



Enhancement in the Analytical Thinking Skills of Secondary School Students through Discourse Construction in English

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ABSTRACT

Analytical thinking skill is a higher order thinking skill and had become high demands of human resources in the 21st century. In the present study the investigator aims to enhance the analytical thinking skills of secondary school students through discourse construction in English. The study was conducted through single group pretest posttest experimental design in a sample of 50 secondary school students of Kerala, India. Data was analysed with descriptive statistics along with Paired t -test. The results of the present study reveals that discourse construction in English was effective for enhancing analytical thinking skill and its components namely; matching, differentiating, attributing, categorising and organising of secondary school students. The different discourses selected for the preparation of modules on discourse construction gave due weightage for each of these component skills of analytical thinking. The findings reveal that the experimentation has resulted in high achievement in the component of attributing followed by organising. This shows that the discourses chosen and the process of discourse construction was most effective for enhancing the components attributing and organising of analytical thinking skill than the other components.

Introduction



The Greeks are generally regarded as the earliest teachers of thinking (Mc Gregor ,2010). From an educational perspective, there are many diverse views about what constitutes thinking. Thinking is defined in many ways by various educators. Dewey (1933) defines it as a sense of thoughts that originates from some perplexity, confusion or doubt. With regard to the role of schools in thinking, Dewey says that all which the school can or need do for pupils is to develop their ability to think. Bloom (1956) have extensively categorized cognitive abilities.

Analytical thinking skill is higher-order thinking skill (Permana et al., 2019), and become high demands of human resources in the 21st century. Analytical thinking skill triggers student ability to solve the problems of their daily lives (Schumacher & Ifenthaler, 2018). Furthermore, it is crucial to improve the students' analytical thinking skills; to understand information comprehensively and be able to associate between components (Brookhart, 2010; Yilmaz & Saribay, 2017), and to explain problems into smaller pieces and understand the interrelationships between these components (Yulina et al., 2019). It is a part of the problem-solving process which is considered essential for providing the skills required to prepare children for a more complex life and work environment in 21st century (Thaneerananon, Triampo, & Nokkaew, 2016). As economic and technological changes shape the occupational outlook of today's students, schools and colleges have begun to embrace the need of higher order thinking (Mainali,2012) in the pedagogical process. Analytical thinking involves a further element of inquiry and situations with less well-defined parameters and outcomes and is necessary when an ambiguous situation requires the learner to identify or create a problem to solve (Robbins, 2011). Analytical thinking skill is very necessary to be used in working as well as daily life in the 21st century by students (Paziotopoulos & Kroll, 2004).

Components of analytical thinking skills are differentiating, attributing, and organising (Anderson, 2001). According to Marzano and Kendall (2008), there are five components of analytical thinking, namely matching, classifying, analysing error, generalizing, and detailing. In the present study the components of analytical thinking skill as proposed by Anderson, and Marzano and Kendall are considered for developing the tool for measuring analytical thinking skills of school students. Components of Analytical thinking skill as derived by the investigator for the present study consists of matching, differentiating, attributing, categorising and organising. These components were used by investigator for developing the research tool, the Test of Analytical Thinking Skill.

A study conducted in Indonesia among grade XI students reveals that the measurement of all aspects in analytical thinking ability is low with the percentage of 30.67%. This result indicates that the teacher has not fully optimized the students' analytical thinking ability in the learning process (Irwanto, Eli Rohaeti,



Endang Widjajanti, *et al*, 2017). Researchers recommend that lecturers should promote the importance of student's analytical thinking skills in facing the challenges of the 21st century (Suyatman, Saputro, S., Sunarno, W., & Sukarmin, 2021). The scientific argumentation levels and analytical thinking skill of the university students in Indonesia are rather low. To enhance these skills, teachers can use alternative teaching strategies in the classroom (Perdana, Jumadi & Rosana, 2019). The results of research conducted among std.X1 students in Indonesia showed that the analytical thinking skills of students are relatively low. Based on this research, it is suggested that the students need practice to answer analytical questions or teacher efforts are needed for using the right strategies that can foster students' analytical thinking skills (Prawita, Prayitno and & Sugiyarto, 2019). The higher secondary school students of Kerala studying commerce and science as subjects of specialisation differ significantly in the analytical thinking skill in all of its component skills. In all of the component skills the science students were found to be better than the commerce students (Varghese & Bindu, 2022).

The above research studies reveals that the analytical thinking skills of the students at secondary level varies and the teachers have to use appropriate teaching strategies in classroom to enhance these skills in the learners.

Studies have been conducted rarely on the potential of various discourses in developing higher order thinking skills. After making a thorough study of various discourses, the investigator selected twelve discourses that are suitable for developing the analytical thinking skill and its component skills. A discourse is a mode of communicating certain ideas meaningfully in a particular context (Rao et.al., 2022). Discourse constructions are idiomatic constructions with fixed and variable elements where the fixed elements capture relational meaning grounded in high-level cognitive models. (Ruiz de Mendoza & Maira, 2014).

In the present study, for discourse construction in English, the investigator selected both spoken and written discourses suitable for secondary school students namely; interview, debate, conversation, poster, brochure, live reporting, panel discussion, weather report, news report, speech, dairy and tourist information notice. In order to ensure the active participation of the learners to construct the various discourses the researcher provided necessary inputs like appropriate reading text and other learning materials based on adequate and relevant themes. The learners were also provided with proper facilitation and timely scaffolding during the various stages of discourse construction. These inputs given at the time of construction of discourses leads to the deeper comprehension of ideas and opinions through the different level of interaction and allows them to develop higher-order thinking skills. Discourses permit



the contextualization of language which paves way for the easy flow of thoughts, ideas and opinions. The learners engaging actively in the various stages of constructing each discourse using the given inputs is termed as discourse construction.

Objective of the Study

To find out whether there is a significant enhancement in the analytical thinking skill and its components namely; matching, differentiating, attributing, categorising and organising of secondary school students through the construction of various discourses in English.

Hypothesis of the Study

There exists a significant enhancement in the analytical thinking skill and its components namely; matching, differentiating, attributing, categorising and organising of secondary school students through the construction of various discourses in English.

Method

Experimental method was adopted for the present study.

Experimental design

Single group pretest posttest design is used for the present study.

Research instruments and materials to be used for the study

1. Modules on discourse construction developed by the researcher
2. Test of Analytical Thinking Skill developed by the researcher.

Procedure adopted for the study

For conducting the experimental study 50 students of secondary school from the state of Kerala were selected through cluster sampling. For testing the analytical thinking skill, Test of Analytical Thinking Skill was prepared and standardised by the researcher. Twelve modules of discourse construction in English prepared by the researcher were validated by the experts and practitioners in the field of education. Test of Analytical Thinking Skill was administered as pre-test to this group. Followed by the pretest, the selected experimental group was instructed with the modules of discourse construction prepared by the researcher for enhancing analytical thinking skill. After completing the transaction of



twelve modules, Test of Analytical Thinking Skill was administered as post-test to this group. The difference in the score obtained in the pre-tests and post-tests were analysed using paired t-test.

Statistical techniques

Descriptive Statistics: Mean, Standard Deviation

Inferential Statistics: Paired t -test

Analysis of Data and Results of the Study

1.Comparison of means of analytical thinking skill of experimental group before and after experimentation

Before and after experimentation, the investigator collected data on analytical thinking skill and its components namely; matching, differentiating, attributing, categorizing, organising of secondary school students belonging to the experimental group. The mean pretest and post test scores of each of the variables under study: analytical thinking skill and its components namely; matching, differentiating, attributing, categorizing, organising of secondary school students were compared using test of significance of difference between means of two dependent groups in order to check the effectiveness of discourse construction in English for enhancing analytical thinking skill and its components. The data and results are presented in Table 1.

Table 1

Number (N), Mean (M), Standard Deviation (SD), t-value of pretest and post -test scores on analytical thinking skill of secondary school students in the experimental group

| | N | M | SD | r | t-value | Level of significance |
|----------|----|-------|------|------|---------|-----------------------|
| Pretest | 50 | 14.38 | 6.89 | 0.72 | 9.22 | 0.01 |
| Posttest | 50 | 21.4 | 7.53 | | | |

Table 1 shows the comparison of mean of pretest and posttest scores of analytical thinking skill in the experimental group. It is seen that the calculated t-value($t=9.22$) is greater than the table t-value 2.58 at 0.01level of significance. Hence it is significant at 0.01 level. The mean of posttest score ($M=21.4$) of experimental group is greater than the mean of pretest score ($M=14.38$) of experimental group. It shows that there is enhancement in analytical thinking skill through discourse construction in English.



2. Comparison of means of analytical thinking skill: matching of experimental group before and after experimentation

The mean pretest and post test scores of each of the variable analytical thinking skill: matching of secondary school students were compared using test of significance of difference between means of two dependent groups in order to check the effectiveness of discourse construction in English for enhancing analytical thinking skill: matching. The data and results are presented in Table 2.

Table 2

Number(N), Mean (M), Standard Deviation (SD), t-value of pretest and posttest scores of the component matching of analytical thinking skill in the experimental group

| | N | M | SD | r | t-value | Level of significance |
|----------|----|------|------|------|---------|-----------------------|
| Pretest | 50 | 3.54 | 1.92 | 0.71 | 4.94 | 0.01 |
| Posttest | 50 | 4.52 | 1.99 | | | |

Table 2 shows the comparison of mean of pretest and posttest scores of the component skill namely matching in the experimental group. It is seen that the calculated t-value ($t=4.94$) is greater than the table t-value 2.58 at 0.01 level of significance. Hence it is significant at 0.01 level. The mean of posttest score ($M=4.52$) of experimental group is greater than the mean of pretest score ($M=3.54$) of experimental group. It shows that there is enhancement in the component skill namely matching through discourse construction in English.

3. Comparison of means of analytical thinking skill: differentiating of experimental group before and after experimentation

The mean pretest and post test scores of each of the variable analytical thinking skill: differentiating of secondary school students were compared using test of significance of difference between means of two dependent groups in order to check the effectiveness of discourse construction in English for enhancing analytical thinking skill: differentiating. The data and results are presented in Table 3.

Table 3

Number (N), Mean (M), Standard Deviation (SD), t-value of pretest and posttest scores of the component differentiating of analytical thinking skill in the experimental group



| | N | M | SD | r | t-value | Level of significance |
|----------|----|------|------|------|---------|-----------------------|
| Pretest | 50 | 2.22 | 1.53 | 0.63 | 6.4 | 0.01 |
| Posttest | 50 | 3.42 | 1.54 | | | |

Table 3 shows the comparison of mean of pretest and posttest scores of the component skill namely differentiating in the experimental group. It is seen that the calculated t-value ($t=6.4$) is greater than the table t- value 2.58 at 0.01level of significance. Hence it is significant at 0.01 level. The mean of posttest score ($M=3.42$) of experimental group is greater than the mean of pretest score ($M=2.22$) of experimental group. It shows that there is enhancement in the component skill namely differentiating through discourse construction in English.

4. Comparison of means of analytical thinking skill: attributing of experimental group before and after experimentation

The mean pretest and post test scores of each of the variable analytical thinking skill: attributing of secondary school students was compared using test of significance of difference between means of two dependent groups in order to check the effectiveness of discourse construction in English for enhancing analytical thinking skill: attributing. The data and results are presented in Table 4.

Table 4

Number(N), Mean (M), Standard Deviation (SD), t-value of pretest and posttest scores of the component attributing of analytical thinking skill in the experimental group

| | N | M | SD | r | t-value | Level of significance |
|----------|----|------|------|------|---------|-----------------------|
| Pretest | 50 | 2.92 | 2.12 | 0.64 | 6.3 | 0.01 |
| Posttest | 50 | 4.56 | 2.13 | | | |

Table 4 shows the comparison of mean of pretest and posttest scores of the component skill namely attributing in the experimental group. It is seen that the calculated t-value ($t=6.3$) is greater than the table t- value 2.58 at 0.01level of significance. Hence it is significant at 0.01 level. The mean of posttest score ($M=4.56$) of experimental group is greater than the mean of pretest score ($M=2.92$) of experimental group. It shows that there is enhancement in the component skill namely attributing through discourse construction in English.



5. Comparison of means of analytical thinking skill: categorising of experimental group before and after experimentation

The mean pretest and post test scores of each of the variable analytical thinking skill: categorising of secondary school students was compared using test of significance of difference between means of two dependent groups in order to check the effectiveness of discourse construction in English for enhancing analytical thinking skill: categorising. The data and results are presented in Table 5.

Table 5

Number(N), Mean (M), Standard Deviation (SD), t-value of pretest and posttest scores of the component categorizing of analytical thinking skill in the experimental group

| | N | M | SD | r | t-value | Level of significance |
|----------|----|------|------|-----|---------|-----------------------|
| Pretest | 50 | 2.78 | 1.76 | .63 | 6.79 | 0.01 |
| Posttest | 50 | 4.22 | 1.73 | | | |

Table 5 shows the comparison of mean of pretest and posttest scores of the component skill namely categorizing in the experimental group. It is seen that the calculated t-value ($t=6.79$) is greater than the table t- value 2.58 at 0.01level of significance. Hence it is significant at 0.01 level. The mean of posttest score ($M=4.22$) of experimental group is greater than the mean of pretest score ($M=2.78$) of experimental group. It shows that there is enhancement in the component skill namely categorizing through discourse construction in English.

6. Comparison of means of analytical thinking skill: organising of experimental group before and after experimentation

The mean pretest and post test scores of each of the variable analytical thinking skill: organising of secondary school students were compared using test of significance of difference between means of two dependent groups in order to check the effectiveness of discourse construction in English for enhancing analytical thinking skill: organising. The data and results are presented in Table 6.

Table 6

Number(N), Mean (M), Standard Deviation (SD), t-value of pretest and posttest scores of the component organising of analytical thinking skill in the experimental group

| | N | M | SD | r | t-value | Level of significance |
|----------|----|------|------|-----|---------|-----------------------|
| Pretest | 50 | 2.94 | 1.82 | .54 | 6.26 | 0.01 |
| Posttest | 50 | 4.54 | 1.94 | | | |

Table 6 shows the comparison of mean of pretest and posttest scores of the component skill namely organising in the experimental group. It is seen that the calculated t-value ($t=6.26$) is greater than the table t-value 2.58 at 0.01 level of significance. The mean of posttest score ($M=4.54$) of experimental group is greater than the mean of pretest score ($M=2.94$) of experimental group. It shows that there is enhancement in the component skill organising namely through discourse construction in English.

Discussion of Results

The results of the present study reveals that discourse construction in English was effective for enhancing analytical thinking skill and its components namely; matching, differentiating, attributing, categorising and organising of secondary school students. Hence the formulated hypothesis is accepted.

Figure 1 shows the difference in the mean scores of analytical thinking skill before and after experimentation. Figure 2 shows the difference in the mean scores of the component skills of analytical thinking skill namely; matching, differentiating, attributing, categorising and organising before and after experimentation.

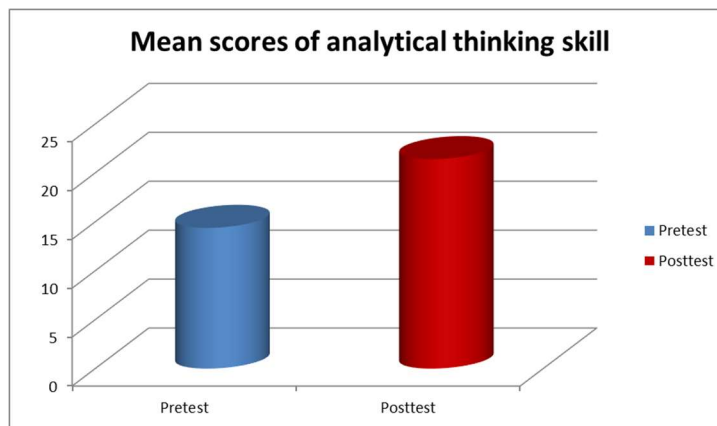


Figure 1: Pretest and posttest mean scores of analytical thinking skill

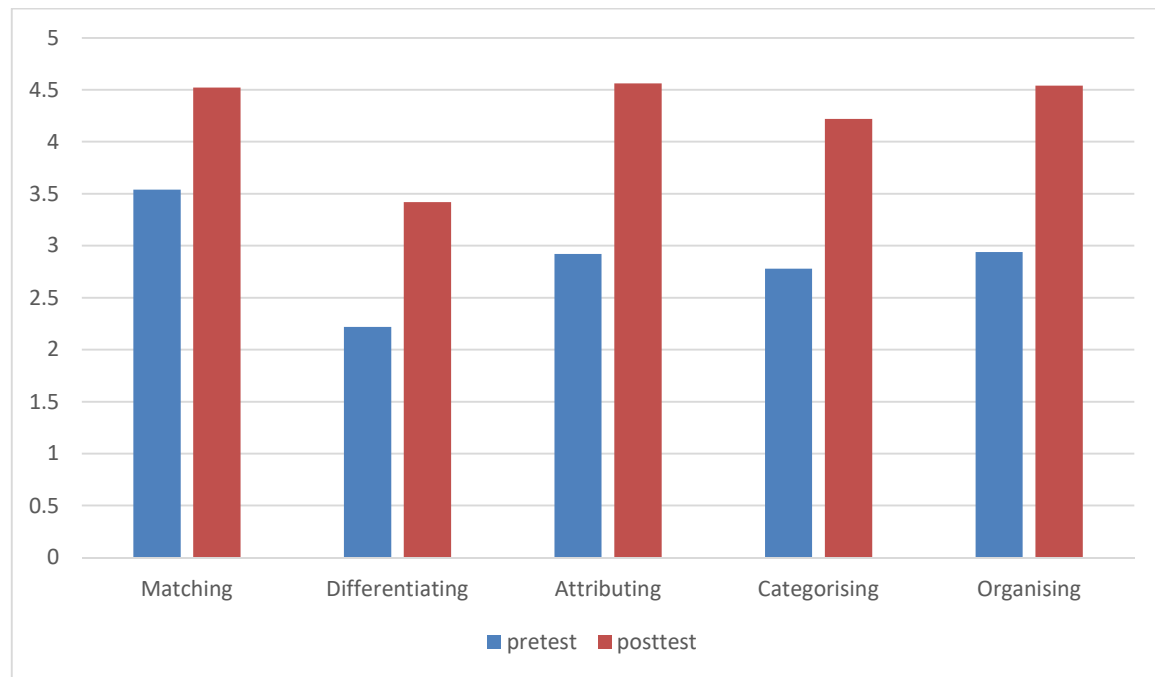


Figure 2: Pretest and posttest mean scores of the component skills of analytical thinking skill

The above results show that there is significant enhancement in the analytical thinking skill and its components namely; matching, differentiating, attributing, categorizing and organising of secondary school students through the construction of various discourses in English. The relatively high mean scores in the post test of analytical thinking skill shows that the students have improved in their skill of analytical thinking. The relatively high mean scores of the posttests of analytical thinking skill: matching, analytical thinking skill: differentiating, analytical thinking skill: attributing, analytical thinking skill: categorising and analytical thinking skill: organising also show that the students have improved considerably in all the component skills of analytical thinking. The transaction of the twelve modules on discourse construction at the time of intervention was effective for enhancing all the selected components of analytical thinking skill namely; matching, differentiating, attributing, categorizing and organising. The different discourses selected for the preparation of modules on discourse construction gave due weightage for each of these component skills of analytical thinking. The findings reveal that the experimentation has resulted in high achievement in analytical thinking skill: attributing followed by analytical thinking skill: organising. The lowest change in achievement is seen in analytical thinking skill: matching. This shows that the discourses chosen and the process of discourse construction was most effective for enhancing analytical thinking skill: attributing and analytical thinking skill: organising than the other components.



Research-based learning with concept mapping, can help students to develop their analytical skills to a higher level. Moreover, the design of teaching plans and the sequencing of assignment plans both have effects upon the development processes of students' analytical thinking skills (Areesophonpichet, 2013). The case study conducted by (Sheri Stover and Sean Pollock, 2014) redesigned the traditional curricular program offered by the university as a synchronous online course that provided students with opportunities to work collaboratively to build a community of inquiry and to develop the analytical skills needed to understand course materials and compete in the 21st -century workforce. The results of the study (Fitriyana, Marfuatuna & Priyambodo, 2019) conducted among senior high school students indicates that there was significant effect of systemic learning approach on students' analytical thinking skills.

From the results of the present study, it is evident that discourse construction was effective for enhancing the analytical thinking skill of secondary school students.

Conclusion

Analytical thinking skill is considered as an elaboration of remembering, understanding, and applying and as the basic skill for evaluating or creating. Unfortunately, the students' analytical thinking skills are rarely explored in our classroom learning process and hence many students experience difficulties in solving the problems of their daily life. Enhancing the students' analytical thinking skills directly leads to the development of critical thinking and problem- solving skills. Thus, analytical thinking is the basic skill that helps to develop the higher order thinking ability in students. The present study becomes significant in the context where the new curriculum frameworks at the global, national and state level attempt to develop the curriculum that is competent to enhance higher order thinking skills through the process of education. The present study can help the educationists and curriculum planners and teachers to design learning materials that are suitable for developing thinking skills. Further, it will help the educators and practitioners in the field of language education to explore the potential of discourse construction for enhancing the thinking skills.

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