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Effect of Web-Based Instructions on the Mathematical Computation Skills of Slow Learners in Mathematics

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Abstract

This study is purposed to find the effect of web-based instructions on the mathematical computation skills of slow learners in mathematics. The sample for the study comprised of 50 slow learners of 7th grade from government schools of Gurdaspur district. Pre-test-Post-test design was used. The sample was randomly divided into two groups viz experimental group which was taught through web-based instructions and control group which was instructed through the traditional classroom method. Pre-tests and post-tests were administered to collect the data. The data was analysed using mean, standard deviation and t-test. The findings of study revealed that experimental group outperformed the control group suggesting that web-based instructions enhance the mathematical computation skills scores of slow learners in mathematics than the traditional teaching method.

Keywords: Web based instructions, traditional classroom instructions, mathematical computation skills and slow learners.

Introduction

Mathematics word is derived from the Greek word *'mathema'*, which means what one learns, or what one gets to know. Shah (2019) described mathematics as a study of patterns, numbers, quantities, shapes, structure and space using logical processes and reasoning. According to Berggren, Fraser, Folkerts, Knorr and Gray (2023), Mathematics is the science of structure, order and relation that evolved from elemental practices of counting, measuring and describing the shapes of objects.

To gain proficiency in mathematics and to acquire more complex mathematical skill one should have mastery over the key concepts of mathematics (Nelson, Burns, Kanive & Ysseldyke, 2013) and fundamental skill that is computation skill. The students who are accurate and fluent in performing arithmetic calculations perform better in all mathematical abilities and gain high mathematics knowledge (Carr, Steiner, Kyser & Biddlecomb, 2008). In a classroom deficit in basic computation skills are very common and mathematics computation skills are a critical component to students' ability to learn higher-level mathematics (Axtell, McCallum, Bell & Poncy, 2009). Deficiencies in mathematics are due to many factors but poor computation is the most prominent one. The students who are weak in basic computation are at risk for math difficulties at elementary level that may continue into young adulthood stage (Nelson, Burns, Kanive & Ysseldyke, 2013).

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Mastery on computation skills is vital due to many reasons like helpful for independent living in adult life (Ritchie & Bates, 2013). It also helps in time and money management (Shapiro, 2004), abstract thinking and problem solving (Desli & Lioliou, 2020; Shapiro, 2004), developing mathematical reasoning (Gurbuz & Erdem, 2016) and comprehending underlying mathematical concepts (Gersten & Chard, 1999). It improves memory, self-confidence, understanding, analysis skills and concentration (Mashqabah, 2021).

Mathematics teacher faces greatest challenge in teaching slow learner child (Yusha'U, 2012) as they lack in comprehension, understanding and expression (Singh, 2004). The learning difficulties can impact their basic number concepts which hinder the understanding and application of number facts and procedure for the students. They easily forget the steps and find it difficult to recall the details required to solve the problem, hence, loose the track (Thames & Ball, 2010). They commit errors in counting, processing, comprehending (Harun et al., 2019) and difficulty in identifying keywords in mathematics problem (Novitasari, Lukito & Ekawati, 2018).

From past few years mathematics education has changed from an era where all math computations were done by hand to the period where most of computations are done using calculators or computers i.e. from blackboard to whiteboard to smart board. Computers are effective tools for increasing mathematical knowledge (Vernadakis, Avgerinos, Tsitskari & Zachpolou, 2005). Web-based instructions is helpful in improving mathematical learning and achievement (Nguyen & Kulm, 2005), develops positive attitude towards mathematics (Morgil, Seyhan, Alsan & Temel, 2008), faster the problem solving ability (Lu, Chiang & Huang, 2007), improving arithmetic and calculation skills of learners (Aydin & Leyla, 2017) and also helpful for students with varied capabilities (Liu & Wang, 2010). These electronic devices are user-friendly and portable which impact the way of thinking of students (Heid & Edward, 2001).

Review of Related Literature

Greene, Tiernan and Holloway (2018) investigated the effect of peer tutoring and fluency based instruction to improve fluency in mathematics computation skills and found that cross-age peer tutoring and fluency-based instruction had a positive effect on tutees in mathematics especially in mathematics fluency. Putri, Akhyar and Fadhilah (2019) analysed the mathematical calculation skill of slow learners in inclusive school and concluded that they experienced difficulty in learning of mathematics and the performance of slow learners in mathematics division and multiplication was under school standards. Desli and Lioliou (2020)

investigated the relationship between computational estimation and problem solving. Analysis revealed that as compared to children, adults were more skilful in computations. A significant positive correlation between computation estimation and problem-solving ability was also found. Kikas, Madamurk and Palu (2020) evaluated the effect of comprehension-oriented learning strategies on solving mathematics calculation and word problems at the end of middle school. Results of the study confirmed that calculation and problem-solving abilities of students were affected mutually whereas task persistence, math self-concept and reading comprehension had a positive impact on problem-solving but did not on calculation skills. Hall, Truckenmiller and Eckert (2022) investigated the influence of hand writing on the computational fluency. Findings of the study showed that handwriting did not improved mathematics computational fluency.

Objectives

To compare the effect of web-based instructions and traditional method on mathematical computation skills of slow learners.

Hypothesis

There exists significant difference in scores of mathematical computation skills of slow learners taught through web-based instructions and traditional method.

Design

The nature of present study was experimental. Two groups were made one was Experimental group which was taught through web-based instructions and other was Control group was taught through traditional classroom teaching.

Sample

A random sample of 50 slow learners of 7^{th} class were selected from the government schools. Slow learners were identified on the basis of their scores obtained in Ravens Progressive Matrices Test, previous class mathematics scores and in consultation with the class teacher teaching mathematics.

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Tools Used

1. Web-based Instruction Package (prepared by investigator).
2. Self -constructed Mathematical Computation Skills Scale

The content for Web-based instruction package was selected from the 7th class text book of Punjab School Education Board. The content included the chapters integers, fractions and decimals, lines and angles, triangles and perimeter and area. Web-based instructions included text, audio, video and animations to make the learning of mathematics easy, interesting and enjoyable for students and also to improve mathematical computation skills. The content was planned keeping in mind that it was meant for the 7th class slow learners.

Treatment

The random sample of 50 slow learners of 7th grade were selected from the government schools of Gurdaspur district. After selecting the sample, the students were randomly divided into two groups: experimental and control group. The experimental group comprised of 25 slow learners was taught through web-based instructions and control group consisted of 25 slow learners was taught through traditional teaching. Mathematical Computation Skills Scale was administrered both as a pre-test to check the mathematical computation skills of slow learners and as post-test to find whether teaching through web-based instruction had any effect on the mean gain scores of mathematical computation skills of slow learners.

Phase 1 (Pre-test)

In this phase, mathematical computation skills scale developed was administered as pre-test on both the groups. The scores obtained by both the groups on pre-test were recorded.

Phase 2 (Experimental phase)

In this phase, the experimental group was taught through web-based instructional package and the control group was taught through the traditional method. Both the groups were taught the same content.

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Phase 3 (Post-test)

In this phase, the same (used in pre-test) mathematical computation skills scale was administered on both the groups as post-test and their scores were recorded.

Data Analysis and Interpretation

The scores of pre-tests and post-test of both the groups (experimental and control group) were analysed by computing mean, standard deviation and difference between the mean scores through t- test. The results were drawn out and interpreted as follows:

Table-1: Mathematical Computation Skills Scores of Slow Learners

Category	N	Mean	SD	t-value	Result
Pre-test	50	6.42	2.23	8.74	Significant at 0.01 level
Post-test	50	11.78	3.72		

Table-1 highlights the pre-test and post-test mathematical computation skills scores of both experimental and control group. The pre-test mathematical computation skills scores are found to be 6.42 and S.D is 2.23 and the post-test mathematical computation skills scores is 11.78 and S.D is 3.72. The calculated t-value is found to be 8.74 which is significant at 0.01 level. It shows that there is a significant mean difference between mathematical computation skills scores in pre-test and post-test of both groups.

Table-2: Mathematical Computation Skills Scores of Experimental Group and Control Group

Test	Category	N	Mean	SD	t-value	Result
Pre-test	Experimental Group	25	7.12	2.33	2.17	Not Significant at 0.01 level
	Control Group	25	5.8	1.96		

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Post-test	Experimental group	25	13.6	3.71	3.94	Significant at 0.01 level
	Control Group	25	9.96	2.75		

Table-2 shows mean gain mathematical computation skills scores in pre-test and post-test of experimental and control group. The pre-test mean scores of mathematical computation skills of experimental group is 7.12 and S.D is 2.33 whereas pre-test mean scores in mathematical computation skills of control group is 5.8 and S. D is 1.96. The calculated t-value is 2.17 which is not significant at 0.01 level. It indicates that there is no significant difference in the mean gain mathematical computation skills scores of experimental and control groups.

Table-2 also highlights that the post-test mean scores of mathematical computation skills of experimental group is 13.6 and S.D is 3.71 whereas the mean and S.D of control group which was taught using traditional method is 9.96 and 2.75 respectively. The t-value calculated is 3.94 which is significant at 0.01 level.

Hence, hypothesis which states that "There exists significant difference in mathematical computation skills of slow learners based on web-based instructions and traditional method" is accepted.

Findings and Conclusions of the Study

1. It was found that there is a significant difference between the mathematical computation skills scores of pre-tests and post-test of experimental and control group.
2. It was found that there was no significant difference in the pre-test scores of experimental and control groups related to the mathematical computation skills of slow learners whereas there was a significant difference in the post-test scores of experimental and control groups related to mathematical computation skills.

Therefore, it is concluded that web-based instructions enhanced the mathematical computation skills of slow learners in comparison to traditional teaching.

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Educational Implications

Students who were taught using web-based instructions have improved their mathematical computation skills as compared to the students taught by traditional classroom method. Hence, web-based instructions should be included in class room teaching as it provides variety of teaching learning experiences that lead to increase mathematical computation skills. Web-based instructions makes student more active as it provides multisensory experiences and also increases the self-confidence. The students having good mathematical computation skills are more capable and interested in solving mathematical problems and also pursue it for higher studies. It also improves the students' knowledge regarding the use of computers and internet and also develops positive attitude towards the usage of technology. Due to its numerous benefits the teachers should be trained and motivated to use the web-based instructions in classroom to encourage the students for effective learning.

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