

In-Service Mathematics Teachers' Knowledge On Web Based Instruction

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ABSTRACT

The technology and its functions boon for educational society. Today education has been searching various ways to reach its destination. Technology helps education to reach its destination. Teachers are determiners of today and tomorrows education. So that teacher and technology joint together to enhance teaching competence as well as students' achievement. Web based instruction is an innovative method that act as a tool to assist teachers in teaching. The web has unlimited resources and resources. Teachers have to develop their competence to select appropriate web applications to reach the goals of education. Before that, diagnosing teachers' knowledge is necessary to address the level of existing state to develop their knowledge in WBI environment at requirement level to progress further. The aim of the study is to address Mathematics teachers' knowledge on web based instruction. The research was using survey method. Participants of the study were mathematics in-service teachers to obtain data by using questionnaire tool. Descriptive statistical technique was used to analyze the data. The results of the study showed that teachers' possesses adequate knowledge on web based instruction significantly.

Keywords

Web based instruction, web based environment, Mathematics teachers and Information and communication technology

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Introduction

Teachers and their teaching methods are the essential part of educational process (Cunsa & Savicka, 2012). Today students are very much inquisitive and comfortable with technology usage. For that, teachers have to proficient in ICT skills and prepare themselves in advantage of technology to involve efficiently in teaching learning process and use potentials of a teacher in a right direction (Chaudhari, 2016). Several number of researches conducted in the area of e- teaching and e-learning, but limited number of researches focus on teachers work and teaching methods in the classroom. The teacher training curriculum and related courses have lack to provide space to innovative techniques, methods, awareness in teaching (Joseph, 2014). De Freitas and Spangenberg (2019) pointed out that in-service teachers' who have connected less with technology, often felt lacking new opportunities in professional development programs in the usage of Information and communication Technologies and its tools. Sharing knowledge, collaboration and problem solving skills are necessary to teachers' in mathematics.

Integration of ICTs, preparation of ICT based teaching learning demanded and needed through in-service programs to enhance teachers' competence. Utilization of ICT is to accelerate and improve teacher preparation is necessity for the contemporary of rapid technological developments and transformations. From the perspective, the teachers need to play multiple roles and enhance themselves through in-service programs to encounter the contemporary demands of education (Chaudhari, 2016). National Council of Teachers of Mathematics of US (NCTM, 2000) and Association of Mathematics Teacher Educators (AMTE, 2006) stated that calculators, electronic technologies, and computers are important tools for teaching, learning as well as doing mathematics for standardized principles of school mathematics. Technology has unlimited features with visualization of mathematical ideas to facilitate organizing,

analyzing and computing data efficiently and accurately. In Mathematics, there is need to adopt web tools at focusing on decision-making, reasoning, and problem solving. Integration of technology changes allowing teachers and students in answering questions in how and what type of method using to teach in mathematics to get depth conceptual understanding, procedural skills, problem solving skills, reasoning skills in decision making situation. Technology facilitates to teach mathematical abstract concepts and skills in meaningful way. The teacher can be visualized and simplified the complex concepts with technology easily by understanding steps clear to making arithmetic operations, improving problem solving skills. Software environments has various dimension such as; Geometer's Sketchpad, Tinkerplots Cabri and Fathom to offer tangibility in the use of mathematical concepts and interactivity for students. Recent literatures pointed out that interactive whiteboard enhances teaching mathematics (Baglama, Yikmis, Demirok, 2017). Certainly, technology has helped more in exploration and content development, such as; algebra, probability, statistics, , geometry combinatorics and matrices by providing novice and access expertise and increased accessibility, understanding and applying advanced mathematical concepts through modeling, applications, and recursive functioning (Grandgenett, 2008) of mathematics.

The technology and technological knowledge had wide scope of newness (Minola, Hahn, & Cassia, 2019). Technological environments offer students for building and investigating mathematical models, physical objects, diagrams, figures and graphs by which students can bridge the gap between concrete and abstract concepts of mathematics. Virtual Learning Environments (VLE) efficiently involved in interactive mathematics instruction, in which students can manipulate physical objects, formations, conjectures with visual images as well as connect abstract to concrete representations clearly. Information and Communication Technology seemed as

cognitive tools in computer supported collaborative learning to teach the specific subject effectively with the ICT tools such as; Geometer's Sketchpad, simulation, Wiki and websites that are function as a communication tool (Chai, Koh, & Tsai, 2013). Such a way, teacher can be a representative of change as well as enforcement professional to be updated latest technologies that enabled them to perform efficiently. Teachers are required to understand the affordance of web resources and its utilities by knowing the skills, concepts and processes of a content domain and increase exploration to select appropriate resources to fulfill the required learning goals (Ertmer & Leftwich, 2010).

From the above, teachers have to prepare themselves to integrate technology and has to know their existing technological knowledge level to need to progress further development in web based instruction. Hence, this study addresses the mathematics teachers' knowledge on web based instruction to enhance teaching competence in Mathematics.

Literature Review

Web Based Instruction (Wbi)

A teacher needs to aware of various teaching methods and knowledge on technology based instruction and its functions, which are necessary to the contemporary need. Teachers take decisions about to integrate technology for instruction, comfortness with the tool, perceptions and confidence in working with web based instruction (McCulloch et al., 2018). When a teacher face difficulties in concept explanation, calculation in problem solving situation, also instruction consumes time a lot in teaching. Each concept of mathematics have specific goals and needs that can be addressed through technology in a variety of ways (Guerrero, 2010). The use of technology is not a choice, but in fact a necessity (Atasoy & Aygun, 2018). The knowledge of teaching with technology considered as a professional knowledge when integrating technology effectively (Rocha, 2018). In which we analyzed research studies related to web based teaching addressed technological knowledge is essential. Knowledge of using various technologies to facilitate knowledge development in specific subject content. According to Ball, Thames and Phelps (2008) technological knowledge in teaching should be detailed in ways necessary for classroom instruction. Most of the study revealed that methods and use of new instruction through independent variables as well as dependent variables. Especially, demographic variables were related differently with beliefs, attitudes towards use of the web potentials (Porter & Donthu, 2006). Because of, teachers perceptions are a major predictor in the use of innovative technologies in instructional environment (Quasem, & Viswanathappa, 2016).

The UNESCO ICT Competency Framework (UNESCO, 2011) emphasized to develop ICT skills among teachers to enable them to teach their students. Teachers need to help learners to become as collaborators, problem-solvers, creative learners in using ICT based tools. So that, teachers have to be effective workforce for the today world. The Mathematics teachers struggle to adopt ICTs as a learning tool for supporting learners' in mathematical understanding

(Spangenberg, 2015). Considered that, appropriate methods and strategies are to be well-trained and presented to attain better education, it also helped to both students as well teachers to achieve the objectives of mathematics (Baglama et al., 2017).

Technological Knowledge

Today's students thinking and processing information mostly depends on technology (Prensky, 2001). Technological Knowledge is essential knowledge by using of various technologies to teach and present the content technologically among teachers. The knowledge on technology about to help and revise the difficult elements of mathematical concepts to teach in traditional ways and support to instruction to provide better transformation, representation in the use of technologies (Jang & Tsai, 2013). Technological Knowledge (TK) is the knowledge is referred to technolog(s) such as; PowerPoint, multimedia, software, interactive whiteboards and digital videos in advancing. Technological Content Knowledge (TCK) is knowledge, which refers how to use technology to characterize the content in various ways, includes the knowledge to the ability in the use of technologies like Web 2.0 tools, smart board and tablet. (Chai et al., 2011, Jang & Tsai, 2013 & Ozudogru & Ozudogru, 2019). Sequence statements emphasized that teaching method and teachers has to change into new profile with new dimension that enable teaching approaches efficiently (Schmidt et al., 2009).

Teachers have to well equipped in 'technological pedagogical content knowledge' (TPACK) (Shulman, 2006) by perceive technology as a delivery vehicle for simplifying the delivery of information. From these, a teacher can be integrated the subject into technology in the area of content, pedagogy, and technology to enable students' in knowledge construction via web based instruction. National Policy on Education (1986) emphasized the wide usage of information in higher education, training and reinstruction of teachers to improve quality of education. UNESCO (2009) emphasized to adopt Virtual Learning Environment, which incorporates collaboration and communication such as wikis, blogs, web-based chats, forums, social networking tools like Facebook, Google Docs in teaching and learning. It also recommended that to develop in developing content using a mixture of face-to-face and computer based applications. National Policy on Information and Communication Technology (ICT) in School Education (2011) recommended incorporated a variety of techniques, tools, content and resources supported for improving the quality and efficiency of teaching-learning process.

Several range of multimedia potentials has been supporting a lesson as self-learning modules in the form of simulations through virtual learning environments, hence there are various options available for the teacher to adopt various modes of ICT tools for effective pedagogy. There are initiations, like National Council of Teacher Education (NCTE), Wipro, and University Grant Commission-Infonet have significant contribution in the area of integrating ICT in Teacher Education. The technological knowledge are required in data processing, accessibility, integrity of technology, Media Design, Collaboration and

Communication and Skills related to web based learning environment (Chaudhari, 2016). The professional development programs continually update teachers' knowledge on technology and its application to support teaching (NCTM, 2015).

On view, technological knowledge required to teachers in mathematics teaching. The present study find out understanding of knowledge in the basics of web based instruction, which plays central role to represent the instruction effectively. Because of, the technological knowledge of web based instruction and its representations are closely depends on teachers' computer knowledge. Technological knowledge is immensely important to teach and enhance teaching competence. Instead of taking implementation of web based instruction, there is a demand to carefully bridge the gap between teacher and knowledge on WBI through address the existing knowledge level on WBI. This paper states the need and teachers' technological knowledge on web based instruction to understand the effectiveness by exploration, how this knowledge is used in web based instruction effectively. The study address the technological knowledge level of Mathematics teachers' on web based instruction to implement innovative method of teaching and strategies on web based environment as well as teaching competence on WBI in Mathematics.

Methodology

The purpose of the study is to address the mathematics teachers' existing knowledge level on web based instruction. Hence, a survey method was undertaken among 60 in-service teachers.

Research Questions

1. Do the teachers' possesses adequate knowledge on web based instruction in teaching Maths (TKoWBI)?
2. Do the mathematics teacher's knowledge about Web based instruction differ in terms of gender?
3. Do the mathematics teacher's knowledge on Web based instruction vary significantly based on their computer skills?
4. Do the Teachers' differ in their knowledge on WBI based on the type of school?

Respondents

The sample consisted of 60 in-service mathematics teachers working under government and non-government schools, handling mathematics subject at secondary level, they were selected as respondents. The researchers invited maximum number of respondents due to covid-19 pandemic, 60 respondents participated via whatsapp groups for giving response. Finally, 60 respondents participated based on their own interest from Dindigul, and Karur and Dharmapuri district at Tamilnadu.

Research Instrument And Data Collection

The study was conducted by using survey method for which, the study was used questionnaire that explored the mathematics teachers' knowledge level on web based

instruction with respect to enhance teaching competence of using WBI. Teachers' Knowledge on Web Based Instruction (TKoWBI) Questionnaire was developed by the researcher to address the mathematics teachers' knowledge on WBI. The questionnaire used as an data collection tool which consisted of 30, multiple-choice items constructed based on comprehensive review of existing literature. The questionnaire has demographic variables about mathematics teachers, such as gender, handling class, years' of experience and computer skill. Respondents asked to give response to each item and obtain 1 mark to the one right answer. Cronbach alpha coefficient for TKoWBI questionnaire was calculated as 0.81 for internal consistency.

Data Analysis

The data obtained from the questionnaire. The data analyzed by statistical techniques. Descriptive statistics was used to describe the respondents' knowledge level on web based instruction statistically. For analyzing the data of different variables, frequencies, percentages, mean and standard deviations were used.

Result

Table: 1

Teachers' possesses adequate knowledge on web based instruction in teaching Maths?

WBI	Mean	SD
Teachers' knowledge	16.08	4.83
Correct responses	32.16	12.62

The mean score for mathematics teachers' knowledge on web based instruction was found as 16.08, standard deviation as 4.83 as well as the maximum score was 25 and the minimum score was 4. The respondents' correct response mean score was 32.16, standard deviation as 12.62. The maximum of 51 mathematics teachers attended correctly and 4 were the minimum. The outcome of the mathematics teachers' knowledge on WBI (TKoWBI) were significantly as positive.

Table: 2 Mathematics teacher's knowledge on Web based instruction differ in terms of gender?

Gender	Mean	SD	Max	Min
Female	16.68	4.53	24	6
Male	15.04	5.24	25	5

The mean score for mathematics teachers' knowledge on web based instruction according to gender was found as 16.68 to female and 15.04, standard deviation as 4.53, 5.24 respectively. The maximum score was 25, 24 to male and female respectively and the minimum score was 6 for female, 5 for male respectively. The mean score of mathematics teachers' knowledge on WBI (TKoWBI) according to female vary significantly as higher than male.

Table: 3 Mathematics teacher’ knowledge on Web based instruction vary significantly based on their computer skill?

Computer skill	Basic %	Intermediate%	Advanced%
Government	9.09	45.45	45.45
Non-Government	18.52	55.56	25.92

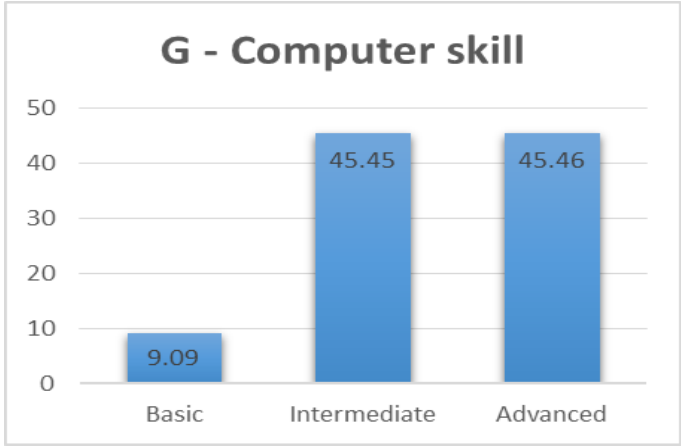


Figure: 1 Computer skill of Government Teachers’

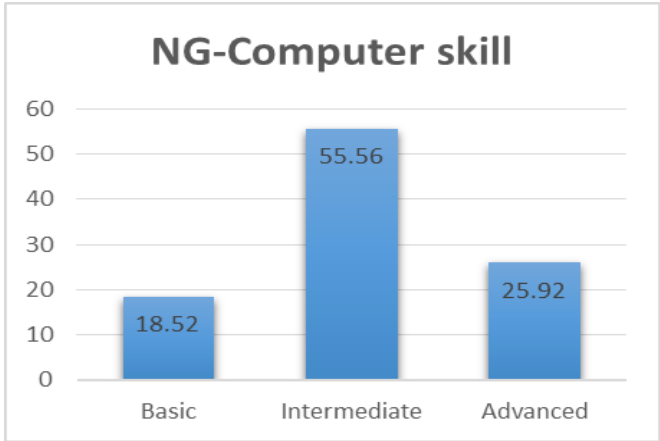


Figure: 2 Computer skill of Non-Government Teachers’

The 45.45 percent of mathematics teachers working under Government schools (G) had advanced, intermediate level respectively on computer skill. Rest of them 9.09 percent had basic level. Furthermore, Non-government(NG) school mathematics teacher’s fall little higher on intermediate level, 25.92 percent on advanced level and 18.52 percent on basic level compare than the same. The outcome of the study were significantly higher than mathematics teachers’ working under non-government schools and most of them fall on intermediate level on both side.

Table: 4 Teachers’ differ in their knowledge on Web based instruction (WBI) based on the type of school.

Type of School	N	Mean	SD	(%)
Government	33	16.9	4.88	55
Non-Government	27	15.03	4.74	45

As the above, government teachers has obtained percentage which was slightly higher than non-government teachers’

comparatively. The mean scores were 16.9 and 15.03 for government and non-government teachers’ respectively. Hence, teachers’ differ in their knowledge on Web based instruction (WBI) based on the type of school.

Discussion

Information and communication technology as a learning tool to support learners’ in mathematical understanding (Spangeberg, 2015). Likewise, the Web based education is an important, that considered as a tool in information retrieval and storage source of information, for assessment, collaborative options through website (Din, 2017). The web-based learning model provide collaborative learning techniques and a scaffolding to enhance learners’ competency in higher education composes high level at 72.56% (Deejring, 2014).Therefore, web based e-learning is the simple solution to provide uniform or standardize teaching learning resources and methods (Ray, 2010). Teachers face difficulties to use the various characteristics of technology, especially in the area of technical and pedagogical, contextual usability but they use limited technology in the same way as using traditionally (Nordin, A.B., 2008 ; Atasoy & Aygun, 2018). Teaching intervention of Web-Based Package had a positive impact on the students of achievements (Nadu & Development, 2019). The conferences, workshops and symposium helped in trained and enlightened people on the demand for instructional delivery in schools (Marcel et al., 2020). Integrating technology is more influencing when teachers have professional competency in using technology in teaching mathematics to diverse needs of individuals in a meaningful way (Baglama et al., 2017). Preparation of teachers to be considered in knowledge creation to present the specific operation technologically by increasing no of web based teacher preparation program remarkably. Only then teacher can expand their vision on types of tools, ways of teaching methods can position them to provide activities align with specific mathematics learning goals (Mcculloch et al., 2018). Thus, finding of the study suggested that teachers need to improve knowledge in using web based instruction.

Conclusion

The web based instruction is an useful method of teaching and has positive impact on teacher preparation significantly. In which, technological knowledge was significant predictor to introduce new method of web-based instruction to study the levels of knowledge. The study result shows us to understand how WBI considered as a tool and knowledge on web based instruction of mathematics teachers and their possesses level. The result of the study addressed that teachers’ have adequate knowledge on web based instruction to implement innovative method of teaching and strategies on web based environment in Mathematics as well as teaching competence on WBI. Todays’ teachers’ are well equipped in WBI to access the web based tools, applications and resources in teaching and learning effectively. Finally, teachers have enough knowledge to adopt web based instructional applications in Mathematics significantly.

Recommendations

Hence, the study suggested that researchers can use multiple types of research instruments such as surveys, observations, interviews or reflections to investigate teachers' technological knowledge on web based instructional environment (WBI) for reviewing different variables and reveal the factors of the obtained results more detail way to enhance teaching competence for the contemporary educational demands. Variety of teaching methods will be discovered based on web based environment to fulfill teachers' as well as students educational needs.

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