Research Article

Paulian Approach to Critical Thinking: Assessing an Intervention Program

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In the 21st century, the market demands individuals who are creative, innovative, technologically advanced, and adaptive to the processes existing in the institutions they function in. Critical Thinking (CT) plays an important role in improving an individual's higher-order cognitive capacities, logical decision-making, and self-realisation. The present study investigated the effect of systematised CT procedures on the development of CT abilities and the learning ecosystem of student teachers. The participants for the study were the teacher trainees who enrolled in the Bachelor of Education programme offered by one of the private universities in Gujarat, India. To improve the external validity of the procedures and explore the practical consequences of the 'Critical Thinking Intervention Program' (CTIP), validated assessment tools like the Analysis of Article Test and Situation-Based Test were used. The data were collected using multiple case studies, focus group discussions, and descriptive feedback. A mixed-methods research design was used for data collection and analysis. The qualitative data was analysed in four phases: de-contextualization, re-contextualization, condensation, theme creation, and compilation.

The study found that the critical thinking intervention programme improved the academic performance of the student teachers. Likewise, it improved reasoning skills, organisation of thoughts, and thought connectivity, supported achieving better work-life balance, developed reflective abilities, developed depth in academic work, and developed metacognitive Skills.

Purpose of Research

The Commissions, policies, and authorities in India, like the National Policy on Education (1986), the National Council of Educational Research and Training, the National Knowledge Commission (2005), and the National Education Policy 2020, advocate the need for the development of critical thinking and actively promote and emphasise the importance of nurturing critical thinking skills. Philosophers and educators like Paul (1990), Frerie (1996), Lipman (2003), and Giroux (2010) have also coined "critical thinking" (CT) as an essential concept in education. An austere contrast becomes evident when education still prioritises the cultivation of rote memory, factual knowledge, and a textbook-centric culture (NCF, 2005, p. 13), rather than focusing on the development of decision-making and judgement capacities (Meghani, 1999; Helsdingen, 2010), as well as fostering deep understanding (Bhattacharya, 2022). The unprecedented importance of the component of critical thinking in education conveys that the curriculum must integrate critical thinking as a component of the school education system. However, the processes in school education have not been able to completely integrate critical thinking as there is no subject that explicitly focuses on critical thinking development, and there is very little evidence to suggest that other subjects can develop critical thinking skills explicitly (National Research Council, as cited in Willingham 2007; Jones & Haydon 2012; Massa, 2014; Behar-Horenstein & Niu 2011).

As currently practised, it cannot be a part of the school curriculum but rather a method of learning that conscientiously needs to be used. The need also arises from the research facts that CT is an important skill that helps enhance the academic achievement of secondary (Prasad, 2015) and senior secondary school students (Sherafat, 2015; Krishnan, 2011; Reed, 1998; Gurubasappa, 2010), as well as B.Ed. students (Sumangala, 2000). It is also observed that CT is an important skill for high-stress tests like the International English Language Testing System (Ramkrishna, 2017). CT is found to have a positive correlation with the mental health of students as it reduces symptoms of anxiety and depression (Tyagi, 2017), improves social skills, and increases environmentally friendly behaviour (Kaur, 2009). It is also one of the most important coping skills of the 21st century (Purohit, 2016). On the other hand, the European Commission Report 'Communication on

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Teacher Education' (2007) observes that teacher quality is significantly and positively correlated with pupil attainment and that it is the most important aspect within schools explaining students' performance. The quality of learning is enhanced if students are taught to think critically. It was remarked in the Education Commission (1964-66) of India, "No system can rise above the status of its teacher…". Similar sentiments have been expressed by the UNESCO Delor report (1996). The teacher's role can be significantly improved if the teacher education programme is commensurate with the CT component. Further, if we look at the condition of high school teachers, it is proven that only 23.2% of high school teachers teach analytical skills (Arckiosamay, 2014). If such is the role of the teachers, the teacher education programme must provide teacher quality. Very few teacher education programmes are implementing the idea of CT, and teachers are inefficient in encouraging students to use CT skills in the classroom. (Paul et al., Everett, 1999; Arkiosamy, 2014; Celik, 2021). Hence, the researcher strongly asserts that CT is a crucial aspect that must be integrated into the training of student teachers. As they form the fundamental component of teacher training programmes, they possess the potential to extend this emphasis on CT to students, thereby promoting its implementation across diverse schools and regions. The sample constituted student teachers of a private university as the experimental group because of the willingness of the university administration to make students available for the study, the duration of the intervention programme, and the vision of providing the student teachers with processing skills like CT. The CT component was taken up in Semester I of the Bachelor of Education programme.

Based on the literature insight, it became evident that Paul's model emerged as the most suitable option for incorporating a comprehensive and pragmatic understanding of CT into the course. This choice is justified by its robust theoretical underpinnings and its incorporation of both philosophical and psychological perspectives on CT (Reed, 1998; Paul & Elder, 2014). Also, Paul's model of CT helps in reaching a higher level of critical reflection as well as in understanding mental processes in a better way (Moreryra, 1991).

Such a comprehensive model can help students improve their abilities to think over variegated domains of knowledge while at the same time preparing them to think more effectively in everyday reasoning tasks. Further, it can be used by anyone, from primary school students to adult learners, wishing to improve their CT. Thus, if effective, widespread use of Paul's model would not only lead to deeper learning and more CT in the subject, but it should also result in better critical thinkers in general.

The literature review from a repository of Indian theses brings to light that only three studies have been conducted on student teachers. One study, titled "Influence of Cognitive Style and CT on Decision Making of Prospective Teachers," concluded that there is a significant influence of cognitive style and CT on the decision-making process of prospective teachers (Lourdouraj, 2016). Another study, titled "Effectiveness of Six Thinking Hats as a Teaching Technique for Enhancing Thinking Skills in Educational Psychology of Student Teachers," found that the Six Thinking Hats teaching technique supports enhancing thinking skills and achievement in the educational psychology subject of student teachers (Gupta, 2020). A study on the emotional competence, thinking style, and work motivation of Bachelor of Education teacher trainees in relation to effectiveness in teaching finds that there is a correlation between positive thinking style and teacher effectiveness (Lavanya, 2016).

This reflects the fact that few studies have been done on developing CT skills for student teachers. Thus, none of the studies has developed a well-structured intervention programme to address the component of Paul's model of CT explicitly (Islek & Hursen, 2013). A researcher has used Paul's model to develop a critical thinking intervention programme to explicitly teach CT.

Research Questions

1. How can Paul's approach to critical thinking prove to be effective in training student teachers to improve critical thinking skills in the Indian context?
2. To what extent will the level of critical thinking among student teachers change after the implementation of the package or intervention programme?
3. What is the impact of the intervention programme in various domains of life on the student teachers?

About the Critical Thinking intervention program

The intervention programme is designed based on Paul's Model of CT and thus reinstates the standards of thinking, elements of reasoning, intellectual traits, and Socratic questioning. Standards of thinking like clarity, accuracy, relevancy, precision, depth, breadth, and logic are used to assess a thought. The elements of reasoning like purpose, questions, information, assumptions, concepts and ideas, implications, and inferences are used to analyse any text, problem, essay, or issue. The traits of the mind, like intellectual humility, empathy, perseverance, integrity, and confidence in reason, are used when analysing any text, problem, essay, or issue. This intervention programme strongly focuses on the theoretical aspect of CT, as a theoretical understanding of the concept is important before applying the same in real-life situations (Paul & Elder 1995). The intervention programme lasted 50 hours. The standards of thinking, elements of reasoning, and traits of mind were taught explicitly to the students. Pedagogical approaches like active learning strategies, questioning techniques, Socratic questioning, dialogic inquiry, self-reflection, and metacognition have been employed in academic settings. These pedagogies have been chosen based on their demonstrated effectiveness in improving students' CT skills (Tyagi, 2017; Prasad, 2015; Ratheesh, 2014; Seeja, 2012; Tawai, 2012; Buranpatana, 2006; Moreryra, 1991).

The basic structure of the intervention programme incorporated the concepts of CT through the various pedagogies highlighted above, along with in-house assignments. An intellectual journal was kept by the students to apply CT concepts learned during the programme, document their real-life applications, and reflect upon their applications of CT.

Week 1 as an example of the intervention programme

Week One topic: introduction to the course; introduction to the concept of CT; three kinds of thinkers

Assignment 1: How do you conceptualise CT? (student teachers' conception of CT)

Assignment 2: Based on the story read and understood, write the traits of the three characters. Reflect on which character you like the most and why. (understanding and identifying the characteristics of the character and reflecting on which character they would like the most and which would become popular.)

Journal Entry 1: Apply the character of Fran in a real-life situation (application of character), and similarly, subsequent weeks were taken up.

Methodology

To achieve the purpose of the research, the data was collected through the following tools:

1. A standardised test developed by Richard Paul (1995) was used for assessing standards of thinking as well as elements of reasoning.
2. To assess traits of the mind, a situational test was constructed and validated by the field experts.
3. Case studies: The data for the cases was collected from an intellectual journal. This journal was used to note down thoughts and also post application situations from the classes taught. This journal was kept by the student teachers over the course of the intervention.
4. Focus group discussion: A focus group discussion was conducted with the students that were randomly selected. This discussion was conducted with the primary objective of determining whether CT skills have developed based on aspects of Paul's model of CT. What are the different areas in which CT has helped these student teachers in their academic and personal lives? The researcher probed for answers wherever it was possible. Audio data was heard, and data reduction was done to analyse it. After the initial analyses of the general themes and initial codes, broad themes were inferred.
5. Descriptive feedback: Feedback with reference to specific questions for the purpose of understanding the overall working of the intervention programme was taken. The questions asked were about significant aspects of the programme and improvements needed in its conduct.

The process used for data collection was

a. Actual Implementation of the Intervention Programme

b. Administration of the pre-test on the sample

c. Administration of the post-test on the sample

d. Data collection from an intellectual journal of cases

e. Data collection from focused group discussions

f. Data collection from descriptive feedback

Sample

The sample consisted of 47 student teachers from Vadodara, ranging in age from 24 and above. The student teachers come from varied economic and cultural backgrounds. The Purposive Sampling technique is selected as per the research needs. The internal and external institutional doctoral review boards, consisting of academia and industry experts, permitted the research on human samples. The doctoral board reviewed the procedures and study every six months.

The hypotheses of the study were:

H01: There will be no significant difference between pre- and post-test scores of the student teachers in terms of standards of CT and elements of reasoning at the 0.05 level of significance (standardised test).

Design of the research

Mixed method research, in which the QUAN-qual approach is used for better understanding quantitative studies.

Data analysis

The researcher used the "t" test for data analysis. In this research, a pre-test was administered to a group of samples. This was the initial test. After the initial test, the intervention designed by the researcher was administered to the sample, followed by a post-test administered to the same sample. To compare the means of two tests of scores that are directly related to each other, a t-test for dependent means was used. This test is a paired sample t-test. To check the normal distribution of the sample, the Shapiro-Wilk Test was administered. The P-value was found to be 0.136705, and the W-value was found to be 0.963260. This meant that it was in the accepted 95% critical value range [0.9524: 1.0000] and that the data was normally distributed.

The following were the phases in which the qualitative data was analysed:

Discussion on phase-wise analysis of qualitative data,

- Phase One: Decontextualisation: The data obtained from various sources was read and re-read to make sense of it. Before the data could be broken down into meaningful units, a lot of thought went into understanding which paragraphs and constellations of sentences could produce a meaning associated with the research questions associated with the study. Individual themes were generated from the case. Themes emerged inductively as the case progressed.
- Phase Two: Recontextualization: The text was again re-read to list out the final broad themes from the individual cases. The unnecessary data from the cases in the journal entries was kept away to keep the relevancy of the themes generated by the research question under consideration.
- Phase Three: Condensation and Creating Themes: The meaningful themes emerging from each case were condensed to form integrative themes that can be meaningfully arranged. There was a lot of moving back and forth to come up with broad integrative outcomes that the researcher reached from the study. Member checking was also part of this phase.
- Phase Four: Compilation: The essence of the studied phenomena was found out. Appropriate running text and quotations were placed to ensure the authenticity of the information. Depending on the number of occurrences of the themes, they were progressively arranged and presented in integrative positive outcomes.

Focus group discussion

This method was essentially adopted to probe into the what, how, and why of various aspects of CT. There was no preconceived hypothesis; rather, the interview proceeded based on the cues obtained from their responses. The teacher began the discussion with the question, "What aspect of CT did you use in life? How has CT helped you in various domains of life? What are the different areas in which CT has helped these student teachers in academic and personal life?" The researcher probed for answers wherever it was possible. The way in which it was analysed was: The researcher heard the interview several times to analyse the dialogue that happened between the researcher and the focus group. After the initial analyses of the general themes and initial codes, broad themes were inferred.

Results

1. Quantitative data

The t-value for the analysis of the article test and situation test is 10.76, and the situation test is 12.32, which is greater than the table value of 't' at the 0.05 level. Thus, the null hypothesis (H0) is rejected and indicates that the CT Intervention Programme was effective in developing the CT abilities of student teachers on the Analysis of Article Test and Situation Test that measured elements of reasoning and standards of thinking along with traits of mind.

2. Qualitative data

For Multiple Case studies

The CT intervention programme based on Paul's Model for CT supported the student teachers in realising how important thinking is, and so they were able to take a deliberate pause in the thinking process. This helped them develop deep thought processes. A quote from the student teacher says, "I came to know that we shouldn't take things for granted; it somewhere shows overconfidence towards that thing. Instead, we should try to understand the things in depth, and then we should decide". The student teachers' have also identified the fact that changing the way one thinks can help build bonds with others. Here are some quotes written by one of the student teachers: "If I had not known or deliberately practised CT, I would have never been able to control my anger, and it would have adversely affected my relationship with my friend. Another quote is, "I would never trouble others by not saying anything and changing my behaviour with them. This is integrity that we all require in our lives to have good relations". One more quote is, "These classes have really helped me reduce my egocentric tendencies in many situations. I keep aside my egocentric tendencies consciously and first try to figure out why something was not done. It's helping me to build more cordial relationships with others". In the same perspective, student teachers also quoted that "negative feelings can be tackled when the logic cycle is followed". They were able to understand their feelings deeply by using the logic of fear, anger, and love (logic is an aspect of the standard of thinking in Paul's Model). The student teacher has quoted that while analysing a subject through logic, "I learned that creating the logic for my subject is pushing me and checking my knowledge of the subject." They were able to identify and reflect on self-pitying and self-validating behaviours. They were also able to accept and identify that they mechanically accepted and conformed to the group decisions, and now it has decreased. They started to think seriously and consciously about their thinking process. They were able to think from different angles and points of view and were able to understand that emotionally charged decisions can make things worse. (through the concept of weak-sense critical thinkers, sophists, and con-artists).

For Focus group discussion

The CT Intervention Programme facilitated the student teachers to improve their reasoning skills, especially while seeking the 'purpose' of any task. The student teacher quoted, "To write an assignment or answer in the question papers, when I know why I am doing it, I am in a better situation to put it up in my writing. Now when I am writing, why am I writing it? I am very much clear into it". Further, organisation of thoughts and thought connectivity, which are cognitive skills, are improved with the CT Intervention programme. The student teacher quoted that "logic helps to organise thoughts because these thoughts will also be required to work in systems. This supported the

development of reasoning skills, which is a mental process. It was strengthened by using the intellectual traits of the mind, particularly intellectual perseverance. The CT Intervention Programme improved the reflective abilities of student teachers, thereby bringing depth to the academic work. The student teacher quoted, ‘‘I listen, then I reflect before I give an answer. I do that on the spot. My thought process would have travelled. It was because of diary reflections. I used to think when I wrote diaries (I used this word for an intellectual journal). So I used to think, and then I used to realise, brainstorming and In brainstorming for the situations to be written for the diary, my thoughts, started travelling, and I had to catch that thought. Further, metacognitive skills improved due to the CT Intervention Programme. Student teacher quoted: ‘‘Now reflect on every issue, incident, and thought. That has really helped me to constantly make necessary corrections to my thoughts and actions.

For Descriptive feedback

The student teachers were able to reflect on their thinking process. They were able to start to think; this process had started consciously; they had come across tools that could be applied in real life; and they were able to take a stand now. Student teachers gained awareness of the tendencies of egocentrism and were able to handle situations in the class. The student teachers further mentioned that they were able to think through the issues explicitly, they were able to stop before reacting, they were able to think about themselves, they were able to stand up for their own rights, and it had changed the way they think. Furthermore, the structure of thinking and reasoned thinking helped to enhance academic performance. The structure of thinking helped to organise thoughts; journal entries helped to reflect and examine situations that went unnoticed; lots of examples were given in the class. Also, the aspects of the intervention programme that student teachers’ thought could be improved upon were that CT can be a part of the curriculum, the language of CT can be easier, there can be more stress on real-life application, more examples of the concepts can be added, it shouldn’t be limited to five months, it can have more practical classes, and a viva can be conducted for assessing the aspects of CT.

Discussion

Answering the first research question on

1. How can Paul’s approach to critical thinking prove to be effective in training student teachers to improve critical thinking skills in the Indian context?

This study was conducted in the regular natural setting of the university. Being the professional course, the heavy schedule of the faculty, the regular classes of the student teachers, and the student teachers’ continuous involvement in regular university events like the Republic Day function, teachers’ day event, etc., were things that were common and were undertaken in such a dynamic environment of the university. In spite of the challenges in the regular working of the university schedule, student teachers’ achievement scores and qualitative analysis reveal significant improvement in scores as well as improvement in aspects of CT, as highlighted above. These results indicate that the Paulian approach was effective in training student teachers to improve CT abilities in an Indian context. It has improved abilities in a broad range of aspects of CT, like purpose, organised thinking, concepts and ideas, implications, and barriers like sociocentrism and egocentrism. This has been effective for student teachers and can now be applied to other disciplines like science, the arts, engineering, and commerce.

2. To what extent will the level of critical thinking among student teachers change after the implementation of the package or intervention programme?

This study also reveals that this is a substantive model that is very comprehensive in its concept, and frustration is natural. So it requires efforts from all throughout the year. Education departments can take CT as a principal task in education, be it school or university. It also requires reflective and questioning qualities in a person so that it can be taken with rigour and intensity.

3. What is the impact of the intervention programme in various domains of life on the student teachers?

These student teachers’ had become so enthusiastic while implementing the programme that they continuously came for queries from their personal as well as academic lives. The students got involved with the researcher to learn more about CT and its dimensions. They also honestly discussed the group dynamics in action in the classroom as well as very significant issues like copying in examinations. These

classes were given the first time slot in the timetable in the morning, which gave them the first aspect that could be absorbed with a fresh mind. It was observed that the students would find it difficult to absorb the contents of the theory as well as to think in any other slot of the class. The students also came to the researcher to discuss the application aspect of critical thinking while they went into their internship training phase. These student teachers found that teaching with the teachers' own real-life examples and connecting to the situations that exist in the outside world was best absorbed and well understood. They found themselves becoming open-minded with respect to the feedback given in the integration and simulation classes. These student teachers also became very aware of the fact that they had a superficial understanding of the content. There were many students who came and requested to continue with the CT course in the second semester. This course, in terms of an intervention programme, was welcomed by most of the student teachers.

Conclusion

The quantitative analysis reveals the effectiveness of the CT intervention programme based on Paul's approach to CT. The results depict that the academic achievement of the student teachers had significantly improved. However, qualitative data served to contribute to a more comprehensive and nuanced understanding of this predicting relationship between the CT intervention programme and academic achievement scores via integrative mixed methods analysis. Academic achievement, along with organisation of thoughts, thought connectivity, metacognitive skills, reflective abilities, conscious thinking processes, and reasoning skills like purpose, had specifically improved. The study provides a comprehensive understanding that, though CT supports academic achievement in a significant way, it also improves processing skills in itself. Thus, CT skills have to be explicitly integrated into the teaching and learning processes so that they are practised and understood with rigour. Moreover, it highlights the importance of patience, hard work, and training in Paul's model to effectively implement and uphold the vision that Richard Paul had envisioned for CT. This study focuses on the fact that CT has to be an explicit part of the teacher education programme. The transaction of CT can be based on Paul's model of CT, as it impacts various domains of the life of a student teacher and helps advance their academic achievement as well.

Data availability statement

The datasets generated during and/or analysed during the current study are available from the corresponding author upon reasonable request. The permission to use the work of the sample student is available on request

Disclosure statement

The authors made no mention of any potential conflicts of interest with respect to the research, authorship, and/or publication of this research article.

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