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Methods for Supporting the Development of Students' Critical Thinking Skills: An Experiment

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Abstract

In the era of globalization and evolving education, one of the primary objectives of higher education institutions is to ensure student success by developing their critical thinking skills. Academics and employers in higher education have identified critical thinking as one of the most essential competencies for students, emphasizing the need to pay greater attention to its development. According to the findings of a study examining the conditions for identifying students' critical thinking skills, 28 students (82.3%) conducted surface-level analysis and made general observations in assignments involving reports and essays, while 6 students (17.6%) demonstrated the ability to express their own understanding, take notes, and identify challenges. Since this skill occupies a critical role in modern education, it can be developed through specialized methods and exercises in instructional activities. Based on this, experimental lessons were conducted, and the results were evaluated. To assess changes in students' critical thinking skills, enthusiasm, and self-confidence, 9 criteria were selected for self-assessment before and after the experiment. The average score before the experiment was 0.72, while the average score after the experiment increased to 0.82, indicating a positive improvement.

Keywords: Critical Thinking, Established Patterns, Methods, Logical Thinking

1. Introduction

The course "Foundations of Learning and Teaching," outlined in the teacher training curriculum, is one of the core foundational subjects in teacher education and is taught in the first semester of the second year. This course helps students understand how children develop, grow, and learn, as well as the teacher's role in supporting and guiding this process. It also encourages students to adopt a positive attitude toward their professional activities. Through the content and methodology of this course, students are expected to develop critical thinking skills, motivation, self-confidence, the ability to engage in discussions, problem-solving, and other intellectual qualities. It aims to foster flexible thinking and attitudes.

In today's era of globalization and information overload, many students tend to accept knowledge and information from various sources without critical processing or reflection. This course, through its teaching methods, focuses on cultivating critical thinking skills and fostering the habit of analyzing and evaluating information rather than mindlessly copying or accepting it. The method used to develop students' critical thinking skills is aimed at enhancing their ability to analyze information, view problems from multiple perspectives, and make sound decisions.

Critical thinking is closely related to other abilities such as creativity, logic, or intuition, and it allows us to create new strategies and develop alternative ways of understanding and interpreting things. Critical thinking, as defined by Linda Elder (2008, p. 38), is the ability to analyze and improve the quality of one's thinking by skillfully examining the issues at hand and applying intellectual standards. It is not about how we accept information, but rather how we think about it. Critical thinking involves evaluating, organizing, verifying, and assessing information through specific criteria to determine what to believe. It allows individuals to reflect, question, and engage in self-directed inquiry (Duro, 2013, p. 275).

According to scholars like Kenneth Ziegler and Daniel Liston, critical thinking within the context of teaching can be viewed from three levels: understanding learning/teaching practices, examining these practices through theories, concepts, social norms, justice, human rights, and legal aspects. At this level, questions such as "How should we teach children?" "How should we meet their needs?" and "What kind of activities should we plan to support their learning and development?" is posed (Baigalmaa, 2015, p. 20).

Critical thinking also means having a fair and balanced approach, recognizing both the good and the bad aspects of an issue. It involves analyzing a topic or problem realistically and drawing appropriate conclusions based on evidence (Bold, 2016, p. 27). This is a cognitive skill that includes asking questions, analyzing, critiquing, synthesizing, evaluating, and drawing conclusions. Logic is a tool commonly used in critical thinking (Philo, 2018, p. 15).

Critical thinking involves evaluating available evidence, observations, and tasks to draw conclusions (Edward, 2017). This process includes assessing and analyzing factual data, considering different perspectives, and making judgments. The subject of critical thinking is complex and has multiple interpretations, but it generally involves evaluating evidence, scrutinizing claims, and assessing arguments (Clark & John, 2019).

In a study conducted on the psychological characteristics of 204 university students, which examined the scope of students' critical thinking, the results indicated that their critical thinking capacity was below average, with an average score of 2.8. This suggests that student's ability to think creatively, understand relationships between phenomena, and reflect deeply is underdeveloped, with their intellectual habits and cognitive skills remaining weak (Erdenechuluun, L., 2022).

2. Research Methodology

The study was conducted using a holistic approach, primarily employing qualitative analysis methods. To identify the current status of how students' critical thinking skills are being supported, a survey was conducted. The research involved 18 second-year students from the Preschool Education program at the School of Education, Arkhangai, Mongolian National University of Education (MNUE). The study included experimental lessons within the content framework of the *Foundations of Learning and Teaching* course, where specific analysis was carried out, and feedback was collected from students through self-assessment surveys. The research was carried out in the following stages:

2.1. Identifying the role of critical thinking skills in teaching through a survey

Survey Objective: To identify which teaching methods are most commonly used to develop students' critical thinking skills.

Survey Scope: 45 teachers from higher education institutions.

1. Is there a need to develop critical thinking skills in students?
 - A. Very much – 77.7%
 - B. Yes – 8.8%
 - C. No – 13.3%
 - D. Don't know – 0%

2. Which teaching strategies do you primarily use to support the development of students' critical thinking skills? (Select 3 commonly used methods)

Graph 1.

The survey results show that 86.5% of the teachers (39 teachers) believe that there is a need to develop critical thinking skills in students.

2.2. Developing and testing certain methods aimed at promoting students' critical thinking skills

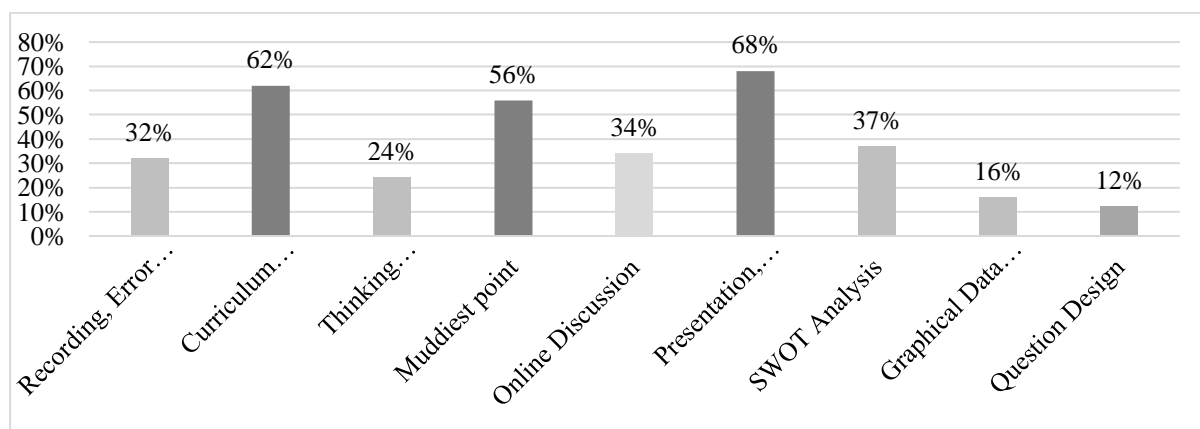
The methods were applied through experimental lessons conducted between September and November of 2020 and 2023 (over a period of 4 weeks). The results were then evaluated.

2.3. Evaluating changes in students' attitudes and self-confidence towards critical thinking

To measure the changes in students' enthusiasm and self-confidence regarding critical thinking, a self-assessment survey was conducted both before and after the experimental lessons with second-year students. (The survey is available in **Appendix 1.**)

3. Research Results

3.1. Students' Critical Thinking Skills and Teaching



Graph 1: Teaching Strategy of the Instructor

Based on the above survey results, it appears that teaching strategies to support students' critical thinking skills are relatively underutilized, indicating the need to test and implement such strategies. (See Graph 1).

3.2. Development and Implementation of Teaching Strategies to Support Students' Critical Thinking Skills Process and Outcomes of Experimental Lessons

Table 1: Planning of Experimental Lessons

Name of the Experiment:	Learning and Pedagogy Fundamentals
Purpose of the Experiment:	Testing methods to support students' critical thinking skills.
Class Format:	Seminar 2, 3
Scope:	2nd-year students of the Department of Preschool Education, Ar Teacher School, Mongolian University of Education (MNUE).
Experimental Group and Number of Students:	PET II a, 19 students
Control Group and Number	PET II b, 20 students

of Students:	
Date, Duration:	2023.09.09-13, 90 minutes
Topic:	2023.09.16-20, 90 minutes Child Development and Growth Child development and the influencing factors
Methods Used in the Experiment:	Presentation and analysis of articles, problem-solving, case study method
Materials Used:	Academic papers, analysis guidelines, worksheets, progress tracking charts
Assignment Task:	Select an academic article related to the seminar topic, reflect on it. Choose one academic article published in the "Mongolian Child" (Mongolian heritage child) journal and perform an analysis on it.

Table 2: Criteria and Results for Analyzing Students' Academic Presentations and Articles

№	Criteria for Analyzing the Academic Article	Total number of students: 34	Percentage	Ranking
1	Identifying the main issue of the research	24	70.5%	2
2	Expressing one's own understanding of the subject matter of the research	6	17.6%	7
3	Thoroughly reviewing the academic article and generating reflective questions	9	26.4%	5
4	Keeping notes using worksheets	18	52.9%	3
5	Identifying the challenges encountered	11	32.3%	
6	Being able to clearly define the main idea of the research	16	47.0%	4
7	Analyzing the research based on reliable sources	26	76.4%	1
8	Logically defending one's position	7	20.5%	6
	Average Score	15	44.1%	

When the research results are ranked, the analysis of students' reports and essays shows that the ability to analyze reliable sources and identify key issues in the research is quite strong, with scores ranging from 70.5% to 76.4%. However, the ability to logically defend their position and express their understanding of the research topic is relatively weak, with scores ranging from 17.6% to 20.5%.

Table 3: Planning of Experimental Lessons

Direction, Criteria	
Objective of the experiment:	To test methods aimed at promoting students' critical thinking skills.
Type of class:	Seminar
Scope:	Second-year students of the Faculty of Education, Mongolian University of Education (MUE)
Dates and Duration:	November 4-8, 2023, 90 minutes November 18-22, 2023, 90 minutes
Topic:	Teacher's job description, standard job description, and standards Teacher's ethical development and current status
Methods used:	SWOT analysis, Identifying the 10 most difficult points, Creative project
Materials used:	Published academic articles, SWOT analysis worksheets, Experiment record tables

Task description:	Carefully read articles on the same topic (teacher's reputation) written by four researchers from different time periods and perform a SWOT analysis based on the following template.
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3.3. Analysis Process and Results of Teacher-Student Assignment Performance

Assignment Description: Carefully read the articles and research papers written by four researchers from different time periods on the same topic (the reputation of teachers) and perform a SWOT analysis using the following format:

1. Research Article 1
2. Research Article 2
3. Research Article 3
4. Research Article 4

Table 4: Student's SWOT Analysis

Strengths	Weaknesses																														
<p>What are the strengths and advantages that current teachers have in terms of enhancing their reputation?</p> <ul style="list-style-type: none"> ○ Effective teaching methods, good delivery of lessons ○ Knowledge and education ○ Salary and compensation ○ Communication skills ○ 	<p>What are the weaknesses that could tarnish the reputation of current teachers?</p> <ul style="list-style-type: none"> ○ Ethical deterioration of teachers ○ Some teachers give grades in exchange for money ○ Outdated teaching methods ○ Shallow or weak knowledge and education ○ Lack of communication skills ○ Irresponsibility 																														
<p>Opportunities</p> <p>What opportunities and resources are available to improve the social perception that influences the reputation of teachers?</p> <ul style="list-style-type: none"> ○ Teacher training and development ○ Increasing salaries and compensation ○ Social welfare and protection ○ The interest and foundational education of students entering teacher training institutions ○ Ensuring all teachers maintain ethical standards ○ Listening attentively to students, being patient, and understanding their perspectives ○ Continuously improving teachers' professional knowledge and skills ○ Increasing government awards and incentives for teachers ○ 	<p>Threats</p> <p>What risks and challenges may arise if the factors negatively affecting the reputation of teachers are not addressed?</p> <ul style="list-style-type: none"> ○ It will impact the future development and growth of students. ○ The value and esteem of teachers will decrease. ○ Students may fall into moral confusion. ○ Unfair practices may become widespread. ○ Students may disrespect teachers and fail to engage in mutual interaction. ○ Teachers' attitudes may remain unchanged. 																														
<table border="1"> <thead> <tr> <th>Арга /Method/</th> <th>Уншиж олж илрүүлсэн санал</th> <th>percent</th> <th>frequency</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>S</td> <td>4</td> <td>16%</td> <td>/</td> <td>4</td> </tr> <tr> <td>W</td> <td>6</td> <td>24%</td> <td>≠</td> <td></td> </tr> <tr> <td>O</td> <td>9</td> <td>36%</td> <td>/</td> <td>9</td> </tr> <tr> <td>T</td> <td>6</td> <td>24%</td> <td>≠</td> <td></td> </tr> <tr> <td>Нийт</td> <td>25</td> <td></td> <td></td> <td>3.25</td> </tr> </tbody> </table>	Арга /Method/	Уншиж олж илрүүлсэн санал	percent	frequency	Amplitude	S	4	16%	/	4	W	6	24%	≠		O	9	36%	/	9	T	6	24%	≠		Нийт	25			3.25	
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From the frequency of students' SWOT analysis, it was found that common negative and challenging factors such as ethics, communication skills, superficial knowledge, and outdated teaching methods were identified under the **WT** category. Additionally, the opportunities to improve the social perception that influences the

reputation of teachers were thoroughly analyzed and evaluated, with 9 suggestions and comments, accounting for 36% of the total responses (see Table 4).

To identify changes in students' enthusiasm and self-confidence toward critical thinking, a self-assessment survey was conducted before and after the experimental lessons on critical thinking methods, held in November 2023, with 18 second-year students. The average scores from the survey were compared for each question before and after the experiment.

Table 5: Descriptive Statistics / Pre-experiment Results (2023.09.06)

Critical Thinking Criteria	N	Mean	Std. Deviation	Variance
1. I question and verify whether the things I hear in class are believable and credible.	18	.722	.4609	.212
2. When reading or introducing theories, explanations, or conclusions in class, I check whether there is supporting evidence.	18	.611	.5016	.252
3. I treat the class materials as a starting point and try to develop my own opinions on them.	18	.833	.3835	.147
4. I try to test my own ideas related to what I have learned in class.	18	.722	.4609	.212
5. Every time I read or hear a claim or conclusion in class, I think about possible alternative explanations.	18	.889	.3234	.105
6. When reading class materials, I create questions that help me focus and understand better.	18	.722	.4609	.212
7. If I get confused about what I am reading, I go back and try to figure it out.	18	.778	.4278	.183
8. I ask myself questions to confirm my understanding of the material studied in class.	18	.556	.5113	.261
9. When reflecting on a topic, I aim to understand not just what to read but also what I should learn from it.	18	.722	.4609	.212
Valid N (listwise)	18			

Table 6: Post-experiment Results (2023.11.05)

	N	Mean	Std. Deviation	Variance
Q1 EA	18	.7778	.42779	.183
Q2 EA	18	.8889	.32338	.105
Q3 EA	18	.8889	.32338	.105
Q4 EA	18	.7778	.42779	.183
Q5 EA	18	.9444	.23570	.056
Q6 EA	18	.6111	.50163	.252
Q7 EA	18	.9444	.23570	.056
Q8 EA	18	.8333	.38348	.147
Q9 EA	18	.7778	.42779	.183

Explanation: To assess students' critical thinking skills, enthusiasm, and confidence, 9 specific criteria were selected for self-evaluation. Before the experiment, the average scores ranged from 0.55 to 0.88, with a high standard deviation of 0.32 to 0.51. After the experiment, the average scores ranged from 0.61 to 0.94, with a decrease in standard deviation (acceptable range) from 0.23 to 0.32. This suggests improvement in the students' critical thinking abilities. Specifically, the average score increased from 0.72 before the experiment to 0.82 after the experiment, indicating progress in students' critical thinking, analytical skills, enthusiasm, and self-assessment. For example, after the experiment, standard deviation decreased from 0.32 to 0.23, reflecting that students started considering alternative explanations when reading or listening to conclusions. (See Table 6).

4. Conclusion

Based on the research findings, it is important to emphasize the significance of experimenting with various methods to support the development of students' critical thinking skills. The following conclusions can be drawn from the study:

- The methods used to enhance students' critical thinking supported the development of fundamental skills such as curiosity, exploration, and skepticism, which were evident from the research results.
- When using methods such as analysis of academic papers, data analysis, problem-solving, discussions, debates, case studies, identifying key challenges, brainstorming techniques, creative projects, and SWOT analysis, students demonstrated creative thinking, analysis, reflection, and idea generation.
- By consistently integrating these methods into the curriculum, students' critical thinking skills can develop, and they can be shaped into independent individuals with problem-solving abilities.
- Future research could involve a broader scope, including more students from universities and colleges, utilizing advancements in technology and research methodologies.
- As students' critical thinking skills develop, it could positively influence their preparation for the workforce and success in their careers.
- It is crucial to implement wide-scale training, seminars, and projects at universities to develop students' critical thinking skills in a comprehensive manner.

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