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Z-A Approach To Enhance Pedagogical Content Knowledge Of Integrated B.Ed. Student-Teachers

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ABSTRACT

Everything in nature is prone to change in some way. Education is no different. In the realm of education, new teaching techniques are put to the test in order to get a good outcome. In this article, the researcher takes a novel technique to explain the wonders of physical science. The present research aim is to determine the influence of Z-A on student-teachers pedagogical topic understanding. A total of 53 student-teachers from the Integrated B.Sc.B.Ed. programme was included in the study. This research used a pre-test and post-test comparable group design. The test was used to analyse the data. The findings of the present research show that implementing the Z-A Approach technique might significantly improve student-teacher Pedagogical Content Knowledge. The typical teaching style did not affect the level of PCK among student-teachers. When pre-achievement was regarded as a covariate, the Z-A Approach technique might dramatically improve student-teachers PCK compared to the standard way. The old teaching style could not claim to have improved student-teachers pedagogical topic understanding. The quality of education is determined by the quality of instructors who have an effect on it.

Key Words: Teacher education system, Integrated B.Ed. student-teachers, PCK and Z-A Approach

INTRODUCTION

The characteristic of a nation's growth is scientific advancement. Ignorance, superstition, and hypocrisy may all be combated with a scientific mindset. It promotes a rational, quantitative, and systematic approach to life, quickly empowering and enhancing individuals who use it. Our newly independent country took many steps to promote and strengthen scientific activities. Today, however, many parts of our scientific progress are perceived as undesirable. Compared to China, India's contribution is qualitative and quantitatively insufficient.

It is critical to define the type of science discussed at the beginning. For example, science as a scholarly endeavour, science for industrial reasons, science in society, science for students, and science for strategic goals are all examples of science. However, the purposes and goals of these many types of science and the methods used to attain success are quite different.

Knowledge of information and science stands out as a highly important and crucial input for growth and survival in modern times. As a systematic activity, science creates and organizes knowledge in the form of tested hypotheses and universal phenomenon predictions. Science is a corpus of information that can be logically explained and reliably applied to human endeavours. Abimbola & Omosewo (2012) define science as "a manner of studying a method and a means of thinking in the quest for understanding of nature." Science, being a dynamic human endeavour, is concerned with the technical progress of the world. It is the foundation upon which current technical advancements are based.

For a long time, teacher empowerment has been explored and argued. However, the current teacher preparation strategies have not successfully empowered science teachers. As a result, reorganizing rules and procedures in teacher empowerment programmes is critical. In addition, the new National Curriculum Framework should make a fresh commitment to prepare high-quality teachers a top

priority. The quality of the teacher is a non-negotiable need to guarantee that the proposed science curriculum's aims and objectives are met.

Raising the motivating levels of instructors has proven to be a difficult task. Even though no ready-made solutions exist for this vexing challenge, we feel it is not completely unsolvable. The situation will improve with systemic adjustments, better-recruiting strategies, greater compensation grades and other material rewards, and the construction of adequate support structures. In addition, it will aid in attracting the correct types of people to the field. Lack of confidence and drive are frequently the outcome of a lack of empowerment and independence.

A full revamp of the country's teacher education system, including modernization of curricula, construction of proper labs for science teacher education, and aggressive recruitment of high-quality teacher educators, is urgently required. Science teacher educators should have some experience teaching science at the relevant level. There is currently no formal framework to support science teacher educators' professional development. The current teacher education programme favours theory over application.

Conceptualizing a subject matter is the process of science. The responsibility of a science teacher to help students gain an understanding of some scientific content. Teaching science demands presenting material to students that leads to the understanding of scientific concepts. Students' content knowledge should be increased by using an organized approach like the Z-A Approach.

Teachers are trained at teacher education institutions in the hope of becoming skilled in their field. Teachers' responsibilities are no longer limited to classroom instruction. They must be professionals with strong academic standards and pedagogical and practical abilities. Our instructors' education determines the quality of education we give our children.

A-Z Approach

This method makes attempt to explain a concept's application first. The application of a certain concept should be discussed first, followed by an explanation of the results of such applications. For instance, motivation is discussed in management courses in such a way that the firm gains significant advantages from employing strategies like promotions and awards. Therefore, in this case, the purpose of promotion is given initially, and students afterward get interested in learning about promotions and rewards. The instructor begins by defining promotion and defining management incentive theory. Another possible example is to first explain the Income statement and Balance Sheet in accounting before bringing up the double entry system of bookkeeping.

Strengths

1) Clarifies a specific topic

2) Students become curious to fully understand the concept.

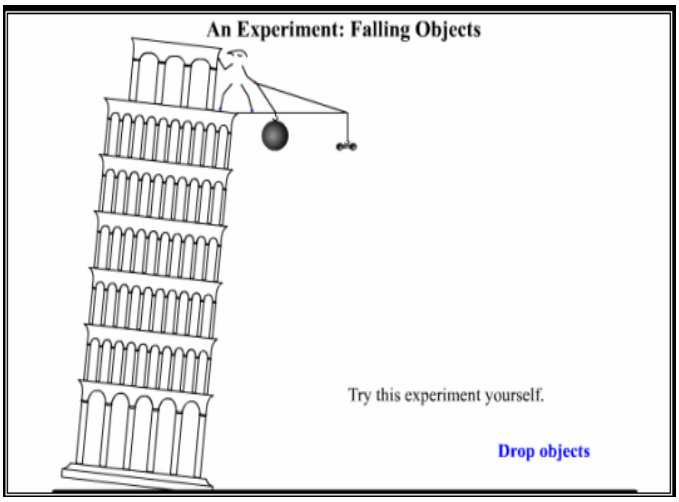
3) Establishes a concept's long-term memory or correlation.

Weaknesses

1) It will take a teacher a long time to explain a topic.

2) You could have trouble grasping a concept at first.

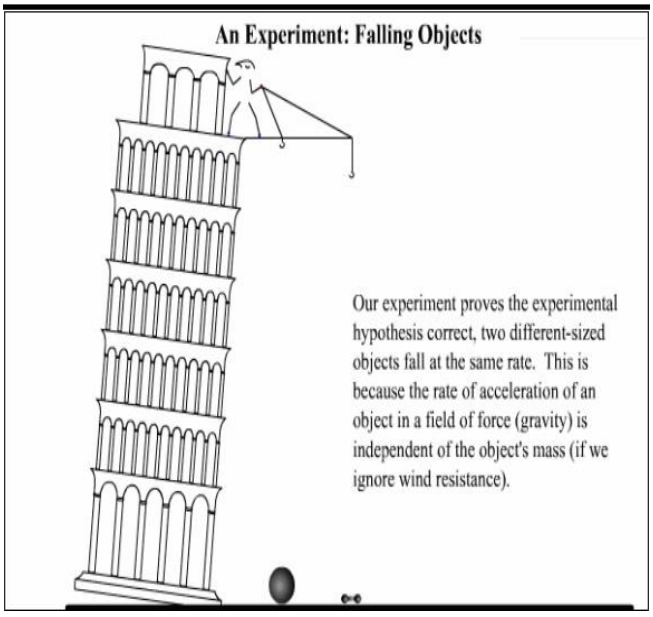
LEANING TOWER OF PISA EXPERIMENT – EXAMPLE TO Z – A APPROACH



Source: Vision Learning

The following two charts explain the Z-A approach. A person drops a cannonball and a lead weight from the top of the structure in the first figure. The experiment's hypothesis is that both objects will fall at the same rate of speed.

In the second figure, the cannonball and lead weight have reached the ground



Source: vision learning

Concept Simulation - Galileo Galileo's experiment of two different objects falling at the same rate.

The application of that Gallileo's theorm is described in the above figure. In this lesson, the teacher discusses how two objects that are dropped from a specific height above ground level will eventually touch the earth. The traditional approach to teaching is to first explain the theorem before moving on to its application. The Z-A approach, however, takes the opposite tack by explaining the theory last and the proof or application first. It is then clarified that Galileo originated this idea. In the experiment depicted in the tower example above, Galileo dropped two things from the Leaning Tower of Pisa to show that their rates of descent were comparable.

PEDAGOGICAL CONTENT KNOWLEDGE (PCK)

Shulman (1986, 1987) and his contemporaries suggested that teaching expertise also includes information about pedagogical content. This comprises both subject stuff (content) information and instruction method information. This concept, which provides a new, broader approach to teaching-learning, was devoted a special issue of the Journal of Teacher Education (Ashton, 1990).

The way in which teaching content knowledge is linked to what teachers know about what they teach is an indicator of their information about pedagogical content. Instructors' pedagogical expertise and their subject matter knowledge are integrated into classroom pedagogy or pedagogical content knowledge. "Knowledge of how to teach" is what Schulman (1986) defined as pedagogical content knowledge.

". . . represents the features of content most pertinent to its teachability. I refer to the class of information about pedagogical content as consists of the furthermost useful conducts of representing and expressing a topic in a way that makes it accessible to others, i.e. the most influential similarities, artworks, samples, descriptions, and demos for the maximum frequently taught subjects in one's subject area. Also included in an understanding of how to make certain concepts easier to learn: what students bring with them in terms of conceptions and preconceptions" (p. 9).

Science teachers are considered to possess pedagogical content knowledge (Gudmundsdottir, 1987a, b). The most important difference between teachers and scientists is not their subject area knowledge, but how they organize and apply that knowledge. Another way to qualify it is that an knowledgeable science teacher's acquaintance of science is organized from the standpoint of training, and it is utilized to assist students in understanding certain ideas.

Hauslein, Good, and Cummins (1992) documented this theory in Biology by studying subject matter knowledge among science instructors, experienced researchers, new science teachers, majors in science and preservice science teachers.

In an analysis of science majors and preservice educators, Hauslein et al. originate that their subject knowledge was similar but loosely structured. Even so, novice and experienced teachers, as well as research scientists, were found to have substantially greater subject knowledge. However, the structure of teachers was more rigid than that of researchers (who had a more flexible subject matter structure), which was thought to be due to curricular restrictions.

SIGNIFICANCE OF THE STUDY

It is as if the mind is overburdened with lifeless knowledge if science is taught or understood poorly by educators or students. This results in new superstitions being formed. When a teacher seeks to have the students internalize the concepts gained in science, he or she should choose an appropriate teaching strategy since students perceive science as a solution to their

hitches, a source of freedom they wish to keep endlessly, and other possessions. Consequently, teachers must be capable of evaluating concepts and creating educational plans. Understanding concepts helps students understand scientific jargon. This allows them to utilize these principles in a variety of science classes.

Ashweh (1985, 1987) concluded that the scientific knowledge of physics educators and biology educators influences their teaching methods in a significant way. Each instructor had to assess their content knowledge of physics and biology subject matter and develop a lesson plan based on the chapter of a textbook. Biology teachers recognized that students would bring misunderstandings to class (such as the belief that plants gain their sustenance from the earth) when studying a subject like photosynthesis. Teachers also taught students which chemical principles needed to be studied before learning photosynthesis.

Few research studies found that novice instructors possess rudimentary knowledge of pedagogical topics. Teachers who are new to teaching are likely to rely more on unaltered subject matter knowledge (which can be directly derived from the curriculum) and lack a clear agenda or standpoint to communicate its meaning. Furthermore, beginners have a proclivity to make broad pedagogical judgments without taking into account pupils' prior knowledge, skill level, or approach to learning (Feiman-Nemser, 1990; Gudmundsdottir, 1987 ; Carpenter, 1988)

The lack of pck is linked to the use of factual and simple recall questions frequently among pre-service teachers (Gess-Newsome and Lederman, 1993); and lack of subject matter knowledge is linked to the use of factual and simple recall questions frequently (Carlsen, 1987). According to these studies, new instructors are concerned about their pedagogical knowledge, as well as the difficulty of converting and translating concepts and ideas in an understandable manner to the students they are teaching.

In view of this background, none of the research studies has explored about the Z-A Approach. Hence, there is an urgent need to explore the Z-A Approach and its importance in the field of teacher education. Z-A Approach aims to first explain the application side of a subject. The instructor should begin by explaining the application of a concept and then the repercussions of such applications. "Pedagogical content knowledge is a collection of common elements, such as subject matter knowledge, curriculum knowledge, and pedagogy knowledge." PCK is "understanding what to teach when to teach, and how to teach using a reservoir of effective teaching practice and experience." Based on studies, it is obvious that different tactics are required to support teacher knowledge.

Physical science concepts can be explored in one way in the present study. Student-teachers can acquire the ability to find significant characteristics and arrange them meaningfully. Blended learning techniques were developed by researchers to assist student-teachers in forming relationships with their pupils. Curriculum developers and textbook writers will benefit from the current study's innovative ideas and thoughts.

OBJECTIVES OF THE STUDY

1. In order to examine the mean scores of potential teachers on Pedagogical Content Knowledge in Pretest and Posttest stages.

2. Pre and Post testing of prospective teachers in the Control group were compared in order to determine their average Pedagogical Content Knowledge scores.

3. Pre-Achievement is taken as a covariate in the comparison of Pedagogical Content Knowledge between Experimental and Control groups.

HYPOTHESES

1. Students in the Experimental group did not differ significantly in terms of Pedagogical Content Knowledge scores between the Pretest and Posttest stages.
2. Student teachers of the Control group did not perform significantly better on the Pedagogical Content Knowledge tests than students of the Experimental group.
3. By taking Pre-Achievement as a covariate, no significant difference can be detected between the Experimental Group and the Control Group when Pedagogical Content Knowledge is taken into account.

METHODOLOGY

A pretest-posttest equivalent group design was used in this study. The equivalent design of the pre-test and

the post-test ensures the presence of the control group as well as the measurement of change over time. Importantly; it also adds a pre-test, thereby assessing any differences between the groups before the study took place. To apply this method, the researcher selected students at random and then segregated them into two groups. Subsequently, each group evaluated the previous semester's grades to arrive at a mean grade point average.

The design is illustrated as follows:

D1-A1 X A2

D2-A3 C A4

A1, A3-Pre Test

A2, A4-Post Test

X- Treatment experimentation

C- Control treatment implementation

D1- Group experiment , D2- Group Control

STUDY TOOLS

1. Pedagogical Content Knowledge Test for Student Teachers
2. Z-A Approach Strategies in Physical Science.

SAMPLE FOR THE STUDY

The present study population covers the student teachers studying in the Vth Sem Integrated B.Sc.B.Ed. in Bengaluru City University. All subjects were carefully selected in many aspects to ensure equal quality.

METHODS USED IN STATISTICAL ANALYSIS

Mean, Median, Mode, SD, Skewness, and Kurtosis are descriptive statistics. Difference between Mean scores is tested for significance.

HYPOTHESES TESTED

HYPOTHESIS 1

TABLE 1 Mean, S.D, Correlation and Correlated 't' values of PCK of Student-Teacher of Experimental group.

Testing	Mean	SD	r	Corresponding t-value
Pretest stage	23.10	6.125	0.571	4.633**
Posttest stage	27.25	5.10		

** Significative at 0.01

According to Table-1, the Correlated 't' value is 4.633, a value that is significant at the 0.01 level. Students in the experimental group have significantly different PCK scores at the pre-test and post-test stages. In this research, the hypothesis-1 that Students in the Experimental group did not differ significantly in terms of Pedagogical Content Knowledge scores between the Pre and Post-tests was rejected, and an alternate hypothesis was accepted.

HYPOTHESIS 2

TABLE 2 Mean, S.D, Correlation and Correlated 't' values of PCK of Student-Teacher of Control group.

Testing	Mean	SD	r	Corresponding t-value
Pretest stage	21.68	6.85	0.725	1.52
Posttest stage	23.19	6.10		

From the Table-2 it can be seen that the Corresponding t-value is 1.52 which is not weighty. It reflects that the mean scores of PCK of student-teachers of the control group do not differ significantly at pretest and posttest

stages. Thus, the hypothesis-2 that "Student teachers of the Control group did not perform significantly better on the Pedagogical Content Knowledge tests than students of the Experimental group" is accepted.

HYPOTHESIS 3

Comparing the adjusted mean scores of PCK of experiments and controls was accomplished by taking into account pre-PCK as a covariant. By considering pre-PCK as covariate, the data were analyzed using One Way ANCOVA. Table-3 summarizes the results.

TABLE-3 Pre-PCK is taken into account in the one-way ANCOVA of PCK

Source of Variance	df	Sum of Squares (SSy.x)	Mean Squares of Variance (MSSy.x)	Fy.x	Remarx
Treatment	**1**	**222.12**	**222.12**	**11.89**	**P<0.01**
Error	**47**	**842.56**	**17.71**		
Total	**49**	**1752.12**			

** Significative at 0.01

TABLE-4 The following table summarizes the PCK scores after considering the pre-PCK score as a covariate

Group	Adjusted Mean Scores of PCK	Standard Error
Experimental Group	**26.745**	**0.833**
Control Group	**22.654**	**0.833**

Note: Pre-Test Score = 21.48

Table-3 shows that the adjusted F-Value (MSSy.x of Treatment/error) is 11.89 (table value is 7.17) which is statistically significant at 0.01 level with a df= 1/47. In this chart, it can be seen that the adjusted mean PCK scores of the experimental and control groups are significantly different. Therefore, the hypothesis "there is no significant difference between adjusted mean scores of PCK after considering pre-PCK as a covariate between experimental group and control group" is rejected, while the alternative hypothesis is accepted.

MAJOR FINDINGS

1. Students-teachers' Pedagogical Content Knowledge was not enhanced by traditional methods of teaching.
2. Pedagogical Content Knowledge of student-teachers could be significantly enhanced with the Z-A Approach.

CONCLUSION

In this study, one of the main objectives was to develop an Enhanced Pedagogical Content Knowledge Approach for student teachers.

Various statistical techniques were used to test the objectives, including analysis of covariance and test of significant differences.

According to the findings, implementing the Z-A Approach technique might significantly improve student-teacher Pedagogical Content Knowledge. The typical teaching style did not affect the level of PCK among student-teachers. When pre-achievement was regarded as a covariate, the Z-A Approach technique might dramatically improve student-teachers PCK compared to the standard way.

The educational implications proposed by the investigator will be beneficial to the qualities of adopting correct measures for increasing teaching qualities, as well as staying tuned to enhance the academic performance of the pupils. Educators must discover the elements that influence student accomplishment in order to improve academic performance. There are several techniques for raising student success. Varying learners have different levels of intellect. The intellect was unaffected by this method. Taking into account the foregoing findings and the findings of this investigation, the following recommendations can be implemented to improve educational observes; appropriate programmes should be given to teachers-students with the goal of improving their performance and equipping them with

pedagogical content knowledge. By reinforcing material with examples and applications, science students can enjoy learning from a variety of perspectives. It is important that the students learn in the way they prefer, so it is important to stress what and how they like to learn.

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