Correlate of Pre-Service Teachers and In-Service Teachers Perceived and Prioritized Students’ Psychological Profiles for The Teaching and Evaluating Basic Science and Technology (BST)

S O Adodo

Science and Technical Education Department, Adekunle Ajasin University, Akungba Akoko, Ondo State, Nigeria.

Abstract
There are certain issues which the teachers, examiners and evaluators must address during basic science interaction. These are issues on the learners which may include learner’s background scientific knowledge of the concept to be taught, their age, personality factors, problem solving styles and attitude. These issues affect not only the student learning outcome in science and technology but possess influence on their academic endeavors. The paper examines some psychological issues of learners and educators desirability for the teaching and evaluating Science education. The paper assumes it will be skyblue clear if Science educators are able to think of and prioritise psychological paradigms that could be set as standard in the teaching, learning and evaluating Basic Science and Technology lessons. This study is purposed to examine what the pre-service and in-service science teachers prioritise as observable psychological variables in the teaching and evaluating Basic Science and Technology Education and Correlates their perception of the actual and expected psychological desirability in evaluating science education. The study will be of benefit to the educators, the students and the curriculum developers as it will provide to the educators the students’ learning style information that can improve the teaching and learning of Science at the basic level. The instrument for the study is a 20 items psychological profile of Science Education Questionnaire (PPSEQ). It was administered on 240 In-service teachers and 240 pre-service teachers. Though a significant difference was observed between the two educators prioritised desirability, personality, maturation, memory, competence, interest/attitude, motivation application, critical thinking etc were highly rated or ranked by both the IST and PST. These psychological issues which needed to be diagnosed and remediated for when they seem to be affecting student negatively were considered essential and could be set as standard for effective Science teaching and evaluation.

Keywords: educators prioritized desirability, students’ psychological profiles, basic science interaction, attitude, interest and aptitude, effective science teaching.

INTRODUCTION
Psychological issues are very fundamental to the teaching and learning outcome of students in schools. They are very congenial not only to liberal arts social and management science but necessary for scientific and technological advancements of the developing nation as the case is in Nigeria. These issues affect the students in their learning processes and their ability to comprehend and their effectiveness in verbal and non-verbal communications. This is what Swanson (1995) describes as learning style. Learning style is defined by Swanson as the cognitive, affective and physiological factors that serve as relatively stable indicators of how learners perceive, interact with and respond to the learning environment. Student’s reactions to a learning environment or instructional method are likely to be influenced by their learning style. The development of an instructional method that would provide an optimal learning experience for each student is an ideal goal. The study is reflecting on the the Onion metaphor of Curry (1983) cited by Swanson, 1995 used as a framework for understanding learning style theories in which the “layers of an onion are analogous to the different levels of a person’s characteristic or learning style. At the center are the basic personality traits, and the outer layers include information-processing, social interaction, and lastly, instructional preference. Student’s preference s at each layer becomes stronger and more stable towards the core, making it less susceptible to change in response to intervention by the instructor. This suggests that before preparing strategies or materials, instructional designers should be able to consider who the intended and appropriate learner is and so design the instruction around the individual learner and not the teacher. The need remains to identify the learners individual learning needs and consider them if the instructional strategies and the delivery methods selected are you be effective.

The development of right attitude interest and aptitude will go a long way to boost students self concept in the transfer of scientific skills and knowledge to solving the problems. As scientist believed that science is the horse the society is riding to solve their daily dynamic problems be it social, economy, psychological and environmental. It should
be noted that pre-requisites for leaning science, technology and mathematics cover not only intellectual skills but also attitudes, interests, motivation, problem-solving styles, reaction to frustrations self-concept and other personality variable. The personality variable includes individual character temperament, intellect an physique that determine his unique adjustment to his/her environment. All these traits are important determinants of classroom behavior and academic success. Some students come to the classroom with different personalities (introverts or extroverts, neurotic or psychotic, adjusted or maladjusted) which should be diagnosed by the teacher as these variables need different approach in teaching and learning. Basic study remarked that introverts preferred abstract, theoretical subjects, while extroverts chooses practical and people oriented area of study (Wankowaski, 1973)

Intelligence, Attitude and Interest
Intelligence is synonymous with aptitude which a bedrock for intellectuals and academic achievement. Intelligence which is a factor of heredity traits and environment determines to some extent on students’ performance and ability. Intelligence being complex and dynamic can increase or decrease depending on the factors associated with it and can determine intellectual development. There exist individual differences in this respect which a science teacher must take cognizance of. On attitudes, Ary (1976) claimed that ‘Attitude is the sum total of a person’s inclination toward a certain type object, institution or idea’, while Adodo (20010) provided the widest meaning of attitude as that which embraces all aspects of personality development such as individual interest, motives, values, vocational adjustment derived from vocational pursuits and other phases of one’s daily lives. These submissions could be inferred from overt behavior both verbal and non-verbal which may have its implication on the academic performance which is the sub-sequent result of learning problem of any students at any educational level. If this is the case, it depicts that Crissy as quoted by Hayefunni (1984) could be proved right in his study that “Rigid stereotyped attitudes can affect achievement in subject where flexibility of outlook (particularly science subjects) is necessary.

Attitude which is a psychological construct according to Thurstone (1982) is the sum total of individual indignations and feelings, prejudice or bias, preconceived notions, fears, threats and conviction about a specified topic. This is a serious factor affecting science and technology development skills among the students in Nigeria. The attitude of Nigerian students to science particularly at the basic class level which is generally negative describes a growing index in lack of interest and poor performance by our students (Akpan 1992). Science is termed to be difficult because of the serious thinking and exactness in reaching conclusions that characterized it. As science teacher, it is pertinent in the course of teaching science and technology to identify the student level of attitude whether low or high, so that measures could be taken to change the former.

Interest. On interest, though a personality factor is considered for use in this study as that variable which could predict the level of learning difficulty of the student in particular area of study. According to Bolarin (1988), ‘interest in more than a discipline and is the key to education successes. For this submission, Bolarin (1988) observed that, ‘at any level of graduation, learners will learn better in subjects or course if they have some degrees of likeness for such subjects or the courses’. This according to Adodo (2012) implies that learners will fail to learn or learn little if they do not like the subjects. Interests therefore at a higher stage become a subjective feeling of value which is experienced when striving. This feeling implies an end-point-on object, a reward, purpose or situation in which one is interested and for which an individual strives at. He also opined that when one is interested in a thing, one is ready to devote attention.

Thomas, in his study of the educational interest according to Bolarin (1988) found that with the ability held constant, through statistical techniques, students with educational interest have high grade point averages in specific related courses than those with low interest scores. The above therefore, is in agreement with the submission of Lavin (1965), Fraudsen and Sorenson (1968) that ‘there is a reciprocal relationship between interest and learning achievements as each reinforces the other. This then indicates that interest measure can serve as a motivating factor of attention and thus enhancing good memory to the learners. Therefore, the level of learning difficulty of students is minimized for those with good personalities, right attitudes and high level of educational interest in a particular subject. Consequently effort must be made to see that students develop the right attitude to learning and where such is hindered by the teacher or any other factors, attempt must be made for necessary adjustments.

Problem-Solving Styles
This is what the psychology referred to as cognitive style. Cognitive style is an individual typical mode of perceiving, remembering, thinking and transfer knowledge to solve immediate problem. These are individual ways of understanding problem, internalizing the problem responding to the problem with the aim of proferring laudable solution. Science students suppose to be resellers or use practical application or critical questioning and other
fundamental principles in their approach to solving problems. Some approach which suppose to be field-independent or field dependent, divergent or convergent thinking while some could employ the ineffective or impulsive approach. The attitude and ability of our science students at the basic level to tackle scientific and technological problems depend upon the dominant style being used in the students. It is important for the teachers to be aware that in preparing instructional strategies or materials, instructional designers should be able to answer the following question “who is the intended and appropriate learner? (Onwa and Monene 1986, Rothwell & Kazanas, 1998, p.81 Ideally, instruction should be designed around the individual learner and not the content or the teacher. It is not responsible to design lessons for the majority while students with specific learning needs are neglected. Rothwell and Kazanas (1998) State there are two kind of learner-centered characteristics."1 prerequisite knowledge, skills and attitudes 2 other learners-related characteristics” such as students’ demographic characteristics, physiological qualities, aptitudes, experience, learning styles attitudes and value systems. In the face-to-face environment with the students, teachers face a greater challenge in identifying these characteristics, but the need remains to identify them and consider them if the instructional strategies design and the delivery method selected are to be effective. (Busari 1996) Finally, learning style is defined by Swanson (1995) as “the cognitive, affective, and physiological factors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment” Students reactions to a learning environment or instructional method are likely to be influenced by their learning style. The development of an instructional method that would provide an optimal learning experience for each student is an ideal.

The Present Situation of Basic Science and Technology Teaching in Nigeria
Science teacher at the basic level in Nigeria hardly take into consideration this psychological issue of problem solving style when teaching basic science, hence a greater number of the students develop negative attitude towards science because teaching and evaluation procedures do not allow them to use their problem solving style effectively as most test, assessment and evaluation procedure nowadays is the objective questions techniques without a practical opportunity given.

Science teaching and evaluation procedures are expected to cover the three domains of cognitive, psychomotor and affective, however only cognitive domain is given priority by the teachers, while the two others are neglected. Also the current assessment practice emphasizes the cognitive outcomes of science only.

PROBLEM STATEMENT
In-service teachers in Nigeria due to unexplainable circumstances are not well equipped with teaching methods to consider those issues in science and technology teaching and hence science is becoming more complex and difficult, requiring rigorous mental activities, short of attitude and interest and the appropriate problem solving styles with less innovative cum initiatives for inventions. It could be observed that, the learners who suppose to use their existing knowledge to determine whether new scientific knowledge or conception is intelligible (knowing what it means, plausible believing it to be true, fruitful, finding it useful) are being denied this opportunities as most science teachers hardly take cognizance of these psychological issues when teaching science. No wonder in Nigeria, the young scientist are far away from scientific innovations and as long as this state remains, Nigerians will continue to be importers and users of technology rather than being producers of technology. As at today, Nigeria is one of the largest market for technical and technology products from China, Japan and India e.t.c

PURPOSE
It is on this note that this study is purposed to
1. Examine what the pre-service and in-service science teachers prioritize as observable psychological variables in the teaching and evaluating Basic Science and Technology Education.
2. Correlates their perception of the actual and expected psychological desirability in evaluating science education.

SIGNIFICANCE OF THE STUDY
The study will be of benefit to the educators, the students and the curriculum developers as it will provide to the educators the students’ learning style information that can improve the teaching and learning of Science at the basic level. It will also help the educators to establish optimal learning processes, a coordinated interactive pattern in the science classroom that will reflect the key aspect of learners psychological variables which would foster the acquisition learning skills, problem solving skills and social relation of the students. It will also help the Science curriculum designers, developer, and text book writers to set their priority right in all their activities for the learners.

HYPOTHESIS
The hypothesis raised for this study states that:Ho: There will be no significant difference between the prioritized actual and expected psychological profiles
METHODS
The study is a descriptive research of the survey type. The population involved all the University Pre-service science teachers and all in-service teachers in Ondo State. A total of 220 subjects was randomly selected among the PST in Science and Technical Education Department in Adekunle Ajasin University Akungba Akoko Ondo State Nigeria. Also 150 In-Service Science Teachers was randomly selected from 50 secondary schools in the state.

INSTRUMENT
The data was collected with the use of open-ended and ranked type questionnaire. The open-ended questionnaire asked these teachers to enumerate the actual psychological desirability presently considered in evaluating science education. It also asked them on what should be the psychological paradigms desirable in evaluating science education. Their responses on this open-ended questions and Barrister et al. (1994) assisted in drawing up the rank-type questionnaire titled Psychological Profile in Evaluating Science Education Questionnaire (PPESEQ). Section A sought for subjects specialty teaching level. Field of specialization and qualification. The other section B consisted of six actual Psychological variables that are presently in practice and 20 psychological profiles that should be considered in evaluating science education respectively. The PPESEQ was validated by 3 experienced science educators using Delphi technique. There was a consensus among the raters. The reliability coefficient was tested using Cronbach alpha and found to be 0.83

Administration of Instrument
The instrument was administered on the respondents and the prioritised responses were ranked by category. The spearman correlation coefficient was determined and t-test was used to test the significance of any observable difference in their prioritized profile using

RESULTS
Table 1: Relationships and Differences among IST and PST prioritized actual psychological variable in Evaluating Science Education

<table>
<thead>
<tr>
<th>S/N</th>
<th>Items</th>
<th>IST rank</th>
<th>PST rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Scientific attitudes</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>Attitude</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>Memory</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>Motivation</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Learning</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Personality</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Self-concept</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Sensation</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>Stress coping</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

Findings in table 2 reveal diverse psychological profiles that are expected to be considered in evaluating science education for fairness and justification of all categories of learners, teachers and developers. There seems to be a positive on the spearman’s rank ordering; but a low agreement with the pre-service teachers (rho =0.202). However, Significant differences exist between the rank ordering (t cal = 13.390.) and pre-service teachers (t cal = 10.2) but the differences was reduced when compared with the rank orderings of actual psychological variables. Worthy for further deliberations is the comparison of IST and PST teachers’ rank orderings. The teacher trainees listed the first ten to be Personality, Interest, Maturation, Memory, Motivation, appreciation. Language and thought, Competence, and Problem-Solving. Out of the first six orderings only competence, memory and motivation. Of the IS Science teachers ranking fall
within the **PST** ranking. The significant differences between teacher trainee and the IS science teachers and the no consensus among the two groups on ranking is also noted.

**DISCUSSION**

Table 1 shows that the in-service teachers prioritized mental ability and attitude towards science as first and second actual psychological variables considered in teaching and evaluation. This is contrary to the strong priority agreement of the pre-service science teachers \((r=-0.77)\). According to Hajsadr (2004), there are many factors contributing towards the vast diversity of students’ learning need in the classroom and that students’ level of knowledge at entering to a course is often the greatest challenge for educators. Others are the students’ individual learning ability and learning styles, the two are affected by age, students’ previous experience, students’ personalities which include basic skill proficiency, and language development .Others are students’ attentiveness and attention span which are contributing factors In Johnson (1972), a child in the process of learning will learn what interest him when he is mature for such learning. Such is the pre-requisite for good memory needs the teacher should take into consideration. He said further that to sustain students’ interest and hence learners’ attention, a judicious use of motivation should be given to the learners. These could be in form of praise, exhibition of best work and encouragement to the weaker ones. He said once interest which is one of the most important factor in learning science had been aroused in learner, it would be easy to make for constant and copious practice and with interest learner would try and try again and the effort goes on to the work. Where problem is encountered, this interest keeps the learners trying until help is available and every success made, victory is registered and more work is required for mastery learning.

According to Adodo (2006), Science should be activities oriented from the practical standpoint of making students to count, to weight, to measure, to handle, to build and mould. Thus science would become an experience rather than a subject taught abstractly. This will lead to stimulating greater interest and hence attention and higher achievement in basic Science. Alonge (2004) said that the role of intelligence tests are to aimed at assessing innate ability to grasp complex idea working in conjunction with a number of more specialized aptitudes such as memory and various verbal, mathematical, manual, mechanical and special ability that can stimulate the critical thinking ability of the learner which such learner can put into use in dealing with irrelevant situation otherwise called application of knowledge. This hinge upon some factors such as maturity, interest innate tendencies, home background, temperament which are generally put as learners, personality. These are well prioritized by the Pre-service teachers. The reason(s) for this might be as a result of the emphasis placed on some child Psychology and Developmental Psychology courses which are made compulsory by the National University Commission (NUC) to all Education students irrespective of their course of study in the Nigeria Universities Faculty of Education before they can graduate as a trained teacher. The contributions of some research work on Child Psychology that are available in journals which the new breed teachers (PST) are exposed to has gone a long way to help them judge aright in the student characteristics prioritized pattern in the classroom situation. The knowledge which the ISTs lack.

**CONCLUSION AND RECOMMENDATIONS**

The conclusion of the study is that if the evaluation pattern based on the learners-related characterististics are followed, it will help to foster teachers’ effective lesson delivery and evaluation methods. The following recommendations were therefore made:

- Efforts should be improved in the teaching and learning of science and technology by addressing these psychological issues among learners.
- There is the need for genuine efforts on the part of the government to improve the working condition of the teachers as a way of satisfying their need and dispositions which is currently affecting their level of competency and effectiveness and efficiency.
- The magnitude of these issues on individuals students vary, Science educators should be ready to cater for theses individual psychological profiles and differences among learners by putting into considerations the student’s level of maturity, intelligence, attitude, personality and cognitive style in Science curriculum design and development, text book writing and in the teaching of Science multi grade classes.
- In evaluating science education, care must be taken not to deal in illusions by assessing nominal treatments which do not exist in science education plans and practices. Attempt should be made to create valid technique for assessing general attitude, scientific attitude. Adaptation, personality, emotions, and language and thought rather than the achievement testing of knowledge and one short practical testing as overall determinant of success in science education. Exploratory and curiosity test for motivation, personality test for personality etc are possible.
The paper is re-emphasizing the fact that Nigerian teachers should be made aware of these psychological issues that have influence in the teaching, learning and evaluation of basic science and technology by organizing seminars, workshops and conferences to address these and other psychological issues in the learners and teaching strategies and techniques that will help address these profiles in the learners.

Further research should be conducted on how these highly ranked psychological profiles are inter-related in science education.

REFERENCES


Wankowsky J A (1973) Temperament, Motivation and academic achievement studies of Success and failure of a randomly sampled of students in one University of Birmingham (Birmingham).