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A Quantitative Study on Prospective Teachers' Assessment Skills About Critical Thinking, Creative Thinking and Problem- Solving Skills Before intervention on HOTS.

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Abstract: An experimental study attempted to find out the perceptions of prospective teachers' assessment skill on critical thinking, Creative Thinking skills and Problem-solving skill before completing the Bachelor of Education degree. A Random sampling technique was employed to select 36 participants, from final year B. ED GRI (DTU) students, Dindigul district, Tamil Nadu. To know their assessment skills in setting questions using HOTS. Students were asked to prepare a assessment tool with six dimensions. Six dimensions include Objective and subjective type of questions. Objective questions included fill in blanks (20), match the following (10), true /false (10), MCQ (20), subjective included short Answer questions (20) and Paragraph Answer questions (20). The scores were subjected to descriptive analysis. Analysis indicated an importance using Hots in assessment tools as their performance was moderate in some of the dimensions and low in some. This also has denoted the awareness on HOTS needs to be given to prospective teachers, regarding enhancing these 3 skills. Prospective teachers recognized the significance and impact of HOTS in fostering Higher Order Thinking Skills. Furthermore, every student teacher has also identified the dimensions to be focused by them in framing questions with HOTS. The study suggests promoting prospective teachers' skills in critical and creative thinking and problem-solving skills and applying these skills to real-life situations.

Index terms: Critical thinking, Creative Thinking, Problem solving, Higher order thinking skills.

1.Introduction

The main purpose of education is to enhance human potential, which is influenced by various reasons. One of the factors is the ability of teacher trainees to assess the students, process of evaluation in achieving the learning outcomes. According Minali, Educational Assessment by Education Assessment Standards is the process of collecting and processing information to determine the achievement of learners' learning outcomes. The principles and standard of assessment emphasize two main ideas namely that assessment should improve learners' learning and assessment is a valuable tool to measure the students' achievement through HOTS. Assessment is not just the data collection of learners in the form of marks, but also preparing them act smart in the real-life situations. Assessment is not just preparing set of questions to obtain a numerical data, but the teacher must make students to think critically, creatively and to develop problem solving skills. To carry out the assessment, teachers need assessment tools with set of good questions to test their HOTS. Assessment can provide the teacher trainees constructive ideas to be executed in assessment tool through HOTS The results of the assessment can also provide motivation to learners to perform better.

The quality of the assessment tools directly influences the achievement status of the teachers' assessment skill outcomes. Hence, the quality of the assessment tool to bringing the learning outcomes is very important which includes the ability of teachers to incorporate HOTS (Higher Order Thinking Skills) in the assessment tool. There is various type of assessments that teachers can make to measure student achievement in learning. When the cognitive domain of students is to be measured, teachers can use assessment like tests. Assessment using tests made in the form of written tests as well as non-written tests. Written tests can be multiple choice, MCQ, Match the following, true or false and descriptive type.

According to Vina Serevina (2016) The situation in the current scenario shows that , the teacher trainees' assessment skills has not been exposed to HOTS to measure students' cognitive abilities. The success of measuring the students' learning achievement depends on the quality of assessment tools used. Assessment tools have an important role in measuring student. learning outcomes. So, it is required to have a standard assessment tool. some teachers who use the correct written test assessments are appropriate in measuring indicators of learning achievement and the cognitive domain of students through HOTS (Serevina et al.('2019)

2.Literature Review

According to Miterianifa et al. (2021) Critical thinking as essential for HOTS in 21st-century science education. They have surveyed definitions, skill components like analysis and evaluation, and dispositions. They also identify classroom strategies like inquiry tasks, problem-based learning, and formative questioning.

Gupta and Mishra (2021) examined the role of higher-order thinking skills in shaping students' futures. They argue that higher-order abilities, including critical thinking, creative thinking, problem-solving, decision-making, and metacognition, are crucial for adaptability and readiness for the future. Prasetyo et al. (2021) explains higher-order thinking skills in relation to Bloom's

revised taxonomy. The authors reaffirm HOTS as higher cognitive processes and link it to creativity, problem-solving, reflection, and decision-making.

Samelian (2017) investigates how higher-order questioning and critical thinking influence reading comprehension. This study of fifth-grade students shows that teaching higher-order questioning techniques improves the quality of student inquiries and the rigor of their written responses. Abosalem (2016) examined assessment techniques and their effect on developing HOTS among secondary students. His research indicated that teacher-made tests often favoured lower-order thinking (LOT), as most questions focused on recall and recognition rather than evaluation or creation.

Ragupathi (2016, updated 2020) provided guidelines for creating effective online assessments. Based on constructive alignment theory, the resource underscored the importance of aligning intended learning outcomes (ILOs) with assessment tasks to ensure valid measurement of HOTS. Behlol, Masood, Hammad, and Arshad (2021) investigated how teacher educators and student-teachers in Pakistan's pre-service teacher education programs incorporate HOTS. The study concluded that reforms in teacher education curriculum and assessment strategies are necessary to instil critical, analytical, and creative skills in future teachers. Critical and creative thinking and Problem-solving skills are crucial capabilities, as three are helping students to always look at every problem critically and to end up with creative solution in order to solve problem facing in the real-life situations.

3.Research Method

To Finding the assessment skill of the prospective teachers using HOTS will be evident by preparing an assessment tool with different type of questions. Evaluating the students and their ability to answering the tool, set with questions which tests their HOTS is crucial to face the challenges in their lives. Hence, it was important to conduct a study on the title "A Quantitative Study on Prospective Teachers' Assessment Skills About Critical Thinking, Creative Thinking and Problem-Solving Skills Before intervention on HOTS." Based on the above title the researcher focuses on the development of assessment tool through HOTS on the subjects of their specialisation for classes 6 to 8.

This research is a single group experimental design. The Independent variable is HOTS and the Dependent variable is Assessment skills The study investigated Pre service teachers' experiences in developing HOTS - based questions by exploring and describing teachers' challenges. The study used random sampling to select the prospective teachers who are interested to participate in the study. The sample of the study included 36 pre-service teachers from GRI(DTU) Tamilnadu. The objects were second year B. ED students, were purposefully chosen as they were at the verge of completion of their course. There were 25 female teachers and 5 male teachers. The number of the participants of the study indicated the unbalanced gender distribution of the sample that mostly carried out by female teachers.

In order to investigate the pre service teacher's challenge in developing HOTS – based questions, this study adapted pretest for 36 samples. Based on this framework, the assessment tool comprised of six dimensions include (i) Fill in the blanks, (ii)Match the following, (iii)MCQ, (iv)True/false(v)Short Answer, (vi)Paragraph Answer. The items of the study were in the form

of objective and subjective type of questions in order to find their skills of each teacher's experiences in HOTS (critical, creative and problem-solving skills). The pre service teachers were asked to set the questions with one mark for each question for objective type (60), short answer (20) and paragraph question (20) for their understanding and 6their experiences related to HOTS-based questions. The data of demographic characteristics such as gender and their subject specialisation. were also collected in the study.

Validation of assessment tool is conducted to evaluate the validity of tools in the form of dimensions on HOTS test. Validation is done by the researcher herself. Descriptive and Inferential analysis was performed.

4.Results and findings

Table 4.1

Descriptive analysis for assessment skills for 6 dimensions

Component	Max Marks	Mean	Std. Deviation	Mean %
Fill	20	7.4	2.27	37.00%
Match	10	3.67	1.85	36.70%
MCQ	20	5.67	2.09	28.40%
True/False	10	4.6	1.19	46.00%
Short Answer	20	7.03	2.53	35.20%
Paragraph	20	9.9	2.35	49.50%

From the descriptive analysis Table 4.1, it is clear that the assessment tool prepared by the prospective teachers for Paragraph Answer section shows the highest average performance (mean = 9.9, 49.5%), suggesting that PT are comparatively better at expressing HOTS for longer subjective questions. The True/False section also has a relatively higher mean percentage (46%), indicating moderate strength in three skills of HOTS of the PT. However, performance is weaker in MCQs (28.4%) and fill in the blanks (37%), suggesting challenges in setting questions for objective type or precise answer-type questions. The Match-the-following (36.7%) and Short Answers (35.2%) also remain below 40%, pointing to gaps in preparing assessment tools with HOTS skills. The standard deviation values (ranging 1.19 to 2.53) indicate moderate variability across students, meaning performance levels differ but not extremely. Overall, students show relative strength in descriptive and reasoning-based questions but need significant improvement in preparation of assessment tool for objective-type questions.

Percentage Analysis

The overall average performance is 38.8%, which indicates that Prospective teachers' performance was below average across assessment dimensions in preparing the assessment tool with HOTS. Among the dimensions, the questions set for Paragraph answer (49.5%) and True/False (46%) are the best-scoring areas, showing that PT perform better in descriptive and simple binary-response questions. The weakest area is MCQs (28.4%), which reflects difficulty in applying HOTS and understanding the multiple-choice formats. Similarly, Fill (37%), Match (36.7%), and Short Answers (35.2%) show lower percentages, tells gaps in preparing the assessment tool with HOTS.

This highlights that preservice teacher sare more confident with setting questions for elaborative/descriptive writing but need focused practice in objective-based questions (MCQs, Fill, Match) to strengthen their Higher Order Thinking Skills

Table 4.2

Correlation Matrix Pearson's r, for the pretest

Dimension	Fill	Match	MCQ	T/F	Short Ans	Para
Fill	1	0.42	0.38	0.35	0.41	0.46
Match	0.42	1	0.47	0.31	0.4	0.44
MCQ	0.38	0.47	1	0.28	0.49	0.52
True/False	0.35	0.31	0.28	1	0.33	0.36
Short Ans	0.41	0.4	0.49	0.33	1	0.58
Paragraph	0.46	0.44	0.52	0.36	0.58	1

The correlation matrix Table 4.2 shows moderate positive relationships among most of the dimensions, students who performed well in one area tend to do reasonably well in others. The highest correlation is between Short Answer and Paragraph (≈0.58)**,** suggesting strong linkage between structured in setting the questions for extended and descriptive writing skills. Objective dimensions like Fill, Match, and MCQ also show moderate correlations (0.38–0.47), as the HOTS skills are moderately incorporated in the tool. True/Fals**e** has the weakest correlations (≈0.28–0.36) with other dimensions, indicating it measures a slightly different skill required to frame questions which test the critical, creative and problem- solving skills of the prospective teachers. Overall, the matrix highlights two main skill domains**:** (1) *objective* (Fill, Match, MCQ, T/F) and (2) *descriptive expression* (Short Answer, Paragraph), with stronger internal consistency in the descriptive domain.

Finding

The study reveals that students demonstrated relative strength in preparing the assessment tool incorporating HOTS for descriptive tasks (paragraphs and short answers), their performance setting standard assessment tool with HOTS in objective assessments such as MCQs, fill in the blanks, and Match-the-following is significantly weaker. The overall mean percentage (≈39%) indicates that most students are performing below the expected benchmark. Correlation patterns show two distinct domains of ability are Objective versus descriptive expression and showed higher consistency in descriptive skills. This suggests that although students can articulate ideas better in preparing the tool for narrative responses than for objective type.

Conclusions.

To address the performance gaps, we need to Strengthen the assessment skills of prospective teachers in Objective-Type Skills which test HOTS of the students by giving strong and proper intervention will increase their performance in MCQs, Fill-in-the-blanks, and Match-the-following. These insights can inform educators and researchers about the specific areas of strength and potential improvement, guiding the development of targeted interventions to enhance overall assessment skills among the prospective teachers.

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