section describes about the process of measuring the Teacher Digital Com- petency(TDC). TDC depends on factors such as knowledge and usage of soft- ware tools, packages, and programming languages in academics and publishing of research papers in computer science, etc. Each of the factors is measure by analysing the responses to the probe pertaining to the factor. The list of probes for Teacher Digital Competency is given in table 3.2. The value of *TDC* is calculated using the expression 2.

$$TDC = \frac{\sum_{i=1}^n w_i^{TDC} * f_i^{TDC}}{\sum_{i=1}^n w_i^{TDC}} \quad (2)$$

where, w_i^{TDC} is the weight of the *i*th factor affecting TDC. The TDC value of an institution is calculated by taking the average of TDC of individual teachers teaching in that institution.

Teacher Learning Preparedness

This section describes about the process of measuring Teacher Learning Pre- paredness(TLP) of institution. TLP depends on factors such as the number of research papers published, number of major/minor projects undertaken,etc.

Sr.No	Probe	Weight
1	Do you know to use Learning Management Sys-tem(MOODLE, JOOMLA, Google Class,etc) ?	1
2	Do you use Learning Management System(MOODLE, JOOMLA, Google Class,etc) ?	1
3	Reason for not using in case you know to use it	1
4	Do you know to conduct ISA/Assignments using online technology(MOODLE, JOOMLA, etc)?	1
5	Do you conduct ISA/Assignments using online technol-ogy(MOODLE, JOOMLA, etc)?	1
6	Reason for not using in case you know to use it	1
7	Do you know to use Software Packages (SPSS, etc)	1
8	Do you use Software Packages (SPSS, GeoDa, QGIS etc)	1
9	Reason for not using in case you know to use it	1
10	Do you know to write programs in any Computer Program- ming Languages?	1
11	Have you written any programs in any Computer Program- ming Languages?	1
12	Do you know to use LATEX?	1
13	Have you used LATEX?	1
14	Reason for not using in case you know to use it	1
15	Have you developed any Software/Application for teaching learning?	1
16	Have you published any paper in the field of Computer Science?	1

Table 2: Probes for Teacher Digital Competency

Sr.No	Probe	Weight
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1	UG Teaching Experience as on 1st Nov 2019 in completed years	1
2	PGTeaching Experience as on 1st Nov 2019 in completed years	1
3	Year of Award of Ph.D.	1
4	Area of PhD Specialization	1
5	Total Projects Completed(Major)	1
6	List the Titles and Funding Agencies of Projects Completed(Major)	1
7	Total Projects Ongoing(Major)	1
8	List the Titles and Funding Agencies of Projects Ongoing(Major)	1
9	Total Projects Completed(Minor)	1
10	Total Projects Ongoing(Minor)	1
11	Total FDPs attended	1
12	New Technologies Learnt (Mention 5 most important Technologies)	1
13	Ph.D. Specialization(In case has done PhD)	1
14	Research area currently pursuing	1
15	New area currently working on(if any)	1
16	Do you feel the need for Learning, Unlearning and Relearning?	1
17	Why do you feel so?	1
18	Is the ecosystem in your institution conducive for Learning, Unlearning and Relearning?	1

Table 3: Probes for Teacher Learning Preparedness

Each of the factors is measure by analysing the responses to the probe pertaining to the factor. The list of probes for Teacher Learning Preparedness is given in table 3.3.

The value of TLP is calculated using the expression 3.

$$\Sigma_n \frac{w_i^{TLP}}{TLP} * f_i^{TLP} \quad (3)$$

d

where, w^{TLP} is the weight of the i th factor affecting TLP and d is the period of teaching in

years. The TLP value of an institution is calculated by taking the average of TLP of

individual teachers in that institution.

Data Collection and Sample Size

The data was collected through an online survey. The survey was conducted on 580 regular teachers in non-professional colleges in the State of Goa.

Observations and Findings

The data collected has been analyzed using Python Language. For the sake of simplicity, all the weights are assigned value 1. The weights can be assigned values as per the importance of the probe.

Influence of TDC on TLP

Expression 4 depicts the relationship between TDC and TLP as a linear function.

$$T_{LP} = 0.001T_{DC} + 0.236 \quad (4)$$

The impact of TDC on TLP, denoted as $sensitivity_{TDC}^{TLP}$ is depicted in the expression 5.

$$sensitivity_{TDC}^{TLP} = \frac{\delta T_{LP}}{\delta T_{DC}} = 0.001 \quad (5)$$

The term $sensitivity_{TDC}^{TLP}$ in expression 5 is the sensitivity of TLP towards TDC. In other words it reflects the amount change in TLP with unit change in TDC. In this study, the observed value of $sensitivity_{TDC}^{TLP}$ is 0.001 indicating that the model in expression 4 is a line almost parallel to the 'x' axis i.e. T_{DC} . This indicates that there is negligible impact of change in TDC on change in TLP.

Influence of IDE on TLP

Expression 6 depicts the relationship between IDE and TLP as a linear function.

$$T_{LP} = 1.16I_{DE} + 3.054 \quad (6)$$

The impact of IDE on TLP denoted as $sensitivity_{IDE}^{TLP}$ is depicted in the expression 7.

$$sensitivity_{IDE}^{TLP} = \frac{\delta T_{LP}}{\delta I_{DE}} = 1.16 \quad (7)$$

The term $sensitivity_{IDE}^{TLP}$ in expression 7 is the sensitivity of TLP towards IDE. In other words it reflects the amount change in TLP with unit change in IDE. In this study, the observed value of $sensitivity_{IDE}^{TLP}$ is 1.16 indicating that the model in expression 6 is a line with a positive slope of 1.16 which indicates that there is quite a substantial impact of change in IDE on change in TLP.

Observation

As described in the previous two subsections, $sensitivity_{IDE}^{TLP} = 1.16$. The value of $sensitivity_{IDE}^{TLP}$ is greater than $sensitivity_{TDC}^{TLP} = 0.001$.

Hence, it is observed that the influence of IDE is more than the influence of TDC on TLP. In other words, improvement in the digital infrastructure of an institution has more positive impact on the Learnability Preparedness of teachers in that institution.

Conclusion

The study in this paper aims to understand the influence of digital environment of the institution (IDE) & digital competency of teachers (TDC) on the learnability preparedness of teachers (TLP) in that institution. The study was done on teachers teaching in non-professional colleges in Goa. From the study it is observed that the digital infrastructure of an institution has more impact than that of teacher digital competency on the Learnability Preparedness of teachers in that institution.

The study reveals that the improvement in the digital environment of the institution motivates and complements the faculty to learn and use the new digital technology thereby enhancing the teacher learning preparedness in that institute.

The study done in this paper is the first of its kind to best of our knowledge. The findings are being conveyed to the policy makers in Higher Education in the State of Goa based on which, the Directorate of Higher Education, Govt. of Goa has created Digital Infrastructure in the Government Colleges in State of Goa.

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