SIRJODL: Volume 6 Issue 2 July 2025
ISSN 2582-9009

Developing Critical Thinking Skills through Online Learning: Approaches and Outcomes

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Abstract

The digital revolution has shown the rapid transformation of education industry and created new landmarks on educational landscape. The Digital advancement and outburst of COVID 19 techniques has resulted in online learning making a significant tool for education. The benefits of online learning are creating a path for educational development and resulting in better resources and better access for the students. With the advantages of online learning where it is creating new opportunities for the students and instructors, it is coming with the challenges too. These challenges do come in the progress path of the learner. The educator wants to imbibe certain skills among the students where the new education policy aims for outcome-based education.

The critical thinking skill is the crucial among all skills to be imbibed and developed among students. Critical thinking is important because it is the ability of interpretation, evaluation, and analyzing available facts and information to form a judgment to decide if something is right or wrong. Beyond mere curiosity, critical thinkers establish logic between ideas to create the bigger picture.

In the light of the fact of critical thinking being very important skill, the present research paper makes an attempt to review the efficiency of online teaching learning process for the development of critical thinking skills of students. It lists various types of pedagogies used in online education,

especially for imbibing critical thinking skills. It examines various pedagogical approaches employed in online education, lists the challenges encountered and suggest some ways to overcome these challenges.

The present study uses structured questionnaire to collect the data in form of survey, conducts some interviews of the educators and policy makers and collects the comprehensive data.

The research reveals that online learning does play an important part in the development of critical thinking skills of students but has significant barriers and challenges to be addressed in order to increase the efficiency of knowledge delivery to the students.

KEYWORDS

student engagement, online learning, student participation and collaboration

Introduction

Adrienne Rich: "Responsibility to yourself means refusing to let others do your thinking, talking, and naming for you; it means learning to respect and use your own brains and instincts; hence, grappling with hard work.

Carol Wade: "People can be extremely intelligent, have taken a critical thinking course, and know logic inside and out. Yet they may just become clever debaters, not critical thinkers, because they are unwilling to look at their own biases."

Elon Musk: "I think it's important to reason from first principles rather than by analogy. The normal way we conduct our lives is we reason by analogy. [With analogy] we are doing this because it is like something else that was done, or it is like what other people are doing. [With first principles] you boil things down to the most fundamental truths…and then reason up from there."

Critical thinking is important because it is the ability of interpretation, evaluation, and analyzing available facts and information to form a judgment to decide if something is right or wrong. Beyond mere curiosity, critical thinkers establish logic between ideas to create the bigger picture.

It's a skill that helps you:

- Solve Problems: By considering various options and solutions.
- Improve Decision-Making: By advocating for ideas logically.
- Enhance Creativity: By connecting ideas and seeing patterns.
- Reflect on Self: By assessing your own beliefs and biases.
- Support Science and Democracy: By evaluating evidence and making informed choices.

In essence, critical thinking empowers you to make well-rounded decisions and navigate complex situations effectively. Whether you're a CEO leading a project or a nurse prioritizing patient care, these skills are universally valuable.

Fig 1.1 Importance of Critical Thinking

Thus, critical thinking is proving to be the most important skill to be imbibed among students as it enhances the decision making and problem-solving ability. It stimulates the curiosity and paves way for the innovation compelling the students to think out of box all the time.

A fundamental skill for both academic success and lifetime learning is critical thinking. It entails having the capacity to assess evidence, analyze data, and formulate compelling arguments. Given the growing popularity of online learning, it is crucial to comprehend how critical thinking abilities are developed through this type of instruction.

The emergence of online learning has changed the face of education, bringing with it both possibilities and difficulties for students for the development of their critical thinking abilities.

The introduction of digital technology has completely changed the nature of education, leading to a rise in the popularity of online learning as a delivery method. Understanding how these virtual settings affect the development of critical thinking and other crucial cognitive skills is becoming more and more important as more and more institutions throughout the world use online platforms. The ability to examine data, assess supporting material, and formulate well-reasoned arguments is known as critical thinking, and it is essential for both academic success and lifelong learning.

Critical thinking abilities can be fostered through unique opportunities and challenges presented by online learning. Many online courses are asynchronous, which lets students interact with the content at their own speed and may encourage more in-depth thought and analysis. The wide range of digital tools and materials at one's disposal can also offer engaging, interactive learning opportunities. Critical thinking skills can be hindered by the substantial obstacles that come with online learning, including the lack of in-person connection, delayed feedback, and uneven access to technology.

Literature Review

The process of literature review is aimed at listing the relevant research in order to understand the major work done in the subject area.

The process of actively and expertly processing the information in order to arrive at a decision or solution is known as critical thinking. It may also be seen as a intellectual process that requires highly developed cognitive abilities to solve problems and make decisions. A new method is introduced and discussed to encouraging and implementing critical thinking in online learning. The strategy that is being provided is more suited and practical for online education, and it can be used in both traditional classroom settings and online ones. There are two parts to the method: a

team-based component and an individual component. There are several processes involved in each component, and the process is finished in a group environment.

The model is applied and tested in both offline and online set up resulting in satisfactory performance levels of critical thinking and intellectual growth(Al-Mubaid, 2014)**.** Online learning is prompted for nursing students by the pandemic environment. Researchers found that critical thinking grows during the learning process, but there isn't enough data to comment on the relationship between critical thinking and online nursing education. (AlOtaibi et al., 2023)**.** This research set out to find out how university students' critical thinking abilities and attitudes were affected by critical thinking instruction delivered in-person, via flipped learning, and online. Teaching critical thinking was done entirely online for the first experimental group. Critical thinking was taught using a flipped classroom strategy in the second experimental group. The third experimental group received instruction in critical thinking in-person. The Sosu Critical Thinking Dispositions Scale and the Watson-Glaser Critical Thinking Test were used to get the data. Explicit critical thinking teaching provided in-person, flipped, and online settings significantly improved the critical thinking abilities and attitudes of university students. Additionally, flipped, online, and in-class learning environments were shown to be the most successful in fostering critical thinking abilities and attitudes.(Orhan, 2023)**.** This study aims to examine three different aspects of mathematics learning goals: independent learning; critical thinking disposition; and joint learning—that is, learning independence and critical thinking disposition—on mathematical learning achievement during the course of online lectures for Analytical Geometry. Learning independence and developing a critical thinking mindset simultaneously has an impact on students' performance in the Field Analytical Geometry online lessons (Suningsih & Juniati, 2022)**.** Students need to self-control by Self-regulated learning in order to develop critical thinking as critical thinking is a goal in higher education in order to be better prepared for entering the corporate landscape. The research assesses the critical thinking skills in online delivery of biochemistry subject.

The learning tool used to observe and assess the critical thinking skill was Moodle (Anwar & Muti'ah, 2022). The research comments that the number of scholarships and the status of enrollment of students do influence critical thinking. It was also observed that interaction and active learning in collaborative environment influence critical thinking very significantly and

positively. It further supports social media based learning tools for the enhancement of soft skills of students (González-Cacho & Abbas, 2022)**.** The use of precision teaching framework with the use of the tool of video-based learning helps to build the student capacity the targeted skill of critical thinking.

The findings focus on the use of tool of video based learning for the improvement of critical thinking skills (Tan et al., 2023)**.** The basic aim of higher education is to improve the critical thinking skills of the students. But sudden shift to online learning because of pandemic has considerably affected the critical thinking ability of the students. Mathematics has been a challenge for the many of the students pre and post pandemic. The research reveals that there are n number of modes are available to improve the critical thinking skills of students through online learning (Kertiyani & Sarjana, 2022)

There is a considerable difference between the pre and post capabilities for critical thinking after taking up an online course in critical thinking course. There was no gender and social bias. But it is suggested that due to improvement in critical thinking ability, the critical thinking courses should be deployed as a part of curriculum**.** (Temel, 2022)**.** The flipped classroom teaching model is very much important in blended and online language learning. The adoption of this model has resulted in the improvement of critical thinking skills with the areas of accuracy, clarity, precision, depth, relevance, and logic. The study recommends the supporting teaching

learning environment for self-study (Yulian, 2021)**.** Interactive teaching methods do increase the critical thinking abilities of the students. The critical thinking skills are necessary to improve the professional image and authority. This has resulted in the increased responsivity of instructors to deliver in a manner where it will reach to the students and content will be adopted by the students. (Poplavska et al., 2022)

This review provides a better understanding of the concept of critical thinking, how it is needed in various fields. It also discusses some of the very important tools for the enhancement.

Research Problem

Despite the growing adoption of online learning, there is limited understanding of its effectiveness in developing critical thinking skills. This research seeks to fill this gap by examining the

approaches used, the challenges faced, and the outcomes achieved in fostering critical thinking through online education.

Research Objectives

1. To identify the pedagogical approaches used in online learning to develop critical thinking skills.
2. To assess the effectiveness of these approaches in enhancing critical thinking.
3. To examine the challenges faced by students and educators in developing critical thinking skills through online learning.
4. To evaluate the outcomes of online learning in terms of students' critical thinking abilities.

Research Questions

1. What pedagogical approaches are used in online learning to develop critical thinking skills?
2. How effective are these approaches in enhancing critical thinking?
3. What challenges do students and educators face in developing critical thinking skills through online learning?
4. What are the outcomes of online learning in terms of students' critical thinking abilities?

Research Methodology

The present research adopts a mixed-methods approach to gather comprehensive data for the development of critical thinking skills through online learning.

1. A structured questionnaire has been circulated to the students, educators, instructors for their experience sharing about online learning and critical thinking skills.
2. Some interviews were conducted to understand whether a respondent group understands the meaning of critical thinking.
3. Also the experience sharing regarding the pedagogical tools was invited through interviews.
4. Academic Performance is collected in forms of evaluation of assignments to measure the improvement in critical thinking skills.

Discussion

After the data collection and interviews, following data were collected.

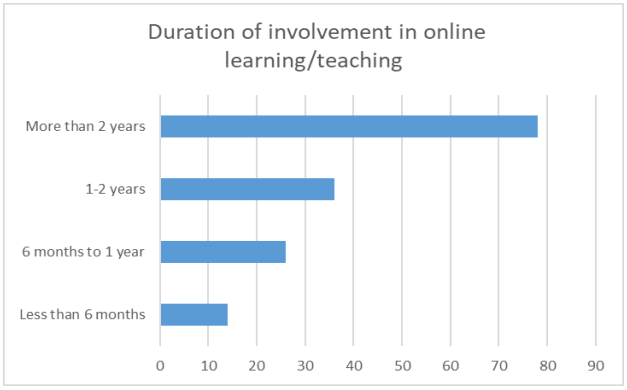
A. Tools used for development of Critical Thinking Skills

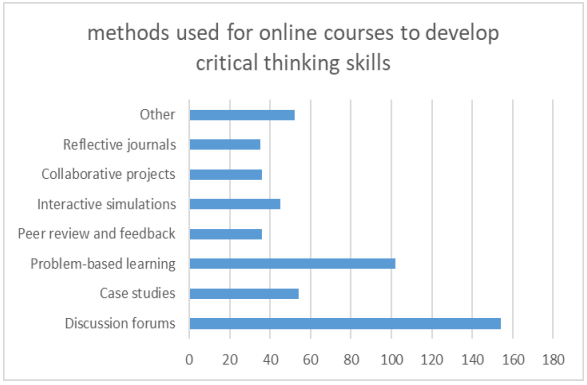
1. Discussion Forums - Students can participate in asynchronous debates on a range of subjects through discussion forums, which give them the chance to consider their answers and apply critical thinking. Students are forced to reply to the opinions of their classmates, clearly express their own ideas, and critically assess other points of view in these forums, which encourages deep thinking.
2. Case Studies - In case studies, real-world situations are presented, and students must use their expertise to apply to solve challenging issues. This method helps students develop their analytical and problem-solving skills by having them examine situations, pinpoint important issues, weigh their options, and provide justification for their choices.
3. Problem-Based Learning (PBL) - PBL, requires students to solve complicated problems together by working through them in groups until an obvious answer is found. By having students identify problems, gather information, assess evidence, and develop and test ideas, PBL encourages critical thinking.
4. Interactive Simulations - Interactive simulations offer students virtual worlds in which they may test various situations and see how their choices affect the situation. Simulations aid in the development of students' skills in hypothesis testing, decision-making, and strategic thinking by letting them change factors and observe the results.
5. Peer Review and Feedback - In this activity, students evaluate each other's work and offer comments. This method helps students analyze and evaluate their peers' work critically, which improves their capacity to evaluate and improve their own concepts and arguments.
6. Collaborative Projects - Collaborative projects demand that students cooperate to finish a task or find a solution. Through the negotiation, synthesis, and exchange of ideas, collaboration fosters critical thinking that results in a better knowledge and creative solutions.
7. Reflective Journals - Students who keep reflective journals regularly write about their ideas, observations, and learning experiences. Journaling promotes introspection, which aids

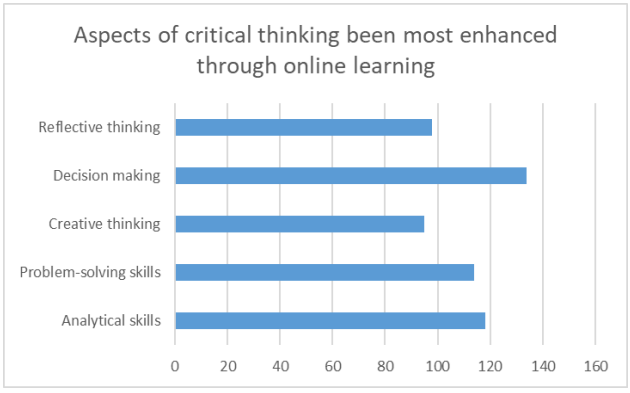
students in examining their own learning strategies, identifying their prejudices, and gaining a more thorough comprehension of the material.

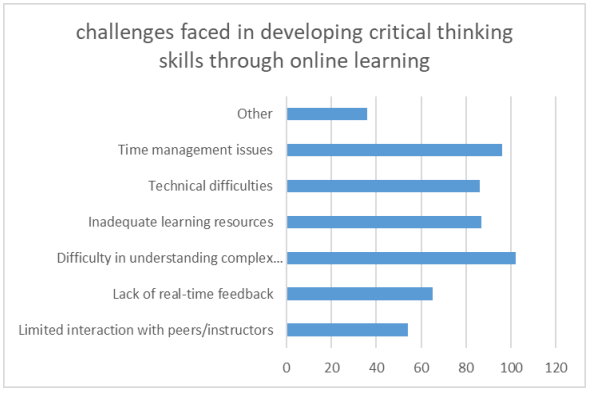
8. Socratic Questioning - With this approach, the instructor poses challenging questions to encourage critical thinking and in-depth conversation. Students can investigate difficult concepts, challenge presumptions, and create well-reasoned arguments by using Socratic questioning.
9. Flipped Classroom - In a flipped classroom, students review lecture materials at home and participate in interactive activities during class time. This method facilitates deeper comprehension and critical analysis by allowing class time to be dedicated to higher-order thinking exercises including discussions, problem-solving, and concept application.
10. Debates - Online debates are arranged discussions with students arguing different positions on predetermined subjects. Students' analytical and rhetorical abilities are strengthened when they are required to conduct research, formulate cogent arguments, foresee counterarguments, and critically assess the evidence in a debate.
11. Virtual Laboratories - In a safe, virtual setting, virtual labs offer online simulations and experiments. These labs foster scientific curiosity and critical evaluation by allowing students to conduct experiments, examine data, and develop conclusions.
12. Concept Mapping - Concept mapping is the process of visualizing the connections between several concepts. With the use of this method, students can better arrange and synthesize their knowledge, make connections, and gain a comprehensive grasp of difficult subjects.
13. Gamification - Gamification is the process of adding gaming aspects to educational programs in order to increase motivation and participation. Gamification encourages creativity, strategic thinking, and decision-making through quests, challenges, and problem-solving exercises.
14. Webinars and Guest Lectures - Experts converse about pertinent subjects and interact in real time with students during webinars and guest lectures. Students are encouraged to think critically about contemporary topics and professional practices when they are exposed to expert ideas and given the chance to ask questions.

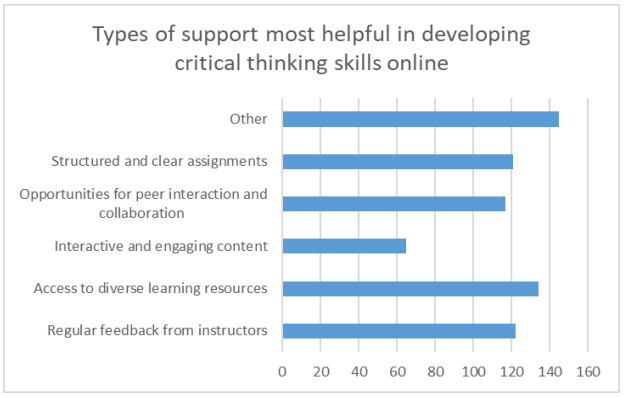
Out of these pedagogical tools, the Discussion Forums, Case Studies and Flipped Class rooms stand out as the most popular ones as they give scope to independent thinking and problem solving.

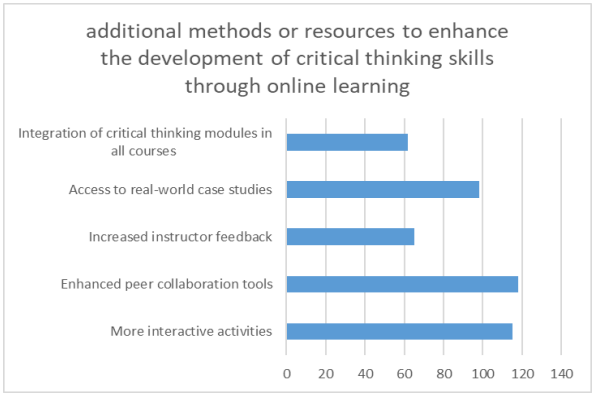












Findings

1. Students expressed a strong desire to participate in discussion boards and valued the chance to communicate with others from different backgrounds and think critically about their answers.
2. Critical thinking abilities were greatly enhanced by these forums, especially in the areas of idea formulation, argument analysis, and comparative analysis.
3. Students' ability to apply theoretical information to real-world circumstances through case studies improved their ability to solve problems and make decisions.
4. Students' analytical abilities were enhanced by the need to recognize important topics, assess the available data, and defend their choices.
5. PBL encouraged students to collaborate with one another in order to address challenging problems.
6. By including students in research, hypothesis testing, and evidence review, PBL encouraged critical thinking.
7. Through interactive simulations, students could experiment with various scenarios and see how their decisions turned out. This allowed for experiential learning opportunities.
8. Interactive simulations helped students to strengthen their strategic thinking and decision-making abilities.
9. Peer review exercises assisted students in honing their critical analysis abilities by having them assess and critique each other's work.
10. Students were able to evaluate and improve their own concepts and arguments as a result of Peer Review and Feedback approach, which also promoted self-reflection.

The results of this study show that when specific pedagogical strategies are used, online learning can successfully foster critical thinking abilities. Case studies, problem-based learning, and discussion boards are especially good in encouraging critical thinking. But the report also points out important obstacles, such as low interaction, a dearth of immediate feedback, and technical issues. If these obstacles are not sufficiently addressed, they may prevent the development of critical thinking abilities.

Challenges:

Following are some of the challenges listed encountered while developing critical thinking skills through online learning mode.

1. In online learning contexts, insufficient interaction has been noted by educators and students as a major obstacle in the development of critical thinking skills.
2. Because students were missing the impromptu conversations and prompt comments that take place in regular classroom settings, they frequently felt alone.
3. Since many online courses are asynchronous, teachers' input is sometimes delayed, which makes it more difficult to use critical thinking techniques right away.
4. Concerns regarding the caliber and scope of input they were given in virtual environments were voiced by a few pupils.
5. Some students faced difficulties due to technological constraints, like not having access to a dependable internet connection or being unfamiliar with digital technologies.
6. The degree of familiarity and expertise with technology varied noticeably, which had an impact on students' engagement and output in online activities.

Outcome:

While it came to test the outcome for the enhancement in critical thinking skills of the students, the educators employed various methods and combined pedagogical tools and techniques to evaluate the performance.

1. The discussion forum witnessed the quality of the discussion and a shift in thinking horizon for the students
2. The case study method analyzed the problem identification and problem-solving method for the students.
3. Project based collaborative learning provided an opportunity to the students for the demonstration of critical thinking skilled learned so far.
4. The process could be documented in the form of reflective journals and learning logs.
5. The combination of one or more pedagogical tools proved useful for the demonstration of the critical thinking tools.

Conclusion

The present research attempts a discovery of the existing online learning system for the improvement in critical thinking skills of the students. The study is useful for the educators as well as the administrators for the effective utilization of learning resources.

Various pedagogical tools are available at the disposal of the educators to deploy independently or in combinations for the effective teaching learning approach. They also include the evaluation modules for the efficiency testing of deployment.

Key findings reveal that discussion forums, case studies, problem-based learning, and interactive simulations are the effective contributors to the enhancement of critical thinking skills.

But the study also points out a number of obstacles that can prevent these talents from developing, such as low interaction, a lack of immediate feedback, and technical difficulties.

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