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# Dimensions for Achievement in Biology Inventory at Higher Secondary Level -Construction and Validation

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**ABSTRACT**

The main purpose of the present study is to develop a research tool to measure the dimensions for achievement in biology. The study has been conducted to investigate the dimensions forstudents'achievement in biology of higher secondary level in Madurai District. The sample consists of 90 higher secondary level students studying 11th standard. The investigator has adopted normative survey method for the present study. The investigator used dimensions of Interest, Motivation, Attitude, School Environment, Teachers Efficiency, Class Room Environment, Study Skills, Study Habits and Future Careerin this study while constructing the tool. Data was collected by using questionnaire of 60 self-constructed tool. The tool was subjected to item analysis using t test. Test-retest (Repetition) method was used to find the reliability of the tool.The value of correlation co-efficient shows that there is high positive degree of correlation between the two tests as 0.809 and 0.868. The intrinsic validity of achievement in biology inventory is 0.809. The final tool of 43 statements on a five point rating scale based on Likert's type. This research tool would significantly contribute to the stakeholders to improve students' achievement in biology

**Keywords:**-Dimensions, Achievement in Biology Inventory,Higher Secondary Level

## INTRODUCTION

Education is an indispensable tool for the development of any nation. Teachers are theimplementers of the educational programme.They are responsible for the translation of educational theoriesinto practice in the classroom. For teaching to be effective, it has to be rooted in an understanding of how students learn. Several researches have conducted in a view of findingbetter ways of teaching and learning Biology.Biology is a mandatory subject for any science oriented course. Biology lays the foundation for the fields of forensic science, genetic engineering and medicine. Biology is a branch of science structured to equip students with the knowledge of relevant concepts and scientific skills. It develops skills such as problem-solving, communication, critical thinking and objective reasoning abilities.

Biology enables one to understand himself and his intermediate environment. The poor academic achievement of students in biology as indicated in the report of WAEC (West African Examination Council) and National Teachers Institute (NTI) as well as the result of state common entrance examination hasbeen come a persisted public outcry as regard to the falling standard of biology education. Science subjects are already facing a problem. This is mostly in the area of availability of laboratories and other teaching facilities in their right number of students studying science.

**Dinah (2013**) found that, availability of text books, laboratory apparatus and other learning resources contribute significantly to the performance of students in Biology examination. He added that, students with positive attitude towards the subject register better performance than those who had a negative attitude andthose with positive attitude are motivated to work hard, this is reflected in the good marks scored in the examination.

**Suman B. (2011)** research on influence of parents' education and parental occupation on academic achievement of students' concludes that education and occupation of parents positively influence the academic

achievement of children. Femi (2012) illustrates that education qualification of parents and health status of students are significant factors that affect the academic performance of students.

**Akinsanya et al. (2014)**revealed that parents' education has the highest significant influence on the academic achievement of students. This is because of the child from educated family has a lot of opportunities to study hard due to his/her access to internet, newspaper and television. They can also be taught with extra lessons at home.

**Memon (2010)**showed that teachers should be encouraged to assess learners regularly on practical skills. Perhaps, more practical lessons should be availed and documented, teachers should plan for them and regular inspection to insure the actual order is adhered. The problems of student's under achievement in biology have been observed by many researchers and viewed in different angles due to its diversity.

**Owino et al. (2014)** attached the problem with inadequate supply of teaching and learning resources such as chemicals, charts, apparatus, models, local specimens, laboratories, textbooks, and libraries lead to poor performance in Biology. They added that irregularities related to the teacher of Biology such as irregularity in administration of practical, class discussion, teachers not allowing students to ask questions, teachers not giving prompt feedback on assignments or exams, not making the Biology subject interesting and teachers not conducting demonstration during practical.

The above mentioned studies indicate the possible factors responsible for low academic performance of students. In order to improve student's achievement and arouse their interest, students have to be taught biology with hands on and different learning materials so as to enable them acquire the cognitive competence and professionals of biology that they need passing biology. The present study will focus on construction attitude scale for the academic achievement level in Biology and also to suggest nine dimensions to be emphasized to improve poor academic performance of Biology students.

**OBJECTIVE**

- To construct and validate the Dimensions for Achievement in Biology Inventory ofhigher secondary level students.

**DIMENSIONS FOR ACHIEVEMENT IN BIOLOGY INVENTORY**

Dimensions for Achievement in Biology Inventory for higher secondary level students has been constructed and validated by the investigator.A lot of literature on achievement in biology, test construction procedures was used for the construction of the tool. The achievement in biology inventory was constructed after having discussion with students of schools and experts in the field of education.

The test has been preferred on five point rating scale based on Likert's type. Initiallyall the statements were preferred in both Tamil and English.

The scoring procedure for the tool are the options **Strongly Disagree** is given a score 1, **Disagree**is given a score 2, **Undecided** is given a score **3**, **Agree**is given a score**4**, **Strongly Agree** is given a score **5**. The **minimum** score for the tool is **60** and **maximum** score of the tool is **300**.

**ITEM ANALYSIS**

The model/draft tool preferred by the investigator was administered on a sample of 90 highersecondary level students. The higher secondary level students were asked to mark their opinion among the given alternatives. Each statement has five alternative responses: namely Strongly Disagree, Disagree, Undecided, Agree and Strongly Agree. Scoring was done for all the statements. The minimum score would be 60 and the maximum score would be 300.

Item analysis was adopted for the final selection of statements. The total scores were calculated separately and they were arranged in the descending order. The top 25% and bottom 25% of scores alone were taken into account. The difference in means of the high and low groups for each item was tested for significance by computing the t-ratios. Items with t-value of 1.96 and above were selected for the final tool. Thus, the final tool contained 43 items; the list of items with the t-value is presented in Table-1. Split-half method was also used to find out the consistency of the test.

**Table 1: Achievement in Biology**

| S. No | Statement | t-value | Selected-S/ Not Selected-NS |
|---|---|---|---|
| 1 | I really like to study biology because it is very interesting. | 4.59 | S |
| 2 | Biology motivates me to know more on living beings. | 1.43 | **NS** |
| 3 | I positively relate myself with the biological world around me. | 1.19 | **NS** |
| 4 | I like to take up a profession related to Biology. | 4.4 | S |
| 5 | School environment helps me to explore the living world. | 4.76 | S |
| 6 | My biology classroom is well arranged with biology related charts and aids. | 4.93 | S |
| 7 | I give importance to biology projects. | 1.91 | **NS** |
| 8 | My biology teacher teaches difficult topics with lots of examples. | 4.6 | S |
| 9 | I read the biology text books before the class. | 4.79 | S |
| 10 | My attitude towards biology has helped me to appreciate nature. | 1.82 | **NS** |
| 11 | Natural world around me motivates me to learn biology. | 1.28 | **NS** |
| 12 | I enjoyed learning biology from my primary class. | 1.38 | **NS** |
| 13 | I schedule my time to study biology every day. | 4.6 | S |
| 14 | My future depends on learning biology well. | 1.69 | **NS** |
| 15 | I love to take up biology related activities in the school campus. | 4.5 | S |
| 16 | Doing biology experiments increase my memory power. | 4.73 | S |
| 17 | Biologist's life motivates me in my class room. | 4.68 | S |
| 18 | Biology teacher shows a lot of interest in the students. | 4.59 | S |
| 19 | According to me biology is of great importance to the nation's development. | 1.67 | **NS** |
| 20 | Learning biology will improve my career chances. | 4.5 | S |
| 21 | Extra-curricular activities in our school campus motivates me to safeguard nature. | 4.69 | S |
| 22 | Mind map helps me to recall and reproduce biology concepts correctly. | 4.68 | S |
| 23 | Biology teacher's positive role model motivates me to do well in biology subject. | 4.59 | S |
| 24 | Biology is very useful to humankind so I like it very much. | 4.7 | S |
| 25 | Studying in groups improve my biology learning. | 4.5 | S |
| 26 | I quickly complete the biology related assignments. | 4.6 | S |
| 27 | Positive feedback by my biology teacher encourages me. | 1.53 | **NS** |
| 28 | New discoveries in medicine increases my interest in biology. | 1.6 | **NS** |
| 29 | I feel excelling in biology will benefit the society. | 4.4 | S |

| | | | |
|---|---|---|---|
| 30 | I have healthy and safe school environment. | 4.5 | S |
| 31 | I collect biology related information from newspapers. | 4.6 | S |
| 32 | I like biology because my biology teacher is very friendly. | 4.99 | S |
| 33 | Biology motivates me to take up profession like medicine. | 4.8 | S |
| 34 | I use internet to find out the unknown facts in biology. | 4.98 | S |
| 35 | I celebrate the environmental days through school Eco club. | 1.7 | **NS** |
| 36 | Group discussion in the biology class improves my learning. | 4.69 | S |
| 37 | Innovative teaching methods are used by my biology teacher. | 4.7 | S |
| 38 | My love for people's health motivates me to study biology. | 4.98 | S |
| 39 | I review my class notes with biology text books. | 4.49 | S |
| 40 | I answer the questions at the end of each chapter. | 4.3 | S |
| 41 | My biology teacher is very knowledgeable. | 4.97 | S |
| 42 | TV programs on biology increases my interest to study. | 1.28 | **NS** |
| 43 | I explain the biology concepts with others. | 1.81 | **NS** |
| 44 | Taking up economic biology will improve my living condition. | 3.6 | S |
| 45 | Biology classroom has facility to do practical. | 4.69 | S |
| 46 | Biology teacher gives individual attention. | 4.94 | S |
| 47 | Biology interests me since its study of living beings. | 1.7 | **NS** |
| 48 | In my view biology is useful in solving problems of daily life. | 3.7 | S |
| 49 | Biology has various courses for higher studies. | 4.2 | S |
| 50 | My school environment influences me to love nature. | 4.2 | S |
| 51 | I employ drawing and diagrams to study biology. | 1.73 | **NS** |
| 52 | My biology teacher makes the subject matter very interesting to me. | 4.59 | S |
| 53 | Biology class room activity helps me to safeguard nature. | 2.37 | S |
| 54 | My school is well equipped with biology lab. | 4.38 | S |
| 55 | My parent's appreciation is a real motivation to learn biology. | 3.98 | S |
| 56 | I like biology because I can easily imagine it. | 4.59 | S |
| 57 | Study of biology inspires me to learn from nature. | 4.5 | S |
| 58 | I take down notes in the biology class. | 4.76 | S |
| 59 | I learn concepts from known to unknown. | 1.92 | **NS** |
| 60 | I will take up biology related research in the future. | 1.34 | **NS** |

**RELIABILITY**

The reliability of test can be defined as the correlation between two or more sets of scores on equivalent tests from the same group of individuals. A test score is called reliable when we have reasons for believing the score to be stable and trust worthy. Stability and trust worthiness depend upon the degree to which the score is an index of "true-ability" free from chance error.

Test-retest (Repetition) method was used to arrive at the reliability of the tool. Repetition of a test is the simplest method of determining the agreement between the two set scores; the test is given and repeated on the same group; and correlation computed between the first and second set scores. Given sufficient time between the two tests the administration results show the stability of the test scores. The value of correlation co-efficient shows that there is high positive degree of correlation between the two tests and give in Table-2.

**Table 2: Reliability Co-efficient of Achievement in Biology**

| S. No | Method of Reliability | Values |
|---|---|---|
| 1 | Test –Retest (Repetition) | 0.809 |
| 2 | Split-Half | 0.868 |

**VALIDITY**

Validity is an indispensable characteristic of measuring devices. Validity is the most important aspect of a test which can be defined as the degree to which a test is capable of measuring the achievement for which it is designed.The appropriateness, meaningfulness and usefulness of the specific inferences made from the test scores. In research, if findings are to be appropriate, meaningful and usefulness are needed to be valid.

The first essential quality of valid test is that it should be highly reliable. Besides, the content or face validity, the investigator intended to arrive intrinsic validity. Guilford (1950) defined the intrinsic validity as "the degree to which a test measures what it measures". The square root of reliability gives the intrinsic validity. Therefore, the intrinsic validity of achievement in biology inventory is 0.809.

**DESCRIPTION OF THE FINAL TOOL**

The final tool with 43 statements was prepared in both Tamil and English. The final tool has been preferred on a five point rating scale based on Likert's type.

The scoring procedure for the tool for the option **Strongly Disagree** is given a score **1**, **Disagree** is given a score **2**, **Undecided** is given a score 3, **Agree** is given a score **4**, **Strongly Agree** is given a score**5**. The **minimum** score for the tool is **43** and **maximum** score of the tool is **215**.

**Table 3: Dimensions for Achievement in Biology**

| **S. No** | **Dimension** | **Number of the Statement** | **Total** |
|---|---|---|---|
| 1 | Interest | 1, 11, 16, 37, 41 | 5 |
| 2 | Motivation | 15, 23, 27, 40, 42 | 5 |
| 3 | Attitude | 13, 19, 34, 38 | 4 |
| 4 | School Environment | 3, 8, 20, 36, 39 | 5 |
| 5 | Teachers Efficiency | 5, 22, 26, 30, 33 | 5 |
| 6 | Class Room Environment | 4, 10, 18, 25, 32 | 5 |
| 7 | Study Skills | 9, 14, 21, 29, 43 | 5 |
| 8 | Study Habits | 6, 7, 17, 24, 28 | 5 |
| 9 | Future Career | 2, 12, 31, 35 | 4 |
| | **Total number of the statements** | | **43** |

## CONCLUSION

This research tool focuses on gathering information on the achievement in biology. The dimensions of the inventory would significantly contribute to the stakeholders to improve students' performance in biology. The present research toolwill throw light on the needed criteria for the students'achievement in biology.

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