



Development and Validation of an Aptitude

Test in Science for Secondary Students

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Abstract

The study aims to develop and validate a science aptitude test for ninth-grade students. A multiple-choice test with 30 items was finalized after the pilot study. The test was administered to 130 secondary-level students, including 60 boys and 70 girls, who were randomly selected. Proper methodology and statistical techniques were used to validate the test. 'Item analysis' was done for the selection of suitable items in the desired test. 'Reliability' was calculated through the 'Kuder-Richardson Formula 20 (KR-20)' and the split-half method, yielding coefficients of 0.88 and 0.86, respectively. Content validity was assessed by expert rating and analysed using the content validity index. Intrinsic validity was also measured by using Pearson correlation techniques. Mean, Standard deviation, and Stanine norms are also set up. The study adopts an analytical approach to assess students' aptitude levels with high accuracy. A reliability coefficient of 0.88, achieved through a robust methodology, underscores the study's credibility. Furthermore, this study will help teachers, curriculum planners, and students develop a stronger aptitude for science at the secondary stage.



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Introduction

Science is a systematic knowledge gathered through observations and experimentation of facts in the physical and natural world. According to Charles Derwin (1887), "...Science consists in grouping facts so that general laws or conclusions may be drawn from them". Psychologists state that every individual is distinctive in nature. Every student has different inner potentiality. Education is the process of developing inner potential and adjusting to an ever-changing society. The educational process brings about behavioural change in a student, enabling him to succeed in life. At the secondary education stage, which begins in adolescence, students are naturally curious and creative. They always try to understand the reasons behind different natural facts. To guide students in this age group, efforts should be made to orient them towards the science stream and develop their aptitude for science. A student with proper scientific aptitude helps in deciding on a career (Rao, 2003, p. 8). Aptitude is an inner capability of a learner to achieve a number of precise knowledge, perform any mechanical work, or to become a musician, etc. Freeman (1962, p. 431) noted that aptitude tests can be used to determine an individual's potential to perform a specific activity within a limited range. The Scientific Aptitude test is used to measure a student's special ability in science to predict future career and achievements. It encourages learning through problem solving, reasoning, and higher-order thinking skills. Rao (2003, p. 8) stated that, to increase scientific aptitude, factors such as physical, social, and emotional development, as well as interests and abilities, would be considered. The current study aims to develop a science aptitude test to assess the aptitude levels of secondary school students. Thus, it helps the teacher inculcate students' aptitude for science and select an appropriate educational course. It also serves to motivate learners, classify learners, and provide proper educational and career counselling.

Review of the Literature

A systematic review of the literature is a key step in conducting any research. It helps identify appropriate gaps in the previous study and provides a framework for conducting each step of the research. The investigator intends to review the relevant literature thoroughly. Dave (1964) developed and standardized a scientific aptitude test to support in-depth analysis. The tool consisted of five dimensions: science information, scientific comprehension, mechanical comprehension, numerical ability, and spatial relations. It was applied to students at the secondary level. Ghosh (1986) measured scientific aptitude for class VIII students in West Bengal. He developed a scientific aptitude test with six dimensions: in-depth scientific facts, scientific comprehension, scientific reasoning, cause-and-effect relationships, critical thinking, and the application of scientific knowledge. The study was conducted on 620 students. Item analysis, reliability, and validity were measured for standardization. Similar works by Chandra (2007) prepared scientific aptitude among class IX students. A stratified random technique was applied to draw samples. The aptitude test consisted of 48 items across 10 sub-scales: scientific interest, ability to reason, interpretation ability, experimental bent, logical reasoning, capability to see relationships, verbal comprehension and interpretation, logical conclusion, data interpretation, and accuracy of observation. Reliability of the test was 0.74. The same line of work was carried out in Nagaland by Zeliang (2007), who developed an aptitude test and standardized it for secondary-level students. The tool consists of four sub-scales: scientific

knowledge and information, scientific reasoning and application, mechanical comprehension, and numerical ability. Stratified random sampling was used to draw 1340 responses from different strata, like rural, urban, govt., and private schools. Reliability was measured using the KR-21 method, with a value of 0.68. Another study carried out by Ahmed (2007), on the impact of aptitude and attitude in science on achievement at the secondary level in Bangalore city. A multiple-choice type 50-item scientific aptitude scale was constructed and validated. Reliability of the aptitude scale was 0.8421. The significant findings were that girls had significantly superior scientific aptitude than boys. Students from the government and private schools had the same level of aptitude. Mukhopadhyay (2011) conducted a study on Aptitude in Physics at the higher secondary level. He constructed a physics aptitude test. Stratified sampling was used to collect the sample. A total of 703 learners were selected as the sample for test standardization. The test encompasses various dimensions, including “scientific information, physics vocabulary, number series, spatial ability, formulation, verbal comprehension and interpretation, and non-verbal (mechanical interpretation) skills”. The test demonstrated high reliability, with a KR-20 coefficient of 0.88. Hashmi et al. (2012) prepared and endorsed a mathematics aptitude test for secondary learners. The tool's reliability coefficient was 0.82. Kumari and Gupta (2013) prepared an aptitude test battery in science at Meghalaya. The test battery had 210 items in four sections: reasoning, numerical ability, scientific information, and science vocabulary. Reliability was very high (0.94) using the test-retest method. Joshi and Patel (2016) developed and standardized a ‘science aptitude test’ for learners aged 12-14 in the state of Gujarat. The ‘reliability’ coefficient of the test, determined using the test-retest method, was 0.674. A significant finding was that boys and girls had the same aptitude level. Rural students had comparatively lower aptitude in science than urban students.

Recently, Pandia, Sridhar, and Kumar (2016) developed a scientific aptitude test for secondary students. The test comprised 30 items distributed across five dimensions: reasoning in science, analogy, comprehension, mathematical ability, and logical reasoning. The test's reliability coefficient was 0.874 by the Spearman-Brown method. Another significant work, conducted abroad by Osadebe and Nwabeze (2018), developed and validated aptitude tests in physics for the higher secondary level. Item analysis and reliability were measured for the Physics aptitude test. The difficulty level of the items ranged from 0.3 to 0.7, and the discriminating index ranged from 0.3 to 0.44. The reliability coefficient was very high at 0.94. Brahmbhatt and Shah (2019) made an aptitude test and validated it in Gujarat state. The test consisted of five dimensions, i.e., reasoning in science, numerical ability, analogy, and logical reasoning. Results showed that boys and girls had the same aptitude. Rural students had superior aptitude to urban students. A similar study by Patel on scientific aptitude at the secondary level was conducted in 2019. The significant findings were that boys and girls had the same level of aptitude. Urban students were superior to rural students, and high achievers were superior to low achievers in spatial ability. Lalrinpuui (2022) measured “Scientific Aptitude of Higher Secondary School Science Students in Aizawl District”. Using stratified random sampling, 325 samples were collected. The tool consisted of eight sub-scales: “experimental bent, ability to reason, ability to draw conclusion, detection of illogical conclusions, ability to interpret, scientific interest, ability to solve general problems, and accuracy of observation”. Intrinsic validity of the test was very high, above 0.9, and the reliability coefficient was 0.85. Significant findings revealed that the majority of learners had an average

aptitude level, and boys and girls did not differ significantly in aptitude. Students in government schools had a comparatively more advanced aptitude than those in private schools.

Need for the study

After an in-depth study of the literature, it was found that there is no such effective tool for measuring science aptitude among secondary learners in the West Bengal Board of Secondary Education (WBBSE) in recent times. Therefore, the researchers decided to develop and validate a science aptitude test for Class IX learners in West Bengal.

Objective

To develop and validate an aptitude test in science for students studying in class IX of WBBSE

Steps for the Development of Aptitude Test in Science (ATS)

I. Selection of Content Areas for the Test

The prime intention of the research was to measure the science aptitude of ninth-grade adolescent students. To achieve this, it was essential to develop and standardize a science aptitude test that covers the physical and biological science content outlined in the WBBSE syllabus.

II. Identification of Dimensions of ATS

The researchers identified eight dimensions from the notable research works in this area in India. These dimensions are i) Scientific Information, ii) Conceptual Understanding, iii) Ability to see Relationship, iv) Ability to see reason, v) Verbal comprehension and Interpretation, vi) Formulation, vii) Accuracy of Observation, viii) Non-verbal (mechanical) Interpretation.

III. Development of Items for Draft ATS

After identifying the various sub-tests or dimensions, items were selected from the Class IX physical and biological science syllabus accordingly. The test was designed using multiple-choice questions, each with four options and one correct answer. Expert reviews were sought to improve the draft by eliminating overly burdensome items and resolving ambiguities. The overall structure of the test was evaluated across key dimensions, and an approximate time limit was established for its completion.

IV. Try-out of the Draft ATS

A try-out is an essential step in constructing an objective test, as it helps determine the difficulty level and discriminatory power of each item. This process allows for the identification and removal of items with low discrimination or ambiguity. The main goal is to ensure the suitability of the test items and finalize the overall test structure.

a. Selection of Samples

For the try-out, a sample of 130 students, comprising both boys and girls from rural and urban areas and from Govt and private schools, was selected using the 'random sampling method'. The participants were newly promoted Class-X students from the 2019–2020 academic session. The sample included 60 boys and 70 girls.

b. Administration of the ATS for try-out

The draft aptitude test, comprising 46 items, was administered to 130 students as a trial. Students were instructed to read the guidelines provided at the top of the test booklet and complete all items. On average, it took about 60 minutes to finish the test. Feedback was collected on

language clarity and comprehension of instructions. Based on student input and observed difficulties, several items were revised to improve clarity and suitability for the last form of the ATS.

c. Evaluation procedure of the answer sheets

After administering the test, the researcher evaluated the response sheets using a pre-prepared answer key. Each correct response was awarded one mark, while incorrect or unattempted items received zero. No partial marks were given for any item.

V. Item analysis

Item analysis is a statistical process used to evaluate how effectively each item contributes to a test's overall quality. This is achieved by calculating the 'difficulty level' and 'discrimination index' for each item, allowing for the selection of the most appropriate items for the final form of this ATS. Kelley's (1939) method was used to compute these values. A higher difficulty value indicates that an item is easier, while a higher discrimination index reflects the item's effectiveness in distinguishing between high and low performers.

VI. Final Selection of the Test Items

The final selection of items for the science aptitude test was based on the item analysis. The items with moderate difficulty levels (difficulty values between 40 and 87) and discrimination indices ranging from 0.2 to 0.8 were retained, in line with the guidelines by Ebel and Frisbie (1991, p. 232), who recommended a minimum discrimination index of 0.19. Sixteen items that did not meet these criteria were removed. The finalized test comprises 8 dimensions and 30 items.

Table 1: *Difficulty Value (DV) and Discrimination Index (DI) of 30 items in the final ATS*

Item	DV	DI	Item	DV	DI
1	66.15	0.54	16	74.61	0.68
2	82.3	0.37	17	60	0.45
3	76.92	0.34	18	77.69	0.54
4	86.92	0.25	19	86.92	0.37
5	81.53	0.54	20	83.07	0.48
6	82.3	0.28	21	75.38	0.57
7	40	0.28	22	49.23	0.71
8	50	0.37	23	74.61	0.51
9	78.46	0.34	24	66.15	0.57
10	60	0.51	25	49.23	0.68
11	70	0.6	26	63.84	0.77
12	80	0.6	27	74.61	0.51
13	63.92	0.77	28	55.38	0.6
14	69.23	0.2	29	40	0.71
15	56.92	0.34	30	77.69	0.37

Table 2: *Dimension-wise test items in the final ATS*

Dimensions	Serial number of the items	Total no of test items
1) Scientific Information (D1)	1,2,3,4	4
2) Conceptual Understanding (D2)	5,6,7,8	4
3) Ability to see Relationship (D3)	9,10,11,12	4

4) Ability to see Reason (D4)	13,14,15	3
5) Verbal comprehension and Interpretation (D5)	16,17,18,19	4
6) Formulation (D6)	20,21,22	3
7) Accuracy of Observation (D7)	23,24,25,26	4
8) Non-verbal (mechanical) Interpretation (D8)	27,28,29,30	4
Total		30

VI. Reliability of the Test

A test is considered reliable if it produces consistent results across repeated administrations. To evaluate the 'reliability' of the aptitude test, both 'internal consistency' and 'split-half' reliability were calculated.

a) Internal Consistency Reliability

An effective method to assess a test's reliability is through its internal consistency. Since the items varied in difficulty and had only one correct answer each, the Kuder-Richardson Formula 20 (KR-20) was used. The resulting reliability coefficient was 0.88, indicating high reliability. According to Fraenkel & Wallen (2009), a KR-20 value of 0.70 or higher is considered acceptable, indicating strong reliability for the science aptitude test.

b) Split-half Reliability

In the split-half method, the scores from the aptitude test were divided into two parts - one consisting of odd-numbered items and the other of even-numbered items. The reliability was then calculated using the Spearman-Brown formula, yielding a coefficient of 0.86. This indicates that the science aptitude test possesses a high level of reliability.

VII. Validity of the Test

'Validity' refers to the degree to which a test effectively measures what it is designed to assess. Establishing validity is essential in the development and validation of any psychological test. In this study, the researcher ensured the validity of the science aptitude test through content validity, face validity, and intrinsic validity.

a) Content Validity

The validity of the ATS was assessed by evaluating how well each item, subtest, and the overall test aligned with the intended content areas. To ensure accuracy, expert judgment was sought. Five teacher educators specializing in physical science, biological science, and education were consulted to carefully review each item, the associated subtests, and the complete test. 'Content Validity Index' (CVI) was applied as the primary measure, following the framework proposed by Lynn (1986) and cited in Polit & Beck (2006). CVI helps to determine whether a test includes a suitable number of items to represent the construct being measured. Two forms of CVI were applied:

- 'Item-Level Content Validity Index (I-CVI)': Signifies the proportion of experts rating an item as relevant (3 or 4 on a 4-point rating scale).
- 'Scale-Level Content Validity Index (S-CVI)': Reflects the validity of the entire scale, calculated through (i) the mean expert proportion, (ii) the combined expert proportion, and (iii) the mean of all I-CVIs.

According to Polit et al. (2007), excellent content validity is indicated by I-CVI values of 0.78 or higher and an S-CVI/Ave of 0.90 or above. In the present study, the Content Validity Index was calculated using the method outlined by Patra & Guha (2018), and the detailed results are presented in Table 3.

Table 3: Ratings of Items by five specialists: Items rated only two (2) on a 2-Point Relevance Scale (Patra & Guha, 2018)

Test Items	Specialist-1	Specialist-2	Specialist-3	Specialist-4	Specialist-5	Number of unity	I-CVI
1	*	*	*	*	*	5	1
2	*	*	*	*	*	5	1
3	*	*	*	*	√	4	0.8
4	*	*	*	*	*	5	1
5	*	*	*	*	*	5	1
6	*	*	*	*	*	5	1
7	*	*	*	*	√	4	0.8
8	√	*	*	*	*	4	0.8
9	*	*	*	*	*	5	1
10	*	*	*	*	*	5	1
11	*	*	*	*	*	5	1
12	*	*	*	*	*	5	1
13	*	√	*	*	*	4	0.8
14	√	*	*	*	*	4	0.8
15	*	*	√	*	*	4	0.8
16	*	*	*	*	*	5	1
17	*	*	*	*	*	5	1
18	*	*	*	*	*	5	1
19	*	*	*	*	*	5	1
20	*	*	*	√	*	4	0.8
21	√	*	*	*	*	4	0.8
22	*	*	*	*	*	5	1
23	*	*	*	*	*	5	1
24	*	*	*	*	*	5	1
25	*	*	*	√	*	4	0.8
26	*	*	*	*	*	5	1
27	*	*	√	*	*	4	0.8
28	*	*	*	*	*	5	1
29	*	√	*	*	*	4	0.8
30	*	*	*	√	*	4	0.8
Proportion relevant	0.9	0.93	0.93	0.9	0.93	(ii) Combined proportion by 5 experts = 0.92	(iii)Mean I-CVI = 0.92
(i)Average Specialist Proportion	0.92						

Perfectly Suitable (*) = 2, Nearly Suitable (√) = 1, I-CVI = Content Validity Index for Items

The average rating provided by the five specialists (experts), reflected in the ‘Scale-Level Content Validity Index (S-CVI/Ave)’, was 0.92 (as shown in Table 3). This high score strongly supports the test's validity, indicating that the science aptitude test is both comprehensive and relevant to its intended content.

b) Intrinsic Validity

Intrinsic validity refers to the internal consistency and interrelationships among the subtests and between each subtest and the overall test. To assess this, the ‘Pearson product-moment correlation’ was used to calculate item-subtest (dimension), subtest-subtest, and subtest-total test correlations. The correlation matrices are presented in Tables 4 and 5. All ‘correlation coefficients’ were found to be significant at the 0.01 level (2-tailed), indicating that the science aptitude test possesses strong intrinsic validity.

Table 4: *Item-Subtest Correlation Coefficients of the ATS (Dimension-wise)*

Dimensions	Item numbers	Coefficient of Correlations(r) with Items respectively
D1	1,2,3,4	0.679, 0.433, 0.750, 0.631
D2	5,6,7,8	0.657, 0.535, 0.672, 0.712
D3	9,10,11,12	0.670, 0.592, 0.752, 0.709
D4	13,14,15	0.704, 0.544, 0.583
D5	16,17,18,19	0.717, 0.562, 0.665, 0.632
D6	20,21,22	0.752, 0.705, 0.776
D7	23,24,25,26	0.705, 0.729, 0.776, 0.748
D8	27,28,29,30	0.705, 0.729, 0.776, 0.748

Table 5: *Subtests (Dimensions) – Total test correlation coefficients of the ATS*

	D1	D2	D3	D4	D5	D6	D7	D8	Total
D1	-	.486**	.450**	.325**	.486**	.364**	.441**	.460**	.694**
D2	-	-	.445**	.356**	.396**	.336**	.304**	.346**	.638**
D3	-	-	-	.435**	.478**	.524**	.456**	.591**	.768**
D4	-	-	-	-	.438**	.369**	.391**	.398**	.624**
D5	-	-	-	-	-	.631**	.549**	.434**	.764**
D6	-	-	-	-	-	-	.472**	.561**	.733**
D7	-	-	-	-	-	-	-	.549**	.749**
D8	-	-	-	-	-	-	-	-	.763**
Total	-	-	-	-	-	-	-	-	-

VIII. Setting up the Norms for the ATS

The researcher proposes two types of norms for interpreting test scores. First, scores can be interpreted by the mean and SD derived from the full sample's responses. Second, Stanine norms are provided to offer a simplified scoring framework. These norms are intended to support researchers in related fields and assist school teachers in effectively identifying science aptitude among secondary school students.

These two Norms are shown in Table 6 and Table 7 below.

Table 6: *Mean, SD of the ATS (N=130)*

Test	Mean	SD
Aptitude Test in Science	20.5231	6.3931

Table 7: *Stanine Norm of the Aptitude Test in Science*

Stanine	Range of scores	No. of sample present	Level of Aptitude in Science
1	< 9	5	Low
2	9-13	13	Below Average
3	13-16	14	
4	16-19	20	Average
5	19-22	8	
6	22-25	21	
7	25-29	45	Above Average
8	29-30	2	
9	30	2	High

Discussion

The entire work was centered on the ‘development and validation’ of the ‘Aptitude Test in Science’ (ATS) for secondary-level learners. The test was developed and validated by the researchers to ensure its effectiveness in measuring science aptitude. Validity, a fundamental psychometric property, indicates the accuracy with which a tool measures what it is designed to assess.

To establish content validity, input was obtained from five teacher educators and subject matter experts. The researchers also calculated the Content Validity Index (CVI) for the test. Intrinsic validity was evaluated using the Pearson product-moment correlation method by analysing the correlations among item-subtest (dimension), subtest-subtest, and subtest-total test scores. All correlations were significant at the 0.01 level, demonstrating the test's strong intrinsic validity.

Initially, 46 items were constructed for the test. Following item analysis, 16 items were eliminated. The retained items had moderate difficulty levels (difficulty indices ranging from 40 to 87) and acceptable discrimination indices (ranging from 0.2 to 0.8), indicating their suitability in both difficulty and discrimination.

The test's reliability was assessed using the KR-20, resulting in a ‘reliability coefficient’ of 0.88. Additionally, split-half reliability was assessed at 0.86. These high reliability values indicate that the Aptitude Test in Science is a consistent and dependable tool for assessing science aptitude among secondary school students.

In conclusion, the Aptitude Test in Science (ATS) developed by the researchers exhibits robust psychometric properties. Therefore, it can serve as an effective tool for identifying secondary-level learners with potential and interest in pursuing the science stream. Additionally, the test can be used to assess learning outcomes in science. It also holds value for science educators and counsellors, enabling them to provide targeted guidance and support to students who score lower on the ATS.

References

- Ahmed, T. S. M. (2007). *Effect of scientific aptitude and scientific attitude on academic achievement of secondary school students in science*, Unpublished PhD Thesis, Karnatak University, retrieved from <http://hdl.handle.net/10603/95379>.
- Anastasi, A. & Urbina, S. (2006). *Psychological Testing (seventh edition)*. Delhi, India: Pearson Education.
- Best, J. W., Kahn, J.V., & Jha, A. K. (2018). *Research in Education (tenth edition)*. Noida, India: Pearson.
- Brahmbhatt Khushbu, N. (2019). Construction and Standardization of scientific aptitude test for SSC student of Gujarat state. *Light House E-Journal* 1(2), 22-26.
- Chandra, T. D. (2007). *Effect of concept mapping on science achievement of secondary school students as moderated by cognitive ability, problem solving and science aptitude*, Unpublished PhD thesis, Karnatak University, retrieved from <http://hdl.handle.net/10603/96331>.
- Channawar, S. N. (2018). A study of scientific aptitude among government high school students of Raipur. *IJCRT*, 6(2), 230-233.
- Creswell, J. W. (2014). *Educational Research* (5th ed.). Delhi, India: PHI Learning.
- Dave, B.M. (1964). *Construction and standardisation of scientific aptitude test*. Unpublished PhD thesis, retrieved from <http://hdl.handle.net/10603/75449>.
- Eble, R. L. & Frisbie, D. A. (1991). *Essentials of Educational Measurement* (5th ed.). New Delhi; Prentice-Hall of India.
- Fraenkel, J. R. & Wallen, N. E. (2009). *How to Design and Evaluate Research in Education* (7th ed.). New York, America: McGraw-Hill. Retrieved from https://www.academia.edu/33649219/HOW_TO_DESIGN_AND_EVALUATE_RESEARCH_IN_EDUCATION_by_Fraenkel-Wallen
- Ghosh, S. (1986). *A critical study of scientific attitude and aptitude of the students and determination of some determinants of scientific aptitude*, Unpublished PhD Thesis, University of Kalyani, retrieved from <http://hdl.handle.net/10603/241013>
- Gronlund, E. N. (1976). *Measurement and Evaluation in Psychology and Education*. New York: Macmillan Publishing Company.
- Hashmi, M. A., Zeeshan, A., Saleem, M., & Akbar, R. A. (2012). Development and validation of an aptitude test for secondary school mathematics students. *Bulletin of Education and Research*, 34(1).
- Joshi, B. S., & Patel, D. S. A. (2016). Construction and standardization of scientific aptitude test for 12+ age-group students. *International Journal for Research in Education*, 5(1), 16-22.
- Kelley, T. L. (1939). The selection of upper and lower groups for the validation of test items. *Journal of Educational Psychology*, 30(1), 17-24, Retrieved from <http://doi.org/10.1037/h0057123>
- Kumari, D. & Gupta, P.K. (2013). Effect of scientific attitude and scientific aptitude on the academic achievement in science subject of class X students in East Khasi Hills district of Meghalaya. *Unpublished PhD Thesis, North-Eastern Hill University*, retrieved from <http://hdl.handle.net/10603/194746>
- Lalrinpuui, R. (2022). A study on the scientific aptitude of higher secondary school science students in Aizawl district.

<http://14.139.116.8:8080/jspui/bitstream/123456789/1218/1/REBECK%20LALRIN%20PUII%20Edu.pdf>

- Mukhopadhyay, R. (2011). *Scientific creativity: Its relationship with study approaches, aptitude in physics, and scientific attitude*, Unpublished PhD Thesis, University of Calcutta, retrieved from <http://hdl.handle.net/10603/155125>.
- Osadebe, P. U., & Nwabeze, C. P. (2018). Construction and validation of physics aptitude test as an assessment tool for senior secondary school students. *International Journal of Assessment Tools in Education*, 5(3), 461-473.
- Pandia Vadivu, P., Sridhar, R., & Kumar, B. M. (2016). Construction and standardization of scientific aptitude test (SAT) for secondary school students-A pilot study. *International Journal of Social Sciences and Management*, 3(1), 17-21.
- Patel, A. P. (2019). A study of scientific aptitude of secondary school Students in context of certain variables. *An International Peer-Reviewed Open Access Journal of Interdisciplinary Studies*, 2(3), 420-424.
- Patra, A., & Guha, A. (2018). Content validity index: A simple but significant approach in social science research. *ACADEMICIA: An International Multidisciplinary Research Journal*, 8(3), 36-42.
- Polit, D. F., & Beck, C. T. (2006). The content validity index: are you sure you know what's being reported? Critique and recommendations. *Research in nursing & health*, 29(5), 489-497.
- Polit, D. F., Beck, C. T., & Owen, S. V. (2007). Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Research in nursing & health*, 30(4), 459-467. <http://dx.doi.org/10.1002/nur.20199>
- Rao, D. B. (2003). *Scientific attitude vis-à-vis scientific aptitude*. Discovery Publishing House.
- Singh, S., Kumar, D., Patel, A. K., & Tiwari, S. K. (2017). Stereotype threat and academic achievements in students of various social groups. *Indian Journal of Health and Wellbeing*, 8(12), 1444-1448.
- What is science? Quotes from great scientists, retrieved from <https://www.famousscientists.org/what-is-science-quotes/>
- Zeliang, L. (2007). *Construction and standardization of a scientific aptitude test for secondary school students of Nagaland*, Unpublished PhD Thesis, Nagaland University, retrieved from <http://hdl.handle.net/10603/118107>.