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"Effect Of Developmental Assessment Technique on Higher Order Thinking Skills of General Science Students at Elementary Level"

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KEY WORDS

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ABSTRACT

This study was designed to explore the effect of developmental assessment technique on higher order thinking skills of students of grade 7. Griffin (2014) presented an approach of developmental assessment for creating evidence base intervention in teaching. Developmental assessment in this study, was independent variable, which helped identifying learning needs or current learning level for every student and focus of teaching, specifically targeting higher-order skills. The present research used qusai experimental design equivalent sample time series to implement a predetermined pattern of teaching. The study selected an intact group of at least 45 female students in Class 7, from a public school in Rawalpindi with mixed socio-economic status, ensuring homogeneity. Three units (Dispersion of Light, Water, Pollination) were selected because of their percentage of content to be taught in HOT skills. Students were assessed for their readiness levels in different higher-order thinking levels, based on these levels (application, analysis, synthesis, evaluation), through pre-test (total three) and then grouped accordingly. The pre-test results shape subsequent instructions and lessons were designed for the targeted learning level, supplemented with home activities tailored to individual levels. At the end of each unit a post test is conducted to assess improvements in HOT skills and this process is repeated for all three units. Across three units, significant improvement is observed in all sub levels of HOT skills for the experimental group. The repeated measure ANOVA and paired sample t-tests yielded a highly significant level of 0.00, indicating the experimental group's substantial improvement in HOT skills. The study reveals that planning teaching based on students' current achievement levels i.e. developmental assessment effectively enhances higher-order thinking skills

Introduction

Assessment is fundamental to student learning, serving the purposes of being *for*, *of*, and *as* learning. The methods teachers use directly influence what and how students learn; an assessment focused on memorization leads to superficial, rote learning (Khalid, 2024). This is a critical issue in contexts like Pakistan, where the National Education Policy (2009) acknowledges that assessment system in Pakistan limits analytical skills. Despite recognition of importance of higher order skills, it has been observed that education system of Pakistan cannot develop these skills in students. A substantial body of literature confirms the effectiveness of various teaching interventions for developing higher-order thinking skills (HOTS) in science students (Zohar & Dori, 2003). However, the successful cultivation of HOTS requires more than just implementing a proven strategy; it necessitates a feedback loop where assessment results are actively used to refine instruction and provide targeted support to students (Brookhart, 2010). This critical step of utilizing assessment data formatively is often the missing link, as many studies and practices focus on the intervention itself rather than on how to leverage subsequent assessment to continuously develop and improve these complex cognitive skills (Black & Wiliam, 2009). A study was conducted by University of Melburn, Australia in which they utilize developmental assessment technique for improving students learning. Developmental assessment is a method of interpreting assessment data to track student growth and plan targeted instruction (Griffin, 2014). This approach begins by identifying a student's current level of understanding and then tailors teaching to progress from that point. Different assessment tools can be used in developmental assessment to keep teacher informed about students' performance and their current level of achievement. The idea behind this method is that assessment can track growth of individuals on the instruments and this could help plan the instruction (Griffin, 2014). The focus of the study was to test that whether developmental assessment method can enhance higher order thinking of science students.

Rationale of the Study

The rapidly changing world need generations who can accept challenges and unfold problems and challenges exist in every single field. Consequently, the modifications are required in the teaching strategies and assessment practices to enhance higher order thinking skills of students in order to enable them to face the challenges of this century. National Education Policy Framework (2018) identified one of the education challenge in Pakistan was that the learning outcome data of students was not used to inform policy making. This document also states that for improving quality of students learning, assessment data should be utilized to improve student learning outcome (p. 12). By and large the assessments in Pakistan are only used to interpret grades and marks instead of using them as a support for learning. We need a technique of assessment that can promote learning by identifying strengths and weakness of students. This gap is effectively addressed by developmental assessment, as articulated by Patrick Griffin (2014). Griffin's model moves beyond merely identifying strengths and weaknesses; it involves mapping student understanding against a developmental learning progression a continuum that describes the typical path of learning a skill. By using judgment-based assessments to place students on this progression, teachers can identify what a student is *ready to learn next*. This allows for the formation of targeted teaching groups and the design of instruction that operates within each student's zone of proximal development (Vygotsky, 1978). While foundational formative assessment practices emphasize the feedback loop (Black & Wiliam, 2009; Brookhart, 2010),

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Griffin's framework provides a structured, evidence-based protocol for *how* to use assessment results to precisely develop and improve complex skills, thereby ensuring that teaching interventions are not just applied, but are strategically adapted to maximize student growth."

Objectives

The objective of the research was:

1. To explore use of assessment data (developmental assessment) for improvement in higher order thinking skills (Application, Analysis, Synthesis, Evaluation) of science students.

Hypotheses

The null hypotheses and alternative hypothesis were formulated as:

1. H_{01}: There is no significant difference between achievement of higher order thinking skills in students with developmental assessment technique.
2. H_1: There is significant difference between achievement of higher order thinking skills in students with developmental assessment technique.

Significance of the Study

The assessment is considered as a mean for directing the teaching in the classroom and it effects all the activities in the classroom (Black & Wiliam, 2018). When teaching will start from the readiness point of students identified by assessment than it will increase engagement level of students. Assessment will help identifying understanding level of students and there is no point in teaching beyond students understanding. This is especially true in science subjects where all the concepts are linked with each other in a hierarchy and if one concept is not understood the next one can never be understood by student. The present study changed the view of utilization of assessment results as generally assessment is considered to be the end of teaching rather in the current approach assessment should be the start of

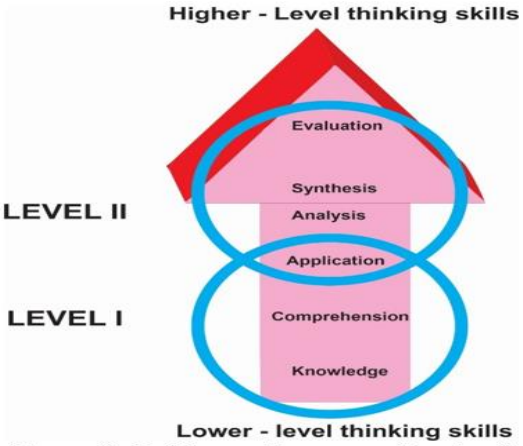


Figure 2. 2 *Blooms Taxonomy (Levels of Thinking Skills)* (Bloom, 1956)

teaching. The potential as well as the limits of uses of assessment for improving higher order thinking will guide teachers to incorporate changes in their teaching methodology for improving students learning.

Delimitations

The study was delimited to the students of class VII in tehsil Rawalpindi of District Rawalpindi for teaching of general science subject. Further this study was delimited for teaching three topics from three units of General Science Textbook. According to the curriculum these units had the most percentage of concepts to be taught in higher order thinking skills.

Review of Related Literature

Defining Higher Order Thinking Skills

The higher order thinking skills are, also called HOTS, are the skills that function beyond memorizing information that are represented by the skills at the bottom of blooms taxonomy (Bloom et al., 1956). These skills are not fixed and their dimension is expanding they are not limited to analysis, synthesis and evaluation. HOTS comprises of many kinds of e.g. making sense of information, searching out order, critical thinking, problem-solving, planning, decision making and, creative thinking, (Abdullah, Mokhtar, Halim, Ali, Tahir & Kohar, 2017), self-regulated thinking skill (Husamah, Fatmawati & Setyawan 2018) and visualization (Ramos, Bretel & Brenda 2013). Benjamin Bloom was amongst the first to arrange the

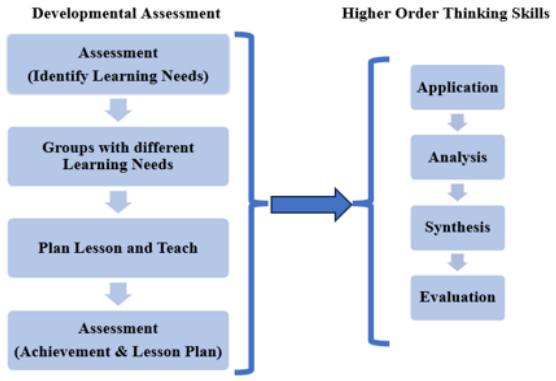
"lower" and "higher" thinking skills and the Bloom's Taxonomy, first developed in the 1950s, is widely recognized by educationalists today. In the framework given by bloom the skills are built upon each other. They are starting from most basic skills (recall and comprehension) and progress towards complex skills (application and analysis) concluding with higher-order thinking skills including synthesis, evaluation and creation. All of these skills involve different levels of cognitive thinking skills (Ramos, Dolipas & Villamor, 2013). The picture in the above describes the two main levels of Blooms Taxonomy. It is depicted in the image that the level two of Taxonomy starts from application and ends at the evaluation skills.

The usage of data to inform instruction in the classroom is an important skill for effective teaching (Protheroe, 2009). The assurance of purposeful and research driven techniques in teaching advance the efforts to drive and implement data driven practices Bernhardt (2004) the performance data of student derived from assessments with the efforts of teachers is very important instrument for refining practices and for supporting teacher effectiveness that will support student learning (Supovitz & Klein, 2003). The question would not be about that we should integrate the usage of data in making decision of teaching rather how can we use data for decision making. Searching the data that will help teaching learning process and its use effectively will be a very multifaceted process. The use of assessment data for instructional importance is a promise to dramatically achieve students achievement. Glaser and Silver (1994) visioned a future in which state testing is more about information and less about selection and sorting on which teachers can build teaching for students. When the assessment as well as instruction will be closely related to measurement, achievement would be essential part of learning not only an external force shaping future of students. The data was not only helping teachers to find out area of difficulty of every student but it also supports teachers to write down objectives that require further attention and there might be need of changing the teaching method so that learning of students can be improved. The use of assessment data can help to locate the certain objectives that students are not achieving or it can identify students who are below a particular level of achievement and providing instruction without taking care of special needs of these students would not be useful (Protheroe, 2009).

What is Developmental Assessment?

Developmental assessment is not a novel type of evaluation; rather, it is a technique for analyzing assessment data to enhance teaching practices (Griffin, Care, Crigan, Robertson, Zhang, & Arratia-Martinez, 2014). This approach incorporates various assessment methods to provide teachers with insights into students' performance and their current levels of achievement. The primary concept behind developmental assessment is its ability to monitor individual growth through assessment instruments, facilitating the planning of targeted instruction. The process begins with assessing students to identify their current knowledge and skill levels. By determining students' skill level and readiness for learning, teaching can be tailored to meet their specific needs, starting from their identified level of understanding (Griffin, 2014). In this approach, the teacher assumes the role of a facilitator, designing and

Conceptual Framework



assigning differentiated tasks that cater to the diverse abilities within the classroom.

Methods and Procedures

Independent Variable	• Developmental Assessment
Dependent Variable	• Higher Order Thinking Skills

Research Design

The present research employs a qausi experimental design and for the purpose equivalent sample time series design was selected to implement a predetermined pattern of teaching intended to enhance the students' higher-order thinking skills. The independent variable was the developmental assessment and the dependent variable was higher-order thinking skills. Given below is the mathematical representation of the design used in the present research:

Experimental Group: O1 X1 O2 X2 O3 X3 O3

Population and Sample Due to practical constraints, the accessible population was delimited to all the middle and secondary school students in Rawalpindi district (Fraenkel & Wallen, 2000). The selection of the accessible population was guided by practical considerations of feasibility, resource availability, and the specific research objectives. The study selected an intact group of at least 45 female students in Class 7, aged 12-14, from a public school in Rawalpindi with mixed socio-economic status, ensuring homogeneity and avoiding formation based on achievement. The rationale for selecting an intact class was twofold. First, it aligned with the natural, pre-existing groupings of the school environment, thereby minimizing disruption a key advantage of this design (Creswell & Guetterman, 2023). Second, the school's mixed socio-economic status was selected to enhance the potential generalizability of the findings to a typical public-school setting, rather than a highly specialized one.

Selection of Units, Teaching Methods and Teacher

The curriculum document provided by Punjab Curriculum and Textbook Board Lahore includes details of contents along with the cognitive level on which the respective topic was taught to students. As the study focus on the higher order thinking skills so the topics to be taught should be identified to teach higher order thinking skills as stated in the curriculum of General Science for class VII. The chapters listed in the table 3.1 were selected based on the proportion of their content that was taught beyond the application level. This selection criterion ensures that the material covered was appropriate for targeting higher cognitive processes. The decision to focus on three specific units was driven by the experimental design, which necessitated three distinct treatments; consequently, a test was administered upon the completion of each unit to evaluate the effectiveness of these treatments. The researcher hired teacher for teaching students so that the bias of the researcher was controlled. The teacher was teaching science to the class selected for experiment. The teacher was trained for one week about the idea of conducting an experiment and teaching of higher order thinking skills.

Table 3. 1

Units and Content Percentage of Different Skill Levels (Application, Analysis, Synthesis, Evaluation)

Unit Number	Topics	Content to taught HOT
Unit 3: Reproduction in Plants	Pollination and its types	33%
Unit 5: Water	Cleaning and Uses of Water	25%
Unit 9: Dispersion of Light	Refraction	40%

Development of the Instrument and its validity

The research questions demand comparison of performance of students on the dependent variable, higher order thinking, therefore test was selected as a data collection

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instrument. A test, as tool, of higher order thinking skills comprising items of application, analysis, synthesis and evaluation was prepared for collecting data from the participants of the experiment. The levels of higher order thinking skills and their sublevels were identified from blooms taxonomy. The tests of all the chapters had questions from selected four levels of blooms taxonomy. Three tests, comprising of 65 items in total to measure higher order thinking skills prepared from three selected units in which at least 2-3 questions for each above stated level were included and each item in the test was representing a skill underpinned. The blue print of the test is given in table 3.3. The table of specification and confirmation from two

1. Application
   i. Selection of abstraction suitable to problem type
   ii. Use of abstraction to solve problem
2. Analysis
   iii. Analysis of Elements
   iv. Analysis of Relationships
   v. Analysis of Organizational Principles
3. Synthesis
   i. Production of a unique communication
   ii. Production of a plan or proposed set of operations
   iii. Derivation of a set of abstract relations
4. Evaluation
   i. Judgments in terms of internal evidence
   ii. Judgments in terms of external criteria

(Bloom, 1956)

specialists ensured content and face validity of the developed instruments (Miller et al., 2013). For ensuring content validity of the test the table of specification with respect to level of learning was prepared (Anderson & Krathwohl, 2001). The prepared test was pilot tested before implementation in the experiment to check if the students can understand the language of the test (Fraenkel et al., 2019). The language in some of items was revised after the pilot (DeVellis, 2017). To establish construct validity the items were check by two experts having Ph.D. degree in preparing higher order thinking items were requested to review the items (Brookhart, 2010). The suggestions given by them were incorporated in the tests (Pallant, 2020).

Table 3. 2
Blue Print of Test Items

Cognitive Level and Sublevel	Number of Items			
	Reproduction in Plants	Dispersion of Light	Water	Total
Application	2	2	6	16
i.Selection of abstraction suitable to problem type/ Classification of the problem to familiar type				
ii.Use of abstraction to solve problem	2	2	2	
Analysis	2	2	2	19
i.Analysis of Elements				
ii.Analysis of Relationships	2	2	2	
iii.Analysis of Organizational Principles	2	2	3	
Synthesis	2	2	2	18
i.Production of a unique communication				
ii.Production of a plan or proposed set of operations	2	2	2	
iii.Derivation of a set of abstract relations	2	2	2	
Evaluation	2	2	2	12
i.Judgments in terms of internal evidence				
ii. Judgments in terms of external criteria	2	2	2	
Total	20	20	25	65
Number of Lessons	19	15	17	51

Treatment

As the study has to employ the developmental assessment method to see improvement of students performance in higher order thinking skills. The process of developmental assessment technique starts with assessment of student's readiness level of learning. The test of higher order thinking skills was conducted for identifying the current or readiness level of students. After utilizing the results of the test, readiness level of each student according to different levels of higher order thinking skills was determined. Student in a class was divided into groups of two to three according to their current level (i.e. application, analysis, synthesis, evaluation) of higher order thinking skills as reported in the assessment. The majority of the students could solve few questions at the application level the ratio of right answers at higher levels were not much. Therefore, for the first cycle it was decided to focus of improving application skills of the students. In the subsequent tests and treatment after them could also focus only on the improvement of analysis skills. The details of experimental process are provided in the pictorial form. Unit 1, Unit 2, Unit 3: These three blocks represent the different units or

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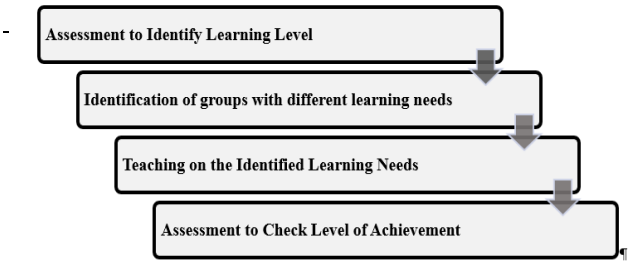


phases of the experiment. Each unit involves a sequence of activities related to teaching and testing. Pre-test and Post-test: Pre-test 1, Pre-test 2, Pre-test 3: Before starting each unit, a pre-test was administered to assess the students' initial knowledge or skills related to the content of that unit. Post-test 1, Post-test 2, Post-test 3: After completing the lessons for each unit, a post-test was administered to evaluate the students' progress or learning outcomes. After each pre-test, a series of lessons were conducted, tailored to the specific unit being studied but focusing on the improvement of the identified skill under it. These lessons were designed to improve students' understanding and skills in the targeted area.

Collection of the Data

Pre-test and post-tests were administered at the completion of each unit, with pre-test results shaping subsequent instructions. Pre-test and post-tests, administered at the start and end of each unit, were conducted in a consistent classroom setting. This process is repeated for all three units for result verification and instructional improvement. There were 45 students in the class and test was administered from all students of the class. The students who were absent in one or more tests their score was excluded at the stage of data analysis therefore for data analysis results of 38 students utilized. In a twelve-week experiment, science subjects were taught six days a week, covering 19 topics with 51 lectures.

Data Analysis

The assessment aimed to identify students' current knowledge levels, with three chapters having both pre-test and post-tests, and total six assessments. Out of 45 students, data from 38 were analyzed, excluding absentees during tests. All the tests were administered for approximately 45 minutes, scored based on predetermined rubrics, and personally checked by the researcher. The analysis of the data was executed using the SPSS software to measure the significant difference between pre-test and post-test with ANOVA and paired sample t-test.

Alignment of objectives, hypothesis and data analysis

Objectives	Hypothesis	Data Analysis
To explore use of assessment data (developmental assessment) for improvement in higher order thinking skills (Application, Analysis, Synthesis, Evaluation) of science students	1. H_0: There is no significant difference between achievement of higher order thinking skills in students with **developmental assessment** technique. 2. H1: There is significant difference between achievement of higher order thinking skills in students with **developmental assessment** technique.	Paired Sample t-Test of Pre-tests/Post-tests Repeated Measure ANOVA of all the Pre-tests Repeated Measure ANOVA of all the post-tests

Performance of Students in Higher Order Thinking Skills

Higher order thinking skills of students' were assessed through a test which was contained four skill levels i.e. application, analysis, synthesis and evaluation. Following null and alternative hypothesis were formulated about the performance of students in higher order thinking skills: Paired sample t-test was used to measure the statistical difference between two measuring points (Manfei, Fralick, Zheng, Wang & Changyong, 2017). The paired sample t-test was calculated to decide about acceptance and rejection of these hypothesis.

Table 4. 1

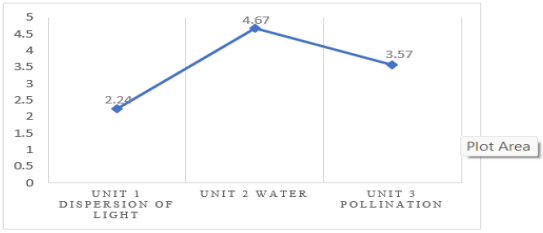
Paired Sample t-Test of Higher Order Thinking Skills Scores

Unit	Name of Unit	Pre-test		Post-test		Gain Score	t	df	Sig.
		Mean	SD	Mean	SD				
1	Dispersion of Light	2.24	1.1	6.13	3.33	3.89	7.36	37	0.0
2	Water	4.67	3.3	9.64	6.08	4.97	6.87	37	0.0
3	Pollination	3.57	1.9	10.38	6.84	6.81	7.07	37	0.0

The number of participants in experimental group were 38. The mean score for the experimental group in pre-test was 2.24 with standard deviation 1.13 in unit 1, 4.67 with standard deviations of 3.29 in unit 2 and 3.57

with standard deviations of 1.87 in unit 3. The mean score for the experimental group in post-test was 6.13 with standard deviations of 3.33 in unit 1, 9.64 with standard deviations of 6.08 in unit 2 and 10.38 with standard deviations of 6.84 in unit 3. In table, paired sample t-test showed that there was a significant difference between pre-test and post-test performance of the participants during study of first second and third units. The t-statistic was 7.36, with df=37 ($p < .00$) for unit 1, 6.87, with df=37 ($p < .00$) for unit 2 and 7.07, with df=37 ($p < .00$) for unit 3. These findings suggest that the planning teaching after finding student current achievement level effectively improved students performance in higher order thinking skills. In summary, the results of the paired sample t-test indicate a significant improvement in higher-order thinking skills from pre-test to post-test across all three comparisons. The positive mean

Figure 4. 4
Comparison of Mean Scores of Pre-test of Higher Order Thinking Skills



differences in each case suggest that the participants' higher-order thinking skills have improved after undergoing the intervention. The consistently low p-values further support the significance of these findings, implying that the observed differences are unlikely to have occurred by chance. The line graph plots the trend lines of pre-test and post-test achievement scores against the student range (1-38). Overall, students performed better in the post-test for higher order thinking skill items than in their respective pre-tests.

Table 4. 2
Repeated Measure ANOVA Size of Change in Higher Order Thinking Skills in Pre-Test

	Sum of Squares	df	Mean Square	F	Sig.
Within Group	112.90	1.61	69.94	13.52	0.00
Between Group	1389.51	1	1389.51		

The table 4.6 represents the results of a statistical analysis, from a repeated measures ANOVA and the sum of squares was found to be 112.90 in within group cases. The mean square represents the variance explained by the independent variables or their interactions, and it was calculated by dividing the sum of squares by the respective degrees of freedom. In this analysis, the F-value was 13.52. The significance level is reported as 0.00, which suggests that the obtained results are statistically significant. The statistical analysis shows that there is a significant effect of the independent variables or their interactions on the dependent variable.

Table 4. 3
Descriptive Statistics of Post-test of all the Units

Units	Mean	SD	N
Unit 1 Dispersion of Light	6.13	3.33	38
Unit 2 Water	9.65	6.08	38
Unit 3 Pollination	10.38	6.84	38

As shown in table 4.7, the number of participants in experimental group were 38. The mean score for the experimental group in post-test of unit 1 was 6.13, with a standard deviation of 3.33. The mean score for the experimental group in post-test of unit 2 was 9.65, with a standard deviation of 6.08. The mean score for the experimental group in post-test of unit 3 was 10.38, with a standard deviation of 6.84. The experimental group improved its mean score from first post-test to last post-test in higher order thinking skills.

Table 4. 4
Repeated Measure ANOVA Size of Change in Higher Order Thinking Skills in Post Test

	Sum of Squares	df	Mean Square	F	Sig.
Within Group	391.17	1.797	217.73	17.61	0.00
Between Group	8662.62	1	8662.62		

The above table represents the results of repeated measure ANOVA and sum of squares, which was 391.17 in within group cases, represents the variability in the dependent variable that can be attributed to the developmental assessment. In this analysis, the F-value was 17.61 which represents the ratio of the variance between groups to the variance within groups. The table indicates a significance level of 0.00, suggesting that the obtained results are highly statistically significant. The statistical analysis revealed a significant effect of the developmental assessment on the higher order thinking skills.

Findings

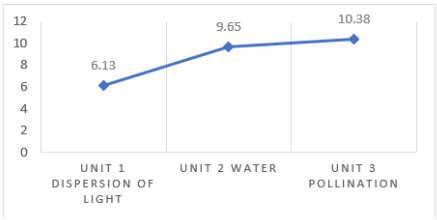
Higher Order Thinking Skills

The mean score for the experimental group in pre-test was 2.24 in unit 1, 4.67 in unit 2 and 3.57 in unit 3. The mean score for the experimental group in post-test was 6.13 in unit 1, 9.64 in unit 2 and 10.38 57 in unit 3 which clearly shows a gradual increase in mean score from unit 1 to 3. The paired sample t-test showed that there was a significant difference between pre-test and post-test performance of the participants during study of first second and third units. The t-statistic was 7.36, for unit 1, 6.87, for unit 2 and 7.07, for unit 3 further all of these are significant. These findings suggest that the planning teaching after finding student current achievement level effectively improved students performance in higher order thinking skills. The results of the paired sample t-test indicate a significant improvement in higher-order thinking skills from pre-test to post-test across all three units. The positive mean differences in each case suggest that the participants' higher-order thinking skills have improved after undergoing the use of developmental assessment technique. Overall, students performed better in the post-test for higher order thinking skill items than in their respective pre-tests. The difference between pre-test and post-test score in teaching of unit 3 is more visible showing the trend of improvement in duration of experiment and justify use of developmental assessment technique to improve higher order thinking skills.

Comparative Analysis of Higher Order Thinking Skills Score Across all Pre-tests

The mean score for the experimental group in pre-test 1 was 2.24, in pre-test 2 was 4.76, and in pre-test 3 was 3.57. The experimental group improved its score in from first pre-test to last pre-test in higher order thinking skills. A repeated measure ANOVA was calculated to check the difference between all the pre-tests. The F-value was 13.52 and the significance level is reported as 0.00, which suggests that the obtained results are statistically significant. A moderate effect size was calculated, suggesting that approximately 27% of the variance in the dependent variable can be explained by the developmental assessment.

Figure 4. 5
Comparison of Mean Score of Post-test scores on Higher Order thinking Skills



Comparative Analysis Higher Order Thinking Skills Score Across all Post-tests

The mean score for the experimental group in post-test 1 was 6.13, with a standard deviation of 3.33. The mean score for the experimental group in post-test 2 was 9.65 and the mean score for the experimental group in post-test 3 was 10.38. The experimental group improved its score in from first post-test to last post-test in higher order thinking skills. In this analysis, the F-value was 17.61 which represents the ratio of the variance between groups to the variance within groups. The significance level of 0.00, suggesting that the

obtained results are highly statistically significant. A moderate effect size, indicating that approximately 32% of the variance in the dependent variable can be explained by the factors under consideration. The statistical analysis revealed a significant effect of the developmental assessment on the higher order thinking skills.

Discussion

This research presents practical approach to improve higher order thinking skill through facilitation of the interpretation of data collected through assessment i.e. utilizing a developmental assessment technique. The developmental approach offered recognizes what the student is ready to learn rather than of what they do not know, are not doing or have not learned (Griffin, 2017). The basic aim of this approach is to enhance and improve outcomes from students through the determining and designing individual learning goals, utilizing assessment data and follow developmental rule (Abrams, Varier & Jackson, 2017). In other words, collecting evidence of students learning needs with the help of students assessment results, before planning teaching. The results of the present study indicated an improved score on higher order thinking skills thinking for students who got a treatment through the planning of instruction after finding out their present level of learning. The study revealed that the students in the experimental group displayed progress in their higher order thinking abilities. The enhanced performance in the experimental group can be credited to the implementation of the developmental assessment technique. By using research and assessment data to inform their instructional decisions, teachers can ensure that they are providing their students with the best possible learning experiences (Jawuor, 2020).. According to King and Kitchener (1994), such assessments contribute significantly to students' cognitive development. Linking the planning of instruction with the use of assessment data was key objective of present research. When instruction was planned keeping in view the current achievement level of higher order thinking skill, it results in improvement of higher order thinking skills. The alignment between curriculum, instruction, and assessments plays a key role in achieving this goal (Sewagegn, 2020). Firstly, educators must recognize the connection between curriculum and instruction, ensuring that assessments reflect the intended or required learning outcomes. Subsequently, the assessment should encompass these elements to accurately evaluate students' learning progress (Sandra, Zepeda, Carla & Forster, 2023). By successfully implementing this approach, teachers can more effectively address higher-level thinking in their classrooms, employing strategies such as scaffolded questions, longer wait times, reflective writing, and in-depth discussions in both small and whole-group settings (Passinger, 2020).

Conclusions & Recommendations

The findings suggest that the planning teaching after assessing student current learning level effectively improved students performance in higher order thinking skills. The results indicate a significant improvement in higher-order thinking skills from pre-test to post-test across all three units. It is therefore concluded that higher order thinking skills of students are improved utilizing developmental assessment technique. Based on the conclusions and discussions presented in the study, the following recommendations are proposed for school administrators, teachers, and teacher educators: As critical thinking skills are becoming increasingly important in the 21st-century, elementary schools should incorporate the developmental assessment into their classrooms. The study demonstrated the effectiveness of this strategy in fostering higher order thinking skills among students.

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