

Secondary School Teachers' Digital Literacy and Use of ICT in Teaching and Learning

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Abstract: *The rapid growth in the field of Information, Communication and Technology (ICT) has highly influenced student life as well as teaching-learning process in Secondary Schools. To face the challenge of exploiting such intimacy of students with technology for promoting constructive learning, the need for teachers themselves to be digitally literate is imperative. Being a descriptive survey, the present study investigated the Digital Literacy level of teachers and their Use of ICT in teaching-learning process among Secondary Schools in Mangaluru Taluk. Besides comparing Digital Literacy level and ICT Use among Urban and Rural school teachers, study also aimed to find relationship between two variables. Findings provide vital information on present status of Digital Literacy and ICT use of teachers. Paper also provides educational implications which assists undertaking suitable initiative to enhance ICT infusion into teaching-learning in more innovative ways.*

Key Words - *Digital Literacy, Applications of ICT, ICT in teaching, ICT in learning, Secondary School teachers*

Introduction:

We are living in a constantly evolving digital era. Present students, also called as 'Digital Natives' grow up using technology like computers, internet and mobile phones constantly from their early years of life. Due to this early exposure to technology, students today think, communicate, seek help, learn and access information differently. For this reason, it has been observed that the digital natives need to be taught in a fundamentally different way. Learners get accustomed to using technology to solve most repetitive tasks in much easier ways, which earlier formed the basis of traditional learning. Hence, it is inevitable for educators to move from traditional teaching methods to more innovative and techno-enhanced methods of teaching and learning.

Secondary Education in India has constantly faced challenges of providing quality education to the student community. The development in the field of Information and Communication Technology (ICT) has paved way to new and innovative possibilities in teaching and learning. The focus of education has changed from the lecture method of teaching to exploratory methods of learning. Lessons are no more teacher-centered but are more learner-centered. Constructivism, the new paradigm of teaching-learning is the "talk of the town" and is said to be well implemented in the class with appropriate use of ICT. As the technology becomes more rooted in our culture, the demand for in-service teachers to become more tech-savvy increases drastically.

Teachers are expected to provide learners with appropriate and contemporary experiences that allow them to successfully engage with digital technology and prepare them for 21st century skilled life after school. Hence, to cope up with the current demands of 21st century student community and techno-enhanced teaching-

learning process, the teachers need to get digitally upgraded. Every teacher who is digitally literate aids in providing the learner community with the abilities and technically innovative skills to achieve global standards in digital world. It is the need of the hour to initiate effective teaching and learning process simultaneously by using latest ICT tools and web-based collaborative learning with global community. In the light of these demands, this paper explores the Digital Literacy level of teachers and use of ICT by teachers in teaching-learning process among Secondary Schools in Mangaluru Taluk.

Digital Literacy:

Digital Literacy is defined in various ways depending on the use of ICT. The Digital Saksharta Abhiyan (DISHA) or National Digital Literacy Mission (NDLM) Scheme initiated by our Prime Minister Mr. Narendra Modi defines Digital Literacy as the ability of individuals and communities to understand and use digital technologies for meaningful actions within life situations. Jones-Kavalier & Flannigan (2006) describe digital literacy as the person's ability to perform tasks effectively in a digital environment which includes the ability to read and interpret media, to reproduce data and images through digital manipulation, and to evaluate and apply new knowledge gained from digital environments. Past researchers have defined Digital Literacy as the combination of a number of complex and integrated sub-disciplines – comprised of skill, knowledge, ethics and creative outputs in the digital network environment (Calvani, Cartelli, Fini and Ranieri, 2008; Covello, 2010).

Having secondary school in-service teachers of Mangaluru Taluk at the focal point of this study, Digital Literacy in school pedagogy can be defined as *the minimum knowledge and ability of the secondary school teachers to use digital technology, communication tools or networks to locate, evaluate, use and create information in order to enhance the learning experience of students and prepare them to face the future global demands*. Thus, digital literacy is more than just embedding technology into lesson plans; it's about using technology to understand and develop modern communication, to locate oneself in digital space, to gather and utilize valuable information from the vast body of knowledge available online, to share and learn from teaching experiences of other professionals and to manage knowledge and experience in the age of information for the benefit of students. It is the ability to provide students with those learning opportunities which develops their higher order thinking, improves digital social skills and helps cope with ethical issues of digital environment.

Computers, mobile phones and tablet are the three major digital devices more often used in the pedagogy. Digital literacy considers the following components:

- Minimum knowledge of computer hardware and software used in teaching-learning. (E.g., Microsoft Office - Word, Excel, PowerPoint).
- Knowledge the use of internet on computers, mobile phones or tablets.
- The ability to directly access information from the wide world of information online.
- The ability to critically think and evaluate the information by comparing the information available online to check for the authenticity of the information.
- Knowledge of cultural and social ethics which is termed as E-safety.
- Collaboration and communication with students and professional experts enabling teachers to keep abreast of the current trends of education.
- Creative use of ICT in the teaching-learning process facilitating students to engage themselves in independent learning and development of higher order thinking skills.

There are various reasons why digital literacy is important to teachers.

- * Revised Bloom's taxonomy categorizes applying, analyzing, evaluating and creating as higher order thinking skills. Digital literacy facilitates teachers to develop students' higher order thinking skills by suitably choosing students' tasks in the classroom. It facilitates teacher to teach students how to think beyond Google for information access, how to evaluate the source of information and how to draw strong conclusions from the set of information obtained from various websites, thus pushing students to higher levels of creativity.
- * Digital Literacy allows teachers to promote Digital Citizenship in students; thus teaching them the effects of plagiarism and cyber bullying. This in turn allows students to think originally and creatively in their academics.
- * Not all students in a single classroom are of same abilities and skills. Using multimedia and ICT, differentiation in teaching and learning can be best implemented. Digitally literate teachers can appropriately design their learning activities with the help of ICT giving equal importance to both gifted and under-achievers. They can design the learning activities appropriately according to the thinking and learning style of students.
- * Digitally upgraded teachers can make innovative attempts to enhance their lessons by expanding the conceptions of digital world like using Social media, Instagram, Blogs etc.
- * Although, most schools in India are provided with Computer systems from the Government to be used in the classrooms, they are not suitably used for the enrichment of students for various reasons. Thus, teachers who are well versed with ICT usage in classrooms can easily step forward to close the Digital Divide, where in all students who have no access to computers and internet can have an access to it and get benefited from it.

Use of ICT in teaching-learning by teachers:

ICT includes both hardware and software. About a decade ago, hardware and software such as radio, television, motion picture, projector, camcorders were considered as ICT tools. In present days, hardware and software like computers, net books, mobile phones, MPS, e-book readers, personal digital assistances, interactive white board, e-mail, video conferencing etc are considered (Omoniyi & Quadri, 2013). Children today, are said to learn the digital skills as part of their lives, like language, which they learn without realizing they are learning it. (Andersen, 2002). Technology when introduced inside classroom motivates students in their learning due to their familiarity and enjoyment in innovative learning and the ease of use of various technological mediums. ICT allows students to learn according to their personalities, in their own thinking and learning styles. Students of various abilities can be easily catered at a time in the ways in which a single teacher could not, in traditional classrooms. ICT allows students to utilize and manipulate media to create their own meaning of the concepts to be learnt. Using ICT allows students to easily share the information with other students, teachers and experts, so that learning is no more time and place bound. ICT if taught to use appropriately, develops creativity, higher order thinking skills and social skills in students which are most essential skills in 21st century.

There are various purposes for which teachers can use digital devices in teaching and learning process. Luehrmann (1972) has proposed five roles of using digital devices in teaching-learning, especially for computers which can be now extended to mobile phones and tablets due to similar use; namely, Learning About Computers (computer awareness and computer literacy program); Learning From Computers (computers used either to tutor a student e.g., tutorial software or to provide additional practice on specific skills e.g., drill-and-practice software); Learning With Computers (student makes decisions about how to interact using the computer, within a simulation or game or problem solving, or using computer as a tool to shape information that is already exists); Learning About Thinking With Computers (computer used to help students develop new patterns of thinking that may assist them in many different learning situations using programming languages); Managing Learning With Computers (indirect use of computers in student learning – maintaining student

profile, record keeping, diagnostics and remediation, communication). Bhalla (2013) provides a comprehensive description of the application of computer for instructional purposes in both instruction and management of teaching and learning process, which includes CAL (computer-aided learning), CMI (computer-managed instruction), and CAI (computer-assisted instruction). CAL is a mode of instruction that employs the use of computer in mainly three ways - Whole Class Instruction; Teacher-Directed Student Assignments and Teacher's Self Learning. CMI employs use of computer in instruction-related tasks such as material generation, lesson plan preparation, schedule preparation, attendance monitoring, student's performance assessment, individualized education plans preparation, student reinforcement, communication. The CAI uses instructional software that can be used for tutorial, drill-and-practice, simulation, instructional gaming and problem solving. Thus, digital devices finds a wide range of utility in pedagogy.

Literature Review:

To analyze the research perspective of present study and the present status of ICT use in teaching-learning, an in-depth analysis of related literature was conducted. It was seen that Government of Karnataka under the Directorate of Public Instruction has undertaken various initiatives to improve computer education and computer based education using schemes like "Mahiti Sindhu" Program in 2000-01, Revised CLASS Project and the Eleventh Finance Commission Project in 2003-04, ICT @schools scheme in 2007-2008 etc. These schemes provided ICT infrastructure (internet, projector, ICT lab) in most government schools of Karnataka and made available trained instructors in all schools. But over a period of time the system deteriorated due to lack of direct monitoring and communication mechanism between the schools and project centre, lack of training to many more teachers and less software that could be directly implemented by teachers in schools.

Nagarajan, Velmanirajan & Kanna (2013) assert that the field of ICT is fast growing in India; hence, both teachers and students need to keep in pace with this fast growth. Since teachers shape the classroom instruction, their primary concern must be to develop the fullest potential of all students, affording them opportunities to pursue variety of avenues. Hence, the need for instructors is to model the new pedagogies and tools for learning by integrating the ICT into classroom instruction with the aim of enhancing the teaching-learning process. Since most pre-service teachers face technology enhanced classrooms, digitally updated students and online official interaction with departments and education systems in their employed schools, Milton (2013) suggests that it is important to provide the new pre-service student teachers proper digital training to face the upcoming professional challenges. A study conducted by Sangrà & González-Sanmamed (2010) found that ICT in teaching favors several teaching and learning processes and that the improvement of teaching-learning processes is higher in schools that have integrated ICT as an innovation factor. He suggests that, to obtain maximum fruit of ICT usage, there is a need for teachers to modernize the technological tools and change the teaching models. Collectively, this proves that digital literacy plays an important role behind a successful teacher.

A review conducted on the effectiveness of integration of ICT in pedagogy in contrast to conventional teaching showed that computer-related technologies change the teaching-learning process rapidly in school levels improving the student achievement and creating learning environments which are more interesting, effective and interactive (Kumar & Singh, 2013; Kaur 2014; Anboucarassy, 2010; Patil, 2011). Appropriate and effective use of technology make students independent learners increasing student motivation, active participation in learning, gain in in-depth information according to their interest and capability, enhanced creativity, improved memory retention, deep understanding, collaborative learning, individualized learning and

self-paced learning (Kumar & Singh, 2013; Mehar & Kumar, 2013; Mirji & Gaddi, 2013; Patil, 2011; Nagarajan, Velmanirajan & Kanna, 2013). Use of ICT has found to develop scientific spirit and scientific attitude of students in problem solving environment (Patil, 2011; Nimavathi, 2013; Singh & Gurdal, 2013). Krishnan & Phalachandra (2010) identify the ingredients of blended learning as live events, self-paced learning, collaboration, assessment and performance support. Using video-based instructional programmes, Reddy & Ramar (1998) have found tremendous increase in the rate of progress in slow learners. Nagarajan, Velmanirajan & Kanna (2013) assert that learners enjoy learning, enjoy democratization process taking place at classroom level, consider lecturers as students themselves and stop spending considerable time and money running around the libraries to look for information. From learner's perspective, some challenges to blended learning were identified the need to consider the learning styles and perceptual skills and abilities of students while designing the blended learning (Krishnan & Phalachandra, 2010).

Although using ICT in teaching and learning has its own advantages, many barriers were identified which inhibited teachers to integrate the multimedia and digital devices into teaching-learning. Bingimlas (2009) differentiates these barriers as teacher-level barriers and school level barriers. Teacher level barriers included lack of teacher confidence due to limited knowledge of ICT; lack of teacher competence due to the lack of knowledge and skills to use computers in the classroom; resistance to the change of old practices in pedagogy and negative attitudes of teachers who still do not believe in the benefits of technology. School level barriers include lack of time to prepare for the ICT based lessons; lack of effective training to the pre-service teachers and continuous professional development to the in-service teachers; lack of accessibility to these digital devices and lack of technical support.

Therefore, the in-depth analysis of the research perspective of Digital Literacy and ICT use in teaching-learning has helped the investigator to ascertain the immediate need for the present study. It was found that, although government has provided the schools with suitable infrastructure, no studies revealed that it is utilized completely for the right purpose. Also, no study tested the Digital Literacy level of present secondary school teachers of Mangaluru Taluk and their use of ICT in teaching-learning process. Study of past researches highlight the advantages of implementing ICT in the teaching. This probes a question - are our teachers sufficiently digitally literate to implement various technology based instructional methods in teaching-learning process for building strong digitally active citizens ready to face 21st century challenges? Also, do the secondary school teachers have the digital expertise to cater to various academic needs of the students? Thus, with strong conviction, the researcher feels that there is an immediate need for moving out of the comfort zone of traditional teaching and testing new constructivist technological approaches.

Objectives of the Study:

The following are the objectives of the present study:

1. To study the level of Digital Literacy among secondary school teachers in Mangaluru Taluk.
2. To study the extent to which ICT is used by secondary school teachers in teaching-learning process in Mangaluru Taluk.
3. To compare the Digital Literacy level of teachers of Urban and Rural schools in Mangaluru Taluk.
4. To compare the use of ICT by secondary school teachers of Urban and Rural Schools in teaching-learning process in Mangaluru Taluk.
5. To study the relationship between Digital Literacy level and ICT use in teaching learning process of Secondary school teachers of Mangaluru Taluk.

Hypothesis of the Study:

- H1: There is no significant difference between the Digital Literacy level among teachers of secondary school of Urban and Rural schools in Mangaluru taluk.
- H2: There is no significant difference between the use of ICT among teachers of secondary school of Urban and Rural Schools in Mangaluru Taluk
- H3: There is significant relationship between Digital Literacy level and ICT use in teaching leaning process of Secondary school teachers of Mangaluru Taluk.

Methodology:

The present study used descriptive survey method, where a survey was undertaken to study the Digital Literacy Level and ICT use in teaching-learning among Secondary School in-service teachers teaching Karnataka State syllabus in Mangaluru Taluk. The investigator collected the data from 73 teachers of private, aided and government schools of both Urban and Rural areas across Mangaluru Taluk. Simple random sampling method was employed to select the samples for the study.

The tools used for the study were two questionnaires namely, 'Digital Literacy Inventory' and 'ICT Use in Teaching-Learning'. Digital Literacy Inventory was constructed by the investigator to measure the level of Digital Literacy among Secondary School teachers of Mangaluru Taluk. The tool 'ICT Use in Teaching-Learning' was adapted from Bhalla (2013) which measures the use of digital devices by secondary school teachers in teaching-learning process. The study utilized statistical techniques namely - percentage and quartile deviation. The significance level was set to 0.05 levels.

Student's t-test was employed to find if any significant difference existed between the Digital literacy and ICT use in teaching-learning among Urban and Rural secondary school teachers. Pearson Product Moment Correlation "r" was calculated to find if there was any relationship between Digital literacy and ICT use in teaching-learning among secondary school teachers.

Analysis of the data and Result:

The level of Digital Literacy among secondary school teachers and the extent to which ICT is used by secondary school teachers in teaching-learning process in Mangaluru Taluk was graded as High, Low and Average using the Quartiles. Teachers having their digital literacy levels greater than or equal to third quartile value ($\geq Q3$) were said to have high digital literacy; values between first and third quartile ($Q1 < \text{Digital Literacy} < Q3$) were said to have average digital literacy and values lesser than or equal to first quartile were said to have low digital literacy.

Table 1.0: Details of level of Digital Literacy of Secondary School Teachers of Mangaluru Taluk

Digital Literacy Level	% of Teachers	% of Digital Literacy
High	21.9 %	91.5 %
Average	53.4 %	76.5 %
Low	24.7 %	57.8 %

From Table 1.0, it is observed that 21.9 % teachers had high digital literacy level of 91.5%, 53.4 % teachers had average digital literacy level of 76.5% and 24.7 % teachers had low digital literacy level of 57.8 %.

Table 2.0: Details of the extent of ICT use by Secondary School Teachers of Mangaluru Taluk

Level of ICT Use	% of Teachers	% of ICT Use
High	24.7 %	72.4 %
Average	53.4 %	53.9 %
Low	21.9 %	35.8 %

From Table 2.0, it is observed that 24.7 % teachers use the ICT in teaching and learning to an extent of 72.4 % ; 53.4 % teachers use ICT to an extent of 53.9 % and 21.9 % teachers use ICT in teaching-learning to an extent of 35.8 %.

Table 3.0 and Table 4.0 shows the results of the comparison of the Digital Literacy level and the ICT use of teachers of Urban and Rural secondary schools in Mangaluru Taluk respectively.

Table 3.0: 't' test details of the mean scores of Digital Literacy of Urban and Rural Secondary School teachers

Variable	Urban teachers		Rural teachers		t value	Result
	Mean	SD	Mean	SD		
Digital Literacy	185.81	28.95	183.19	34.13	0.3471	Not significant

It is evident from Table 3.0 that there is no significant difference between the Digital Literacy level among Urban and Rural secondary school teachers of Mangaluru taluk.

Table 4.0: 't' test details of the mean scores of ICT Use of Urban and Rural Secondary School teachers

Variable	Urban teachers		Rural teachers		t value	Result
	Mean	SD	Mean	SD		
ICT Use	85.21	24.31	83.90	23.63	0.25	Not significant

It is evident from Table 4.0 that there is no significant difference between the use of ICT in teaching-learning among teachers of secondary schools of Urban and Rural areas in Mangaluru Taluk.

Relationship between Digital Literacy level and ICT use in teaching learning process of Secondary school teachers of Mangaluru Taluk was studied by employing Product Moment Coefficient of Correlation 'r'. The details of the results of relationship is given in Table 5.0.

Table 5.0: Details of Relationship between Digital Literacy and ICT Use in teaching-learning among Secondary School teachers of Mangaluru Taluk

Variable	Mean	r value	Result
Digital Literacy	184.342	0.983	Positive Relationship
ICT Use	84.479		

It is evident from Table 5.0 that there is a significant positive relationship between the Digital Literacy level and ICT use in teaching learning process of Secondary school teachers of Mangaluru Taluk.

Major Findings of the study:

From the present study it was found that, most secondary school teachers of Mangaluru Taluk have average Digital Literacy and the extent to which they use ICT in teaching learning process is also average. Both Rural and Urban secondary school teachers are equal in terms of their Digital Literacy and the extent of ICT use in teaching learning process. There is a significant positive relationship between Digital Literacy level and ICT use in teaching learning process among Secondary school teachers of Mangaluru Taluk.

Educational Implications:

Based on the research findings, the researcher has put forth the following educational implications of the study:

- * Since both the Digital Literacy level and ICT use of the secondary school teachers is average and no significant difference between Urban and Rural schools of Mangaluru Taluk, the department of secondary education can collectively put in place a mechanism to train/orient teachers into ICT. The training programs must convincingly highlight the benefits of integrating ICT into teaching-learning both for academic progress of students as well as the professional development of teachers.
- * Training programmes must cover all in-service teachers in an elaborated manner such that all teachers who are digitally immigrant must get self sufficient in using ICT resources in their classrooms.
- * Trainings must include specific areas of ICT use. Namely, regular classroom instruction, differentiated instruction, drill and practice of concepts, research and exploration of concepts to enhance higher order thinking skills, assessment of thinking and learning styles of students, introduction of self-directed learning, etc.
- * Trainings for teachers also must focus on blending and enhancing social skills of teachers. This in turn will reflect on students when teachers focus on collaboration, communication and sharing of knowledge from one person to the other. Further, promoting international mindedness in the entire educated community of Mangaluru taluk
- * Since most school teachers are loaded with both teaching and administrative works, a systematic curricular programme around ICT in every subject must be drawn defining benchmarks of achievement that helps monitor the implementation.
- * Teachers who are already digitally literate must be given the liberty, flexibility and encouragement by the schools to try innovative ways of using the ICT in the schools for various educational purposes.
- * Online courses as a part of distance education could be formulated for in-service teachers to enhance the digital literacy and improve their teacher competence. The teachers can undergo these courses at their own pace and time.

Conclusion:

Teachers play a major role in preparing today's children to confidently face tomorrow's digital world. The present study reveals that Digital Literacy of secondary schools teachers plays a major role in the teaching-learning process of secondary school students. Also, the use of ICT in the pedagogy currently is very limited. Thus, every teacher must take it as their personal responsibility to digitally upgrade themselves for the benefit of their digital native students. Every school must take it as their personal responsibility to cater to the specific needs of their teachers and students in this concern. Teachers are required to use ICT, not only for the content mastery like Mathematics, Science and language; but also integrate ICT into pedagogy for cultivating interdisciplinary ideas like global awareness, civic and health literacy, mastery of major skill areas like creativity and innovation, communication and collaboration, critical thinking, problem solving and decision

making. Teachers must take the first step to materializing these ideas which will promise a better future for the present young Indians.

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