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## **Development of Scale on Reflective Thinking**

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### **Abstract**

The purpose of this study was to develop a reflective thinking scale for the students who were given concept map-based instructions in the classroom. The five point Likert Scale was used to measure reflective thinking. Concept Map, Reflective Thinking, Habitual Action, and Critical Reflection were chosen as the four dimensions or sublevels of the scale to measure reflective thinking. The scale construction was accomplished with the support of area specialists and linguistic experts. 76 ninth-grade students were chosen from three separate schools in the district of Ajmer, Rajasthan, for the 2018-2019 school year. The internal consistency of the scale was evaluated using Cronbach's alpha internal consistency and the Split-half internal consistency method. On the scale, both techniques exhibit optimal level of internal consistency.

*Key Terms:* Reflective Thinking, Concept Mapping, Secondary Education

### **Introduction**

According to Gagnon and Collay (2001), reflection means when someone expresses their feelings and ideas about a subject or concept. John Dewey initially established the concept of reflective thought in 1910 in his book "How We Think," which was aimed at teachers. The most significant idea in Dewey's mind was that learning improves to the extent that it emerges through the process of reflection (Dewey, 1933). After some time, these thoughts were dubbed analytical thinking or critical thinking, and other terms such as problem-solving and higher-level thoughts were coined. Reflective thinking is a method of making meaning that leads to deeper knowledge. It is a method of thinking that is systematic, arduous, and disciplined (Dewey, 1933). Reflective thinking is critical for success in settings that are always changing and diverse, such as working with students. Reflective thinking is the act of making informed and logical educational decisions and then evaluating the repercussions of those decisions

(Taggart & Wilson, 2005). There are many types of research available that advocate the thoughts that reflective thinking is an important variable for meaningful learning in the classroom. In the last two decades, many documents like NCF (2005), NKN (2009), and NEP (2020) also express in their recommendation that we have to adopt such types of pedagogies and teaching methods in school education which provide an opportunity to reflect over the subject so that students can construct their understanding by own.

We know Concept maps are a reflective tool, Joseph D. Novak introduced the concept map technique for the first time when he and his colleagues observe and analyze changes in pupils' behavior at Cornell University. Concept maps, according to Novak (1990), are graphical tools for organizing and displaying knowledge. It has a few enclosed figures, such as circles and boxes, which represent concepts or sub-concepts, and these boxes are coupled with linking lines and nodes, which reflect the relationship between distinct concepts (Novak, 1990). Furthermore, concept maps served as an effective tool for participating students to convey the comprehension of their courses, not only as a way to indicate changes in a child's grasp of a topic but also as a way to represent the change in a child's understanding of a topic.

At the school level, we can use different types of modern reflective techniques as instruction methods so that we can foster reflective thinking skills in the students. At the same time, we need to develop a few tools related to reflective teaching methods so that we can check how efficiently these methods or approaches work in the school settings and which kind of modifications is needed in the future. Understanding this need, the researcher has developed a reflective thinking scale when concept mapping-based instructions are provided in the classroom.

### **Reflective Thinking**

The process of developing judgments about what has happened is the focus of reflective thinking (Halpern, 1996). It involves the meaning and the implications of an experience or action. In simple words, we can say it is not about what you plan? Or what do you do? It facilitates to understand the reality around you more accurately that can help to make your own understanding of the incident. The main focus of reflective thinking is to help you so that you can better understand something and the exploration of emotions, sentiments, reactions, and information (Taggart & Wilson, 2005).

## **Concept Mapping**

Concept mapping is a tool or technique for visualizing the relationship between multiple concepts, according to (Novak & Canas, 2007). When we make it correctly and in a methodical manner, concept mapping can help pupils achieve high levels of cognitive function. With the help of this instrument, we can estimate the growth of learning, which is very useful for teacher educators. Students construct concept maps by repeating ideas in their own words and assisting educators in identifying unfitting ideas and concepts; educators can see what students don't comprehend, which is helpful in understanding the problem in students' learning.

## **Reviews related to Reflective Thinking Scale**

Liao and Wang (2019) prepared a reflective thinking scale for healthcare students. For this purpose, 579 healthcare students were randomly selected and 22 items were rated on 9 points Likert scale. The finding of this study shows Cronbach's alpha reliability of the overall scale was found .87. Zhang and Dempsey (2019) did an exploration and confirmation study for reflective thinking scale for an online course. During this study three-factor instrument has been developed and examined. Basol and Gencel (2013) did a study on reflective thinking and prepared a reflective thinking scale based on Likert 5-point system. For this study, 1413 undergraduate students were selected and the findings of this study indicate good internal consistency on Cronbach alpha and spearman brown split-half correlation. Kizilkaya & Asker (2009) develop a reflective thinking skill scale towards problem-solving. For this purpose, 339 7th-grade students were selected and 3 subthemes of the scale were decided. The KMO value of the scale was found 0.872. Semerci (2007) did work on the development of a reflective thinking tendency scale for teachers and pupil teachers. For a sample researchers selected students and primary teachers as well total of 599 cases were selected. The findings of this study showed 0.91 KMO value of the scale. The test-retest correlation and the split-half correlation were found to be 0.74 and 0.77 respectively.

## **Need of the Study**

Teachers or instructors at the secondary level typically use traditional teaching methods in which pupils learn through memorization and recitation techniques, resulting in a lack of reflective thinking and problem-solving skills (Maheshwari,1996). On the other hand, the modern or constructivist approach to learning is quite popular these days, but due to a lack of

constructivist approach training, instructors are unable to implement this approach in the classrooms, and instead rely on the lecture-demonstration method of teaching, which is a less effective way of learning for students in terms of achieving desired classroom outcomes. While learning new concepts, it is important that students reflect on ideas that will help them deepen their understanding in a meaningful, logical, and deliberate manner. The concept maps have the value of "making learning visible" because the teacher can actually "see" what ideas the student has about a topic and evaluate students' learning and acquisition of crucial concepts (Hay 2007; Hay & Lygo-Baker, 2008; Meyer & Land, 2006; Novak,1990). After reading extensive literature background of reflective thinking and reflective thinking scale researcher has developed a reflective thinking scale based on Likert 5 points scale system. This scale will be helpful for teachers as well as students at secondary level.

### **Delimitations of the study**

English medium schools associated with the C.B.S.E. board of district Ajmer have been included in the current study. It excluded schools that taught in languages other than English, such as Hindi and Marwari. The participants in this study were ninth-grade students. Students from other primary and secondary schools were not allowed to participate. Schools associated with the Rajasthan Board of Secondary Education (R.B.S.E.) and other boards are also excluded. The schools in this study were chosen using a purposive sampling strategy. This research was done in the field of science.

### **Aim of the Study**

The aim of the present study was to develop a reflective thinking scale where concept mapping based instructions are given in the classroom.

### **Objectives of the Study**

- To develop a reflective thinking scale where concept mapping based instructions are given in the classroom.
- To find out the reliability and validity of the reflective thinking scale.

## **Method**

In this study survey method was used for the collection of data. Since students don't know about concept mapping techniques, basic coursework about concept mapping was given. One teaching module based on concept mapping was prepared by the researcher. After completion of the module, reflection of students was measured through a reflective thinking scale.

### **Participants**

For the present study, researcher has selected participants by using purposive method of sampling in district Ajmer, Rajasthan. 76, ninth-grade students were selected from CBSE affiliated three English medium schools of district Ajmer.

## **Development of the Scale**

### **Subthemes for Reflective Thinking Scale**

The dimensions of the Reflective Thinking Scale were originally determined by the researcher. The researcher created a reflective thinking scale based on these dimensions. Because this scale was tied to concept mapping, the researcher has included concept map as one of the scale's dimensions. The scales other dimensions are listed below:

- Concept Map
- Reflective Thinking
- Habitual Action
- Critical Reflection

Because pupils in the ninth grade are in the early stages of adolescence when they begin to think abstractly, the researcher employed a five-point rating scale to collect responses from the students, emphasizing the students' thinking process before selecting one of five responses. The researcher's response options for the student are listed in the table (1).

**Table 1**

### **Available Responses for Students**

Always	Often	Sometimes	Rarely	Never
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## Development of the Items for the Scale

The researcher first developed a pool of 35 items based on 5-point likert scale related to four subthemes. These items were provided to subject and area experts to check its face validity and content validity.

## Face Validity and Content Validity

For content validity, the researcher offered his tools to his professors, teachers, and research scholars of same background and solicited feedback from all of them. After that, the researcher changed the phrasing of the items to match the study's requirements and removed certain questions that were not fit for the study. The researcher attempted to rewrite the items in more relevant and straightforward language. At the last 28 items were finalized for further process of the research.

**Table 2**

### Finalized items after content validity

S.No.	Statements	Alwa ys	Oft en	Someti mes	Rare ly	Nev er
1.	I can figure out how to use ideas and data to make concept map.					
2.	I can easily analyze the information and ideas in the given text.					
3.	I find it difficult to visualize the text in the form of concept mapping.					
4.	I consider all the dimensions while making concept map.					
5.	I utilize my time to reflect upon the text.					
6.	I can explain the concept map drawn by me.					
7.	I can easily link ideas in complicated pattern.					
8.	I am able to generate new ideas from the given information.					
9.	It was difficult for me to understand the concept mapping.					
10.	Organizing information in a unique pattern was difficult.					

11.	Concept map initiate us to reflect on our ideas.					
12.	It is easier for me to understand the topic with the help of concept mapping.					
13.	Concept map provides complete representation of important ideas on one page which is easy for review.					
14.	Meaningful learning helps to retain the concept.					
15.	I have trouble in understanding what's written in the text book.					
16.	I am able to learn easily the concept by understanding the logic behind it.					
17.	When I am working on some activities I work on them without thinking.					
18.	I need to understand the material taught by teacher in order to perform practical task.					
19.	I reflect upon my action for the further improvement.					
20.	The best way to retain information is through concept mapping.					
21.	I struggle in understanding the abstract concepts.					
22.	I feel that visualizing any topic is quite interesting.					
23.	I came to most of the classes with questions in mind seeking for the answers.					
24.	I have trouble in explaining my ideas in a comprehensive manner.					
25.	It is easy for me to apply my knowledge in similar situation.					
26.	The content taught help me to draw concept map effectively.					
27.	Concept map help me unleash my visual strength in activating solution the problem.					
28.	I practice on important topics until I understand completely.					

The researcher developed a Reflective Thinking Scale with 28 items based on these qualities. These items were separated into four dimensions, and the researcher included some negative questions from these categories to prevent respondents from responding in the same way, limiting the tool's biases. In the table below, the number of questions the researcher has taken from each dimension is listed.



**Table 3****Number of questions from each dimension of Reflective Thinking Scale**

<b>Dimensions for Reflective Thinking Scale</b>	<b>No. of Items</b>	<b>No. of Negative Items</b>
Concept Map	11	02
Reflective Thinking	07	01
Habitual Action	07	04
Critical Reflection	03	00
<b>Total no. of Items</b>	<b>28</b>	<b>07</b>

**Pilot Study for Reflective Thinking Scale.** For the purpose of pilot study researcher went to a Girls secondary school established under the campus of Haribhau Upadhyaya College for Women, Hatundi in Ajmer, Rajasthan. The researcher obtained the permission of the principal for the pilot study. The researcher provided fundamental coursework to the pupils of class 9th. There was only one section in ninth grade and 22 students were present there. The researcher distributed their tool to students and provided enough time to fill it. When all students recorded their responses the researcher collect the tool from students and find its reliability with the help of a reliability calculator. In pilot study researcher has used Cronbach's Alpha method for internal consistency of the tool. MS Excel software has been used for analysis and the index of Cronbach's Alpha was 0.660. Which was acceptable level then researcher decided to find the reliability of the tool on large sample size which will representation of both gender.

**Final Data Collection for Reflective Thinking Scale.** For the final data collection researcher has decided to collect data for reflective thinking scale from three different schools. The researcher selected 76 pupils in class 9th from three schools in District Ajmer for this study. The researcher chose one public school and two private schools based on the availability of classes in those schools. The researcher chose the sample using the purposive approach. Researchers gathered 28 pupils from Demonstration Multipurpose School in Ajmer, 18 pupils from Bhagwan Mahavir Public School in Makarwali Road in Ajmer, and the remaining 30

students from Samrat Public School in Kotra in Ajmer. The information for this study was gathered in three phases:

**Phase-I.** The researcher went to the Demonstration Multipurpose School (R.I.E.) in Ajmer for the initial step of data gathering. The researcher went to this school for two days. On the first day, the researcher offered students fundamental course work, and on the second day, the researcher gave students tool related to reflective thinking, as well as enough time provided. Thus after 1 hour 30 minutes, the researcher collected all of the students' sheets. The researcher gathered data from 28 ninth-grade pupils at this school. There are two sections of class 9th at D.M.S. One is Hindi-medium, and the other is English-medium, although the researcher has only collected data from English-medium students.

**Phase-II.** Following the end of the first round of data collection, in which the researcher collected information from 28 pupils, the researcher went to Bhagwan Mahavir Public School (B.M.P.S) on Makarvali Road in Ajmer. In this school, the researcher spent two days with the students, giving them basic course work on the first day and tool related to reflective thinking on the second day. Enough time was given to all students and when they recorded their responses successfully the researcher collected all sheets from them. The researcher gathered data from 18 ninth-grade pupils at this school. There was only one English medium section in the ninth class.

**Phase-III.** After successfully completing the first and second phases of data collection, the researcher was unable to obtain the desired sample for the study. As a result, the researcher decided to visit Samrat Public School (S.P.S.) Kotra, Ajmer, where he spent two days giving students basic course work and tool related to reflective thinking, as well as providing adequate time for filling the tool. The researcher gathered data from 30 ninth-grade pupils at this school. There is only one English medium section in class ninth. Following the end of the third round of data collection, the researcher gathered data from 76 students for the current study, all of them were English medium pupils.

**Analysis of Reliability.** The Cronbach Alpha Reliability Method was used by the researcher to determine the reliability of Reflective Thinking Scale. After entering all of the scores on the excel sheet, the researcher used the MS Excel software to calculate the reliability of the Reflective Thinking Scale and found that the alpha value was 0.74. He also used this application to find some other reliability methods that fall under the internal consistency

method, such as the split half method. Different reliability scores are listed below in the table 4.

Table 4

Values of different types of reliability on Reflective Thinking Scale

<b>Reliability</b>	<b>Values of Reliability</b>
Cronbach's Alpha	0.74
Split Half (odd-even)	0.81

Since the researcher recorded the responses of the respondent on the basis of the Likert 5-point scale system that's why Cronbach's Alpha Method of reliability was the most preferable method to check the internal consistency of the scale. In the table 4, we can see the Cronbach's alpha reliability index of the scale was 0.74 and Split-half (odd-even) internal reliability index was 0.81. Both indexes are good for the acceptance.

### **Discussion**

Philosophers and psychologist like John Dewey, Halpern, Kolb have explained in their work how reflection affects one's learning process? That's why in the field of education we shift towards those approaches, methods, and pedagogies which provide students an ample amount of reflection over new concepts or situations. So that students make connections between new knowledge and previous knowledge on their own and make decisions accordingly. In India, after NCF 2005 and National Knowledge Commission 2009, we tilt towards the modern way of the teaching-learning process. NEP 2020 also advocated the use of such types of teaching-learning methods in school education so that we can provide quality school education to all. In this sequence, such types of scales must be very helpful for teachers as well as school heads. In this study, we used concept mapping instructions in the classroom as a modern teaching-learning approach. This study provided a pathway to those who want to use such types of modern student-centric teaching-learning methods in the classroom and want students to reflect more and make their own understanding of concepts.

## Conclusion

It may be concluded that reflection is very important for an effective teaching-learning process. It is also very helpful for meaningful learning and decision-making. In the present scenario we can say that without reflection we cannot assume any method or pedagogy will be successful in the classroom. The concept map is also a very important tool for fostering reflecting thinking strength among students at the school level. In this study, the researcher decided on two objectives initially first was to develop a reflective thinking scale based on concept mapping instructions in the classroom, and the second was to establish its reliability and validity. The researcher successfully developed the reflective thinking scale and established its reliability and validity. The experts and professors related to this field ensured that the face validity and content validity of the tool were up to the mark. The reflective thinking scale can be used for further studies and analysis.

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