

/*+*-EFFECT OF DIFFERENTIAL INSTRUCTION TO DEVELOP FUNCTIONAL MATH AMONG ADOLESCENTS WITH MILD INTELLECTUAL DISABILITY STUDYING IN INTEGRATED SETTING

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ABSTRACT: This study investigated the effect of differential instruction on developing functional math Skill among Adolescent with Mild intellectual disability. Single group pre-test and post-test design was used and the samples for the study consisted of 5 students with mild intellectual disability. The subjects were drawn from special education unit of Neeraj Public School, Secunderabad. The subjects were between the age range of 11-14 years. The intervention programme was conducted for 15 sessions. The duration of each session was 40 minutes. In differential instruction, two strategies were chosen i.e Mnemonics and graphic organizers (GO) as in functional math Money and measurement skills were identified. The researcher used MAAM checklist for assessing pre-requisite skill for the selection of the sample and find out the performance of the subjects in math skill. The paired t-test was conducted to find out the statistical significance between the mean scores. The derived conclusion indicated that the subjects showed higher achievement in functional math (money and measurement) when they were taught through differential instruction.

Index Terms: Differential instruction, mnemonics, graphic organizers, functional math, pegword strategy.

1. INTRODUCTION

Learning is a process by which behavior is originated or changed through practice and training. In order to facilitate good learning one need to impart instruction divergently. Learning strategies are technique, principle or rules that facilitate the acquisition, manipulation, integration storage and retrieval of information across situation and settings. (Deshler Ellis & Lenz, 1996).

Teaching and learning is the process which goes simultaneously and instruction is the soul which is required to complete the task. Instruction has different forms such as direct instruction, indirect instruction, interactive instruction etc. The concept of “differential instruction” is based on the need for general education teachers to differentiate instruction to meet the learning needs of diverse learners in the general education class this include intellectual and developmental disorders as well as number of other disabilities.

“Differential Instruction” can be termed as teacher’s response to the diverse learning needs of the student (Tomilnson 1999, 2001). It is not enough to understand things like learning preferences of individual student but the teacher should also show a concern for each student by tailoring instruction to meet the need of each individual student.

Differential instructions are different from conventional instruction and can be termed as teacher’s response to differentiate instructions within the classroom.

Studies which have been conducted in past have evident that all differential instructions are academically proven strategies.

Recent emphases on heterogeneity, Special Education, inclusion, and reduction in out-of-class services for gifted learners, combined with escalations in cultural diversity in classrooms, make the challenge of serving academically diverse learners in regular classrooms seem an inevitable part of a teacher’s role.

In differential instructions for present study the researcher has chosen two learning strategy to instruct functional math.

- Mnemonics
- Graphic Organizers (GO)

These strategies help in remembering and explaining the learnt skills effectively (Jefferey P.Bakken, 2011)

Mnemonics- Mnemonics can be described as a set of strategies design to help students to improve their memory of new information by providing effective cues for recall it can be a word, picture or any clue. The general potential of mnemonic strategy can be extended to benefit a wider range of students with Intellectual disabilities.

Types of mnemonic strategy that are used for teaching academics

- Letter Strategy (choosing the initials of each word and forming a word)
- Keyword Strategy
- Peg word strategy (can be used when paired or numbered)

Mnemonics assist student with acquiring information in the least amount of time and also experience that mnemonics enhance student retention and learning through the systematic use of effective teaching variable (Lenz, Ellis & Scanlon, 1996).

Graphic Organizer- Graphic Organizers are visual representation of knowledge that structures information by arranging important aspects of a concept or topic into a pattern using labels (Bromley, DeVitis & Modlo, 1999).

Graphic Organizers main function is to help present information in concise ways that highlight the organization and relationships of concepts. Teacher involves efforts to structure information or arrange important aspects of a concept or topic into a pattern using graphic modalities. It can be related to any subject mathematics, history even in literature. Graphic organizers assist students in organizing and retaining information when used consistently. It helps the teacher by integrating into instruction through creative approaches.

Children with mild Intellectual disabilities can acquire maximum level of independency in activities of daily living, social and occupational skills. When it comes to learning, memory and recalling, deficits can be more persistently observed. Reports have shown that maximum number of children with special needs struggles with acquisition of mathematical skills. Difficulty can be observed in several different aspect of memory functioning like memorizing steps and procedures, quick identification of probable mathematical operations etc.

It is fact that math is a procedural and meaningful learning so in order to minimize the error differential instruction can be effectively used to the children with Intellectual disabilities.

Students with special need are when taught through differential instruction it enables them to learn efficiently moreover they can generalize the fact, operations. Research indicates that there is a functional relationship between math instruction and students academic performance with an overall increase in independent responses. So the present study is an attempt to improve functional math (money and basic measurement) skills among adolescent students with mild range of intellectual disability studying in integrated setup.

3.1 Population and Sample

Population includes students with Intellectual disabilities studying in integrated set up in the schools of Hyderabad and Secunderabad of Andhra Pradesh now Telangana. Out of total number of students between the age range of 11-14 years with intellectual disabilities, 5 students with mild intellectual disability were selected at the end for intervention. Only those students who obtained 40% or below based on Mathematical achievement analysis matrix (MAAM) checklist were selected as sample. The method of randomization was followed for selection of 5 samples.

Objectives

- To assess the level of competencies in money and measurement skills among the students with mild intellectual disability.
- To enhance the money skills among student with mild intellectual disability by using differential instruction studying in integrated setup.
- To improve the basic Measurement skill among student with mild intellectual disability at adolescent age by using differential instruction studying in integrated setup.

Variables

In the study following are the dependent and independent variable

- Independent variable
Differential instruction (Mnemonics and Graphic organizers)
- Dependent variable
Functional Math (Money and Measurement)

For this study primary data has been collected by giving students training on functional math through differential instructions i.e. mnemonics and graphic organizers. 5 Students with intellectual disabilities were trained in concepts selected under functional math such as money and measurement. Concepts were selected out of students need in chosen areas (money and measurement). Lesson plan including task analysis were developed and executed for each students on individual skills. Prompts were given to each student as and when required. Scores were recorded on daily basis immediate after intervention.

Pilot study gives significant facts regarding the strategy to be followed during intervention. For the purpose of pilot study the researcher in the present study has approached to Neeraj Public School, Ameerpet and imparted differential instruction (mnemonics and graphic organizers) on the students having intellectual disability and similar features like age group, severity level etc. Each student was given sum based on money and measurement according to the present functioning of the child.

3.3 Theoretical framework

Variable of study contains dependent variable as functional math more specifically money and measurement where as independent variable was differential instruction. Under differential instructions mnemonics and graphic organizers were selected for training in money and measurement. In mnemonics letter strategy and key word strategy was adopted and in graphic organizers, students having intellectual disabilities were trained in following these strategies through intervention sessions. In intervention sessions different concepts like number concept/numerals, money, measurement and time, difficulty level has been increased gradually as the student is proceeding towards higher level. Mnemonics and Graphic Organizers assist students with acquiring information in least amount of time and also enhance student retention and learning the systematic use of effective teaching. Children with intellectual disabilities can acquire maximum level of independency in activities of daily living, social and occupational skills. When it comes to learning, memory and recalling, deficit can be more persistently observed. Reports have shown that maximum number of children with special needs struggles with acquisition of mathematical skills.

Environment has great influence on learning of child. In the present study for convenience of the researcher the school administration has facilitated a math lab to the researcher as the experiment was on functional areas of math so it become easy for

the researcher to conduct sessions in math lab. It was well equipped with all kind of necessary furniture, setting and assistive technology, as the researcher has made the use of smart board sometimes to teach concepts which needed more explanation.

3.4 Statistical tool

In the present study researcher has used following tools for eliciting scores from samples which is Mathematical Achievement Analysis Matrix (MAAM) Checklist developed by Dr. A. T. Thresiakutty (2008) for baseline assessment including pre & post test another checklist i.e. task analysis was also developed by the researcher. Main task was broken into sub task, for assessing the session wise performance for selected concept. Scoring for baseline was like 1 mark for each correct response, 0 for each wrong response.

3.4.1 Descriptive statistics

The data was analysed using SPSS which stands for Statistical Package for Social Sciences. Non-parametric statistical test was used due to small group instruction and mean, SD was calculated. Wilcoxon signed rank test was computed to find out the level of significance between pre & post test mean scores of both domains. Descriptive statistics was used to analyse the following.

- Session wise Mean Score (Money & Measurement)
- Maximum scores
- Minimum scores
- Standard Deviation

RESEARCH DESIGN

Considering the nature of study design looks at only one group of individual who receive intervention, which can also be called as a treatment group. The sample for the present study consisted of 5 adolescent students between the age group of 11-14 years with mild intellectual disability studying in integrated school of Secunderabad.

The students were asked to solve the initial problems which consisted of number concept, big, small, ascending, descending, and mathematical operations like addition and subtraction. Students who scored 40% (qualifying criteria as per MAAM checklist) or more than that in baseline, they were given questions based on money and measurement from the same MAAM checklist based on the performance, 5 students were selected at the end for intervention, task analysis checklist was also used for the purpose of training in selected skills. The intervention programme was conducted for 15 sessions for students. Duration of each session was 1 hour 30 minutes on daily basis except weekends and holidays. Every day researcher observed the students performance and provided scoring on the correct responses made.

In present study the researcher also developed work sheets which comprises of the pictures of coins, currency notes and different grocery items like bread packet, butter, body lotion bottle, sugar packet etc. For measurement the researcher took pictures of weighing machine and measurement tape. However different kind of soap packets, toothpaste and other daily use commodities were gathered and given to students for the purpose of generalization. For measurement researcher has used specimen self-designed worksheets. Other worksheets were designed similarly for the whole intervention separately for domain Money and Measurement.

Whether the chosen strategy can be effective on a large population or not for that purpose pilot study was conducted by the researcher. For the purpose of execution in present study researcher has approached to Neeraj Public School, Ameerpet, (Secunderabad) and applied the differential instruction (mnemonics and graphic organizers) on the sample having similar features like age group, severity level. The samples were given money and measurement sums based on differential instruction after collecting the baseline of each student. Sums were given according to the present functioning level of the children.

IV) RESULT AND DISCUSSION

Table 1.-Comparison of Pre and Post test Mean scores of Money & Measurement Domain using Wilcoxon Sign Ranked Test

S. No.	Variable	Total student	Mean	Std. Deviation	Wilcoxon	Sig.Diff.
1.	Money	5	Pre-test-54.2	Pre-test-30.9	z- value	.000
			Post-test-83.4	Post-test-16.5	1.753	P<0.05
2.	Measurement	5	Pre-test-28.4	Pre-test-8.6	z-value	0.043
			Post-test-85	Post-test-22.3	2.023	P<0.05

Table. 1 above depicts the difference between Pre & Post test using Non-parametric test i.e. Wilcoxon Sign Ranked Test. All the 5 students were assessed in Pre and Post test and scores were taken after 15 sessions of intervention. Intervention was given using Differential instruction for teaching Functional math (money and measurement). Table indicates that difference in the pre and post test achievement scores were highly significant at P<0.05.

The outcome of the present study is supported by the findings of M. Browder and A. Scruggs (2008), they both found in their individual study that mnemonics and graphic organizers has a great influence on enhancing math as well as other subjects like Geography, learning vocabulary skills etc.

Therefore research hypothesis "There will be significant improvement in the mean scores of money domain one of the components of functional Math as a result of Differential Instruction (mnemonics and graphic organizers) stands accepted.

A perusal of table above also shows significant difference between the Pre and Post test Mean scores by conducting Wilcoxon Sign Ranked Test. Findings are consonance with the hypothesis that there will be significant improvement in the mean scores of measurement domain, one of the components of Functional math as a result of differential instruction.

Hence the hypothesis “There will be significant improvement in the Mean scores of measurement domain as a result of Differential instruction” is accepted.

In the other words it can be interpreted that the strategies (mnemonics and graphic organizers) enhanced the performance of all the students in domain money and measurement and resulted in improvement in functional Math.

More over the students were following the principles of learning of acquisition, maintenance and generalization and taught in such a way that they can do generalization of learnt skills, at the end of Post-test all students were informally evaluated through the weighing machine and measurement tape. Different commodities were used to measure the weights and length, every student was allowed to read the numbers appeared on screen and finishing point of measurement tape. Verbal prompts were given during this informal evaluation also.

In the year 2001, Butler, Miller and Hung lee has done a systematic review of research conducted between the year 1989-1998 and they have got the similar result which supports the findings of present study. They found that technique such as peer tutoring, direct instruction and other form of Differential Instruction has proved beneficial in improving Mathematics skills.

The present study has concentrated on group instructions and individual support during intervention but the individual achievement and scorings plays an important role so individual learning graph is shown below along with the description of each individual subject.

Discussion

The results revealed that differential instruction such as mnemonics and graphic organizers was effective in improving functional math among adolescent student with mild intellectual disability. The study also revealed that student has learnt basic measurement skill more effectively by the use of differential instruction as compared to money domain. The entire intervention process made them familiar with certain instrument and money transaction skill which was earlier not taught to them in the classroom. The findings of the study can attribute to the effectiveness of using differential instruction as an integral part of classroom instruction for enhancing functional math skill. Though the sample size and duration of the study was very limited and small so the vast reliability and findings of research will have less applicability. Generalization of skill trained in has not been done in real setting so it can be one of the aspects or avenue to conduct research in future or add on in the procedure.

Conclusion

Persons with intellectual disability face challenges in academic performance such as functional math which can further hinder their ability to lead an independent life in community. A key objective of the study is not only to come up with new knowledge but also to confront assumptions and explore what we don't know. The findings of the present study primarily emphasizes on implementation of something new as an instruction while teaching in classroom specially when it is procedural and logical learning.

The differential instructions make the student to learn and memorize the functional concepts for the longer period of time. Conventional mathematical instruction in middle school level for large group is difficult to acquire, therefore mathematical instruction when simplified through differential strategy creates a platform to modify and simplify these instruction. Teacher plays a key role in modifying or altering the instruction in classroom and it should be compatible to skill chosen and most importantly to learners.

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