ISSN: 2584-0231(Online)
International Journal of Multidisciplinary Research in Arts, Science and Technology
Volume 4 | Issue 5 | May 2026
Available online at: https://ijmrast.com
DOI: https://doi.org/10.59828/ijmrast.v4i5.275

Development and Psychometric Validation of a Linguistic Intelligence Scale

Dr. C. Ashok Kumar[1], R. Kayalvizhi[2]

[1]Principal, Sakthi Institute of Teacher Education and Research Oddanchatram, Dindigul, Tamilnadu.

[1]**Email**: asoka7gi@gmail.com

[2]Assistant Professor in Pedagogy of English Sakthi College of Education for Women Oddanchatram, Dindigul, Tamilnadu

[2]**Email**: kayalraj19@gmail.com

Abstract

Howard Gardner, a psychologist, hypothesized several intelligences, including linguistic intelligence. It refers to the ability to utilize language effectively and skilfully, which includes understanding, analyzing, and communicating with words in a variety of contexts. People with linguistic intelligence excel at reading, writing, speaking, and listening. They excel in using words to articulate difficult concepts, persuade people, tell stories, and convey emotions. They may also be highly sensitive to the intricacies and subtleties of language, such as wordplay, metaphors, and symbolism. The investigator developed and standardized a linguistic intelligence scale for college students and teachers. A simple random sampling technique was employed for data collection. To determine the reliability of the scale, the Goodness of Fit Test and Cronbach's Alpha method were used. The preliminary draft of the linguistic intelligence scale consisted of 41 items. After item analysis, 36 items were retained in the final version of the scale. The reliability coefficient (Cronbach's Alpha) of the finalized scale was found to be 0.83, indicating a high level of internal consistency. Thus, the linguistic intelligence scale was found to be highly reliable and suitable for use among college students and school and college teachers.

Keywords: Psychometric Analysis; Linguistic Proficiency; Brainstorming; Logical Intelligence.

1. Theoretical Perspectives of English Grammar

Linguistic intelligence is the ability to think in words and to use language to express and appreciate complex meanings. Linguistic intelligence allows us to understand the order and meaning of words and to apply meta-linguistic skills to reflect on our use of language. Linguistic intelligence is the most widely shared human competence and is evident in poets, novelists, journalists, and effective public speakers. Young adults with this kind of intelligence enjoy writing, reading, telling stories, or doing crossword puzzles. A person with linguistic intelligence would love to discuss what he reads. He would like learning and speaking foreign languages. Linguistically clever persons are thought to be passionate readers who are particularly skilled at recalling quotes. Their language use would contain puns, rhymes, and more fancy terms. They enjoy word games and are not afraid to use fancy terms when speaking a new language. They have an equal interest in writing. Linguistic intelligence has numerous benefits. The first and most important is your capacity to communicate.

Armstrong (2009) and Hammoudi (2010) provide classroom activities for linguistic intelligence learners, including brainstorming, choral reading, debates, extemporaneous speaking, individualized reading, journal keeping, big and small-group discussions, lectures, manuals, and memorization linguistic facts, publishing (e.g., creating class newspapers), reading to the class, sharing time, storytelling, student speeches, talking books, tape recording one's words, using word processing software, word games, worksheets, and writing activities such as writing a story, poem, or drama, writing an essay, writing a

newspaper article, writing in a learning journal, making a book, interviewing, doing research at the library or on the internet, using a dictionary, and making a presentation.

It can be argued that persons who master a language have higher linguistic intelligence, whereas those who have little exposure to language have lower linguistic intelligence. In short, people with high verbal intelligence exhibit normal actions. They learn the language more effectively and perform better than others. They will also outperform others in terms of linguistic proficiency. As a result, their activities and potential careers are based on their characteristics, such as the ability to learn other languages by listening, reading, writing, and speaking to communicate, using language effectively to explain things well and persuade others; good at writing, speaking, reading, and listening; easy to remember information; enjoys word games; and uses complex sentence structure grammatically.

2. Purpose of the Present Study

According to Gardner (2011) and Armstrong (2002), intelligence is an individual difference influencing to what extent a language learner learns a second or foreign language. In learning a foreign language, especially English, the intelligence is involved. It can be inferred that intelligence plays an important role in language learning effectiveness. As one of the influencing factors in learning a foreign language, intelligence itself has developed throughout the years. In the past time, it was defined only as a single property of one's brain and was measured by IQ tests that focused on both linguistic and logical intelligence. The standard definition of intelligence based on IQ tests is quite narrow (Gardner, 2011; Hoerr, 2000). Gardner (2011) suggested a Multiple Intelligences theory, which includes nine categories of intelligence, including language intelligence. Linguistic Intelligence, one of the nine forms of intelligence, is associated with language. It is particularly described as the ability to successfully employ words in both oral and written form (Armstrong, 2009; Gardner, 2011). Teachers are among individuals with high levels of language intelligence (Armstrong, 2009). The teacher imparts the content to the students using her great language intelligence. Furthermore, they get information more easily and can plainly understand what others are saying. It may be concluded that linguistic intelligence is linked to language and is an important tool for instructors in presenting, receiving, and comprehending knowledge. To take advantage of these benefits, EFL students must have a high degree of linguistic intelligence in order to advance to professional English teaching employment. A professional English teacher is required to have good English proficiency, such as good fluency in all English skills, namely: listening, reading, writing, and speaking (Husarida, & Dollete, 2019; Marzulina, Nova, Herizal, Holandyah, Erlina, & Lestari, 2018; Mukminin, Ali, & Ashari, 2015; Mukminin, Haryanto, Sutarno, Sari, Marzulina, Hadiyanto, & Habibi, 2018; Mukminin, Masbirorotni, Noprival, Sutarno, Arif, & Maimunah, 2015). Butler (2012) supports this, stating that teachers' English abilities are acknowledged as a crucial qualification for successful English teaching. Thus, it may be argued that English teachers should have excellent linguistic intelligence, as evidenced by their knowledge of English abilities.

3. Methodology

The present study adopts a survey method for the development and validation of the linguistic intelligence Scale. This method is appropriate as it facilitates the systematic collection of data from a sample to construct, standardize, and validate the scale. The population of the study was student teachers from colleges of education. A sample of 150 respondents was selected for the study using the simple random sampling technique to ensure equal representation. The Chi-square goodness of fit test was used to determine whether each item in the scale significantly contributes to measuring linguistic intelligence. The reliability of the scale was established using Cronbach's Alpha, which measures internal consistency.

4. Construction and Validation of Attitude towards English Grammar Scale

4.1. Planning

"Test planning encompasses all of the varied operations that go into producing the tests. Not only does it involve the operation of an outline or table specifying the content or options to be covered by the test, but it must also involve careful attention to item difficulty, to types of items, to direction to the examiner, etc." (Lindquist, 1965).

Before the construction of the linguistic intelligence scale planning of the scale was done by the investigator. Objectives or purposes for constructing the scale were formulated. The different kinds of items to be taken in the scale were determined. And time duration, test size, total marks, printing, and size of letters were planned.

4.2. Preliminary Outline of the Scale

For the preliminary outline of the linguistic intelligence scale investigator consulted the literature available on linguistic intelligence. The investigator consulted the books, journals, newspapers, and other available tests. After reviewing all the material a preliminary draft of 44 items on a three-point Likert rating scale was developed by the investigator. Each item is to be answered by the respondents on a three-point scale Always, Sometimes, and Never.

4.3. Pilot Study I

A pilot study was undertaken to validate the tool being constructed.

4.3.1. Content Validity

After preparing the first draft of 44 items it was given to language and Education experts to select the items. The investigator contacted eight experts in the language. Following the feedback given by the language professional necessary modifications were made to the scale of linguistic intelligence.

According to the suggestion given by the experts, some statements were deleted and some statements were modified. So the preliminary outline of 41 items was finalized by deleting 3 items as shown in table 1. After content validation of items by the experts, 41 items were selected.

Table - 1

Preliminary draft of the Linguistic Intelligence Scale

S. No.	Statements
1	I have enjoyed reading books, magazines, or other writings very much since child.
2	I learned the meaning of voices that are new to me.
3	I find differences between words with similar meanings.
4	My friends say that I can explain different topics.
5	I write short stories, poetry, and articles.
6	I use different words when I speak or write.
7	I prefer exams or tests where I can develop my answers in writing.
8	I am good at memorizing long lists of words.
9	When I write a composition, I choose the right and precise words.
10	When I write about a topic, I think about the order in which the words should follow.
11	I can hear words in my head before I read, speak, or write them down.
12	I enjoy word games like Scrabble, Anagrams, or Password.
13	I enjoy entertaining myself or others with tongue twisters, nonsense rhymes, or puns.
14	Other people sometimes have to stop and ask me to explain the meaning of the words I use in my writing and speaking.
15	English, social studies, and history were easier for me in school than math and science.
16	My conversation includes frequent references to things that I've read or heard.
17	I've written something recently that I was particularly proud of or that earned me recognition from others.
18	I can recognize basic syntactic patterns.
19	I can recognize reduced forms of words.
20	I can distinguish word boundaries.
21	I can recognize typical word-order patterns.
22	I can guess the meaning from context.

23	I can put words together in the correct word order.
24	I use vocabulary appropriately.
25	I can recognize grammatical word classes: nouns, adjectives, etc.
26	I can detect sentence constituents, such as subjects, verbs, objects, prepositions, etc.
27	I can reconstruct and infer situations, goals, and participants.
28	I can get the main point or the most important information.
29	I can distinguish the main idea from the supporting details.
30	I can adjust reading strategies to different reading purposes, such as skimming for main ideas or studying in-depth.
31	I can use the correct forms of words. This may mean using forms that express the right tense, case, or gender.
32	I have a lot of interest in books and reading.
33	I love exaggerations, verbal abuse, meaningless songs, and two-sided words.
34	The lessons of literature and social sciences are easier for me than mathematics and science.
35	I enjoy teaching others.
36	In my dialogues, I refer to things that I have seen or heard before.
37	Most people ask about the meaning of the words.
38	I have a daily diary to record the events of my life.
39	Recently I wrote something that I am proud of.
40	Before writing, reading, or saying the words, I must remember them.
41	When talking, I tend to wave my hands and use obscenities such as facial expressions.

4.3.2. Item Validity

To establish the item validity, the modified Draft tool was administered to 150 student teachers doing their B.Ed. degree course in Colleges of Education in Dindigul district, Tamilnadu. Using the tabulated data collected from the respondents, the validity of each item has been established by subjecting the data to the Goodness of Fit Test, which is otherwise called the CHI SQUARE ONE SAMPLE TEST. It is one of the several applications of the chi-square test (Cohen Louis, 1977). Here it is used to test the null hypothesis formed for every statement in the draft tool that "the responses obtained under Always, Sometimes, and Never are not by CHOICE".

Table - 2

Goodness of Fit value of Items of the Linguistic Intelligence Scale

S. No.	Chi-square value	Remark on Ho	S. No.	Chi-square value	Remark on Ho
1	16.66	*Rejected*	**22**	35.56	*Rejected*
2	3.97	*Rejected*	**23**	11.39	*Rejected*
3	17.51	*Rejected*	**24**	20.70	*Rejected*
4	8.65	*Rejected*	**25**	24.71	*Rejected*
5	10.71	*Rejected*	**26**	14.23	*Rejected*
6	6.31	*Rejected*	**27**	18.63	*Rejected*
7	8.50	*Rejected*	**28**	7.41	*Rejected*
8	6.09	*Rejected*	**29**	9.50	*Rejected*

9	15.93	*Rejected*	**30**	9.32	*Rejected*
10	7.53	*Rejected*	**31**	21.92	*Rejected*
11	17.64	*Rejected*	**32**	**3.31**	***Accepted***
12	13.87	*Rejected*	**33**	11.07	*Rejected*
13	14.02	*Rejected*	**34**	6.28	*Rejected*
14	1490	*Rejected*	**35**	3.94	*Rejected*
15	18.48	*Rejected*	**36**	13.45	*Rejected*
16	6.32	*Rejected*	**37**	10.32	*Rejected*
17	12.01	*Rejected*	**38**	5.01	*Rejected*
18	**0.77**	***Accepted***	**39**	14.14	*Rejected*
19	8.05	*Rejected*	**40**	**1.98**	***Accepted***
20	**2.43**	***Accepted***	**41**	6.13	*Rejected*
21	7.60	*Rejected*			

3.85 Significant at 5% Level

The above table furnishes the Goodness of Fit value for each one of the 41 items and also the details about acceptance or rejection of the stated null hypothesis formed of every statement. Out of 41 statements 4 have been deleted by Goodness of Fit Test, with the retention of 37 items. So the second draft of the tool comprised 37 items only. The following are the four items deleted from the first draft.

S. No.	Statements
1	I can recognize basic syntactic patterns.
2	I can distinguish word boundaries.
3	I have a lot of interest in books and reading.
4	Before writing, reading, or saying the words, I must remember them.

4.3.3. Construct Validity

Using the tabulated data, after the deletion of four items, the Item total correlation was computed for each statement to establish the construct validity of the newly formed tool. Table 3 reveals the item total correlation for all 37 items.

Table - 3

Item- Total correlation value of Items of the Linguistic Intelligence Scale

S. No.	'γ' Value	Remark	S. No.	'γ' Value	Remark
1	.30	*Retained*	**20**	.57	*Retained*
2	**.18**	***Deleted***	**21**	.39	*Retained*
3	.43	*Retained*	**22**	.44	*Retained*
4	.34	*Retained*	**23**	.44	*Retained*
5	.46	*Retained*	**24**	.34	*Retained*
6	.30	*Retained*	**25**	.40	*Retained*
7	.34	*Retained*	**26**	.21	*Retained*
8	.28	*Retained*	**27**	.31	*Retained*
9	.34	*Retained*	**28**	.28	*Retained*

10	.31	*Retained*	**29**	.39	*Retained*
11	.46	*Retained*	**30**	.38	*Retained*
12	.40	*Retained*	**31**	.33	*Retained*
13	.30	*Retained*	**32**	.25	*Retained*
14	.45	*Retained*	**33**	.36	*Retained*
15	.54	*Retained*	**34**	.36	*Retained*
16	.35	*Retained*	**35**	.31	*Retained*
17	.37	*Retained*	**36**	.47	*Retained*
18	.31	*Retained*	**37**	.38	*Retained*
19	.37	*Retained*			

0.196 Significant value at 5% Level

From Table 3 it may be seen that 36 Statements are significantly correlated with their respective items, hence retained in the scale; whereas one statement not securing significant correlation with their items was deleted.

4.4. Pilot Study II

4.4.1. Reliability

The reliability coefficient of the tool has been established by Cronbach's Alpha method. The computed reliability coefficient of 0.83 shows that the tool is highly reliable. To verify the internal consistency of the tool with the help of Cronbach's Alpha test, the corrected item-total correlation was computed first for every statement included. Table 4.9 gives the Cronbach's alpha for each one of the 36 items when the concerned item is deleted.

Table - 4

Cronbach's Alpha value for items of the Linguistic Intelligence Scale

S. No.	Corrected Item Total Correlation	Cronbach's Alpha if the item deleted	S. No.	Corrected Item Total Correlation	Cronbach's Alpha if the item deleted
1	.23	.82	**19**	.53	.81
2	.36	.81	**20**	.33	.81
3	.27	.82	**21**	.39	.81
4	.38	.81	**22**	.39	.81
5	.23	.82	**23**	.28	.82
6	.26	.82	**24**	.35	.82
7	.20	.82	**25**	.16	.82
8	.28	.82	**26**	.24	.82
9	.23	.82	**27**	.23	.82
10	.38	.81	**28**	.34	.81
11	.33	.81	**29**	.31	.81
12	.23	.82	**30**	.26	.82
13	.39	.81	**31**	.19	.82
14	.47	.81	**32**	.30	.81
15	.26	.82	**33**	.28	.82
16	.29	.81	**34**	.23	.82

17	.25	.82	**35**	.40	.81
18	.32	.81	**36**	.30	.81

Table 4 shows that the value of Cronbach's alpha is lesser than the computed reliability coefficient of 0.83 revealing the fact that the deletion of any item will cause a sizable reduction in the reliability of the tool. Thus the internal consistency of the tool has been established.

5. The final form of the tool

Table – 5. Linguistic Intelligence Scale

Instruction: Kindly go through each one of the 36 statements given below carefully, and give your response under any one of the following – Always, Sometimes, and Never by putting a tick (√) mark.

S. No.	Statements	Always	Sometimes	Never
1	I have enjoyed reading books, magazines, or other writings very much since child.			
2	I find differences between words with similar meanings.			
3	My friends say that I can explain different topics.			
4	I write short stories, poetry, and articles.			
5	I use different words when I speak or write.			
6	I prefer exams or tests where I can develop my answers in writing.			
7	I am good at memorizing long lists of words.			
8	When I write a composition, I choose the right and precise words.			
9	When I write about a topic, I think about the order in which the words should follow.			
10	I can hear words in my head before I read, speak, or write them down.			
11	I enjoy word games like Scrabble, Anagrams, or Password.			
12	I enjoy entertaining myself or others with tongue twisters, nonsense rhymes, or puns.			
13	Other people sometimes have to stop and ask me to explain the meaning of the words I use in my writing and speaking.			
14	English, social studies, and history were easier for me in school than math and science.			
15	My conversation includes frequent references to things that I've read or heard.			
16	I've written something recently that I was particularly proud of or that earned me recognition from others.			
17	I can recognize reduced forms of words.			
18	I can recognize typical word-order patterns.			
19	I can guess the meaning from context.			
20	I can put words together in the correct word order.			

21	I use vocabulary appropriately.			
22	I can recognize grammatical word classes: nouns, adjectives, etc.			
23	I can detect sentence constituents, such as subjects, verbs, objects, prepositions, etc.			
24	I can reconstruct and infer situations, goals, and participants.			
25	I can get the main point or the most important information.			
26	I can distinguish the main idea from the supporting details.			
27	I can adjust reading strategies to different reading purposes, such as skimming for main ideas or studying in-depth.			
28	I can use the correct forms of words. This may mean using forms that express the right tense, case, or gender.			
29	I love exaggerations, verbal abuse, meaningless songs, and two-sided words.			
30	The lessons of literature and social sciences are easier for me than mathematics and science.			
31	I enjoy teaching others.			
32	In my dialogues, I refer to things that I have seen or heard before.			
33	Most people ask about the meaning of the words.			
34	I have a daily diary to record the events of my life.			
35	Recently I wrote something that I am proud of.			
36	When talking, I tend to wave my hands and use obscenities such as facial expressions.			

6. Scoring Scheme

The 36 items of the scale are in statement form. For each item, the respondent is to show his / her preference by putting a tick mark under the 3-point scale ranging from Always, Sometimes to Never. The scheme of scoring is given hereunder.

Table – 6. Scoring scheme of the Linguistic Intelligence Scale

Item No.	Nature of Statements	Score		
		Always	Sometimes	Never
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36	Positive	3	2	1

7. Conclusion

The present study successfully developed and standardized a Linguistic Intelligence Scale for college students and teachers. Linguistic intelligence plays a vital role in language learning, communication, reading, writing, listening, and speaking skills. Since language proficiency is an essential requirement for academic success and effective teaching, the development of a reliable and valid tool to measure linguistic intelligence is highly significant in the field of education.

The investigator carefully followed systematic procedures in the construction and validation of the scale. Initially, a preliminary draft consisting of 44 statements was prepared after reviewing related literature, existing scales, books, journals, and expert opinions. Through content validation by language and educational experts, unsuitable and ambiguous items were removed or modified, resulting in 41 items in the preliminary form of the scale. The tool was then administered to a sample of 100 student teachers for pilot testing.

The validity of the items was established through the Goodness of Fit Test (Chi-Square One Sample Test)**.** Based on the obtained values, four items that failed to meet the required significance level were deleted. Further, construct validity was established using item-total correlation analysis, which resulted in the deletion of one additional item. Finally, 36 well-structured and significant items were retained in the Linguistic Intelligence Scale.

The reliability of the scale was determined using Cronbach's Alpha method. The obtained reliability coefficient of 0.83 indicates a high level of internal consistency and confirms that the scale is highly reliable. The corrected item-total correlation and Cronbach's alpha values further revealed that each item contributes meaningfully to the overall consistency of the scale. Hence, the finalized Linguistic Intelligence Scale can be considered both valid and reliable for measuring linguistic intelligence among college students and teachers.

The developed scale will be highly useful for researchers, teacher educators, psychologists, and educational institutions to assess the linguistic abilities of learners and teachers. It may also help in identifying strengths and weaknesses related to language usage, communication skills, vocabulary, comprehension, and grammatical understanding. Furthermore, the scale can support future research studies related to language learning, teaching competency, communication skills, multiple intelligences, and academic achievement.

Thus, the investigator concludes that the Linguistic Intelligence Scale developed in the present study is a scientifically standardized tool with satisfactory psychometric properties and can effectively be used for educational and research purposes.

Reference

[1]. Anastasi, A., & Urbina, S. (1997). Psychological testing (7th Ed.). Prentice Hall.

[2]. Armstrong, M. (2009) Armstrong's Handbook of Human Resource Management Practice. 11th Edition, Kogan Page Limited, London.

[3]. Armstrong, T. (2002). Multiple intelligences in the classroom (3rd Ed.). Alexandria, VA: ASCD.

[4]. Best, J. W., & Kahn, J. V. (2006). Research in education (10th Ed.). Pearson.

[5]. Cohen, L. (1977) Educational Research in Classrooms and Schools: A Manual of Materials and Methods. London: Harper & Row.

[6]. Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. Psychometrika, 16(3), 297–334.

[7]. DeVellis, R. F. (2016). Scale development: Theory and applications (4th Ed.). Sage Publications.

[8]. Field, A. (2018). Discovering statistics using IBM SPSS statistics (5th Ed.). Sage Publications.

[9]. Gardner, H. (2011). Frames of mind: the theory of multiple intelligences (10thed). New York, NY: Basic Books.

[10]. Garrett, H. E. (2008). Statistics in psychology and education. Surjeet Publications.

[11]. Hammoudi, A. (2010). Multiple intelligences and teaching English as a foreign language, the case of second-year pupils at Malika gaid secondary school Setif (Master's thesis). Ferhat Abbes Unversity, Setif, Algeria.

[12]. Hoerr, T. R. (2000). Becoming a multiple intelligences school. Alexandria, VA: ASCD.

[13]. Husarida, H., & Dollete, R. (2019). Perceived Effectiveness on the Use of English Language in Teaching Mathematics and Science. Indonesian Research Journal in Education |IRJE|, 3(1), 177-198. https://doi.org/10.22437/irje.v3i1.6961

[14]. Kline, P. (2015). A handbook of test construction (psychology revivals): Introduction to psychometric design. Routledge.

[15]. Lindquist, J. H. (1965). An occupational analysis of local politics: Syracuse, New York, 1880-1959. Sociology & Social Research, 49(3), 343–354.

[16]. Mangal, S. K. (2013). Statistics in psychology and education (2nd Ed.). PHI Learning.

[17]. Marzulina, L., Nova, L. P., Herizal., Holandyah, M., Erlina, D., & Lestari, I. T. (2018). Looking at the link between parents' educational backgrounds and students' English achievement. Indonesian Research Journal in Education |IRJE|, 3(1), 57-76. https://doi.org/10.22437/irje.v3i1.6507

[18]. Mukminin, A., Ali, R. M., & Ashari, M. J. (2015). Voices from within: Student teachers' experiences in English academic writing socialization at one Indonesian teacher training program. The Qualitative Report, 20(9), 1394-1407.

[19]. Mukminin, A., Haryanto, E., Sutarno, Sari, S, R., Marzulina, L., Hadiyanto., & Habibi, A. (2018) Bilingual education policy and Indonesian students' learning strategies. İlköğretim Online, 17(3), 1204-1223.

[20]. Mukminin, A., Masbirorotni, M., Noprival, N., Sutarno, S., Arif, N., & Maimunah, M. (2015). EFL speaking anxiety among senior high school students and policy recommendations. Journal of Education and Learning, 9(3), 217-225.

[21]. Nunnally, J. C., & Bernstein, I. H. (1994). Psychometric theory (3rd Ed.). McGraw-Hill.

[22]. Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. Research in Science Education, 48(6), 1273–1296.

Cite this Article:

Kumar, C. A.; Kayalvizhi, R. (2026). Development and psychometric validation of a linguistic intelligence scale. International Journal of Multidisciplinary Research in Arts, Science and Technology (IJMRAST), 4(5), 52–61.

Journal URL: *https://ijmrast.com/* ***DOI:*** *https://doi.org/10.59828/ijmrast.v4i5.275*