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EFFECT OF COMPUTER BASED ADAPTED CURRICULUM IN LEARNING MATHEMATICAL CONCEPT AMONG CHILDREN WITH INTELLECTUAL DISABILITY

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ABSTRACT

Curriculum adaptation is a continuous process that modifies or adapts the standard of prescribed curriculum in terms of content or delivery of instruction to meet the learning needs of students with learning problems, including children with disabilities. The content, teaching process, assessment and evaluation, and the physical environment may be modified or adapted and activities must be flexible for the students to benefit and achieve success in the classroom. In this study investigator attempted to find out the effect of computer based adapted curriculum in learning mathematics among children with intellectual disability (CwID). True Experimental Research Design with Pre and Posttests has been employed in the study. Investigator has chosen two chapters namely 'patterns in shapes' and 'numbers' from II class math text book developed by Tamil Nadu Text Book Corporation. The researcher adapted the above stated two chapters by using clicker software version 6.0.Theadapted math curriculum (AMC) checklist was prepared with 75 items under 21 domains after validation. In total ten CwID were selected as sample for the present study by adopting purposive sampling under non probability sampling method. Among the ten students, five represent control group and remaining five were in experimental group. Computer based adapted curriculum for mathematics was implemented among the samples for 35 sessions. The collected data were analyzed quantitatively by applying Mann-Whitney test, Wilcoxon signed Rank test. The findings revealed that there is a significant difference in pre and posttests mean scores of the sample in learning mathematics. It also states that the performance level of the sample closely corresponded to the criterion shifts in all the items of computer based adapted mathematics curriculum.

Key words: *Computer Based Adapted Curriculum, Mathematical Concept and Children with Intellectual Disability*

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INTRODUCTION

Children with Disabilities (CwD's) are in great requirement of appropriate educational measures for helping them in meeting out their special needs and to cope with their deficits or extraordinary abilities. CwD's face numerous barriers in attending school and receiving appropriate education. An essential practice required for CwD's to access and progress in the education is the provision of accommodations and modifications in the curriculum. Access to assistive technology and accessible technology for CwD's is critical for many to access and benefit from education. For CwD's, technology can give access to learning opportunities previously closed to them. Education for intellectually disabled children is a challenging task. Children with mild Intellectual Disability (CwID) demonstrate wide diversity in their academic and behavioral performance. Moreover, within typical classroom settings they learn academic materials much slower than their normal peers that result in low achievement in all academic areas of subject including Mathematics.

According to American Association on Intellectual Disabilities (AAIDD) "Intellectual disability is a disability characterized by significant limitation in both intellectual functioning and in adaptive behaviour, which covers many everyday social and practical skills. This disability originates before the age of 22. Many of the disabled are affected throughout their lifespan. CwID are distinctly identified because they do not keep pace with developmental expectations in cognitive, social and motor functioning. Characteristically, significant developmental delays in early childhood are predictive of poor academic functioning in childhood, as compared with same age peers. Most of the studies have been conducted towards identifying the cognitive difficulties associated with intellectual disability, based on the deficit model of intellectual disability. The subsequent studies have adopted a developmental perspective, in which the functioning of CwID is compared with typically developing children of comparable developmental level (Williams, 2005). Currently, the emphasis has switched from assessing people' deficiencies to identifying useful support (Buntinx & Schalock, 2010). CwID generally follow the same developmental pathways as their typically developing peers but at a slower rate. Lower attainment rate influences their learning and academic achievement especially learning mathematical concepts.

Curriculum for Children with Disabilities

No country in the world has regular curriculum which is appropriate for all students. While most educational institutions

claim that their curriculum is acceptable for all students, this is never the case unless curriculum modification is implemented. Toilet training and self-feeding are two essential learning goals that few school systems cover in their regular curriculum. Similarly, educational goals relevant to intellectually gifted children frequently fall outside of what is scheduled in the standard curriculum for children up to the ending of secondary school. While good instructional design for the entire class can minimize the need for adaptation, adapting the curriculum to meet the learning goals of children with these diverse demands is sometimes the only way to satisfy their needs. Curriculum for CwID should aim at a) attaining personal adequacy, b) developing social competence, c) achieving economic independences (Msipha, 2013).

Curriculum Adaptation

The term "curriculum" refers to all aspects of teaching and learning, including learning objectives, learning programmes, assessment, and methods. It refers to all of the formal and informal learning opportunities provided by the school to prepare students for the opportunities and responsibilities of adulthood. In general, an adaptation is a goal-driven process that involves making a change to better satisfy the goals of an individual or a group. Curriculum adaptation, on the other hand, refers to making components of the curriculum accessible, such as teaching and learning resources, in order to meet the requirements of all learners (Msipha, 2013). As a result, curriculum adaptation is a change to the delivery of instructional techniques and the intended goals of student performance that does not affect the content but does modify the conceptual complexity of the curriculum slightly. Curriculum adaptation is based on the principle that the school must respond to the educational requirements of the students, rather than just providing a place for students with special needs among their peers with no difference in instruction. (Hassall & Rose, 2005).

Computer Based Adapted Curriculum

Computer-based education has expanded the classroom experience by providing students with material directly pertaining to their selected subjects of interest, analyzing students' responses immediately to determine whether or not to spend more time on a specific topic. Moreover, computers are being used to expand the learning experience in different subjects such as Mathematics in classrooms (Chambers, et al., 2011. They can be used to teach new skills or to help learning Mathematical concepts that a student has been experiencing difficulties with. Students who struggled to study in a printed materials environment benefit greatly from multimedia applications. Students with disabilities benefit from Computer Based Instruction (CBI) since

they get rapid feedback and don't waste time practicing the improper skills. Computers hold students' interest since their programmes are interactive and encourage them to compete in order to improve their grades. Furthermore, CBI watches the students' progress and does not advance them until they have mastered the skill.

Need and Significance of the Study

The goal of curriculum adaptation is not to decrease educational standards, but modify the curriculum to make education more accessible in the first place, and to ensure that no student is unfairly biased or excluded. Math skills are essential for a student to be able to live freely in the community, care for oneself, and make decisions about their lives. Teachers should adjust the curriculum to ensure equality and match the needs of different students so that everyone benefits and can fully engage in classroom activities. This encompasses numerical awareness and ideas, time, money, measurement, calculator use, and so on. Understanding the notion of mathematics should be a priority for all students, including children with intellectual disabilities.

Effective technology integration such as computer based adapted curriculum can provide all learners the ability to access the general education curriculum, providing them multiple means to complete their work with greater ease and independence in performing tasks that they were formerly unable to accomplish, or had great difficulty in accomplishing them (Roberts et al., 2008). As a result, they are tackling the 'functional obstacles' by increasing, maintaining, or enhancing their learning outcomes in a wide environment of abilities and expectations. Computer assisted mathematics instruction programmes can demonstrate concepts, instruct, and remediate student errors in learning various Mathematical concepts. Considering that computers offered multiple activities, researchers also used them with special populations in order to “enhance the quality of life of SwID and other developmental disabilities” (Foshay and Ludlow, 2005).

A technology-oriented learning environment that makes use of accessible technology supports educational equality by offering access to and equitable learning opportunities through individualized and differentiated teaching that can fit each learner's requirements and preferences. As a result, there is a need to give instructors with adequate knowledge and abilities, which will aid in the development of a more favourable attitude toward the use of technology in the classroom (Afzal, et.al. 2014). The way educators educate has already been altered by technological advancements. McManis & Gunnewig, (2012) reported that Computer-Assisted Instruction (CAI) has been used to

teach a variety of academic skills and subjects such as Mathematics to teach students with disabilities including intellectual disabilities. Hence the need has arisen to know about the effect of Computer Based Adapted Curriculum on learning mathematical concepts of CwID. The present study attempts to develop Mathematical concepts particularly pattern in shapes and number in academic learning of the CwID through Computer based adapted curriculum.

REVIEW OF LITERATURE

Zilaey S.et.al. (2017) conducted a study to determine the effectiveness of attention training on the math performance of elementary school students with intellectual disability adopted quasi experimental study by pre-test, post-test design with the control group. Students with intellectual disabilities aged 10 to 12 years were included in the study. Subjects were selected by convenient sampling method and 30 students with intellectual disability were participated. The results indicated that attention training program has influenced math performance of the primary school students with intellectual disability.

Singh and Agarwal (2013) examined the effectiveness of teaching mathematics to children with mental retardation using computer games with conventional method of teaching. The result showed that the group taught with the help of computer games produced significantly greater remediation of mathematics skills as compared to the group taught through conventional method of teaching. It was found that gender did not affect acquisition of mathematics-concepts on two concepts. However, on one concept a contradictory result was obtained. Similarly, it was found on two mathematics concepts that boys benefit more from computer games as compared to girls. However on one concept, no difference was found. Educationists and other scientists believe that early interventions give children the best chance of developing their full potential.

Ghaywan and Arakh (2012) studied the effectiveness of computer assisted instruction on academic performance of the children with mild mental retardation at primary level. The major findings of the study were: CAI increased students learning outcomes, has an impact on learning literacy and numeracy skills of students with mild retardation. Students showed increase in their attention span, were highly motivated with increased communication and cooperation among the students. The study also revealed that computers could also help in developing social and interpersonal skills. The researchers suggested that more exposure was required to the special need children in operating the system independently

OBJECTIVES

1. To find out the difference between pre and posttests mean scores of control group of CwID in learning Math concept.
2. To find out the difference between pre and posttests mean scores of experimental group of CwID in learning Math concept.
3. To compare the pretest mean scores of control and experimental group of CwID in learning Math concept.
4. To compare the gain mean scores of control and experimental group of CwID in learning Math concept
5. To find out the effect of computer based adapted curriculum in learning Math concept among CwID.

Hypotheses

1. There will be no significant difference between the pre and posttests mean scores of control group of CwID in learning Math concept.
2. There will be no significant difference between the pre and posttests mean scores of experimental group of CwID in learning Math concept.
3. There will be no significant difference between the pretests mean scores of control and experimental group of CwID in learning Math concept.
4. There will be no significant difference between the gain mean scores of CwID in experimental and control group in learning Math concept.
5. There will be no significant difference in the effect of computer based adapted curriculum in learning Math concept among CwID.

METHODOLOGY

Research Design

The research design selected for the present study was true experimental design under experimental method.

Variables

The variables that have causative characteristics are called ‘independent’ variables, whereas the ‘end result’ is the dependent variable. The present study aimed at finding the effect of computer based adapted curriculum on learning mathematical concept among children with mild intellectual disability.

- Independent Variable: Computer Based Adapted Curriculum
- Dependent Variable: Mathematical Concept

Sampling Technique

Purposive sampling under non probability sampling method was adopted for selecting samples.

Inclusion Criteria

- Condition :Children with Mild Intellectual Disability
- School :Inclusive School
- Grade :Secondary
- Gender :Male and Female
- Age Group : 9 to 11 years

Sample size: A total of 10 students with mild intellectual disability pursuing secondary education at T.A.T Kalanilayam Middle School, Coimbatore were taken as sample for the current study. Among the 10 students, 5 represent control group and remaining 5 were in experimental group.

Table 1 – Details of Control Group

S. No	Name of the Child	Condition	Associated Condition (If any)	Age	Gender	Class
1	SA	Mild (MR)	No	11	Female	5th
2	HA	Mild (MR)	No	9	Male	3rd
3	PR	Mild (MR)	No	11	Female	5th
4	SR	Mild (MR)	Down syndrome	10	Male	4th
5	CH	Mild (MR)	No	11	Male	5th

Table 2 – Details of Experimental Group

S. No	Name of the Child	Condition	Associated Condition (If Any)	Age	Gender	Class
1	AD	Mild (MR)	Speech Problem	10	Female	4th
2	HA	Mild (MR)	No	11	Male	4th
3	SA	Mild (MR)	No	11	Male	5th
4	AS	Mild (MR)	No	11	Male	5th
5	PR	Mild (MR)	No	11	Female	4th

Development of Tool

The researcher has chosen two chapters namely ‘patterns in shapes’ and ‘numbers’ from II class math text book developed by Tamil Nadu Text Book Corporation. The researcher adapted the above stated two chapters by using clicker software version. The researcher developed and administered the Adapted Math Curriculum (AMC) checklist on the selected sample. The final checklist was prepared with 75 items under 21 domains after validation.

Date Collection Procedure

After obtaining prior permission, researcher explained the need and importance of computer based adapted curriculum for CwID to the headmaster. Orientation was given to the teachers who are handling the CwID about the adapted math curriculum checklist. Samples were taken to the allotted classroom and investigator established a good rapport

with them. Investigator started the 1st session with motivation, gradually the concepts (patterns in shapes and numbers) were taught to the selected samples. Periodical evaluation was done to check the progress of the students in the curriculum. All the 21 domains were taught in 35 sessions. After that, post test was administered and the scores were recorded.

Results and Discussion

1. Hypothesis (H_0)

There will be no significant difference between the pre and post-tests mean scores of control group of CwID in learning Math concept.

Table 3 - Pre and Posttests Mean Scores of Control Group of CwID in Learning Math Concept

	Test	N	Mean	SD	Z	Sig
Control group	Pre test	5	26.4	8.87694	-.271	.786
	Post test		27.6	12.66096		

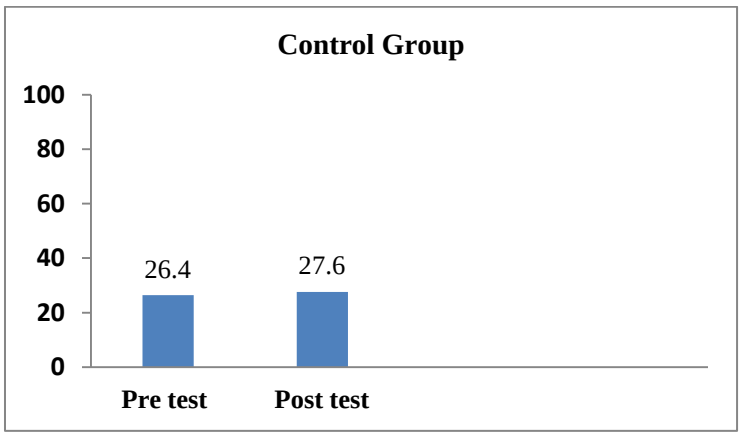


Figure1 - Pretest and posttests mean score of control group of CwID in learning Math concept

Table 3 and Figure 1 show the pre and posttests mean scores of control group of CwID in learning Math concept. The pretest mean score of control group of CwID in learning Math concept is 26.4 whereas the posttests mean score is 27.6. The calculated Z value 0.271 shows that there is no significant difference in the pre and posttests mean scores in learning Math concept. Therefore the above stated hypothesis is accepted.

2. Hypothesis (H_0)

There will be no significant difference between the pre and post-test mean scores of experimental group of CwID in learning Math concept.

Table 4 - Pretest and Posttests Mean Score of Experimental Group of CwID in Learning Math Concept

	Test	N	Mean	SD	Z	Sig
Experimental group	Pre test	5	28.6	16.00937	2.032	.042
	Post test		66	12.14496		

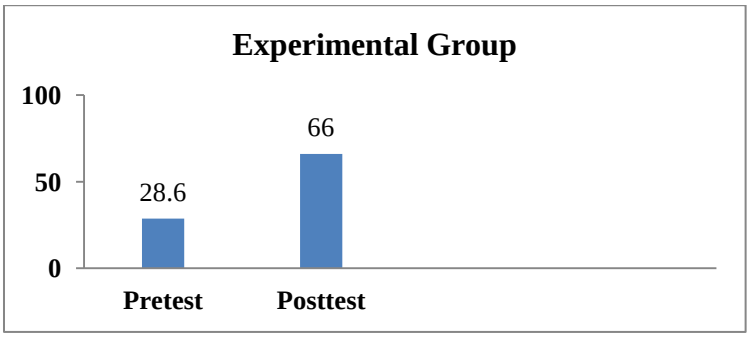


Figure 2 - Pretest and posttests mean scores of experimental group of CwID in learning Math concept

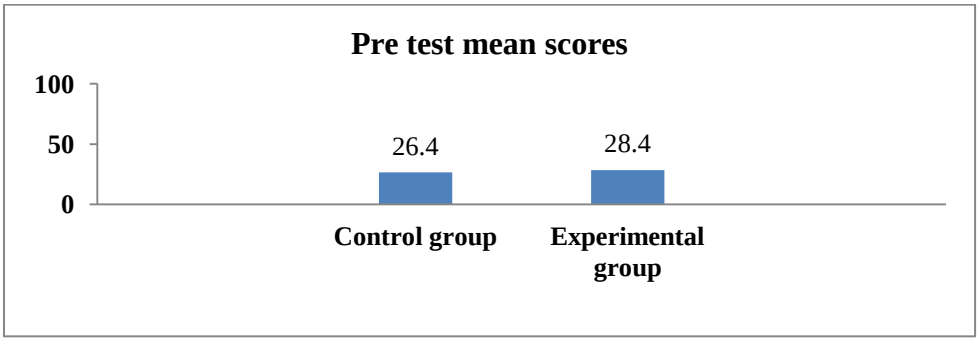
Table 4 and Figure 2 depict pre and posttests mean scores of experimental group of CwID in learning Math concept. The pretest mean score of experimental group of CwID in leaning Math concept is 28.6 whereas the posttests mean score is 66.The calculated Z value 2.032 shows that there is significant difference in the pre and posttests mean scores in learning math concept. Therefore the above stated hypothesis is rejected.

3. Hypothesis (H_0)

There will be no significant difference between the pretest mean scores of control and experimental group of CwID in learning Math concept

Table 5 - Pretests Mean Scores of Control and Experimental Group of CwID in Learning Math Concept.

	Group	N	Mean	SD	U	Sig
Pretests	Control	5	26.4	8.87694	11.000	.754
	Experimental		28.6	16.00936		



Figures 3 - Pretests mean scores of control and experimental group of CwID in learning Math concept

Table 5and Figure 3 depicts the pretests mean scores of control and experimental group of CwID in learning math concept. The pretest mean score of control group of CwID in learning math concept is 26.4 whereas the pretest mean score of experimental group is 28.4. The calculated U value, 11.000, shows that there is no significant difference in the control and experimental group of CwID in learning math concept. Therefore the above stated hypothesis is accepted.

4. Hypothesis (H_0)

There will be no significant difference in the gain mean scores of experimental and control group of CwID in learning Math concept.

Table 6 – Gain Mean Scores of CwID in Control and Experimental Group

	Group	N	Mean	SD	t	Sig
Gain Scores	Control	5	1.2	2.29347	6.704	0.001
	Experimental	5	37.4	4.82286		

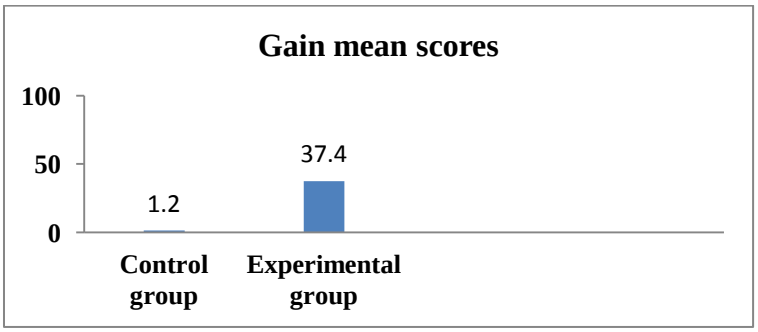


Figure 4 – Gain Mean Scores of CwID in control and experimental group

Table 6and Figure 4 depicts the gain mean scores of CwID in control and experimental group in learning math concept. The gain mean scores of control group of CwID in learning math concept is 1.2 whereas the gain mean scores of experimental group is 37.4. The t value, 6.704, calculated shows that there is significant difference in the control and experimental group. Therefore, the above stated hypothesis is rejected.

5. Hypothesis (H0)

There will be no significant difference in the effect of computer based adapted curriculum in learning Math concept among CwID

Table 7 – Post-tests Scores of Control and Experimental Group of CwID in Learning Math Concept

	Group	N	Mean	SD	U	Sig
Posttest	Control	5	27.6	12.66096	1.000	0.016
	Experimental	5	66	12.89574		

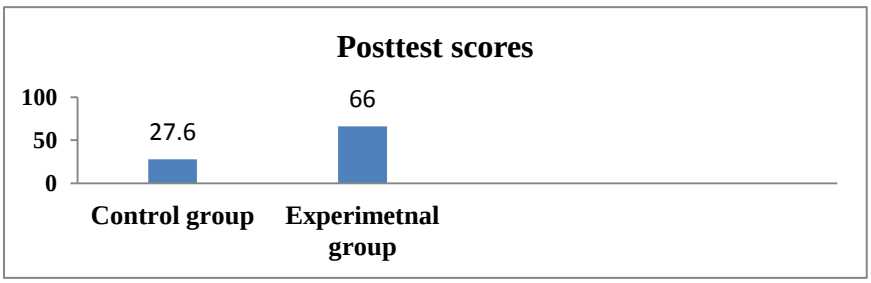


Figure 5 - Posttests Scores of Control and Experimental Group of CwID in Learning Math Concept

Table 7and Figure 5 depicts the posttests mean scores of CwID of control and experimental group in learning math concept. The posttest mean score of control group of CwID in learning math concept is 27.6 whereas the posttest mean score of experimental group of CwID is 66. The U value, 1.000, shows that there is significant difference in the control and experimental group. Therefore, the above stated hypothesis is rejected.

CONCLUSION

This study sought to find out that learning Mathematical concept among CwID get improved while using computer based adapted curriculum. After analyzing the data, it was discovered that there was a significant effect of computer based adapted curriculum on learning mathematical concept among CwID. It shows that computer based adapted curriculum facilitating learning Math concept. It also appeals to children through auditory and visual senses. The importance of the research study will include classroom teachers to employ instructional methods to using for teaching Math and improving arithmetic skills. It will assist them to prepare & to meet the diverse needs of all students learning the concept of Math such as Pattern in shapes and Numbers. Computer based adapted curriculum method helps the CwID to understand more easily, to see more clearly, to handle conveniently and to have better learning in Mathematics.

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