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## **JOURNAL OF CONTEMPORARY TEACHER EDUCATION**

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## Concept Process with Mathematical Thinking Tools under the Domain of Piaget's Theory of Cognitive Development

Muhammad Khalil \*  
Zahoor-ul-Haq \*\*

### Abstract

Mathematical thinking is the habit of mind. It is important for school as it activates and regulates thinking that is essential for conceptual learning. Although, mathematics' educationists are undivided in this that conceptual learning is a tough cognitive activity and uncontroversial aim of mathematics education. Piaget described this conceptual learning process in four discrete stages that transcend with the passage of time. In mathematics, developing concept is a long term process, independent of age and it progresses in stages. And each stage requires proper mathematical thinking behavior that evokes different images of related concept. This article explained the process of concept that depends upon four interconnected mathematical thinking stages with reference to Piaget's stages rather than age. Despite the formal age of a person, a person will be in the first stage of a specific concept if he/she does not have the sense of concept. The critical conclusion of this article revealed that mathematics teachers should use stages in their teaching and integrate thinking behavior along with content transformation.

**Keywords:** Concept, Concept image, Procept, Mathematical thinking,  
Symbol

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## Introduction

In this technological globe it is not easy to survive without the necessary skill of mathematics and mathematical thinking. The need of mathematical thinking for a person to live in this society and the advancement of technology are highly correlated (Khalil, Khalil, & Ulhaq, 2019). This technological advancement demands to teach and equip students with necessary concepts and thinking behaviors (Tajudin & Chinnappan, 2016). Normally, concept basically means a deep understanding of an object, an idea or a subject in an organized form. However on the basis of this organized form of thinking, an individual can easily communicate and interpret a concept in sophisticated way (Arends, 2007). Like in mathematics, mathematicians compress the concepts into logical collections of words which are called definitions. When individuals look at these definitions with different perspectives under their limitations, it results into different images. Although, all these images may or may not be coherently related to the other parts of the concept images but concept always evolves in an individual's mind within constraint of standard definition (Mason & Johnston-Wilder, 2004).

In other way, in mathematics concepts are represented through symbols and to teach students in symbolic restrictions result always less effective, because it represents a network of connected ideas, need explanation and reflect a definite structure under definite rule (Haylock & Cockburn, 2000). Moreover, the interpretation of symbol depends on both age and stage, and context is also an important factor for its internal meaning. While, during different circumstances (age and stage), through assimilation and accommodation, the nature of symbols for learners are not invariant. In the words of Gray and Tall (1994) symbols are used for its dual job: as a process and as a concept. Mathematically, Symbol = (process U concept). In addition, the representation of an object through flexible symbol is called procept. It is the combination of three components: process which results in specific object, and a symbol which may represent process or object. In short, procept is an equivalence class of symbolic representations act in flexible way and produce the same object. Tall (2000) states that in two-dimensional geometry  $(x, y)$ , is an order pair. The concept of  $(x, y)$ :  $(x, y)$  represents a point and the process in relation to the origin. And in the same way the concept  $\sin \theta$ , is a relation and the process is a ratio of two sides of a triangle at right angles, that is to say the ratio of the perpendicular and the hypotenuse. The procept of  $\sin \theta$  will be a real number in the closed interval.



**Mathematical Thinking**

No doubt, developing thinking and internalizing concept are the basic domains of mathematics teaching- learning process. And to deliver mathematics with concept is a tough cognitive task because it demands various cognitive processes by which it is conceived. In addition to reach and recognize a concept, individual experiences and the context of this concept are also essential (Tall & Vinner, 1981). Students have various thinking capacities that differ from each other. This difference is because of their processing content in different stages and ages (Ummah, 2018). Therefore, to learn and teach mathematics so many skills and abilities are required, in which students' hypothetical attitude (mathematical thinking) is of the most paramount. This behavior is described into a number of interrelated attributes that is necessary for mathematics among which abstract attribute is one of the most difficult one. Concurrently, on the basis of this behavior one can represent an idea or concept in some meaningful ways. Further, without certain mathematical thinking attributes, concepts could not be produced effectively (Mason & Johnston-Wilder, 2004). And, it is mathematical thinking that regulates thinking across different semiotic systems of representation in an effective way. Stacy (2007) described that to improve mathematical literacy, mathematical thinking process is very essential.

**Mathematical Knowledge**

Mathematics is a subject that develops thinking behavior in the students (Önal, İnan, & Bozkurt 2017). Its content developed constructively, and the development is based on: history, social interaction and the psychological origin of ideas. This knowledge is the union combination of ideas result in different concepts. Even more complex and abstract idea or concept surely is the transformation of some elementary concepts. And to uncover the concept not only logical thinking but psychology is also required (Cappetta, 2007). Likewise, mathematics learning goals are to understand the concept along with procedures (NCTM, 2000), and student's mathematical knowledge has to build on the basis of previous knowledge and experiences (Yani & Chih-Huang Chang, 2017).

### **The essential thinking behaviors of Piaget's theory**

The cognitive learning process of human brain was categorized into four progressive different levels by Jean Piaget. The characteristics of each level totally depend on age.

The theory is invariant of context. Some of the characteristics of this theory are:

**Stage1:** This stage label with sensorimotor, constraint in age for this stage is  $\{2 \leq \text{Age} \leq 3\}$ . Within this domain the child recognize the object with unstable image. The mental world of the baby is geared towards action. Actions are repeated by the child for its own sake to produce pleasant stimulation. Through many automatic actions and reflexes, children accommodate the desire action toward the goal and to draw the memory. Circular reaction carried out for the pleasure, they give independence of any communication with other. Hidden concept does not still exist in learner's mind. At the end of this stage mental representation starts and actions are transferred to language.

**Stage 2:** Pre-logical: the age constraint for this stage ( $3 \leq \text{age} \leq 7$ ). This is the stage in which thinking begins and students describe about an object in a subjective way. The nature of their thinking mainly is linear and non-conservative.

**Stage3:** Concrete logical. The age limit for this stage is ( $7 \leq \text{age} \leq 12$ ). Real thinking emerges and develops progressively in a concrete manner. Student understands the conservation of transformation in different but in realistic way. Perception relies on physical appearance. Logical behavior is still weak in solving logical problem.

**Stage4:** Abstract logical. The age limit for this stage is ( $12 \leq \text{age}$ ). In this stage the reasoning of 3<sup>rd</sup> stage is transformed into abstract way. Students can use multiple representations with hypothetical situation. They can use their mental capacity for hypothetical deduction and understanding of cause and effect situation. Deductive logical style of thinking behavior is the main characteristics of this period.

This article described the process of conceiving concept with four basic mathematical thinking aspects with reference to Piaget's stage theory.

1. concept specializing
2. concept generalizing
3. concept classifying and analyzing
4. concept formalizing or symbolizing

### **Research Questions of the study**

The main research questions of this study were:

1. How Piaget's thoughts can be extended and organized in the acquisition of mathematical concepts?

2. How to integrate the tools of mathematical thought in the acquisition of mathematical concepts?
3. How epistemological problems of learning can be solved by tools of mathematical thought?

**Explanation of the four concept stages with mathematical thinking tools with reference of Piaget's four primary stages**

**1. Concept specializing (Sensorimotor stage)**

Specializing is a process in which the individual have to get the sense of the concept through repetition of the action either in physical or mental way. While, to know about the reality of the abstract concept specializing the concrete example of this is of the most paramount. The role of specialization in solving mathematical problem according to Tall (2002) is to analyze the given information and required information. And this process result in discovering the structure, sequence and underlying pattern in the given problem. Expansion in the sense prevails after specialization that is said to be generalization. Cognition takes place in this process that is pre-requisite stage for concept understanding. Specializing process is the pivotal stage in getting the sense of a concept and it's begin with a simple case. To know about the nature of problem in the solution process, try to understand the problem by taking different numerical examples of particular concept.

According to Tymoczko (1998), for specialization process one's must take a subset from the broader set. For example to get to the concept of regular polygon first take the concrete sub-collection an equilateral triangle for specialization purpose. Specialization stage is action oriented that provide the essential base for human's thoughts and later on it promotes higher order thinking. In early mathematics teaching to specialize number concept we use different physical and visual imagers to grasp the concept of different arithmetic. The process of these numbers is counting number on their finger or drawing lines to reach to these object symbols. The process of specialization result meaning of the knowledge of the concept and different aspects of the concept developed. The basic point in specialization process is to acquire knowledge and skill in restricted condition. To understand the concept of algebra first students must arithmetize the abstract concept. For example,  $y-x = 2$  is algebraic equation and for numerical values of  $x$  and  $y$  this will result different numerical values of  $y$ . Through table values the learner will discover the pattern and different possible values of  $y$ . The main issue in this stage is to develop the schema and to get the sense of the underlying concept in a limited way.

x	$y=x+2$
1	$y=1+2= 3$
2	$y=2+2= 4$
3	$y=3+2= 5$
4	$y=4+2= 6$
5	$y=5+2= 7$

## 2. Concept generalizing (pre operational stage)

The process of generalization always comes after specialization and it results in specific image. Expansion in the skill and knowledge take place in this stage in restricted dimension which is said centration. Learner understands the concept in a concrete manner and illogical way. Students can solve only similar or equivalent problem on the basis of their generalization skills. In this stage concept get language and concrete reasoning takes place (Dorko& Weber, 2014; Geraniou et al, 2008). Learner expands the content of concept and understands the process of concept in limited way. Learner observes the concept subjectively and lack of transformative thinking. Students can't conserve the concept and lack of creativeness.

For example to understand the area concept, as area is the product of width and length. As symbol 'A' represents area concept and the process is the multiplication of two perpendicular sides of rectangular region. In this stage extension in the existing concept occurs.

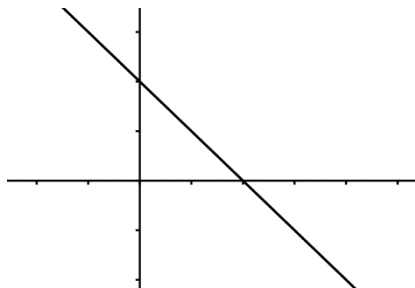
## 3. Concept classifying and analyzing (concrete operational stage)

This stage is the classification of existing concept in multiple dimensions along with context. Language improves in this stage, and with reference to Piaget's the learner can see the concept in different frame of reference. The student's logical thinking also jump out from unit dimension to multi dimension that causes creativity. The different attributes of this stage are: non static thought, transitivity and reversibility, and clarification of idea in concrete manner. In this stage the learner learns the concept in sequential way. Critical analysis develops during this stage. For example in teaching of linear equation, let  $y = 2x + 3$ . To understand the concept of this linear equation, student has to understand the role of '2' and '3'. That is "2" stands for slope and '3' stands for y-intercept in realistic way. In addition, student has to

transform this equation in multiple ways and has to conserve its meaning in different ways. i.e.  $2x - y + 3 = 0$ ,  $y - 2x - 3 = 0$  and  $-\frac{x}{3} + \frac{y}{3} = 1$ .

#### 4. Concept formalizing or internalizing (Formal operations stage)

The stage is also called abstract stage and it is the highest cognitive approach in understanding the concept. Student learns the concept in this stage in symbolic manner. Axiomatic nature prevails in this stage. The structural behavior of the concept transferred to symbolic and the information are compacted in the piece of symbolic language. Students reach to this stage at different pace and depend on the previous level of the concept. The main characteristics of this stage are: logical application towards the solution of the problem in hypothetical manner and extract the information from the given situation in logical way. Both critical and creative thinking develop in this stage. The main attributes of this stage are: inductive and deductive reasoning, logical behavior and creative behavior. For example, take an example of linear equation  $AX + BY + C = 0$ . As this is an abstract equation less concrete. In this stage students have the power to reason its different aspects in abstract and hypothetical ways. What are the role of A, B and C in this equation. In addition if the line equation is given in coordinate plane as given in the below figure.



The result of this step is a complete knowledge of cognitive unity and compression and a long-term schema. And the product of this result can easily be retrieved, described, and applied depending on the context of the problem. Conceptual thinking has been developed around a particular concept.

#### Practicing the above idea in general phenomena

When a child learns an activity, he first observes the activity and tries to make sense of the activity. He / she specializes the activity through practice and wants to know what is happening. Example, when a child learns to ride a bike. At first he specializes in the task, he balances,

looking up and down, but after a while, he adjusts and acquires the sense of the bicycling. In the second stage, he generalizes the task and can drive in a way but according to a fixed definite pattern in his mind. In the third stage, the child classifies and analyzes the skill in different ways, a multiple representation of the skill. In the last step, he tries to test different hypotheses. As a result, the cognitive unit of the bicycle concept is completely compressed and can use the cycle without a definite rule and fully internalizes the skill. Unconsciously, he can use the skill of the bicycle in all situations. An individual reaches this stage several times. The complete cognitive structure of the concept is developed at this stage.

**Practicing the above idea into teaching learning process**

**The sequential model for understanding rectangle area concept**

In the first stage specialize the area concept, i.e. arrange different activity to use the formula and to find the area of a rectangle. As area = length x breadth.

Find area if L = 2, & b = 3, students must perform the activity to specialize the area concept

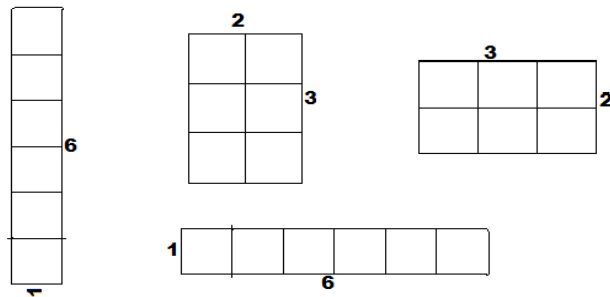
Length=L	Breadth = b	AREA=L * b	AREA
2 cm	3cm	A= 2cm*3cm	6 cm <sup>2</sup>
4cm	5cm	A=4cm*5cm	20cm <sup>2</sup>
3cm	6cm	A=3cm*6cm	18cm <sup>2</sup>

In the second stage, the student will generalize the area. But thinking will be in the dark. Thinking will be critical rather than creative. The student will understand the region according to its length and width. Count the squares in the rectangle with the changing perspective to inculcate conservation of the area in the minds of the students. Use simple arithmetic skill to understand different possibilities.

Area of a rectangle of sides 3, 2, and 2, 3.

In this stage student will take time to understand the difference between these two areas.

**In third stage:** Activities that cover the concrete logical thinking stage. That is, the area of rectangle  $3 \times 2 = 2 \times 3$  without counting the squares in the rectangle and also transforming thinking. Keeping the resulting area 6/six in mind, the possibility of sides and proceptual concept of 6 squares, if area is 6 and length is 2 then what will be the breadth? The development of concrete proceptual thinking develops in this stage.



**Last stage** which is formalized stage, student will apply the concept of area in word problem, real world situation, symbolic representation and also he can find and interpret the below concept  
Find area if length =  $x$ , and breadth =  $y$ . Abstract thinking will take place in this stage, playing with symbol and hypothetical possibilities about the area concept. Having this type of concept image, one' can use it in the solution of different problems related to area.

### Conclusion

Although the mind of the man works at odds with each other and they learn the same mathematical concept with different conceptual images. But to give them the same mathematical reasoning skills and, at the same time, good design-oriented course planning, the variance in learning concepts could be reduced.

### Recommendations

- The concept should be taught on the basis of the learner's previous stage.
- Teachers must link different stages of concepts while teaching mathematics.
- Teachers should avoid abstract teaching at the beginning of the lesson.
- At the beginning of the lesson in either level, the teacher must study the learner's proper stage.

- Mathematical thinking should be at the center of mathematics education.
- Different activities should be included in the curriculum that encourages students to think.



## References

- Arends, R. I. (2007). *Learning to Teach*. New York: McGraw-Hill.
- Cappetta, R. W. (2007). Reflective Abstraction and the Concept of Limit: A Quasi-Experimental Study to Improve Student Performance in College Calculus by Promoting Reflective Abstraction through Individual, Peer, Instructor and Curriculum Initiates. PhD Thesis, Northern Illinois University.
- Dorko, A. & Weber, E. (2014). Generalizing calculus ideas from two dimensions to three: how multivariable calculus students think about domain and range, *Research in Mathematics Education*, 16 (3), 269-287.
- Geraniou, E., Mavrikis, M., Hoyles, C., and Noss, R. (2008). A constructionist approach to mathematical generalisation. In: *Proceeding of the British Society for Research into Learning Mathematics*. 28(2). 37-42.
- Gray, E. M. & Tall, D (1994). Duality ambiguity & flexibility: a precept simple arithmetic, *Journal for Research in mathematics Education*, 26(2), 115-141.
- Haylock, D. & Cockburn, A. (2000). *Understanding mathematics for young children*. (4<sup>th</sup>.ed.) SAGE publications Ltd: London, 13-15.
- Khalil, M., Khalil, U., & Ulhaq, Z. (2019). [Geogebra as a Scaffolding Tool for Exploring Analytic Geometry Structure and Developing Mathematical Thinking of Diverse Achievers](#). *International Electronic Journal of Mathematics Education*. 14(2). 427-434.
- Mason, J. & Johnston-Wilder, S. (2004). *Fundamental Constructs in Mathematics Education*, Routledge Falmer. London. p-198-201.
- NCTM (2000) Principles and Standards for School Mathematics, U.S: NCTM.
- Ojose, B. (2008) Applying Piaget's Theory of Cognitive Development to Mathematics Instruction." *Mathematics Educator* 18, 1, 26-30.
- Önal, H., İnan, M. & Bozkurt, S. (2017) "A Research on Mathematical Thinking Skills: Mathematical Thinking Skills of Athletes in

- Individual and Team Sports” *Journal of Education and Training Studies*, 5(9), 133- 139.
- Stacey, K. (2007). What is mathematical thinking and why is it important? APEC- Tsukuba International Conference 2007. Retrieved from [http://www.criced.tsukuba.ac.jp/math/apec/apec2007/paper\\_pdf/Kaye%20Stacey.pdf](http://www.criced.tsukuba.ac.jp/math/apec/apec2007/paper_pdf/Kaye%20Stacey.pdf)
- Tajudin, N., & Chinnappan, M. (2016). The Link between Higher Order Thinking Skills, Representation and Concepts in Enhancing TIMSS Tasks. *International Journal of Instruction*, 9(2), 199-214.
- Tall, D. & Vinner, S. (1981) Concept Image and Concept definition in mathematics with particular reference to limits and continuity. *Educational Studies in mathematics*, 12, 151- 169.
- Tall, D. (2000) Technology and versatile thinking in mathematics. 19p. In: proceedings of the international conference on technology in Mathematics education.
- Tall, D. (2002) *Advanced mathematical thinking*. (pp. 19-81). Dordrecht: Kluwer Academic Publishers.
- Tall, D.O. (2002) *Advanced mathematical thinking: The Role of Definitions in Teaching and learning mathematics chapter 5 by Shlomo Vinner p-69. CHAPTER 5*. Dordrecht: Kluwer Academic Publishers.
- Tymoczko, T (1998). *New Directions in the Philosophy of Mathematics: An Anthology* Princeton, NJ: Univ. Press.
- Ummah, SK (2018) *Analysis of Mathematical Thinking Styles through Oral Test for Proving Curvature Theorem*. In: Proceedings of the 5th International Conference on Community Development (AMCA 2018). *Advances in Social Science, Education and Humanities Research*. Atlantis Press, pp. 464-467. ISBN 978-94-6252-561-0
- Yani, A & Chih-Huang Chang, L. ( 2017). Presentation of Mathematics Object in Verbal and Symbolic Forms to Increase Conceptual Understanding in Category Statistics Math. *Journal of Education, Teaching and Learning* 2(2). 253-258.

## **Development and Validation of Biology Attitude Scale for Secondary School Students in Islamabad, Pakistan**

Shahzad Ahmad\*

Sadia Jamil\*\*

### **Abstract**

The aim of present study was to develop and validate an instrument to measure attitude of Students towards learning biology at 9<sup>th</sup> grade. It is imperative to ensure students' positive attitude towards biology at 9<sup>th</sup> grade as research has suggested that both attitude and achievement are inter-dependent. In order to develop the scale, a draft of 40 items on seven different constructs was developed after discussion with experts. The draft scale, was pilot tested on 200 grade 9 biology students (girls=97, boys=103). To determine construct validity, exploratory factor analysis with varimax rotated method was performed. Final scale reduced to 26 items with seven factors explaining 52.2% of the total variance. Overall, Cronbach's alpha reliability coefficient of the biology attitude scale was found 0.81. In view of above results, it is concluded that the developed scale is reliable and valid measurement tool for assessing students' attitude towards biology at secondary level.

**Key words:** Attitude, Exploratory factor analysis, Reliability coefficient, Construct validity.

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## **Introduction**

Attention of people to study science has been increasing due to expanding advancement in science and technology and this is predominantly relevant in Pakistani scenario which is at the moment struggling for a reputable status among internationally growing communities and where the number of engineers and scientists are very low comparatively other developed countries. In order to confirm the invasion of new scientists, it is essential to understand that how science is to be taught in schools and how these practices affect learner's inclination toward playing active role in learning science.

It is important to understand students' attitude toward a particular discipline for supporting and guiding their achievement and interest in that discipline. There are numerous research studies highlighting students' attitude toward science (Dhindsa & Chung, 2003). But primarily, researches were associated significantly with attitude on science in general (Dawson, 2000) and less attention was given to subjects like Physics, Chemistry and Biology (Salta & Tzougraki, 2004). This can somewhat disguise students' attitudes because science itself is not considered as homogeneous subject (Spall, Barrett, Stainistreet, Dickson & Boyes, 2003). In Pakistan, biology as a science subject is taught separately to the students of 9<sup>th</sup> grade. It is considered as a part of general science up to grade 8<sup>th</sup> in education system of Pakistan. The present study differs from the other studies concerning students' attitudes (Shah & Mahmood 2011) in the sense that it investigates students' attitudes toward biology rather than science only.

## **Rationale for the Development of Biology attitude Scale (BAS)**

Researches on the development of scale to measure student's attitude towards science have been done by many in the field of science education. The most generally used instruments include, TOSRA (Test of Science Related Attitude) was developed and validated by Fraser (1981) and S.O.T (Scientific Orientation Test) was developed by Meyer (1995). Both above mentioned instruments related to student's attitude towards science. Keeping in view the limitations, researcher developed attitude scale for knowing students' attitude towards biology as a separate discipline at secondary level.

## Objectives

The main objective of the current study was:

1. To develop biology attitude scale for secondary school students in Islamabad.
2. To establish the validity of the biology attitude scale using exploratory factor analysis.
3. To determine the reliability of the biology attitude scale.

## Literature Review

In literature there are numerous definitions on the term attitude. Therefore, it is difficult to give one single definition on attitude which is accepted universally. However, almost all definitions manifest that attitude depict the idea like desirable or undesirable feelings, ideas or actions towards certain attitudinal objects (Petty, 1995). According to Eagly and Chaiken (1993) the attitude is considered as a psychological construct which includes three different components like cognitive, affective and behavioral respectively. The cognitive component of the attitude associated with the traits of the object, affective component concerning feelings about the attitudes' object and behavioral component involves the action of individuals toward particular object (Eagly & Chaiken, 1993). According to Koballa and Crawley (1985) the attitude can be observed as "a learned, positive or negative feeling about science that serve as a summary of wide variety of beliefs about science" (Koballa and Crawley, 1985). How attitude impact the learning of biology can be best understood by realizing following example. The announcement like that "I like biology" or "I don't like biology" indicate positive or negative feelings of individuals towards learning biology. Students with such varying opinion are subjected to the same set of instruction definitely produced different results. Affective dimensions sandwiching the cognitive and the behavioral dimensions in learning. In order to perform an effective teaching, it is essential for the subject teacher to understand this bridge on his/ her students.

In general student's attitude toward science decline with increase in grade level (Ramsden, 1998; Osborne, Simon, & Collins, 2003) boys show more positive attitude toward science than girls (Simpson & Oliver, 1985; Schibeci & Riley, 1986; O'Brien & Porter, 1994; Francis & Greer, 1999) and more negative attitudes are linked with physical sciences than biological science (e.g. Spall et al., 2003; Spall, Stanisstreet, Dickson, & Boyes, 2004).

Keeves (1992) and Jones, Howe and Rua (2000) reported that, girls show more positive attitudes toward biology than boys unlike

chemistry and physics. Dawson (2000) while comparing changes in interests and attitudes of Australian Students' over 20 years, reported that, girls shows more performance in human biology and general biology, but boys were intensely interested in earth sciences. Unlike gender differences, research on attitudes of UK students of age level 11-16, reported that attitudes toward biology show different age-related patterns than attitudes toward physics (Spall et al., 2004). According to Spall et al., (2004), Student's attitude toward physics becoming more negative with increase in age, relative to more positive attitudes towards biology.

Attitude has been extensively studied in the existing literature; it is still an issue to be studied because it is one of the predictors for effective learning. Biological concepts and sub concepts are of abstract nature which is difficult to understand. So, it is important to investigate students' attitudes toward biology.

The purpose of present study was to develop a valid and reliable attitude scale for 9<sup>th</sup> grade biology students to understand their liking or disliking about the subject of biology. The content of the biology scale developed is important as it is different to the already developed instruments in sense that it concerns with biology and also most suited to the researcher to utilize it for his doctoral study.

## **Methodology**

It is keeping in view the importance to measure student's attitude towards science in general and biology in particular in school (Osborne et. al., 2003) the presently available attitude scales in the existing literature there is hardly any scale assessing student's attitude towards biology at secondary level in Pakistani scenario. In the recent past, attempt was made to translate and validate a scale to evaluate attitude towards science of students in Pakistan (Shah & Mahmood 2011). The present study was conducted to develop and validate biology attitude scale for 9<sup>th</sup> grade students. Researcher used 5- points Likert-Type scale; ranging from "strongly disagree" to "strongly agree" with "neutral" as the central point. Students' responses on five-point scale would be evaluated separately for positive and negative statements. In case of positive statements i.e. Strongly Disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly Agree=5 and reversed in case of negative statements i.e. Strongly Disagree=5, Disagree=4, Neutral=3, Agree=2, Strongly Agree=1. This section provides details about the selection of subjects, different stages of scale development, validity and reliability of the final scale.

### Sample

The sample was comprised of two hundred (200) students (97 girls and 103 boys) in model schools and Colleges in Islamabad under Federal Directorate of Education (FDE). The size of an appropriate sample does matter in conducting factor analysis and there are different opinions about it. The detail of sample size is given below:

Table 1  
*Sample Size and Characteristics*

Sr. No.	Size of Sample	Remarks
1	50	Very Weak
2	100	Weak
3	200	Medium
4	300	Good
5	500	Very Good
6	1000	Perfect

Comrey & Lee, 1992

Keeping in view the above-mentioned opinions, researcher decide to go with medium level sample (N=200) for factor analysis.

### Instrumentation

A 25-items biology attitude scale was developed to find out students' attitudes toward biology at secondary level. Five-point Likert-scale with seven dimensions (Interest in biology, career in biology, importance of biology, biology teacher, difficulties in biology, equipment used in biology and methodology of biology) was used. Development of biology attitude scale involves following steps (see figure 1 on next page).

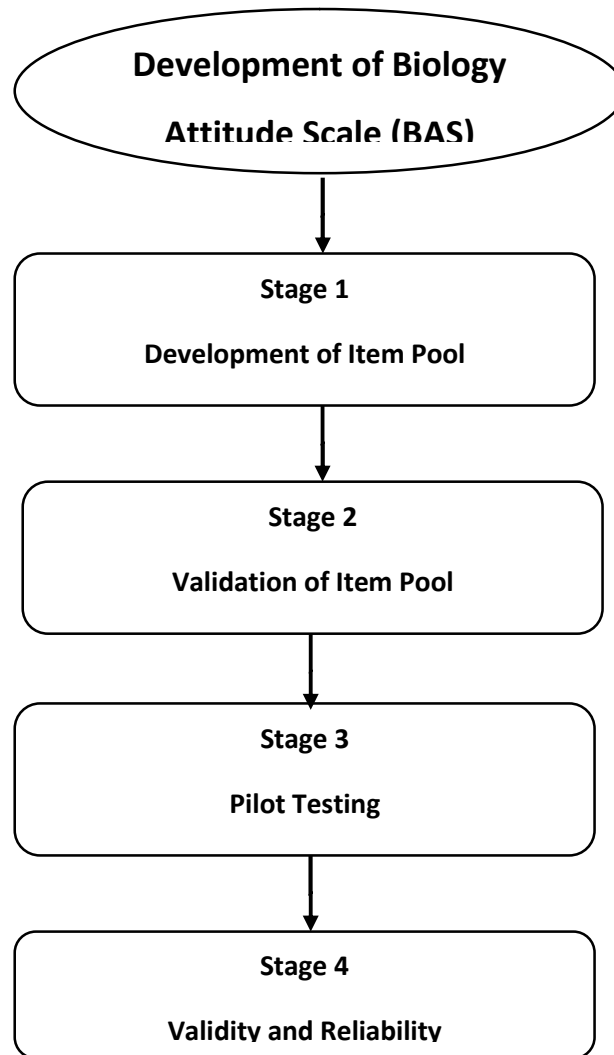


Figure: 1 Development process of biology attitude scale.

### Step 1. Development of Initial Draft of Item Pool

Researcher extensively studies the different constructs concerning students' attitude toward biology, before the actual development of item pool. Then items were developed against each major construct while keeping in mind the teaching and learning



practices in local scenario. Initially, draft of the biology attitude scale was consisting of 40 items.

### **Step 2. Validation of Item Pool**

Draft items of the biology attitude scale were examined by a panel of five judges who evaluate three areas: content validity, clearness and readability of the draft items. After receiving useful suggestions from experts, researcher carefully incorporates the changes based on the evaluation. On the basis of this external review, few items were rejected and numerous were revised. Finally, researcher left with an item pool of 35 items.

### **Step 3. Pilot Testing**

Final draft of the biology attitude scale, which was designed according to experts' opinions, was applied to the sample of 200 students (girls= 97, boys=103) belonging to the different institutions under the umbrella of federal directorate of education, Islamabad. Sample of participants was comprised of 9<sup>th</sup> grade biology students. For further statistical treatment, researcher entered student's responses into an excel file.

### **Step 4. Calculating Validity and Reliability**

The data obtained from the sample of 200 students (girls=97, boys=103) were analyzed by using SPSS version 23.0. Construct validity of biology attitude scale can be measured by using factor analysis method (exploratory factor analysis). EFA was used to determine the latent structure of the biology attitude scale and the verification of such embedded structure (Secer, 2015). Reliability of the instrument was determined by applying technique of Cronbach alpha reliability coefficient.

Initially, researcher develop an item pool of 40 items was while keeping in mind the seven different constructs regarding students' attitude toward biology i.e. "Students' Interest in Biology", "Students' Career in Biology", "Importance of Biology", "Biology Teacher", "Difficulties in Biology", "Equipment use in Biology" and "Methodology of Biology". Then a panel of five experts evaluated the initial draft of 40 items for adjusting the content validity, clearness and readability. After incorporating suggestions obtained as a result of expert opinion, the list of items reduced to 35 (19 positive and 16 negative statements). It is suggested that Likert-type scale is easier and economical to develop comparatively others (Tavsancil, 2002). The basic characteristic of Likert-type scale is to make sure that all the items would measure the one and the same thing i.e. uni-dimensionality of the issue under consideration. The scoring criteria followed for 5-point Likert-type scale ranging from 1= S.D (Strongly Disagree) to 5= S.A

(Strongly Agree) through 3= N (Neutral) at the middle position for positive statements. It is reversed in term of negative statements. The final draft of 35 items was applied to 200 students (girls=97, boys=103) from different institutions under umbrella of Federal Directorate of Education (FDE) in Islamabad.

Table 2  
*Descriptive Analysis of Biology Attitude Scale (BAS)*

Items	Mean	S.D.	Scale Mean if Item is Deleted	Corrected Item-Total Correlation	Cronbach's alpha if Item Deleted	N
Item 1	4.330	.7025	123.970	.426	.801	200
Item 2	3.140	1.2523	125.160	.230	.805	200
Item 3	3.965	1.2892	124.335	.232	.805	200
Item 4	4.120	1.1542	124.180	.475	.796	200
Item 5	4.080	1.1664	124.220	.255	.804	200
Item 6	3.650	1.1152	124.650	.270	.803	200
Item 7	3.895	1.2335	124.405	.442	.797	200
Item 8	2.595	1.3822	125.705	.052	.812	200
Item 10	4.230	1.1850	124.070	.316	.802	200
Item 11	4.215	1.1643	124.085	.222	.805	200
Item 12	2.995	1.4648	125.305	.316	.802	200
Item 13	3.790	1.1674	124.510	.364	.800	200
Item 14	4.065	1.1608	124.235	.460	.797	200
Item 16	4.070	1.2217	124.230	.286	.803	200
Item 21	3.955	1.1832	124.345	.493	.796	200
Item 22	3.925	1.2398	124.375	.505	.795	200
Item 23	4.095	1.0253	124.205	.303	.802	200
Item 24	3.830	1.1303	124.470	.453	.797	200
Item 25	3.475	1.4421	124.825	.276	.803	200
Item 26	4.210	1.1368	124.090	.499	.796	200
Item 29	3.895	1.2971	124.405	.410	.798	200
Item 30	3.740	1.1615	124.560	.259	.804	200
Item 31	3.750	1.2350	124.550	.371	.800	200
Item 33	3.005	1.2501	125.295	.260	.804	200

Item 34	3.390	1.1895	124.910	.190	.806	200
Item 35	4.185	1.1992	124.115	.390	.799	200
Item 9	3.595	1.2645	124.705	.137	.808	200
Item 15	3.055	1.5440	125.245	.039	.814	200
Item 17	3.360	1.3187	124.940	.302	.802	200
Item 18	2.535	1.4764	125.765	.147	.809	200
Item 19	3.670	1.1258	124.630	.206	.805	200
Item 20	3.795	1.2290	124.505	.494	.795	200
Item 27	3.040	1.24	125.26	.258	.804	200
Item 28	2.950	1.16	125.35	.010	.813	200
Item 32	3.705	1.15	124.59	.236	.804	200

Table 2 here, indicates the item-total correlation values for each individual item as well as and mean value of each scale item. It is suggested that item-total correlation should be positive but smaller than 0.25 (Ozdamer, 1997; Punch, 2005)). Item-total correlation values for 35 items remained between 0.50 to -0.10. Seven items out of 35 items were found with negative correlation values or values smaller than 0.25 and thus rejected. In order to confirm internal consistency of the scale, it is necessary to remove such items before the start of factor analysis. The scale with final 28 items generated a mean of 3.79 and standard deviation of 1.19.

### Exploratory Factor Analysis

An exploratory factor analysis (EFA) was performed on the remaining items of the scale i.e. 28 items to observe the implicit structure underlying the scale. In order to observe the factor structure of the scale, varimax rotation method and principal component factor analysis were used. It is suggested to test the appropriateness of the data for conducting factor analysis by using Kaiser-Mayer-Olkin (KMO) and Barlett Sphericity Test (Ugulu, 2011). KMO (Kaiser-Mayer-Olkin) test is concerned with the measure of sampling adequacy and Barlett Sphericity test examined the sample sufficiency. In case of principal component factor analysis, the acceptable value of KMO test is 0.681. Table 3 here, shows values of KMO and Barlett's tests necessary for conducting factor analysis.

Table 3  
*The results of Kaiser-Meyer-Olkin and Barlett's tests*

Kaiser-Mayer-Olkin (KMO) For Sample Adequacy		0.778
Bartlett's Test of Sphericity	Chi-Square	1383.660
	(Approx.)	378
	df	.000
	Sig.	

The scree plot graph of the attitude scale in which the eigen values are compared to the numbers of the factors. In this study, the investigator followed the criterion of eigenvalues  $\geq 1$  to determine the number of factors. Figure 2 clearly shows that the decline in the high curve was detected after the seventh factor. According to Field (2005), one could say that the attitude scale in biology has a seventh different factor.

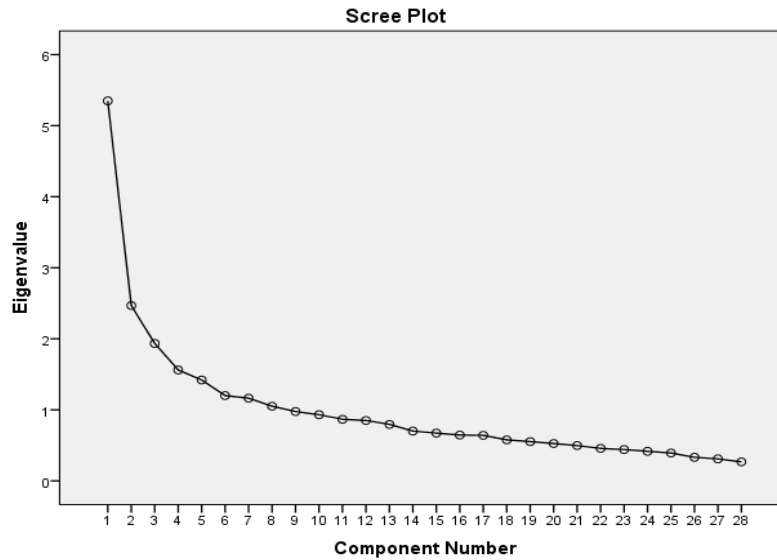


Figure: 2 The Scree Plot Graph of Biology Attitude Scale

Table 4  
*Factor Analysis of Biology Attitude Scale*

No.	Statements	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>	F <sub>4</sub>	F <sub>5</sub>	F <sub>6</sub>	F <sub>7</sub>
04	My Biology teacher is favorite one.	.549						
14	I prefer the teaching style of my Biology teacher	.758						
21	I have an easy access to my biology teacher when I have any problem in Biology.	.678						
22	I am not satisfied with teaching style of my biology teacher.	.727						
24	My biology teacher is strict in his dealing.	.649						
03	I would like to make a career in Biological sciences.		.754					
11	Biological knowledge is essential for my future career.		.573					
25	I would like to be a Biologist.		.757					
26	I am inspired by my Biology teacher.		.441					
29	There is no place for Biology in my future plans.		.709					
01	Biology is my favorite subject.			.682				
06	I deal Biology with feelings of hesitation.			.822				
16	I prefer to have more lessons on Biology.			.576				
02	The concepts and theories of Biology are too difficult to understand comparatively other science subjects.				.748			
33	I often face difficulties in understanding concepts in Biology.				.613			
34	Biology is the easiest subject for me.				.569			
12	We do not make use of Biology equipment.					.644		

31	I realize the importance of equipment when I prepare Biology lesson.	.683							
35	I dislike performing biology experiment.	.416							
05	Biological knowledge supports us in understanding other courses and phenomenon.	.688							
10	Biology is less important as compared to other science subjects.	.399							
23	The awareness in Biology is necessary for improving our lives.	.631							
07	Biology class is somewhat boring to me.	.472							
08	I easily understand biological concepts during class time.	.776							
13	It is easy to raise question during biology class.	.533							
30	I am satisfied with the method of teaching Biology in my school.	.430							
	Variance Explained (%)		13.2	8.65	6.36	6.33	6.05	5.83	5.74
	Total Variance Explained (%)								52.2

**Factors:**  $F_1$ =Biology Teacher,  $F_2$ =Career in Biology,  $F_3$ =Interest in Biology,  $F_4$ =Difficulties in Biology,  $F_5$ =Equipment use in Biology,  $F_6$ =Importance of Biology and  $F_7$ =Methodology of Biology

In order to establish the construct validity of the attitude scale a principal component factor analysis with varimax rotation was used. As can be seen from Table 4 the consequences of factor analysis including factor loading and the variance explained (in Table 5).

Table 5  
*The Results of Factor Loading and Variance of each Factor*

Factors	% of total Variance	Factor Loading	
		From	To
F <sub>1</sub>	13.282	0.549	0.749
F <sub>2</sub>	8.657	0.441	0.757
F <sub>3</sub>	6.360	0.576	0.822
F <sub>4</sub>	6.333	0.569	0.748
F <sub>5</sub>	6.059	0.416	0.683
F <sub>6</sub>	5.833	0.399	0.688
F <sub>7</sub>	5.740	0.430	0.776

After applying principal component factor analysis with varimax rotation method factor F<sub>1</sub> (Biology Teacher) comprised of five items with factor loading ranging from 0.549 to 0.749. The scale items in factor F<sub>1</sub> are 04, 14, 21, 22 and 24. Factor F<sub>2</sub> (Career in Biology) comprised of five items with factor loadings ranging from 0.441 to 0.757. The scale items in factor F<sub>2</sub> are 03, 11, 25, 26 and 29. Factor F<sub>3</sub> (Interest in Biology) comprised of three items with factor loadings ranging from 0.576 to 0.822. The scale items in factor F<sub>3</sub> are 01, 06 and 16. Factor F<sub>4</sub> (Difficulties in Biology) comprised of three items with factor loadings ranging from 0.569 to 0.748. The scale items in factor F<sub>4</sub> are 02, 33 and 34. Factor F<sub>5</sub> (Equipment use in Biology) comprised of three items with factor loadings ranging from 0.441 to 0.757. The scale items in factor F<sub>5</sub> are 12, 31 and 35. Factor F<sub>6</sub> (Importance of Biology) comprised of three items with factor loadings ranging from 0.416 to 0.683. The scale items in factor F<sub>6</sub> are 05, 10 and 23. Factor F<sub>7</sub> (Methodology of Biology) comprised of four items with factor loadings ranging from 0.430 to 0.776. The scale items in factor F<sub>7</sub> are 07, 08 and 13.

The last factor containing just one item which was decided to include in factor third as it doesn't affect its Cronbach's alpha reliability co-efficient. One item in first factor being irrelevant was discarded. The items with minimum factor 0.41 were accepted as valid.

### **Reliability of the Attitude Scale**

The Cronbach's alpha coefficient of the biology attitude scale was 0.81 that considered as highly reliable for the research instrument (Hogan, 2003). According to Spooren, Mortelmans & Denekens (2007), the Cronbach-alpha value more than 0.70 is satisfactory. Hence, it is concluded that the items in the attitude scale are reliable with each other and measure the same construct. Therefore, it is confirmed that the biology attitude scale is a consistent as well as valid research instrument.

### **Conclusions and Recommendations**

In the present study, exploratory factor analysis of the BAS was made to assess 9<sup>th</sup> grade student attitudes toward biology. The procedure for developing attitude scale was comprised of four steps: (1) Development of initial draft of item pool; (2) validation of item pool; (3) pilot testing; and (4) validity and reliability. In step-1, researcher involved in extensive study of the different constructs concerning student attitudes towards biology. As a result, researcher developed an item pool of 40 items. In step-2, taking opinion of five judges in term of content validity, readability and language of item involved in initial draft. After incorporating changes, the draft reduces to 35 items. In step-3, researcher administered final draft of 35 items to 200 students (boys=103, girls=97) for pilot testing. In step-4, construct validity of the attitude scale was determined by applying procedure of factor analysis with varimax rotation. As a result, researcher left with 25 statements belonging to seven different constructs: Students' attitude towards interest in biology, students' attitude towards career in biology, students' attitude towards importance of biology, students' attitude towards biology teacher, students' attitude towards difficulties in biology, students' attitude towards using equipment in biology and students' attitude towards methodology of biology. The reliability co-efficient of the attitude scale was found as  $\alpha = 0.81$ , which is acceptable.

It is recommended that the present attitude scale should be used by researchers in different research studies, like experimental and descriptive, to determine student's attitude towards biology. It is important to mention that the current biology attitude scale may come across with testing its factor structures as well as its usage in varied samples. Also, it is recommended that the subject teachers must check attitude of their student at the beginning and ending of an academic session.



## References

- Dawson, C. (2000). Upper primary boys' and girls' interests in science: have they changed since 1980. *International journal of science education*, 22(6), 557-570.
- Dhindsa, H. S., & Chung, G. (2003). Attitudes and achievement of Bruneian science students. *International journal of science education*, 25(8), 907-922.
- Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes*. Harcourt Brace Jovanovich College Publishers.
- Field, A. P. 2005. *Discovering Statistics Using SPSS*, Sage Publications Inc.
- Francis, L. J., & Greer, J. E. (1999). Attitude toward science among secondary school pupils in Northern Ireland: Relationship with sex, age and religion. *Research in Science & Technological Education*, 17(1), 67-74.
- Fraser, B.J. (1981). *Test of Science-Related attitude (TOSRA)*. Melbourne: Australian Council for Educational Research.
- Hogan, P. T. (2003). *Psychological testing: a practical introduction*. USA, John Wiley & Sons, Inc.
- Jones, M. G., Howe, A., & Rua, M. J. (2000). Gender differences in students' experiences, interests, and attitudes toward science and scientists. *Science Education*, 84(2), 180-192.
- Keeves, J. P. (1992). Disparities between the sexes in science education: 1970-84. The IEA Study of Science III: Changes in Science Education and Achievement: 1970 to 1984, 141-164.
- Koballa, T. R., & Crawley, F. E. (1985). The influence of attitude on science teaching and learning. *School Science and Mathematics*, 85(3), 222-232.
- Meyer, G.R. (1995). *Scientific Orientation Test*. Beecroft, Australia: GRM, Educational Consultancy.

- O'Brien, J., & Porter, G. C. (1994). Girls and physical science: the impact of a scheme of intervention projects on girls' attitudes to physics. *International Journal of Science Education*, 16(3), 327-341.
- Osborne, J., Simon, S., & Collins, S. (2003). Attitudes towards science: A review of the literature and its implications. *International Journal of Science Education*, 25(9), 1049-1079.
- Ozdamar, K. (1997). Paket Programlar ile İstatistiksel Veri Analizi. Anadolu Üniversitesi Yayını: Eskişehir.
- Petty, R. (1995). Attitude change. In A. Tesser (Ed.), *Advanced social psychology*. New York: McGraw-Hill.
- Punch, F. K. (2005). *Introduction to social research, second education*. Sage Publication: London.
- Ramsden, J. M. (1998). Mission impossible? Can anything be done about attitudes to science? *International Journal of Science Education*, 20(2), 125-137.
- Salta, K., & Tzougraki, C. (2004). Attitudes toward chemistry among 11th grade students in high schools in Greece. *Science Education*, 88(4), 535-547.
- Schibeci, R. A., & Riley, J. P. (1986). Influence of students' background and perceptions on science attitudes and achievement. *Journal of Research in Science teaching*, 23(3), 177-187.
- Seçer, I. (2015). *Psychological Test Development and Adaptation Process*. Ankara: Anı Publishing.
- Shah, Z. A., & Mahmood, N. (2011). Developing a scale to measure attitude towards science learning among school students. *Bulletin of Education and Research*, 33(1), 71-81.

- Simpson, R. D., & Oliver, J. S. (1985). Attitude toward science and achievement motivation profiles of male and female science students in grades six through ten. *Science Education*, 69(4), 511-525.
- Spall, K., Barrett, S., Stanisstreet, M., Dickson, D., & Boyes, E. (2003). Undergraduates' views about biology and physics. *Research in Science & Technological Education*, 21(2), 193-208.
- Spall, K., Stanisstreet, M., Dickson, D., & Boyes, E. (2004). Development of school students' constructions of biology and physics. *International Journal of Science Education*, 26(7), 787-803.
- Spooren, P., Mortelmans, D., & Denekens, J. (2007). Student evaluation of teaching quality in higher education: development of an instrument based on 10 Likert-scales. *Assessment & Evaluation in Higher Education*, 32(6), 667-679.
- Tavsancil, E. (2002). Attitudes measurement and data analysis with SPSS. *Ankara: Nobel Publishing Ltd.*
- Ugulu, I. (2011). The impact of recycling education on the knowledge, attitudes and behaviors of secondary school students. *PhD diss., Dokuz Eylul University, Turkey.*

## **Dimension Wise Difference in Planning Instructional Strategies at Secondary Level in Pakistan**

Sidra Rizwan\*

### **Abstract**

The article focuses on planning instructional strategies (PIS) with its three dimensions namely understanding, dispositions and practices as reported in the “National professional standards for teachers in Pakistan” (NPSTP). The research determined the difference in the three dimensions of the defined standard among in-service secondary school teachers with respect to gender and location. It was a survey type quantitative study. The population included all the secondary school teachers (SSTs) in the four provinces and Islamabad. The sample was selected through multi stage sampling which comprised of 400 teachers teaching secondary classes. To calculate the difference of means independent sample t-test was applied between the understanding dimension of male & female teachers which showed no significant difference, whereas significant difference was observed between the dispositions and practices of male & female teachers. Location wise no significant difference was found between the understanding and practices of urban & rural teachers related to PIS, while significant difference was established in the dispositions of rural & urban teachers towards PIS. On the basis of the findings it was recommended that strata wise all the SSTs required in-service professional development in all the three dimensions of PIS at varying degrees.

**Keywords:** Professional standards, Instructional Planning, Understanding, Dispositions, Practices

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## **Introduction**

The concept of teaching has changed from transfer of knowledge to transformation and understanding of knowledge in a well organized systematic way, for this the planning and delivery mechanism of teaching is imperative. Planning covers all the aspects of delivery i.e. what, how, when, where and whom to deliver. This requires teaching that is based on multiple strategies for understanding of knowledge. This gave birth to the standard of “Instructional planning and strategies” which has been included in the professional standards in the country.

The current teacher education programs in Pakistan are under constant criticism and teachers are mainly held responsible for this deterioration. To rectify the situation, the government of Pakistan has put an effort in teacher education programs in the form of professional standards which are implemented throughout the country. The execution of these standards will enable the adoption of new methodologies and techniques in the real classroom which will enhance the pedagogical skills of prospective as well as in-service teachers in the country.

## **National Professional Standards for Teachers in Pakistan (NPSTP)**

The National Education Policy (2010) recognized teachers’ role in these words, “the teacher is considered the most crucial factor in implementing all educational reforms at the grassroots level.”

PST provide premise for consistent and standardized teacher education which comprises of knowledge, values, understandings and skills for effective teaching. They provide for the up gradation of teachers’ professional status and position in the society and also typical reference point for interaction within the profession.

In 2009 PST were introduced in Pakistan with the consent of all the four provinces and federal capital. These standards identify the domains of specific expectations from the teachers regarding content knowledge, dispositions or attitudes/beliefs and skills related to instructional planning & strategies which are binding for the teachers and provide a framework for the improvement of programs of education of pre- service and in-service teachers (NPSTP, 2009).

## **Planning Instructional Strategies (PIS)**

Eggen & Kauchak (2001) reported that teachers’ understanding comprises of content knowledge, pedagogy of content and general pedagogy. It is rightly stated that you can only teach what you understand. Teaching as a multifaceted activity requires detailed preparation and planning. Effective teachers aim highly for the students

and apply a variety of strategies for enhancing students' outcomes. Well planned and prepared instructions result in effective teaching learning process.

According to Jackson & Davis (2000), professional standards show the students' learning outcomes but teacher is the sole decision maker as to what shall be taught in the class and how this teaching may take place as s/he is responsible for the achievement of the desired learning outcomes in students.

Planning is an organized process that prepares teachers to teach effectively before they face the actual class room (Wharton-McDonald, Pressley & Hampston, 1998). Different aspects as time allocation and preparation of suitable resources prior to classroom teaching are of great significance. Stronge (2007) reported that effective teachers develop instructional plans and follow them by revising continuously according to the changing needs of diverse classrooms with a focus of providing opportunities of meaningful learning for all the students. An instructional plan that considers students' diverse learning styles, previous knowledge and skills can result in effective teaching.

### **Difference in Teaching**

#### *i) Gender*

In 2004 Kardia & Wright stated "Teaching requires skill, insight, intelligence, diligence, and faculty struggle to succeed in a variety of ways in meeting the challenges of the classroom." Teachers hold a vital position in the teaching and learning process of any education system. A visionary educator with distinctive comprehension of the way toward transforming hypothesis into training is in a superior position to gadget and actualize reasonable useful methodologies in his/her working circumstance. The obligation of organizing understudies' states of mind and practices in the general public lies with the instructors (Aggarwal, 2010).

Despite the fact that both male and female teacher demonstrate similar characteristics their methods for addressing the showing difficulties might be extraordinary. It is pivotal to comprehend why and how male and female teachers instruct in various courses keeping in mind the end goal to help instructors in their endeavors towards enhancing their instructing.

Starbuck in 2003 studied difference in teaching styles according to gender by controlling the disciplinary variables. In 2004 Kuh, Laird & Umbach acknowledged, "Besides controlling for disciplinary and other differences women are more likely than their counterparts to value and

use effective educational practices.”

The National Survey of Student Engagement (2005) suggested means in which male and female vary in their teaching. The female teachers stress upon higher order skills, dynamic and mutual learning; and variety of experiences more as compared to male teachers.

ii) *Location*

Location is another feature which is a source of variation among the teachers at different levels around the world. Teachers of urban and rural areas have disparities between the facilities provided to them and available opportunities. There are researches which provided the facts that teachers teaching in urban areas have more opportunities and facilities of development than the teachers working in the rural areas.

Beesley, Atwill, Blair, & Barley (2010) reported that teaching posts remain vacant in the rural areas as teachers prefer to work in the urban areas due to facilities and opportunities of career development. There is shortage of teachers, especially for the science subjects which may cause the deficiency of teachers and increase the work load on the available faculty teachers. This may affect the learning outcomes of the students.

According to Erickson, Noonan, & McCall (2012) the teachers working in the rural schools have lack of facilities and opportunities for the development of their teaching career as compared to the options available to their urban fellow teachers. This aspect shows that the teachers working in the rural school struggle more and face difficulties in coping with their successful career while on the other hand their fellow teachers working in the urban schools enjoy more options and opportunities to development of their teaching career.

Ali & Halai (2010) revealed that male school teachers were more inclined towards use of PST as compared to the female school teachers on the contrary teachers working in urban schools were more inclined towards the use of PST as compared to the teachers working in the rural areas.

In view of Shakir & Adeeb 2014, the male teachers at the secondary level were more competent as compared to their female counterparts while the performance of urban secondary school teachers was better than the rural teachers working in secondary schools.

Moreover, according to Nejati, Hassani, & Sahrapour (2014) no difference was seen according to gender in classroom management and teaching strategies whereas, male teachers showed good inclination in student engagement and teaching as compared to the female teachers.

**Objectives**

The objective of the study, in the light of NPST, was to determine the difference in planning instructional strategies of male & female, urban & rural teachers teaching secondary classes.

**Hypotheses**

The following hypotheses were verified:

H<sub>0</sub>1: There is no significant difference in the understanding, dispositions and practices of PIS according to gender.

H<sub>0</sub>2: There is no significant difference location wise in the understanding, dispositions and practices related to PIS.

**Methodology**

It was a survey study conducted by using quantitative research approach. All the public sector in-service secondary school teachers of the four provinces and Islamabad were the population. Multistage sampling technique was used to draw the sample of the study. Firstly from every province a single district was selected through convenient sampling. Secondly, a Tehsil (administrative unit) was selected randomly from each district, along with Islamabad. Thirdly, proportionate stratified sampling technique was applied to select 80 secondary level schools to serve the purpose of the study. At the fourth stage random sampling was used to select at least 5 SSTs from each selected secondary school;  $5 \times 80 = 400$ .

The data for understanding dimension of PIS was collected through a self-reporting questionnaire; for dispositions dimension a Teacher Behaviors Inventory was developed and for practices dimension of PIS a rating scale were developed to gauge the levels of secondary school teachers in the three dimensions. The research tools for the study were developed on five point Likert scale.

**1. Understanding dimension**

A questionnaire comprising of 50 statements and a test of 20 MCQs was developed to collect data about the understanding of the content of PIS. The reliability was  $\alpha = .92$ .

**2. Dispositions dimension**

A 42 items Teacher Behaviors inventory was designed to collect data from the SSTs about their dispositions towards PIS. The reliability of the tool was  $\alpha = .82$ .



### 3. *Practices dimension*

A rating scale with 20 items was developed to appraise the practices of SSTs regarding engagement in activities of PIS. Its reliability was  $\alpha = .97$ .

The response rate of all the three research tools was 86%.

### Analyses

#### i) **Gender wise**

The difference between male and female SSTs in the three dimensions of PIS was calculated by applying the Independent sample t-test, which is given in table 1.

Table 1

*Difference in the three dimensions of PIS of male (M) and female (F) SSTs*

S/N	Dimensions	Gender	n	Mean	SD	Mdif.	t-value
1	Understanding	M	197	202.1	16.6	.5	.27 (p= .79)
		F	148	201.6	18.5		
2	Dispositions	M	197	169.9	17.6	-5.4	-3.00 (p= .00)
		F	148	175.5	16.8		
3	Practices	M	197	78.6	10.3	-2.3	-2.14 (p= .03)
		F	148	80.9	9.3		

Level of significance  $p < 0.05$

Table 1 reveals the understanding dimension where  $t\text{-value} = .27$ ,  $p = .79$ , the difference between male and female SSTs is not significant at  $p < 0.05$ . According to dispositions dimension  $t = -3.00$ ,  $p = .00$  the difference between male and female SSTs is significant at  $p < 0.05$ . In the practices dimension the difference between male and female SSTs  $t = -2.14$ ,  $p = .03$  is significant at  $p < 0.05$ . Thus  $H_0$  is partially rejected.

**ii) Location wise**

The difference between urban and rural SSTs in the three dimensions of PIS was calculated by applying Independent sample t-test, which is shown in table 2.

Table 2

*Dimension wise difference between urban (U) and rural (R) SSTs*

S/ N	Dimensions	Location	N	Mean	SD	Mdif.	t-value
1	Understanding	U	107	202.4	17.4	.8	.4 (p=.69)
		R	238	201.6	17.5		
2	Dispositions	U	107	176.0	15.5	5.4	2.7 (p=.01)
		R	238	170.6	18.0		
3	Practices	U	107	80.9	10.9	1.9	1.6 (p=.10)
		R	238	78.9	9.3		

Level of significance  $p < 0.05$

Table 2 illustrates the understanding dimension where  $t = .4$ ,  $p = .69$  at  $p < 0.05$  the difference between the urban and rural SSTs in this dimension is not significant. Whereas, in the dispositions dimension  $t = 2.7$ ,  $p = .01$  at  $p < 0.05$  the difference between the urban and rural SSTs is significant. Although, in practices dimension  $t = 1.6$ ,  $p = .10$  at  $p < 0.05$  the difference between urban and rural SSTs is not significant. Therefore,  $H_02$  is partially rejected.

**Findings**

- There was no significant difference in the understanding dimension of male and female SSTs, whereas there was a significant difference between dispositions and practices dimensions of male and female SSTs.
- There was no significant difference between the understanding and practices dimensions of urban and rural SSTs, whereas there was a significant difference between the dispositions dimension of urban and rural SSTs.

## Discussion

The research investigated strata wise difference in the three dimensions i.e. understanding, dispositions and practices related to planning instructional strategies by SSTs according to NPSTP. As these standards were introduced in 2009 they are still in implementation phase in the country. The present study provided a clear picture of where the in-service teachers currently stand and what is required of them to achieve the prescribed standard according to the professional standards.

The findings of the study identified that the female SSTs were comparatively better than the male SSTs as they valued and showed more commitment in their dispositions towards PIS, they were found more engaged in the activities related to PIS in their teaching. This could be because the female SSTs are generally known to have better dispositions towards teaching and the general perception is that they are more dedicated to the profession than their male counterparts. These findings supported the results of Ali & Halai (2010) which revealed that male school teachers were more inclined towards use of professional standards as compared to the female school teachers on the contrary teachers working in urban schools were more inclined towards the use of professional standards as compared to the teachers working in the rural areas.

The findings of Shakir & Adeeb, 2014 propagated that male teachers at secondary school level were more competent as compared to the female secondary school teachers while the urban school teachers were more skillful than the rural teachers. These were very similar to the findings of the present study which showed that urban teachers were better than the rural teachers in the area of PIS. Whereas, Nejati, et al (2014) reported that according to gender no difference was observed in classroom management and teaching strategies of male and female school teachers; on the other hand male teachers showed good inclination in student engagement and teaching as compared to the female teachers. These finding were contradictory as the female teachers were reported better than the male teachers in the present study.

It was observed that the urban secondary school teachers showed improved dispositions towards PIS than the rural secondary school teachers, they gave value to all the components of PIS and portrayed more committed teaching. Erickson, et al (2012) reported that the teachers working in urban areas have access to quality professional development as compared to the rural schools teachers who have to struggle for quality training initiatives.

### **Conclusion**

The findings of the research concluded that the female teachers of secondary schools showed better dispositions and practices in PIS than the male SSTs. However, the teachers at secondary level regardless of their gender possessed practically the same levels of understanding of PIS.

The SSTs working in urban schools displayed better dispositions towards PIS than those teaching in rural schools, whereas their understanding and practices regarding PIS were almost the same.

### **Recommendations**

- Both gender and location wise SSTs needed training at varying degree in all the three dimensions of PIS.
- Gender wise female SSTs required more in-service professional training in the understanding of content of PIS, whereas the male SSTs needed training in the dispositions towards PIS and practices of PIS.
- Location wise rural SSTs were in dire need of professional development in all the three dimensions of PIS more than their urban counterparts.

## References

- Amirali, M., Halai, A. (2010). Teachers' Knowledge about the nature of mathematics: A survey of secondary school teachers in Karachi, Pakistan. *Bulletin of Education and Research*, 32(2), 45-61
- Aggarwal, J. (2010). *Principles, Methods and Techniques of Teaching* (2nd ed.). New Dehli: Vikas Publication House Pvt. Ltd.
- Beesley, A. D., Atwill, K., Blair, P., & Barley, Z. A. (2010). Strategies for recruitment and retention of secondary teachers in central U.S. rural schools. *The Rural Educator*, 31(2), 1-9.
- Erickson, A. S. G., Noonan, P. M., & McCall, Z. (2012). Effectiveness of online professional development for rural special educators. *American Council on Rural Special Education*, 31(1), 22-32.
- Government of Pakistan. (2009). *National Professional Standards for Teachers in Pakistan* (NPST-2009). Islamabad: Ministry of Education.
- Government of Pakistan. (1998). *National education policy 1998-2010*. Islamabad: Ministry of Education. Government of Pakistan.
- Jackson, A., & Davis, G. (2000). *Training points 2000: Educating adolescents in the 21<sup>st</sup> century*. New York: Teachers College Press.
- Kardia, D.B., & Wright, M.C. (2004). Instructor Identity: The Impact of Gender and Race on Faculty Experiences with Teaching.
- Kuh, G. D., Nelson Laird T. F., & Umbach, P. D. (2004). Aligning faculty and student behavior: Realizing the promise of Greater Expectations. *Liberal Education*, 90(4), 24-31.
- National Education Policy. (2009). Ministry of Education, Government of Pakistan.

- National Survey of Student Engagement (2005). Exploring different dimensions of student engagement. Bloomington, IN: Indiana University Center for Postsecondary Research.
- Nejati, R., Hassani, T.M. & Sahrapour, H.J. (2014). The Relationships between Gender and Student Engagement, Instructional Strategies, and Classroom Management of Iranian EFL Teachers. *Theory and Practice in Language Studies*, Vol. 4 (6), 1219-1226
- Policy and Planning Wing. (2009). *National Professional Standards for Teachers in Pakistan*. Ministry of Education, Government of Pakistan.
- Shakir, M., & Adeb, M. A. (2014). Performance Appraisal: An Evaluation of Teachers' Competencies Based on National Professional Standards in Pakistan. *International Review of Social Sciences*, 2 (12)
- Starbuck, G.H. (2003). College teaching styles by gender. Paper presented at the Western Social Science Association Annual Meeting, Las Vegas, NV, April 9-12.
- Stronge, J. H. (2007). *Qualities of Effective Teachers*. Alexandria: ASCD
- Wharton-McDonald, R., Pressley, M., & Hampston, J. (1998). Literacy Instruction in Nine First-Grade Classrooms: Teacher Characteristics and Student Achievement. *Elementary School Journal*, 99, 103-119.

## **Effect of Senior Secondary School Students' Exposure to Formative Testing On Performance in Biology in Ekiti State, Nigeria**

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Henry O. Owolabi\*\*

### **Abstract**

This is a pretest-posttest, quasi experimental study of the effects of formative testing procedures on Biology performance of senior secondary school students. Attempt was made to find out whether formative testing with remediation and without remediation across gender would affect the Biology performance of senior secondary school students. The  $3 \times 2$  factorial design was adopted and a sample of 90 senior secondary school two (SSS 2) students consisting of forty-nine males and forty-one females was drawn. The science class of SS2 in each of the selected schools was included in the study. Six tests were developed and used for data collection. Data collected for the study were analyzed with the analysis of covariance. Findings showed that the students in experimental group one (formative testing with remediation) performed better in Biology than students in experimental group two and control group (formative testing without remediation and no formative testing). It also revealed that gender has no significant effect on Biology performance of students but there was a significant interactive effect of gender and formative testing on their performance. Based on these findings, formative testing with remediation was recommended as an alternative assessment technique to enhance students' performance in Biology at secondary level.

**Keywords:** Formative Testing, Senior Secondary Students, Performance, Biology

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## **Introduction**

Assessment is part and parcel of the school system. It is an important aspect of teaching/learning processes that educationists could hardly achieve their objectives without engaging in it. Educational assessment is an indispensable element in educational planning, curriculum development, innovation and other routine activities in the school system (Nuhfer, 1996). Its outcomes could be a source of motivation for both teachers and learners and provides feedback data to both the teachers, learners as well as other stakeholders in education (Owolabi, 2004).

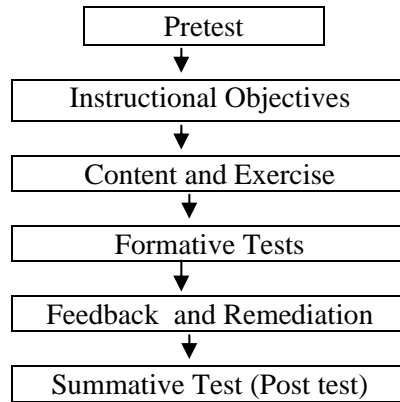
Assessments to a large extent determine what, when and how students study. Teachers use it to discover the extent to which students have actually acquired knowledge and skills they are expected and for diagnosing learners' problems. Through assessment, teachers ascertain whether their teaching objectives were achieved and also appraise the performance of their students for the purpose of certification. Assessment could either be formative or summative. Formative assessment is designed to monitor learning progress during the course of instruction. Due to the fact that formative assessment is conducted when the programme activities are ongoing, it deals with the process (Bhola, 1990). Its purpose is to provide continuous feedback to both the pupil and the teacher concerning successes and failures in such a way that the processes would lead to high quality product.

Formative assessment comprises mostly teacher made tests and other techniques that produce comprehensive results on the competence and skill acquired by the learner (Alonge, 2003). Teachers also use summative assessment at the end of each term or session for meeting their objectives. Though summative assessment has its own roles in education, formative assessment should be complementary to it in many ways. On the other hand, formative assessment is used to achieve the objectives of the mastery learning strategy

Mastery learning strategy, found to be a highly effective for imparting knowledge, involves the use of formative tests with corrective feedback and remediation (Bloom, Hastings & Madaus, 1971). Corrective feedback places a heavy demand on the time of the teacher who has to prepare, teach, diagnose and adopt appropriate corrective measures for re-teaching to bring the students to mastery (Owolabi, 2000). Block (1971) stated that remediation involves re-testing and re-teaching for bringing learners to mastery. Although, Bloom's format was modified to make remediation limited and prescriptive, time is still taken by the corrective feedback system affects progress and extent of syllabus



coverage in the regular school system. An alternative formative testing model proposed by Glasser and Nitko (1971) suggested a combination of formative with feedback, remediation and summative tests. The model is as presented below:



*Source: Glasser and Nitko's Model (1971)*

The model uses feedback and remedial instruction involving diagnosing learning difficulties and identifying strengths and weaknesses in group performances for the purposes of improving the students' academic performance and achieving instructional objectives. It could be inferred that problems of mass failure of students, especially at the senior secondary school level could be addressed with the use of formative assessment procedures with corrective feedback.

Biology is one of the science subjects offered by students at the Senior School Certificate Examination level by more than a yearly average of 80%. Despite the large number of candidates registering for this subject, the candidates' performances over years were neither encouraging nor stable as no particular trend was identified. The problems of student's low performance in biology have been observed by many researchers. Owino et al. (2014) noted that the problem with inadequate supply of teaching and learning resources such as chemicals, charts, apparatus, models, local specimens, laboratories, textbooks, and libraries led to poor performance in Biology. Also, the apparent failure of continuous assessment (C.A) for improving students' performance in our schools needs also to be addressed. Okwilagwe (2000) established that there were doubts as to the adequate implementation of the C.A. process in Nigerian schools.

Moreover, the students' poor performance has affected the popularity of Biology among students. This has given rise to the need to develop teaching and learning methods that could transform the performance of candidates enrolled for Biology in certificate examinations. In view of this, this study investigated effect of senior secondary school students' exposure to formative testing on performance in biology in Ekiti State, Nigeria

### **Statement of the Problem**

Evidence from Senior School Certificate Examination results indicate that a large proportion of Nigerian senior secondary school students have difficulty performing well Biology. Review of literature has shown that teaching methods could account for poor performance. Other key factors isolated by Kareem (2003) as causes of poor performance in SSCE Biology include ineffective teaching, failure to use continuous assessment to direct learning, lack of bio-statistical knowledge, inability to make good drawings and so on. It has been established that poor implementation of Continuous Assessment, which was designed to revolutionarily improve students' performance, may also account for the high failure rates observed. Educationists and Biologists have concerned themselves with the search for approaches capable of making teaching of Biology more meaningful to the learners and an intervention strategy that will turn students' performances round (Adepoju, 2003). It could be inferred however that formative assessment with corrective feedback may bring about an improvement in Biology performance of the students.

This study therefore investigated the effect of formative testing in achieving mastery among secondary school students. The study aimed at investigating the effect of senior secondary school students' exposure to formative testing on performance in biology in Ekiti State, Nigeria. It designed to examine whether formative testing with or without remediation will affect students' performance in Biology.

### **Research Hypotheses**

Three hypotheses were formulated for the study.

1. There is no significant effect of formative testing on Biology performance of senior secondary school students'.
2. There is no significant effect of gender on Biology performance of senior secondary school students'.
3. There is no significant interactive effect of formative testing and gender on Biology performance of senior secondary school students'.

## **Methodology**

The researchers adopted quasi-experimental research design for the study. This design is suitable for use when researchers have no intention of tampering with intact groups to avoid likely negative effects on research outcomes. Out of four senior secondary schools in Three Ilejemeje Local Government Area of Ekiti State, the researchers randomly selected three senior secondary schools. The science arm of SS2 in each of the sampled schools participated in the study. The sample for the study is made up of 49 males and 41 females which were randomly assigned into two experimental groups and one control group by the researchers. The sampled classes were treated as intact groups for the purpose of this study. In addition, a 3 X 2 factorial model with factors includes teaching method at three levels (Formative Testing with Remediation, Formative Testing without Remediation and Control Group) and Gender at 2 levels (male and female).

Instructional modules were developed from the SSCE syllabus on four topics - Homeostasis: Regulation of Internal Environment, the Mammalian Liver, the Mammalian Skin and Hormonal System. These four topics were broken into 12 modules with each topic taught in three periods of 45 minutes each per week in the 8th, 9th, 10th and 11th weeks of the term as indicated by the schools' scheme of work. This was carefully planned to agree with the academic calendar of sampled schools during the four weeks that the experiment lasted. Treatment was randomly assigned to two experimental groups and placebo to the control group.

Pretest and posttest were administered to the two groups (experimental and control groups) and the criterion of mastery was set at 80% in line with guidelines by Bloom, Hastings and Madaus (1971). The first experimental group, which was exposed to formative tests with remediation, took the tests and was later given their answer scripts after learning problems associated with their performances were used to diagnose and remediation procedures executed through re-teaching. Experimental group two took formative tests only and were not exposed to remediation. Though they were informed of their performance, no attempt was made to revise and re-teach them. The third group, which is the control group, did not receive formative tests at all, but went through conventional instruction.

Six multiple choice tests in Biology were developed and used for data collection. These comprised a pretest made up of 20 items, four formative tests with 22, 23, 15 and 20 items respectively and a posttest made up of 35 items. The researchers validated the instruments to make sure that all multiple choice items were developed from the topics chosen

from Senior School Certificate Examination syllabus and scheme of work contents used by the schools for teaching their students. Both the face and content validities of the tests were established by the three Biology teachers in the sampled schools. The reliability of each of these instruments was found to be 0.75, 0.72, 0.71, 0.75, 0.78 and 0.76 respectively. The three hypotheses generated in this study were tested by using the Analysis of Co-variance (ANCOVA) with pretest scores as covariate.

## Results

The summaries of Analysis of Covariance and post hoc tests are presented on Tables 1 to 3 with respect to the hypotheses tested. The Duncan's Multiple Range Test (DMRT) was used to identify the sources of variation in cases where significant differences were observed in students' performance.

### **H<sub>01</sub>: There is no significant effect of formative testing on Biology performance of senior secondary school students'.**

On Table 1 are the results of the performances of experimental and control groups subjected to Analysis of Covariance.

Table 1

*Summary of ANCOVA Table on Treatment and Students' Performance in Biology*

Source of Variation	Sum of Square (SS)	DF	Mean Square (MS)	Calculated F- Ratio	Sig. of Remark F (P)
Corrected model	976.08	6	162.68	5.21	.00
Intercept	3511.26	1	3511.26	112.61	.00
Covariate	168.10	1	168.10	5.39	.02
Gender	119.62	1	119.62	3.83	.05 s
Formative Testing	375.76	2	187.88	6.02	.00 s
Interactions Gender* Formative Testing	319.33	2	159.66	5.12	.00 s
Error	2587.91	83	31.18		
Total	21204.00	90			
Corrected Total	3564.00	89			

\* Interactive Effect; S = Significant

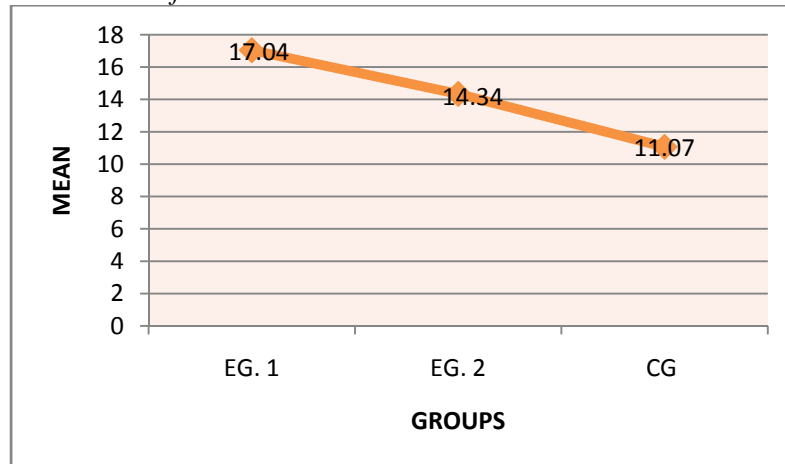
For hypothesis one, results on Table 1 reveals the calculated F-ratio of 6.026 which is significant at 0.05 alpha level ( $F(p)$  value= 0.00) , thus the null hypothesis was rejected. This means formative testing significantly had effect on Biology performance on senior secondary school students' performance. Duncan's Multiple Range Test (DMRT) was used to trace the source of observed variation as presented on Table 2 below:

Table 2  
*Post Doc Analysis (Duncan's Multiple Range Test) on Treatment and Students' Performance*

<b>Duncan's Grouping</b>	<b>Mean</b>	<b>Treatment</b>
A	17.04	Formative Testing with Remediation
B	14.34	Formative Testing without Remediation
C	11.07	No Formative Treatment

The Duncan's Multiple Range Test (DMRT) post-hoc analysis indicated that the highest mean performance was shown in the group subjected to formative test with remediation with 17.04 followed by the group exposed to formative test without remediation with 14.34. The control group had the least mean performance of 11.07. The experimental groups which were exposed to formative test with remediation and formative test without remediation performed significantly better in Biology than those in the control group.

**Graph 1**  
**Mean Graph Showing the Duncan's Grouping on Treatment and Students' Performance**



**Key:** EG. 1: Experimental Group 1 (Formative Testing with Remediation)

EG. 2: Experimental Group 2 (Formative Testing without Remediation)

CG: Control Group (No Formative Treatment)

Graph 1 reveals that the mean scores of the subjects in experimental and control groups are significantly different based on Duncan's analysis table. Therefore, hypothesis one is not upheld.

**H<sub>02</sub>: There is no significant effect of gender on Biology performance of senior secondary school students.**

For hypothesis two, Table 1 shows that the calculated F-ratio of 3.837 which is significant at 0.05 alpha level of significance ((F (p) value = 0.05). Therefore, we do not accept the null hypothesis two. This result indicates that gender has significant effect on Biology performance of senior secondary school students'.

**H<sub>03</sub>: There is no significant interactive effect of formative testing and gender on Biology performance of senior secondary school students'.**

Table 1, reveals a calculated F-ratio of 5.12 with a p value of 0.00 which is significance at 0.05 alpha levels. It shows that there is a significant interactive effect of gender and formative testing on Biology performance of senior secondary school students'.

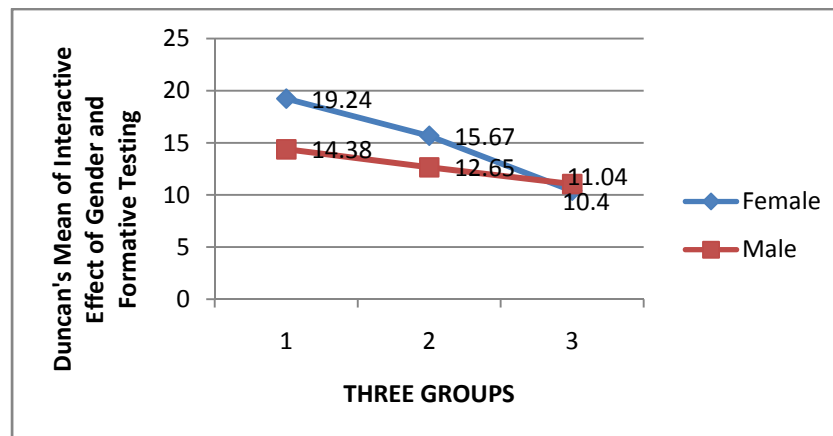
Table 3  
*Post-hoc Analysis (Duncan's Multiple Range Test) on Effect of Treatment and Gender on Students' Performance*

<b>Grouping</b>	<b>A</b>	<b>B</b>	<b>C</b>
Formative Testing	Formative Testing with Remediation	Formative Testing without Remediation	No Formative Testing
Female	19.24	15.67	10.40
Male	14.38	12.65	11.04

Different letters indicate that there is a significant interactive effect of gender and formative testing on Biology performance of secondary school students'. DMRT indicated that the mean of the male and female were 19.24 and 14.38 in formative testing with remediation group, that of male and female were 15.67 and 12.65 in formative testing without remediation group and the means of male and female in group without formative testing (control group) are 10.40 and 11.04 respectively. Therefore, the interactive effect of formative testing and gender on students' performance in Biology is positive since the means of students' vary from one method of testing to another and differ from male and female students.

Graph 2

*Mean Graph Showing the Duncan's Grouping of Interactive Effect of Gender and Treatment on Students' Performance in Biology*



**Key:** 1. Experimental Group 1 (Formative Testing with Remediation)

2. Experimental Group 2 (Formative Testing without Remediation)
3. Control Group (No Formative Treatment)

Graph 2 shows that the mean scores of interactive effect of formative testing and gender on students' performance in Biology is significantly positive. Therefore, hypothesis we do not accept hypothesis three.

### **Discussion of Findings**

The results obtained in this study indicate that formative test with remediation is a better method of assessment that can improve students' performance in Biology. This finding indicated that students exposed to formative test with remediation and formative test without remediation had significantly better performance in Biology when compared with the control group. King (2003) study supported the findings of this study, he concluded in his study that teachers accepted formative assessment as a valuable teaching strategy, and they thought that it improved science teaching. The findings from this study support the work of Afemikhe (1985) who found that when formative test was used in teaching Mathematics, the students so exposed were found to be significantly better than students not exposed to it. Similarly, Okpala and Onocha (1990) observed that students performed better when they are systematically assessed. In addition, Yin et al. (2008) did not support the finding of this study; they found that formative assessment did not lead to a significant influence on students' achievement.

It was discovered from this study that students' gender has significant effect on their performance in Biology. However, the observation that male students performed equally well as their female counterparts is against the findings of the study. Akande's (2001) study in which it was observed that gender has no significant effect on academic performance did not support the result of hypothesis two. Moreover, Olasehinde and Olatoye (2014) result also disagree with the findings of this study; they reported that there is no significant difference between male and female students in science achievement.

It was also found in this study that there is significant interactive effect of gender and formative testing on students' performance in Biology. Students' academic performance can therefore be attributed to the interaction of gender and treatment conditions. This study further showed that formative test with remediation is a better method of assessment than formative testing without remediation and that it could be used to improve students' performance in Biology. Also, from the



findings of this study, it could be concluded that formative tests with remediation could be used to improve learning of Biology among secondary school students.

### **Conclusion**

The results of this study indicate that formative test with remediation and formative test without remediation are effective in improving academic performance of students in Biology. It also showed that students exposed to formative test with remediation performed better than those exposed to formative test without remediation. Though gender differences were established in students' performance in Biology, significant interactive effects of formative testing and gender on performance in Biology were also observed.

### **Recommendations**

Based on the findings of this study, the researchers conclude that testing could be used to institute educational reform in Nigerian secondary education. Thus, it is recommended that continuous assessment, currently being used at this level, should be replaced with formative test with remediation and mastery standards observed. This may help to overcome perennial failure in school certificate examinations at the end of their programmes. Teachers should thus be exposed to training that would foster adoption of formative testing procedures while executing the secondary school curriculum. This study was conducted in secondary schools, further study may be conducted in primary schools and tertiary institutions to further ascertain the relative effectiveness of the assessment techniques: formative testing with remediation and formative testing without remediation. Research is also required in other school subjects while experts in educational measurement should ensure that standardized formative tests are produced and made available for use in schools.

## References

- Adepoju, A.A. (2003). Mastery Learning Strategy and Secondary School Teaching. In S. O Ayodele, Teaching Strategies for Nigerian Secondary Schools. Ibadan: Power House Press and Publishers
- Afemikhe, O.A. (1985). The Effect of Formative Testing on Students Achievement in Secondary Mathematics. (Unpublished Ph.D. Thesis). University of Ibadan, Ibadan.
- Akande, F. F. (2001). Effects of Academic Values Clarification and Peer Competition on Academic Achievement Motivation and Academic Performance among Secondary School Students. (Unpublished Ph.D. Thesis). University of Ilorin, Ilorin.
- Alonge, M.F. (2003). Assessment and Examination: The Pathways to Educational Development Inaugural Lecture. University of Ado-Ekiti.
- Banta, T.W. Lund, J.P; Black, K.E & Oblander, F.W. (1996). Assessment in Practice. San Francisco, CA: Jossey Bass.
- Bhola, H.S. (1990). Evaluation Planning Design Implementation and Utilization of Evaluation. Germany: German Foundation for International Technology Publication (ETP).
- Block, B.S. (1971). Schools, Society and Mastery Learning. New York: Holt, Rinehart and Wiston.
- Bloom, B.S; Hastings, J.T. & Madaus C.F (1971). A Handbook of Formative and Summative Evaluation of Student Learning. New York: MCGraw-Hill.
- Glasser, R. and Nitko. (1971). Measurement in Learning and Instruction, in R.L. Thorndike (Ed), Educational Measurement. Washington D.C.: American Council on Education.
- Kareem, O. L. (2003). Strategies for Teaching Biology Concepts: An Educational Technologists Perspectives. Journal of Postgraduate Students Association, 4, 25-39.

- King, M. D. (2003). The effects of formative assessment on student self-regulation, motivational beliefs, and achievement in elementary science (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3079342)
- Nuhfer, F.B. (1996). *The Place of Formative Evaluations in Assessment and Ways to Reap their Benefits*. Denver: University of Colorado.
- Okwilagwe, E.A. (2000). Effects of Two Assessment and Methods on Learning Outcomes of Pupils in Social Studies. A Case Study of University of Ibadan Staff School. *African Journal of Educational Research* 6 (1&2), 21-34.
- Olasehinde, K. J. and Olatoye, R. A. (2014). Comparison of male and female senior secondary school students' learning outcomes in science in Katsina State, Nigeria. *Mediterranean Journal of Social Sciences MCSER Publishing, Rome-Italy*. 5 (2), 517-523.
- Owino, O. A.; Ahmad, O. and Yungungu, A. (2014). An investment of factors that influence performance in KSCE biology in selected secondary schools in Nyakach District, Kisumu Country Kenya. *Journal of Education and Human Development*, 3(2), pp 957-977.
- Owolabi, H.O. (2000). Adopting Mastery Learning Strategy for Teaching and Learning in Nigeria: Time Implications, in A.I. Idowu, et al, (Ed.) *A Guide to Teaching Practice*. Ilorin: Haytee Press & Publishing Co. Ltd.
- Owolabi, H.O. (2004). Assessment in the classroom, in E.O. Ogunsakin (Ed.) *Teaching in Tertiary Institutions*. Paper presented at the workshop on Teaching for newly recruited University Lecturers, Faculty of Education, University of Ilorin, Ilorin.
- Okpala, P.N & Onocha, O.C. (1990). The Effects of Systematic Assessment Procedures on Students Achievement in Mathematics and Science Subjects. Paper Presented at the Staff Seminar of the International Centre for Educational Evaluation, University of Ibadan, Ibadan.

Yin, Y., Shavelson, R. J., Ayala, C. C., Ruiz-Primo, M. A., Brandon, P. R., Furtak, E. M., ... Young, D. B. (2008). On the impact of formative assessment on student motivation, achievement, and conceptual change. *Applied Measurement in Education*, 21, 355–359.

**Needs Analysis of Designing Course Materials for  
Primary Education Studies (PES) Students of Federal  
College of Education, Yola Adamawa State of Nigeria  
Learning Arabic for Specific Purposes (ASP)**

Jabir Abdullahi\*

**Abstract**

This paper carried out needs analysis with the aim at shedding light on the necessity for the innovative course materials that will be designed and developed for the effective teaching and learning of the Arabic courses, specifically for the learners in the department of Primary Education Studies (PED). The population of the study comprised of one hundred and seventy five (175) NCE II students, who took PED 219 (Arabic in Primary Education 11), in first semester NCE II as well as PED 126 ( Arabic in Primary Education 1) in their second semester NCE I 2017/2018 academic session. One hundred and twenty (120) students were selected using simple random sampling. Quantitative data was obtained by means of 4-point Likert Scale. The data was analyzed by using frequencies, simple percentages and weighted average. The findings reaffirmed the added advantages of learning Arabic language for the learners, educational system and national integration. The study also found that learning Arabic language requires instructional materials and relative courseware that will make the learning more effective. Parental misconception, religion undertone as well as students Arabic backgrounds were also identified as added challenges to the effective learning of Arabic language.

**Keywords:** ASP, Course Materials Design, ECCE, Needs Analysis, PES

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## **Introduction**

Nigeria is known as most populous black-race nation in Africa, with diverse multi-cultural, multi-ethnic and multi-religious peoples. Education become topmost priority of Nigerian government and the standard of education depends on teachers, as popular saying that “no nation rise above qualities of its teachers”. Thus, the Nigerian educational system put teacher’s education at centre and specifically saddled colleges of education with the responsibility of producing teachers for the base schools (primary education). The 2012 edition of minimum standards for Nigeria Certificate in Education (NCE) mandated all students in the Colleges of Education at the department of Primary Education Studies (PED) to register a foreign language course as elective course. This was aimed at exposing the students to other foreign languages (Arabic or French), and training students to become teachers with adequate knowledge of the Nigerian primary school curriculum, skill, attitude, and methods, to enable them teach the subjects of primary 1-6 as contained in the National Curriculum. At the same time they are equipped with foreign language competency in order to face the challenges in the real world. The maximum period of the course is three semesters at the different NCE levels. The course is taught to all registered students in Primary Education Department (PED) regardless of their ethnic and religious backgrounds.

Arabic language plays a vital role for students of PED in the college of education, it assists students in understanding terminologies found in Arabic for primary education texts, as it provides an exposure to the students on the context and usage of the language in primary education studies. The language also exposes students to exhibit the four basic language skills of listening, speaking, reading and writing.

Among the reasons that make teaching of Arabic Language to PED students important is due to fact that Arabic language has become part of the minimum standard in Nigerian colleges of education. The stipulated lecture periods of 2 hours per week for total of 9 weeks, making 18 hours in a semester was well spelt-out in the minimum standard for (PED 126) titled “Arabic Language in Primary Education Studies”. The minimum standards required the assessment to be based on the objectives of the course which include speaking, reading, and writing of elementary Arabic. At the end of the course the students are expected to be able to speak, read and write elementary Arabic. To this effect, the following text books have been currently introduced for students uses: Al’assas (Basic Arabic), Annahwul-wadh (Arabic Brighter Grammar), Durusul-lugatil-arabiyya li gairil-nadiqinabiha (Arabic for non-Arabs), as

well as permissibility of using relevant online materials for the teaching and learning of Arabic language.

Course materials form an important part in the teaching and learning of any subject (Dubin & Olstain, 2000). It is therefore, crucial to re-evaluate the existing course materials for PED126 in order to design and develop an innovative courseware. In designing a language course material, it is important to carry out a needs analysis to determine the specific reason for learning the language in addition to the learner's objective needs. Also, the learners' affective needs, such as their interest, wishes, expectations and preferences should be taken in to cognisance when designing the courseware. On this note, it is highly essential to carry-out needs analysis through collection of data that can be used to develop a profile of the language needs of a group of learners in order to make decisions about the goals and content of a language course. More so, needs analysis should not only be considered as a pre-stage part of designing language courseware, it should be an on-going process to ensure relevance and quality of subject matter.

The aim of this research is to design and develop an innovative course materials for PED126 (Arabic Language in Primary Education 1), as the research will report on the preliminary findings on the needs analysis which will be used to determine the basic components necessary for designing a course materials that are suitable to the needs of the learners.

### **Objectives of the Study**

1. To determine the perception of learners on whether Arabic language has added value to their profession and offer them better job opportunity.
2. To determine the purpose of learner' interest in the study of Arabic language.
3. To determine whether there is need for the instructional material for the learning of Arabic language.
4. To identify factors those inhibit the learners from learning Arabic language.

### **Research Questions**

1. Does learning Arabic language have any added advantage for the PES students of Nigerian colleges of education?
2. What are the motives behind learner interest in the study of Arabic Language?

3. Is there a necessity for having instructional materials for the learning of Arabic Language for PES students in Nigerian Colleges of Education?
4. What are the factors inhibit the PES students from learning Arabic languages?
- 5.

### **Literature Review**

Teaching language for specific purposes is a new trend in the field of teaching Arabic, while the English language has already been to this field and known among different communities which is ESP (English for specific Purposes). So, teaching Arabic for specific purposes means teaching it by specific method to achieve specific aims for a certain range of students. It is not intended for this type of specification of teaching Arabic in general and comprehensive, but the focus is learning Arabic in which a certain side benefit the student in which to achieve a specific purpose, such as travel, tourism, trade etc. However, there is a difference between teaching Arabic, for example, for political purposes and the teaching Arabic for the purposes of the academic study. Arabic in the first case is a specific goal, but in the second case is a general goal.

Teaching Arabic for religious purposes was the first step in teaching Arabic for specific purposes. It has been appeared when every Muslim was eager longing to understand the teachings of Islam, so every Muslim was trying so hard to learn Arabic in order to satisfy the needs and achieve his own purposes which understand the Quran and Hadith and doing worships.

The second step to teach Arabic for specific purposes was teaching it for functional purposes. It happened in Umayyad era at the beginning of the Arabization of the offices of the Islamic state. Therefore, the children of non-Arab Muslims learned Arabic for jobs in that state.

Some argue that the interest in the development of teaching Arabic for specific purposes has begun to emerge in its new robe in the sixties in the last century, when a group of specifics in Applied Linguistics analysis of the different language field they found that in each language (Abdul-Raouf, 2004).

Field has its vocabulary, rules and methods, which is different from other language field. They also found that the field of teaching Arabic for specific purposes divided into multiple fields depending on the specificities of students. So , there are programs for teaching Arabic for Academy purposes , professional , religious , commercial , medical ,



scientific , legal , media , and political which included all the educational and professional fields .

Thus, we can say that there is an old movement to teach Arabic for specific purposes (religious and functional), With the passage of time, the evolution of the ages, the conditions in the Arab world, and after the events of the eleventh of September 2001 the interesting of Arab world has been increased. This means of course an urgent need to learn Arabic, specifically for commercial purposes, diplomatic, and political.

Unfortunately, studies associated with these fields are inadequate and unable to meet the needs of language learners in the teaching of specific purpose, specifically political purposes.

Hutchinson and Waters (1987) divided teaching Arabic for specific purposes into two kinds; the first: Arabic for academic purposes or scientific. This applies to the Arabic language for educational purposes for students of colleges and universities, where the program meets the needs of learners to understanding books and references for specification and exchange scientific ideas at the academic communication. And the second: teaching Arabic for professional or functional purposes such as teaching Arabic for diplomats, businessmen, counsellors tourism, and the nurses. This program serves professionals and business owners who need Arabic as mean to perform their job, duties or professional.

In developing syllabus, an important element is analysing the needs of the students. Needs analysis is used to collect information about learners' needs. Learning needs refer to what the learner needs to do in order to learn. It is concerned with the method and activities, in learning process. To decide the method and activities, the teacher should understand the learning goals.

Hutchinson and Waters (1987) (in Nation and Macalister, 2010) divided needs in to target needs and learning needs. Target needs refer to what the learner needs to know in order to function in the target situation, what they know already, and what they need to know. Target needs make sure that the course contains relevant and useful things to learn. It is more useful to look at the target situation in terms of necessities refer to what the learner has to know in order to function effectively in the target situation. Lacks refer to gap between the target proficiency and the existing proficiency. On the other hand, wants refer to what the learner wishes to learn.

Learners are not consulted as to whether a need for such knowledge is needed. Their needs have been decided for them by those concerned with their long term welfare. Needs analysis thus include the

study of perceived and present needs as well as potential and unrecognized needs. It is used to make sure that learners learn useful things. It further proposes the function of needs analysis, as they need to find out what language skills a learner needs in order to perform a particular role; help determine if an existing course adequately addressed the need of potential students; determine which student from a group are most in need of training in particular language skills; identify a change of direction that people in a reference group feel is important; to identify a gap between what students are able to do and what they need to be able; and collect information about a particular problem learners are experiencing.

### **Methodology**

A survey research design was adopted in this research. The population of the study comprised of one hundred and seventy five (175) NCE II students, who took PED 219 (Arabic in Primary Education 11), at first semester NCE II as well as PED 126 (Arabic in Primary Education 1) in their second semester NCE I 2017/2018 academic session. It is assumed that these students will be able to give necessary feedbacks, comments and criticism on the course materials that have been used in their previous Arabic courses. One hundred and twenty (120) students were selected using simple random sampling procedure from the total population of one hundred and seventy five (175). Quantitative data was obtained by means of 4-point Likert Scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The questionnaires were administered to the respondents; all the responses in the 4-point scale questions were sorted after analysing the responses thoroughly. The codification were made carefully and then followed by the data analysis. The data and the results were then presented in tabular form using frequencies, simple percentages and weighted average.

Since the instrument for this research was based on 4-point Likert Scale, therefore, the weight for Strongly Agree is 4 points, Agree – 3 points, Disagree – 2 points and Strongly Disagree –1 point. Thus, the average point will be  $(4+3+2+1)/4 = 2.5$ . Therefore any weighted responses value greater than or equal to 2.5 will be considered as “agreed” while those values less than 2.5 will be regarded as “disagreed”.

## Results

Table 1

*Distribution of Responses on Whether Learning Arabic Language in PES Department of Nigerian Colleges of Education Has Any added Advantage*

S/N	Items	SA FX(%)	A FX(%)	D FX(%)	SD FX(%)	w $\bar{x}$ n=120
1.	The PES students need Arabic knowledge to master part of the requirements for the Primary Education	55(46%)	28(23%)	26(22%)	11(9%)	3.06
2.	The PES students need Arabic language to be more suitable for job after graduation	71(59%)	27(23%)	10(8%)	12(10%)	3.31
3.	When the Arabic language learnt, the learner can make use of it to interact with Arabic native speakers	23(19%)	74(62%)	15(13%)	8(7%)	2.93
4.	Training Nigerian students with Arabic language makes them employable outside the country soil	31(26%)	56(47%)	12(10%)	21(18%)	2.81
5.	Training Nigerian students with Arabic language makes them more relevant for the international relationship and ambassador for the world peace	30(25%)	73(61%)	13(11%)	4(3%)	3.08
	Grand Average					3.04

w $\bar{x}$ : Weighted Average from 4-Point Likert Scale (accepted value  $\geq 2.5$ )

The results in the Table 1 reveal that students from PES department in the Federal college of education, Yola perceived learning Arabic language has added advantages. Most students (69%) strongly agreed that learning Arabic language will make them more relevant in their field of study (w $\bar{x}$ =3.06). More so, 82% of the students believed that learning Arabic language will make them more suitable to secure job in future time (w $\bar{x}$ =3.31). Majority students (81%) opined that learning Arabic language can make them interact with Arabic speaking people within and outside the country (w $\bar{x}$ =2.93), while 73% of the students were of the opinions that learning Arabic language can make them employable outside the Nigeria soil (w $\bar{x}$ =2.81). Also, 86% of the PES students believed that with Arabic language knowledge, Nigerian students can effectively participate in the world peace (w $\bar{x}$ =3.08). The

table reveals further the grand average value of 3.04 which is greater than accepted value 2.5, which, implies that students agreed that learning Arabic language has added advantage.

Table 2  
*Perceptions of Respondents on Rational Behind Learner Interest in the Study of Arabic Languages in Nigerian Colleges of Education*

S/N	Items	SA FX(%)	A FX(%)	D FX(%)	SD FX(%)	w $\bar{x}$ n=120
1.	The learner motive for acquiring the Arabic language is to understand Arab culture	10(8%)	12(10%)	17(14%)	81(68%)	1.59
2.	The learners are learning Arabic language in order to be able to read and write Arabic texts	51(43%)	23(19%)	11(9%)	35(29%)	2.75
3.	The learners are learning Arabic for effective communication using the language	32(27%)	56(47%)	29(24%)	3(3%)	2.98
4.	Most learners are more interested in Arabic grammar than reading texts	20(17%)	56(47%)	36(30%)	8(7%)	2.73

w $\bar{x}$ : Weighted Average from 4-Point Likert Scale (accepted value  $\geq 2.5$ )

The results in Table 2 reveal that the majority of students (82%) strongly disagreed that they are interested in learning Arabic language in order to understand the Arabic culture (w $\bar{x}$ =1.59). However, most students (62%) strongly agreed that they are learning Arabic language in order to be able to read and write Arabic texts (w $\bar{x}$ =2.75). Likewise, 74% of the PES students strongly agree that they are learning Arabic for effective communication (w $\bar{x}$ =2.98). More so, most students (64%) expressed their agreement views to the assertion that most learners simply prefer Arabic grammar than reading the text (w $\bar{x}$ =2.73). The results from this table show that most learners are not truly interested in the cultural outfit of the native Arabic speakers rather; they prefer knowledge that makes them read their Arabic text; pass their examination and communicate with Arabic native speakers.

Table 3  
*Respondents Perception on Necessity for the Instructional Material for Teaching and Learning Arabic Language*

S/N	Items	SA FX(%)	A FX(%)	D FX(%)	SD FX(%)	w $\bar{x}$ n=120
1.	Arabic words and sentences can be read correctly without vowelization diacritics, such that compressive materials may not be needed for the Arabic	2(2%)	17(14%)	21(18%)	80(67%)	1.51
2.	Most learners do not need glossary of vocabularies at the end of each chapter	10(8%)	12(10%)	23(19%)	75(63%)	1.64
3.	Pronunciation and reading of Arabic exercise can be understood better without necessary acquire CBT (Computer Based Training)	0(0%)	21(18%)	12(10%)	87(73%)	1.45
4.	Arabic letter are legible for learners at every font size. Thereby, the Arabic textbook and instructional materials do not necessarily needed to be bold	12(10%)	23(19%)	12(10%)	73(61%)	1.78
5.	Most learners learn Arabic language better, even in the absent of clear instructional materials.	8(7%)	12(10%)	31(26%)	69(58%)	1.66
6.	Arabic can be better read and understood ever without colourful text	15(13%)	63(53%)	38(32%)	4(3%)	2.74

w $\bar{x}$ : Weighted Average from 4-Point Likert Scale (accepted value  $\geq 2.5$ )

The results in Table 3 reveal the respondents perception on necessity for the instructional material for teaching and learning Arabic language. The results indicate that most respondents (85%) disagreed to the assertion that Arabic words and sentences can be read correctly without vowelization diacritics (w $\bar{x}$ =1.51) this implies that the students

unanimously viewed that Arabic words and sentences needed correct vowelization diacritics. Likewise, 82% of the respondents disagreed to the assertion that learners do not need glossary of vocabularies at the end of each chapter ( $w\bar{x}=1.64$ ). More so, majority of respondents (83%) indicated the necessity for the introduction of CBT and other ICT facilities for the effective learning of pronunciation and reading of Arabic text ( $w\bar{x}=1.45$ ). The results from this table also indicate strong disagreement views of the respondents (71%) to the assertion that since Arabic letter are legible for learners at every font size, there is no need for bolding the texts of all the Arabic textbook and instructional materials ( $w\bar{x}=1.78$ ). Likewise, respondents (84%) unanimously disagreed that learners can learn Arabic language better without any clear instructional material ( $w\bar{x}=1.66$ ). However, most respondents (66%) agreed that Arabic can be better read and understood without colourful text ( $w\bar{x}=2.74$ ).

Table 4  
*Factors inhibiting learning of Arabic language among the PES students in colleges of Education*

Factors	Fx	%
Student's Arabic background	90	20%
Lack teaching aids and instructional materials	117	26%
The fear of Islamization by non-Muslim parents	78	17%
Lack of qualified teachers	32	7%
Too much of courses in NCE programmes	67	15%
Lack of consideration for learner with little Arabic background	64	14%
Total	448*	100%

\* Multiple responses

The results in table 4 reveal the students' perceptions on the factors preventing them from having good understanding of Arabic language. The table revealed that 26% of the factors responsible students' poor understanding of Arabic language is contributed by lack of teaching aids and instructional materials. Also, the results show that students' background in Arabic contributed 20% of factors that affected their interest in the learning of Arabic language. Likewise, fear of Islamising children by the non-Muslim parents contributed 17% of the

factors that inhibit the learners from effective learning of Arabic language. More so, 15% of the factors inhibiting the learning of Arabic language is contributed by too much of courses offered in NCE programme. 14% of the factors responsible for the poor Arabic learning among the PES students in the college of education is due to lack of consideration for learners with little Arabic background, while lack of qualified teachers was rated low rate only 7% of overall factors.

### **Discussion**

The learning of Arabic language has been reaffirmed by the study for its added advantages for the learners, educational system and national integration. This agrees with the submission made by Onisabi, Adam and Jami'u (2013) that Arabic language remains among few languages that intricate multifunctional phenomenon, through facilitates human communication. The utilities of learning Arabic as foreign language transcend the benefit of obtaining an academic qualification for employment. Foreign language learning is now construed as a facilitator of globalization and a strong vehicle of fostering world peace and intercultural understanding in a world of extreme diversities. In a nutshell, if Nigerian students were exposed to the knowledge of Arabic language their chances to be part of international peace and unity are high.

This study also found that learning Arabic language requires instructional materials and relative courseware that will make the learning more effective. This agrees with the conclusion drawn by Musa (2008) that the Arabic language is facing stiff competition with English and French as first and second official languages respectively and with Hausa, Igbo, Yoruba and other indigenous languages as Nigerian Mother Tongues offered as school subjects, this according to him places Arabic within a matrix of the daunting challenges and little instructional materials as well as getting less attention from education planners. Parental misconception, religion undertone as well as students Arabic backgrounds were also identified by this study as added challenges to the effective learning of Arabic language. This finding is in accordance with the finding made by Oladosu (2012) that erroneous belief and perception of Arabic language, in some quarters, as synonymous to Islamic study hindered learning of Arabic language in our schools.

**Conclusion**

This study has reaffirmed the need for the course materials as one of the important factors that can influence the learner's motivation in learning Arabic language. Also, the learning materials and provision of necessary courseware can be used to encourage all parents to allow their wads to learn Arabic language as a foreign language rather being falsely sensitive on Islamization, since parents will have access to the detail of the contents in the courseware. Designing course materials for the teaching of Arabic language will facilitate chances for the Nigerian graduates to be employable away from Nigeria soil. Failure to come up with effective, attractive, simple and innovative learning materials by the concerned authorities (teachers and education planners inclusive), will affect the learners' level of participation and motivation, and also limited their efficiency as class teachers in various primary school as well as reducing their chances for the job opportunities.



## References

- Abdul-Raouf. M .S (2004) Arabic for specific purposes: Roots and Reality. Paper presented at the Arabic and Egyptian Culture week, Embassy of the Arab Republic Egypt Italy- Rome, from December 15<sup>th</sup>- 19<sup>th</sup> 2004.
- Dubin, F.and E.Olstain, (2000). Course design: developing programs and materials for language learning. cambridge: cambridge university press.
- Federal Ministry of Education (2012). Nigerian education research and development council. lagos- nigeria: NERDC Press.
- Federal Republic of Nigeria (2012). nigeria certificate in education minimum standard. Abuja- Nigeria: National commition for colleges of education.
- Hutchinson, T. and Waters. (1987) "English for specific purposes" Cambridge, University Press pp.16-19.
- Musa, I.A. (2008). Developing the child's communicative skills in Arabic. Nigerian Journal of Religious Education, pp.60-71.
- Oladosu, A. (2012.). Fluctuations in the Fortunes of Arabic Education in Nigeria. Inaugural Lecture, University of Ilorin, Ilorin, Nigeria, pp.49-50.
- Onisabi A. S., & Adam A. G. and Jami'u A. M. (2013).Arabic Education for Nation Building Prospects and Challenges. Paper presented during the National Conference organized by School of Education, Kaduna State College of Education, Gidan -waya, Kafachan, held between 6th -9th November, 2007.

## **A Study of Prospective Teachers' Professional Knowledge and its Practice at Secondary Level**

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Irfan Ullah\*\*\*

### **Abstract**

The study aimed to investigate the prospective teachers' professional knowledge and its practice at secondary level and to examine the impact of different factors that affect the professional knowledge and its practice. All the 210 prospective teachers (students) of B.Ed and M.Ed, programs of Northern University Nowshera constituted population of the study. A sample of 105 prospective teachers of B.Ed and M.Ed programs were randomly selected. A questionnaire was used as data collection instrument. The collected data was analyzed through Chi square. On the basis of findings it was concluded that the teachers can improve the students' academic performance by advising them to study additional text related books. It was also found that sharing of problems with teachers can solve many problems of students. So it is recommended that teachers should guide their students to study subject related books for further clarification of concepts and it is also recommended that the teachers must provide guidance and counseling to the students regarding (personal problems).The study was significant for all stakeholders in education including teachers, students, educational authorities and policy makers.

**Keywords:** Professional Knowledge, Practices, Prospective teachers

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## **Introduction**

Acquisition of professional knowledge through various teacher training programs enables teachers to teach professionally as compared to untrained teachers. During the conduction of teacher education programs, these prospective teachers try to learn different methods and techniques of instruction that help them in their teaching profession. Teacher training programs should be a model to guide them through different phases; some of which might be difficult. The knowledge that is acquired in these teacher training programs needs to be implemented and furthermore should develop appropriate skill and attitude. Teachers who are new to the profession usually face problem when they practically face educational problems (Flores, 2006). Therefore a prospective teacher needs to polish him/herself in order to handle any problem confronting him/her. Teacher's quality is directly proportionate to quality education. To bring quality in education it is highly recommended to recruit energetic, focused, visionary and highly qualified teachers. The teacher training programs should be carried out in such an environment which is supportive for academic as well as research orientation. The views of different educationists about professional knowledge vary. According to (Maijer, et. al., 1999) those teachers who are well qualified are always successful at handling different situation in the field of teaching learning. They are good just because they implement their knowledge or what they have in their minds. Similarly what teachers do is a representation of the knowledge that they have gained or learnt in their respective professional trainings.

Teacher is the agent of qualitative change and can raise the standards of education that ensure progress and prosperity of a nation (Government of Punjab, 1998). Professional knowledge makes a teacher aware of his/her subject contents and the ways through which s/he transfers the teaching contents to his pupils. The availability of professionally qualified teachers in a school can ensure best academic achievements. According to Meijer, et al (1999) "professional knowledge" is a multidimensional subject. One of the perspectives of professional knowledge is command on the subject which is a key for effective teaching, Secondly, understanding the psychology of learners during teaching. The third most important principle of teacher's professional knowledge is teaching methodology. Ernest (1989) states that in the choices of teaching methods and approaches pedagogical knowledge plays a central role and similarly this knowledge is also essential in lesson planning. According to Nadkarni (2003) a properly planned and organized method of instruction should be in the hands of a

teacher while he or she teaches. Next there is the school curriculum, general pedagogical knowledge, knowledge of context, knowledge of self and finally there is professional practice. According to Kagan (1992) the knowledge of "self" determines the very way of teacher's role in the imparting of education. The knowledge of self covers all the areas of teacher's professional practices and actions i.e. responsibilities, training and other related and necessary qualifications and skills. To sum up, teaching is a profession and teachers should be equipped with enough professional knowledge in order to make them well equipped for their job. This poses a very pertinent question that "Do the teachers agree to the statement that professional knowledge assists in improving their teaching practice."

### **Literature Review**

The aim of the literature review is to throw light and highlight work that is related to the topic of the study. In Professional knowledge teachers know the subject matter and methods i.e. the way to impart inner self to students. The main aim of teachers is not only to teach but also to know how to teach and polish manners of the learners. Like all other activities education will be fruitful if teachers' concentrate on professional knowledge and its practice. Van Es and Sherin (2008) states that if teachers get sufficient knowledge of classroom issues, they will surely be successful at analyzing the situation of classroom. Thus it is highly requisite to develop such an environment which is helpful and supportive for teacher training. To think about teaching and learning in a more deep and considerate way is a skill and in order to develop this skill there is a need to prioritize it in the courses of teacher education programs. In today's modern world of science and technology the profession of teaching has also become more systematic, logical and objective. Today's teachers must possess subject or content knowledge and teaching expertise if they really want to be effective. Their professional knowledge and particularly its application is given great importance in the field of education and along with this some other distinctive aspects of teaching are given priority in the training of teachers in Pakistan. The basic qualification of a teacher is a set of information which helps in his/her performance and practices, Birman, et al. (2000). The role of teacher's is central to education as described by Gupta, (1996). Teachers must transfer cultural heritage which includes skills, knowledge, customs, social norms, attitudes which are acquired by the society in past extensive period. They must try to develop the element of adaptability in learners as world is rapidly changing. The

effective teacher must possess the ability to motivate students for learning. Therefore, professionally equipped teachers ensure best academic achievements of students (Gupta, 1996).

Education takes place as a dual process of gaining experience and giving knowledge i.e. either we take it or give it. This process is done for the sake of learning. A teacher is a person who conveys or transfers knowledge to others. Teacher is a professional who needs to know the art of communication. Spiegel (2005), states that discussion in class has proved vital for learning. Everyone knows the significance of communication and due to this it is considered an essential element of both teaching and learning. Discussion allows us to express ourselves and explore other. The main aim of classroom discussion in class is to increase the confidence level of learners to interact or express. It is also used to entertain learners when they are bored with routine lessons or lectures. The nations which have taken major initiatives in education system have made revolutionary advances and have performed miracles in the last couple of decades. No doubt this great achievement is based on their effective education system (Ahmad, 2001). It is proved that education decides the prosperity of a country. If a country wants to survive, then it needs to have standard education system (Saeed, 2001). Iqbal (1996) stated that teaching is the management and judgment of situations in which there are shortcomings on the part of the learner who tries to overcome the shortcomings which we call learning. The role of teachers as supervisors was recommended by the UNESCO (1975). The recommendation states that teachers and administrators/management of all levels should be aware of the role they play in the educational context today. The recommendations suggest that the teachers should be aware that their roles and behavior must not be fixed. They must be adapted according to the changes taking place both in society and in education system.

Teaching is a procedure in which there is a friendly interaction between a teacher and the learner. In the process, the teacher is the learned person who conveys knowledge to a person who does not possess the knowledge. To bring improvements in education, the status of the teaching profession needs to be reformed. This should be done in order to attract respectable and highly qualified individuals to the system of education. Moreover, advance levels of professional trainings are highly inevitable if we want to bring positive changes in education. Effective teachers own their students and possess sufficient knowledge about their students. They know not only about their curricular but also about their co-curricular excellence and attachments. The teachers, who

have contacts with the family members of the students, can control the students very easily and effectively. Effective teachers have full command on their subjects. According to Ellie et al., (2012), teaching approach of a teacher that is friendly positively affects the behavior and personality of learners. It boosts the confidence level of students to face any academic challenge.

There are certain pre-requisite which have great impact on the development and professional growth of teachers. It comprises of necessary requirements for teaching, practice standards and methods of assessment. No teacher or person can claim himself or herself as complete. This is because numerous changes are taking place both in teaching and learning therefore, it is almost impossible to keep one fully updated with the current trends and needs.

Professional knowledge helps in the improvement of teaching methodologies of all those subjects which are taught by teachers. The pedagogical content knowledge and curriculum studies are the two basic components of professional studies (Shulman, 1986). This also helps in the understanding of students' psychology. The teachers get knowledge about the contents they teach to students. The teacher training programs normally covers the contents, teaching methods and teaching practices. But in the area of pedagogy a lot is to be done yet. Professionalism is a distinguishing feature of an individual in an occupation. It also means some special skills in the field of knowledge and specialization. This is the application of knowledge of an individual and on the part of a teacher this is very much necessary as it sets a climate for proper teaching and learning. According to Fishman et al, (2003) professional developmental programs will bring a positive change in the extrinsic behavior of the teachers and they will move towards a better and effective teaching model and practice. According to Buczynski and Hansen (2010) successful teachers must bring into practice their professional experiences and knowledge. Professional development of teachers must be based on ground realities and practices. Goodson (1997) say that the basic function of such development is the improvement. He further states that such programs must be research and practice based. These programs keep the teachers aware of subject matter, teaching methodologies, instructional strategies, societal changes and all the teaching practices and education. To make a teacher best or efficient it is very important that all the existing professional courses for teachers must be reconsidered in order to change the current status of teacher to a better teacher. Properly trained teacher will ensure to provide quality and

standard teaching or education which will be seen in the form of quality of education of the coming generation.

### **Objectives of the study**

- 1 To investigate the prospective teachers' professional knowledge and its practice at secondary level.
- 2 To examine the impact of different factors that affects the professional knowledge of prospective teachers and its practice.

### **Significance of the Study**

The findings of the study will be of great significance to both working teachers and prospective teachers at secondary schools in a sense to utilize professional knowledge and to make it an effective tool for achieving targets of creation of good students. The study will also be beneficial for curriculum developer bodies of teacher education in bringing positive improvement.

### **Methods and Procedure**

The study was aimed to investigate the views of prospective teachers about professional knowledge and its practice and to be aware of the worth of prospective teachers' Professional knowledge and its practice. The study was descriptive and quantitative in nature; therefore, survey design was applied in order to seek responses of participants.

### **Population**

The population of the study comprised of all the 210 male prospective teachers of B.Ed and M.Ed, classes in Northern University Nowshera.

### **Sampling**

Looking at the nature of population of the study, random sampling technique was used for selecting the sample. In this way a sample of 105 prospective teachers (the students of) B.Ed and M.Ed programs of Northern University Nowshera were randomly selected.

### **Research Design and Instrumentations**

The study was descriptive and quantitative in nature; therefore, survey design was applied in order to seek responses of participants, a questionnaire was used. The questionnaire consisting 12 items was used for getting data from prospective teachers.

### **Validity**

Before administering the questionnaire on the sample validity of the instrument was checked by the opinions of the educational and subject specialists in order to remove ambiguity of the items. Consequently, some items were found irrelevant and were replaced. Some items were rephrased to make them more understandable. Then the questionnaire was finalized in the light of suggestions given by the experts for administration.

### **Pilot Testing**

#### **Reliability**

Reliability of the research instruments was checked after pilot testing. The reliability of questionnaire was calculated by using split half method and reliability co-efficient was found to be 0.78 which was satisfactory.

### **Data Collection**

Data was collected through personal visits as the population was near to the researcher. Before distributing the questionnaire, proper permission was taken from the university administration. A total number of 105 questionnaires were distributed among prospective teachers and were collected on the same day.

### **Data analysis**

The collected data were analyzed by using chi-square. The interpretation and conclusions were drawn on the basis of support when the value found is greater than the table value ( $\chi^2 = 5.99$ ) at 0.05 level of significance and not supported, when the calculated value was found less than the table value.

### **Analysis of the responses**

Responses of the prospective teachers were analyzed through Chi-square test and results were interpreted and conclusions were drawn according to the findings of the study.



Table 1  
*Teachers' professional knowledge and its practice*

Prospective Teachers Statement	Mostly	To some extent	Not at all	$\chi^2$
Teachers apply their professional knowledge in teaching	52	51	2	46.67
Professional education is the source of change behavior	86	18	1	127.69
Teachers know the psychology of students.	38	55	12	26.78
Teachers involve their students in learning process.	57	39	9	33.58
Teachers add new information to basic contents	42	51	12	23.82
Teachers use additional material during teaching	31	52	22	13.52
Teachers suggest additional study to students.	41	48	16	16.15
Teachers involve their students in discussion	48	49	8	31.24
Teachers know individual differences of students	34	52	19	15.58
Teachers discuss class room problems with students	42	53	10	28.50
Teachers share students' problems with them.	36	49	20	12.04
Teachers' contact parents regarding the progress of students	45	44	16	15.47
Table value at 0.05	df=2	Table value=5.99		

Table 1 shows that for all the statements the calculated values were found to be greater than table value ( $\chi^2 = 5.99$ ) at 0.05 level of significance, Hence all the statements were supported.

According to the responses of the prospective teachers they should apply their professional knowledge in teaching. They opted that professional education is the source of change in behavior. They held the view that teachers should know the students psychology. The teachers agreed that they should involve their students in learning process and add new information to the basic contents. Most of the respondents agreed

that teachers should use additional material during teaching and suggest additional study to students. They agreed to the statement that they should involve their students in discussion and should be aware of students' individual differences. They responded that they should discuss and share class room problems with students. This would be helpful for the teachers in providing timely feedback to contact parents regarding the students' progress.

### **Discussion**

Regarding progress of the students the views of Sybouts (1994) are supporting the results of the researcher. Majority of the respondents were of the view that teachers applied their professional knowledge in teaching. The same idea is supported by Bridgett (2008) "the teachers apply their professional knowledge in classroom while teaching to students". The study revealed that the behavioral change of teachers while teaching in the class generated the ability of the teacher's professional knowledge. Ellie et al., (2012), has also suggested the idea of behavioral change due to professional education. Majority of the respondents expressed that the teachers know the students' psychology due to professional knowledge. The result of the study is in consistency with the Shulman (1986) views. The study identified that teachers involve their students in learning process for discussion and know about student's individual differences. The results from the data are in support of the views of Meijer et al (1999).The results of the study showed that teachers add new information to the basic contents of the lesson. The results from the data are in support of the views of Sybouts (1994).The study identified that teachers use additional material during teaching and suggest additional study to the students in class room. The results of the research are also supporting Shulman (1987).The study revealed that teachers involve their students in discussion. The results support the views of the Spiegel (2005).The study identified that teachers discuss and share class room problems with students' in order to help and assess them in their problem solving.

### **Findings and Conclusions**

Findings of this study revealed that the teachers depend on their professional knowledge in teaching therefore; the teachers must be professionally qualified and should be equipped with latest knowledge of the field. The present study shows that professional education is the source of change in behavior of the teachers therefore, professional

qualification is necessary for the teachers to change their behavior. The study identified that the teachers know the psychology of students and involve their students in learning process therefore; the teachers must be professionally qualified to be aware of the psychology of their students. The study identified that respondents were of the view that teachers add new information to basic contents, use additional material during teaching and suggest additional study to students. The present study revealed that teachers involve their students in discussion and know about students individual differences showed the application of professional knowledge and its practice. The study also illustrated that teachers discuss classroom problems and share students' problems too which leads to fruitful atmosphere of discussion for solving classroom problems and knowledge about students personal problems by sharing with them. The present study further showed that teachers contact parents regarding progress of the students showing the application of professional knowledge.

### **Recommendations**

- The study revealed that the teachers can improve the students' results by suggesting additional study to students. Therefore it is recommended that teachers should guide their students to study subject related books.
- The results of the study revealed that teachers should ensure to share students problems. It is recommended that the teachers must be trained in how to deal with students' problems.
- The study may provide a background for future researchers in the field of professional development of teachers.
- Teachers must be oriented about proper communication skills in order to appropriately deal with parents, and other stakeholder of the education system.

## References

- Ahmad, M. (2001). To investigate the Causes of Dropout at Higher Level. (Unpublished M. Phil. Education thesis), AIOU, Islamabad, Pakistan. P. 174, 185.
- Birman, B. F., Desimone, L.M, Porter, A. C., & Garet, M. S. (2000). Zsignin professional development that works. Educational Leadership.
- Buczynski, S., & Hansen, C. B. (2010). Impact of professional development on teacher practice Uncovering connection. Teacher and Teacher Education.
- Ernest, P. (1989). The knowledge, beliefs and attitudes of the Mathematics teacher: a model. *Journal of Education for Teaching*, 15, 1, pp. 13-33.
- Ellie L. Young, et al., (2012). Positive Behavior Support in Secondary School. A Division of Guilford Publications. Inc 72 Spring Street, New York NY 10012.
- Fishman, B. J., Marx, R. W., Best, S., & Tal, R. T. (2003). Linking teacher and student learning to improve professional development in systemic reform. *Teaching and Teacher*
- Flores, M. A. (2006). Being a novice teacher in two different settings: Struggles, continuities, and discontinuities. *Teachers College Record*, 108(10), 2021-2052.  
<http://dx.doi.org/10.1111/j.1467-9620.2006.00773.x>
- Goodson, I. (1997). 'Trendy theory' and teacher professionalism. In A. Hargreaves R. Evans (Eds.), *Beyond educational reform: Bringing teachers back in* (pp. 29-43). Buckingham: Open University Press.
- Government of the Punjab. (1998). *The Critical Study of Practice Teaching by Trainee Teachers in Pre-Service*. Directorate of Staff Development Lahore Pakistan. P. 157.

- Gupta, S. M. (1996). *Teacher Education in the Changing Scenario*. Parkash Brothers, Ludhiana, India. P.48.
- Iqbal. (1996). *Teacher's Training*. Institute of Policy Studies and International Institute of Islamic Thought. Islamabad, Pakistan. P. 19.
- Kagan, D. M. (1992). Proportional growth among pre-service and beginning teachers, *Review of educational research*.
- Maijer, P. C, et. al. (1999). Exploring language teachers' practical knowledge about teaching reading Comprehension. *teaching and teacher education*.
- Nadkarni, S. (2003). Instructional methods and mental models of students: An empirical investigation. *Academy of Management Learning & Education*, 2(4), 335-351.
- Saeed, M. (2001). *A Study of Principal as Instructional Supervisor*. Taleemi Zaviyay; Pakistan Education Foundation. Lahore, Pakistan. P. 73.
- Shulman, L.S. (1986). *Those who understand: knowledge growth in teaching Educational Research*.
- Spiegel, D. L. (2005). *Classroom discussion: strategies for engaging all students, building higher-level thinking skills, and strengthening reading and writing across the curriculum*. New York: Scholastic.
- UNESCO. (1975). *Report of International Conference of Education*. UNESCO Press, Janeva. P.87.
- Van Es, E. A., & Sherin, M. G. (2002). Learning to notice: Scaffolding new teachers' interpretations of classroom interactions. *Journal of Technology and Teacher Education*, 10(4), 571-596.

## **Teachers' Perception about Assessment of Handwriting among Hearing Impaired Children**

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### **Abstract**

Handwriting is considered one of the fundamental tools to assess the academic performance of students in schools. The quality of students' handwriting greatly influences their academic success. The study was designed to identify the variables to measure the quality of handwriting. Teachers completed a questionnaire that utilized a 5-point Likert Scale. The sample was comprised of 60 primary school teachers who teach children with hearing impairments. The collected data rendered results using means, frequencies, standard deviations, independent sample t-test, one-way ANOVA test and chi square through SPSS (Statistical Package for Social Sciences) 16. An analysis of variance was conducted to compare the views of quality handwriting between various institutions, which showed a significant difference in views about legibility. Furthermore, evaluation determined whether the female and male teachers of the hearing impaired students at the primary level provided equal responses on all the variables the data analyzed.

**Key Words:** Assessment, Quality of handwriting, Hearing Impairment

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## **Introduction**

Handwriting is an essential tool for communication that helps children develop cognitive and motor skills. During the pre-school and kindergarten years, children begin to understand writing is meaningful (Naidoo, Engelbrecht, Lewis, & Kekana, 2009). Many researchers have stated that learning how to write by hand is a necessary early motor exercise for other cognitive and physical skills. It helps to develop eye-hand coordination skills and boosts brain development at a greater rate among young children (Berninger, 2012; James & Gauthier, 2006). Many researchers have found that better handwriting is an indicator of higher academic achievement. Those students who took notes by hand showed good comprehension of the material and a longer attention span during the discussion (Mueller & Oppenheimer, 2018; Peverly, 2012).

Handwriting developed independently in the old civilization as well as in recent. It is the mark of culture, education, communication and equally essential for the culture of each individual in the past and present. It is the sensory experience that connects the cognitive and physiological activities for the development of fine motor skills (Levine, 2003). Handwriting is an important task used to communicate feelings and thoughts using written code. It required full participation from the students in the school activities because children spend up to half of their time in paper and pencil activities on daily basis (Kushki, Schweltnus, Ilyas, & Chau, 2011).

Handwriting is an important activity not only for school-age children but also for all age groups who belong to any kind of culture and capacity (van Drempt, McCluskey, & Lannin, 2011). Accurate formation of the letters and numerals is the key component of motor learning and handwriting practice (Asher, 2006). When the child's fine motor skills are developed with the help of cognition, this will increase their writing speed and output (Graham & Harris, 2005; Graham & Weintraub, 1996). Six handwriting elements are letter formation, slant, size, spacing, alignment and neatness (Graham, Berninger, Weintraub, & Schafer, 1998). These are common factors for all the students including the students with hearing impairments. According to the students, they may devote themselves more attentively to complete the complex task and improve written language when their handwriting becomes more automatic and fluent. Handwriting has its significance due to writing fluency and quality, and it is important for primary and intermediate students (Graham, Berninger, Abbott, Abbott, & Whitaker, 1997).

Children with hearing impairments have different accesses to sound based on their hearing level. If the access to sound is impaired, then their

access to spoken language is also affected. History has shown that students with hearing impairments have difficulty with handwriting and develop writing skills at a slower rate than their normal-hearing peers. Handwriting develops gradually from pre-speech gestures. Children acquire their language from hearing and later use it in their handwriting. The students with hearing impairments cannot do this.

This study was conducted with teachers at special schools because teachers are the best source for communicating information about their students. Teachers can easily understand the handwriting and are knowledgeable about handwriting legibility as well as the day to day development of the students' handwriting. In Pakistan, students begin learning and studying handwriting at an early school level.

The current study was designed to explore components of legibility which are important in the Pakistan schools for students with hearing impairments.. The main objective was to identify the legible components of handwriting for children who have hearing impairments. The research question was based on identifying essential components of the handwriting legibility for children with hearing impairments.

### **Methodology**

The current study was descriptive in nature and data were collected through the survey method.

### **Participants**

Sixty teachers of students with hearing impairments were selected from Lahore district using a purposive sampling technique. The age range of the students was 11 to 14 years old. All the students had severe to profound degree hearing loss. Some students had hearing aids, and some did not.

### **Instrument for Evaluation of Handwriting**

A structured questionnaire based on a 5-point Likert Scale [Excellent (5), Good (4), Average (3), Fair (2), Poor (1)] was used to collect specific information about handwriting legibility of the students with hearing impairments according to the objectives and research questions developed.

The handwriting assessment incorporated observation of technique, style and legibility of handwriting. Techniques and styles include correct and consistent pencil holding, posture while writing and the formation of the letters. Handwriting legibility involves the readability of letters, as well as spacing within and between the words. Nevertheless, quality of the writing production such as legibility, neatness, uniform size and



spacing is most commonly measured in writing activities that oppose measuring handwriting automaticity and fluency, in whole speed and accuracy (Abbott & Berninger, 1993; Tucha, Tucha, & Lange, 2008). Table 1 shows the important variables for assessing the handwriting legibility of the students with hearing impairments.

Table 1  
*Variables for Legibility of Handwriting of Students with Hearing Impairment*

No	Statements	Variables
1	Copying ability affects handwriting	Copy
2	Written letters are of acceptable size in all the directions	Dimension
3	Written letters are of consistent size	Size
4	Shapes of the words are appropriate	Shape
5	Spacing within words is adequate	Spacing
6	Writing pressure is too hard	Pressure
7	Handgrip is troublesome	Grip
8	Sitting posture during handwriting	Posture
9	Straight back and head up during the writing	Straightness
10	Words are facing suitable directions	Direction
11	Appropriate lighting in the work area	Lightening
12	Place words on the baseline	Baseline
13	Irregular letter formation	Irregularity
14	Appropriate letter formation	Formation
15	Consistency in writing quality	Consistency
16	Style of pencil grasp during handwriting	Grasp
17	Secureness the paper in one place	Paper
18	Suitable seating position during the writing	Seat

The measurement of percentage, frequencies, mean and standard deviation (SD) was used to quantify the appropriate sitting posture, hand gripping, and legible components of handwriting for students.

### **Data Collection**

Data were collected by the researchers. The researchers personally distributed the questionnaires in various schools and explained the

purpose of the study. After a week, the researchers collected the questionnaires through school administration.

### Data Analysis

Data collected from the questionnaires yielded descriptive statistics about the variables. Inferential implications were then derived and recorded. Statistical significance of the data was determined through descriptive statistics by using Statistical Package for the Social Sciences (SPSS) 16. The researchers used frequencies, mean values, standard deviation, Independent- Sample t-test, One way ANOVA and Chi Square Goodness of Fit Test for analyzing the results.

### Results and Discussion

The purpose of the study was to explore the components of handwriting legibility and teacher awareness of those components in the handwriting of students with hearing impairments. Handwriting is a writing which is done using pen and paper (Rooney, 1999). The operational definition of handwriting is writing by hand including all types of alphabetic practice, print, pre-writing exercises, and any form of pen or pencil or paper that is used to strengthen the cognitive and motor skills.

Table 2  
*Analysis of teachers' responses*

No	Variable	Excellent	Good	Average	Fair	Poor	Mean $\pm$ S. D
1	Copy	27(45.0)	33 (55.0)	0 (0.00)	0 (0.00)	0 (0.00)	4.45 $\pm$ 0.50
2	Dimension	10 (16.7)	40 (66.7)	8 (13.3)	0 (0.00)	2 (3.3)	3.93 $\pm$ 0.78
3	Size	7 (11.7)	30 (50.0)	21 (35.0)	0 (0.00)	2 (3.3)	3.67 $\pm$ 0.82
4	Shape	8 (13.3)	30 (50.0)	22 (36.7)	0 (0.00)	0 (0.00)	3.77 $\pm$ 0.67
5	Spacing	3 (5.0)	32 (53.3)	25 (41.7)	0 (0.00)	0 (0.00)	3.63 $\pm$ 0.58
6	Pressure	0 (0.00)	23 (38.3)	26 (43.3)	8 (13.3)	3 (5.0)	3.15 $\pm$ 0.84
7	Grip	2 (3.3)	22 (36.7)	29 (48.3)	6 (10.0)	1 (1.7)	3.30 $\pm$ 0.77
8	Posture	4 (6.7)	35 (58.3)	12 (20.0)	3 (5.0)	6 (10.0)	3.47 $\pm$ 1.05
9	Straightness	2 (3.3)	25 (41.7)	17 (28.3)	9 (15.0)	7 (11.7)	3.10 $\pm$ 1.09
10	Direction	9 (15.0)	29 (48.3)	16 (26.7)	0 (0.00)	6 (10.0)	3.58 $\pm$ 1.08
11	Lighting	0 (0.00)	21 (35.0)	21 (35.0)	9 (15.0)	9 (15.0)	2.90 $\pm$ 1.05
12	Baseline	6 (10.0)	21 (35.0)	28 (46.7)	3 (5.0)	2 (3.3)	3.43 $\pm$ 0.87
13	Irregularity	0 (0.00)	10 (16.7)	40 (66.7)	2 (3.3)	8 (13.3)	2.87 $\pm$ 0.85
14	Formation	0 (0.00)	20 (33.3)	35 (58.3)	4 (6.7)	1 (1.7)	3.23 $\pm$ 0.65
15	Consistency	1 (1.7)	22 (36.7)	36 (60.0)	1 (1.7)	0 (0.00)	3.38 $\pm$ 0.56
16	Grasp	3 (5.0)	25 (41.7)	22 (36.7)	10 (16.7)	0 (0.00)	3.35 $\pm$ 0.82
17	Paper	0 (0.00)	26 (43.3)	26 (43.3)	6 (10.0)	2 (3.3)	3.27 $\pm$ 0.78
18	Seat	9 (15.0)	32 (53.3)	18 (30.0)	1 (1.7)	0 (0.00)	3.82 $\pm$ 0.70

Table 2 shows all the variables were equally important for good handwriting. Copy from whiteboard has a higher mean of 4.45. The standard deviation of two variables such as straight back and feet on the floor while writing is 1.147 which is higher than the other variables. The results of this study revealed the majority of teachers agreed that legible components of handwriting have equal importance for good handwriting.

Table 3  
*Analysis of different responses on the different variable of Handwriting*

Variables	df	Chi-Square	Sig
Copy	1	0.6	p > 0.05
Dimension	3	57.87	p < 0.01
Size	3	32.93	p < 0.01
Shape	2	12.40	p < 0.05
Spacing	2	22.90	p < 0.05
Pressure	3	25.20	p < 0.01
Grip	4	53.83	p < 0.01
Posture	4	59.17	p < 0.001
Straightness	4	27.33	p < 0.001
Direction	3	20.93	p < 0.001
Lighting	3	9.60	p < 0.05
Baseline	4	46.17	p < 0.001
Irregularity	3	5.87	p < 0.001
Formation	3	49.47	p < 0.001
Consistency	3	58.8	p < 0.001
Grasp	3	21.2	p < 0.001
Paper	3	32.20	p < 0.001
Seat	3	35.33	p < 0.001

The above table indicates there is no significant difference between female and male teachers' responses on different given variables. It shows the variables are playing their role in the development of legible handwriting of the hearing impaired students.

An independent sample t-test was conducted to compare male and female responses. On average, there was no significant difference among the males (M = 69.80, SE = 5.33) compared to females (M = 64.91, SE = 1.01),  $t(58) = 1.28$ ,  $p > 0.05$  for legibility of handwriting. The results showed that gender does not have effect on the perception of the legible components of handwriting. An Analysis of Variance (ANOVA) was conducted to compare the effects of handwriting between institutions. A

statistically significant difference exists between the mean numbers of words  $F(2, 57) = 11.68, p < 0.001$ . An ANOVA was also conducted to compare the effects of handwriting on age. No statistically significant difference appeared between the mean numbers of words  $F(2, 57) = 0.03, p > 0.05$ .

The standardized loading based on the correlation matrix was used with a pattern matrix. The test of the hypothesis showed that four factors are enough for the degree of freedom. The null model objective function was 171. The objective function was 1,437. Chi square of the degree of freedom for the null model was 101. The standard function was 4.36. The root mean square of residential (RMSR) was 0.06 and df corrected root mean of the residual was 0.08. The harmonic number of observations was 60 with empirical chi square was 72.94 with a probability  $< 0.98$ . The total number of observations was 60 with Likelihood Chi Square was 214.24 with probability  $2.9e-10$ . Tucker Lewis Index of factoring reliability was 0.64, RMSEA index = 0.162 and the 9 % confidence interval was 0.112, 0.163, BIC = -199.29, Fit based upon off diagonal values = 0.07

Table 4  
*Factor Analysis of the Construct*

Variables	MR 1	MR 2	MR 3	MR 4	h2	u2	Communality
Copy	-0.26	0.35	0.62	-0.03	0.55	0.45	2.0
Dimension	0.31	0.0	0.64	0.11	.67	0.33	1.5
Size	0.32	0.04	0.82	0.10	0.86	0.14	1.3
Shape	0.16	0.29	0.48	0.17	0.49	0.51	2.2
Spacing	0.19	0.42	0.43	-0.08	0.42	0.58	2.5
Pressure	0.05	0.08	-0.03	0.87	0.80	0.20	1.0
Grip	0.74	0.10	-0.1	-0.11	0.49	0.51	1.1
Posture	0.78	-0.02	0.16	0.27	0.89	0.11	1.3
Straightness	0.50	-0.11	0.34	0.07	0.48	0.52	1.9
Direction	-0.42	-0.12	0.77	0.04	0.63	0.37	1.6
Lighting	0.54	-0.13	0.17	0.29	0.56	0.44	1.9
Baseline	0.17	-0.30	0.67	0.16	0.65	0.35	1.7
Irregularity	0.35	-0.13	-0.09	0.69	0.68	0.32	1.6
Formation	-0.24	0.29	0.29	0.26	0.33	0.67	3.9
Consistency	0.07	0.90	-0.05	0.06	0.82	0.18	1.0
Grasp	-0.31	0.24	0.10	0.65	0.59	0.41	1.8
Paper	0.06	0.51	0.02	0.26	0.41	0.59	1.5
Seat	-0.35	0.34	0.25	0.19	0.35	0.65	3.4
SS Loading	3.31	2.02	3.53	2.36			
Proportion	0.17	0.11	0.19	0.12			
Variance							

Cumulative Variance	0.36	0.59	0.19	0.48
Proportion Explained	0.29	0.18	0.31	0.21
Cumulative Proportion	0.61	1.00	0.31	0.82

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A principal component analysis was conducted on 18 items with promax rotation and four factors were seen sufficient. Factor 1 (MR 1) may be named Posturing and contained five items including Grip, Posture, Straightness, Lightening and Seat. The factor 2 (MR 2) may name Shapes as and contained 3 items i.e. Formation, Consistency and seat. The factor 3 (MR 3) may be named as Legibility and contained 7 items i.e. Copy, Dimension, Size, Shapes, Spacing, Direction and Baseline. The factor 4 (MR 4) may be named Corrections as and contained 3 items i.e. pressure, irregularity and Grasp. It is in line with the previously formed questionnaire but with its own dimensions (Graham et al., 1998; Jameel & Nabeel, 2017).

### Conclusions

The results of this study revealed that all the respondents think all three portions of the questionnaire are important for good handwriting. Findings also revealed the participants believe sitting posture, handgrip and the legibility of the components are essential for good handwriting. Handwriting legibility found that children wrote more legibly while copying than creating, and that legibility declined when children were encouraged to write quickly. The study also revealed that Positioning, Shapes, Legibility and Corrections factors are important components of handwriting legibility.

### Recommendations

Based on the results and conclusions of the study, the researchers put forth the underlying recommendations. Handwriting is an important skill in the student's life. Teachers may assign home tasks to their students in order to improve the efficacy and sense of mastery of the components of handwriting legibility. In addition, parents should give children proper

time and attention in order to improve their handwriting particularly in the actual legible components of handwriting. Furthermore, the teachers and parents should select attractive ways to enhance handwriting capabilities of the students so they can become skilled in good handwriting. Future researchers may aspire to replicate this study with a larger population.

## References

- Abbott, R. D., & Berninger, V. W. (1993). Structural equation modeling of relationships among developmental skills and writing skills in primary-and intermediate-grade writers. *Journal of Educational Psychology*, 85(3), 478-508.
- Asher, A. V. (2006). Handwriting instruction in elementary schools. *The American journal of occupational therapy*, 60(4), 461-471.
- Berninger, V. (2012). Evidence-Based, Developmentally Appropriate Writing Skills K to 5: Teaching the Orthographic Loop of Working Memory to Write Letters So Developing Writers Can Spell Words, and Express Ideas. Handwriting in the 21st century, Educational Summit.
- Graham, S., Berninger, V., Weintraub, N., & Schafer, W. (1998). Development of handwriting speed and legibility in grades 1–9. *The Journal of Educational Research*, 92(1), 42-52.
- Graham, S., Berninger, V. W., Abbott, R. D., Abbott, S. P., & Whitaker, D. (1997). Role of mechanics in composing of elementary school students: A new methodological approach. *Journal of Educational Psychology*, 89(1), 170-182.
- Graham, S., & Harris, K. R. (2005). Improving the writing performance of young struggling writers theoretical and programmatic research from the center on accelerating student learning. *The journal of special education*, 39(1), 19-33.
- Graham, S., & Weintraub, N. (1996). A review of handwriting research: Progress and prospects from 1980 to 1994. *Educational Psychology Review*, 8(1), 7-87.
- Jameel, H. T., & Nabeel, T. (2017). Effect of Visual Motor Integration Training on Legibility of Urdu Handwriting. *Pakistan Journal of Education*, 34(1), 81-94.
- James, K. H., & Gauthier, I. (2006). Letter processing automatically recruits a sensory–motor brain network. *Neuropsychologia*, 44(14), 2937-2949.

- Kushki, A., Schwellnus, H., Ilyas, F., & Chau, T. (2011). Changes in kinetics and kinematics of handwriting during a prolonged writing task in children with and without dysgraphia. *Research in developmental disabilities*, 32(3), 1058-1064.
- Levine, M. (2003). *The myth of laziness*: Simon and Schuster.
- Mueller, P. A., & Oppenheimer, D. M. (2018). "The pen is mightier than the keyboard: Advantages of longhand over laptop note taking": Corrigendum.
- Naidoo, P., Engelbrecht, A., Lewis, S., & Kekana, B. (2009). Visual-motor integration (VMI)-a predictor for handwriting in Grade 0 children. *South African Journal of Occupational Therapy*, 39(2), 18-21.
- Peverly, S. (2012). The relationship of transcription speed and other cognitive variables to note-taking and test performance. *Handwriting in the 21st Century*.
- Tucha, O., Tucha, L., & Lange, K. W. (2008). Graphonomics, automaticity and handwriting assessment. *Literacy*, 42(3), 145-155.
- van Drempt, N., McCluskey, A., & Lannin, N. A. (2011). A review of factors that influence adult handwriting performance. *Australian occupational therapy journal*, 58(5), 321-328.



## ARTICLES

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