



Research on the Impact of Creating a Positive Classroom Atmosphere on Teaching Effectiveness

Xia Zhao*

School of Information Engineering, Nanjing Xiaozhuang University, Nanjing 210017, China
244593412@qq.com

Abstract. This article analyzes the impact of classroom management methods, teachers' competencies, student participation, and teacher-student relationships on teaching effectiveness. It proposes three strategies for creating a positive classroom atmosphere: stimulating interest in learning, creating teaching scenarios, and implementing democratic teaching practices. Creating a positive classroom atmosphere can enhance teaching effectiveness and learning efficiency. Take the teaching of the concept of limits as an example. Through experimental comparison, it was observed that quantitative indicators such as students' speaking frequency, accuracy rate of responses, and homework submission rate in the experimental class showed significant improvement. By deriving formulas through practical exercises and contextualizing knowledge within historical frameworks, students were able to appreciate the rational beauty and creative power of mathematics when solving complex problems. Establishing a positive classroom atmosphere has multidimensional impacts on students' academic performance, emotional well-being, and learning attitudes.

Keywords: Classroom Atmosphere, Teaching Effectiveness, Strategy.

1 Introduction

Focusing on student development, learning processes, and learning outcomes constitutes the core characteristics of the contemporary educational paradigm.[1] In foreign literature, classroom environment is interchangeably referred to as classroom climate or atmosphere, or psychological environment. Despite these varying terms, the classroom remains the constant element, affirming that "classroom climate" is inherently a product of the classroom context. [2] Since the 1980s, a substantial body of research has emerged on classroom atmosphere, with scholars examining this topic from diverse perspectives. Post-1990 teaching manuals have increasingly incorporated discussions on classroom atmosphere. Articles [2]-[5] explore the multifaceted definition of classroom atmosphere, elucidating how inadequate teacher preparation and strained teacher-student relationships can lead to a less conducive learning environment. These studies also highlight the influence of schools, teachers, and students on classroom dynamics. Research [6]-[7] indicates that many mathematics teachers still adhere strictly to textbooks. Effective classroom teaching hinges on stimulating students' cognitive engagement and empowering them to learn independently under teacher guidance. Therefore,

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strategies and methods for fostering a positive classroom atmosphere are introduced to enhance students' enthusiasm and initiative in learning. Studies [8]-[9] delve into how classroom management techniques and teachers' self-efficacy impact classroom climate, which in turn affects students' learning states.

2 Classroom Atmosphere and Teaching Significance

2.1 The Connotation of Classroom Atmosphere

The classroom atmosphere is significantly influenced by three major factors: teachers, students, and the classroom itself. "Classroom atmosphere refers to the dominant psychological environment formed during the interaction between teachers and students around teaching activities in the classroom setting." [10] Based on the psychological factors such as attention, thinking, emotion, and will of teachers and students in the classroom, classroom atmosphere can generally be divided into positive and negative categories. In a positive classroom atmosphere, teachers and students have harmonious relationships, close communication, and active classroom interaction. In contrast, a negative classroom atmosphere is characterized by a lack of communication between teachers and students, conflicts, and if left unaddressed, may escalate into a confrontational classroom atmosphere.

2.2 The Teaching Significance of A Good Classroom Atmosphere

Shulman Lee introduced the concept of "academic teaching and learning" to replace Boyer's "scholarship of teaching.". He posits that teaching is an interactive process encompassing both instruction and learning, where "academic teaching and learning" includes not only teachers' ability to instruct but also their capacity to facilitate students' learning improvement. A positive classroom atmosphere can provide students with a conducive learning environment, fostering self-confidence and cooperative spirit. It encourages students to develop trust and intimacy towards their teachers, thereby becoming more active and bold participants in classroom activities, truly taking ownership of their learning. This aligns with the new curriculum framework's emphasis on integrating knowledge and understanding in the teaching process. Exploring a positive classroom atmosphere enriches teachers' pedagogical methods both practically and theoretically, updates their teaching concepts, and enhances their professional quality.

3 Factors Affecting Classroom Atmosphere

3.1 Management Approach

In his experimental exploration of leadership types, Lewin observed changes in students' facial expressions and noted that under the control of authoritarian teachers, students exhibited signs of passivity and lacked initiative within just half an hour. This teaching method deprives students of the joy of learning, rendering the classroom monotonous

and rigid, which is not conducive to stimulating students' interest in learning. The laissez-faire classroom management approach fails to maintain classroom order and reflects teacher inaction and irresponsibility. Teachers who adopt democratic classroom management practices employ democratic teaching methods, fostering an environment of equality in classroom activities. In this setting, teachers proactively engage in communication with students, while students feel encouraged to share their thoughts and ideas. Within the classroom, students engage in autonomous and cooperative learning. They independently formulate questions and seek solutions, collaborate with peers, participate in discussions, and work in groups to achieve shared learning objectives.[11]

3.2 Teachers' Qualifications

The quality of a teacher encompasses both expertise and personal charisma. Possessing extensive and profound professional knowledge serves as the foundation for fostering an effective classroom environment. A teacher's authority, which is a manifestation of personal charisma, plays a crucial role in establishing credibility and influence. "Authority, defined as prestige and credibility, is a powerful attribute that can persuade others and endows an individual with influence, appeal, deterrence, or binding power." [12] The prestige of teachers is the foundation and prerequisite for students to receive a quality education. Teachers who command respect can inspire students to internalize exemplary behavior as their own intrinsic motivation, thereby fostering a compelling spiritual appeal. Respected educators can establish a classroom environment that is disciplined and equitable. Students are more likely to follow the teacher's guidance, engage in active thinking, collaborate effectively, and strive for self-improvement and personal development.

3.3 Student Participation

Among the influencing factors of classroom atmosphere, it is essential to emphasizing the leading role of teachers while fostering students' subjectivity. Classroom teaching activities should not adhere to a closed understanding of knowledge, but instead adopt a generative mindset. Students should be viewed as unique individuals requiring guidance and development, and knowledge should be regarded as a system that requires continuous construction and generation rather than predetermined conclusions [13]. Leif, who won the US Presidential National Art Award and was hailed as "the best teacher in America" by the Washington Post, once remarked, "You won't hear more laughter in any other classroom than in Room 56. But that laughter is the laughter of education, emanating from children's happiness and confidence that everything they do meets the highest expectations." [14] Such laughter, revealing happiness and confidence, is undoubtedly demonstrates teachers' ability to stimulate students' enthusiasm for learning.

3.4 Student Participation

The teacher-student relationship is defined as an interpersonal relationship formed between the educator and the educatee regarding educational goals and tasks.[15] The teacher-student relationship constitutes a dynamic and vibrant whole. Teaching is a collaborative activity between teachers and students. Harmonious teaching is characterized by harmony between teachers and students, harmony between teaching and learning and consistency between ideals and goals. Based on teachers' classroom teaching management styles and teaching effectiveness, teacher-student relationships are categorized into four types: confrontational, dependent, permissive, and democratic [16]. In a confrontational teacher-student relationship, there is alienation and tension, a lack of communication between teachers and students and extremely poor teaching effectiveness. In a dependent teacher-student relationship, teachers view themselves as leaders, and students habitually obey. Students are allowed to learn knowledge under teachers' guidance but lack initiative and creativity. A permissive teacher-student relationship can lead to a loose classroom atmosphere. Students lack consciousness in learning. In a democratic teacher-student relationship, the classroom teaching atmosphere is active. Although teachers are strict, they provide students with sufficient respect and understanding. Students actively engage in logical thinking activities such as analysis, reasoning, and judgment.

4 Strategies for Creating a Positive Classroom Atmosphere

4.1 Stimulate Learning Interest

The professional proficiency of teachers forms the cornerstone for fostering a positive classroom atmosphere. Teachers should commit to continuous learning and development, enhancing their professional abilities. They can leverage online resource platforms to disseminate educational knowledge. They can readily share their exceptional teaching experiences or pose pedagogical questions via social media. Every teacher can share their teaching cases and resources, engage in healthy and constructive communication and seek guidance and assistance from peers. Teachers' expressive and infectious teaching methods can create a lively and interactive classroom atmosphere, encouraging students to actively participate in the entire classroom teaching process, thereby maximize their potential. A vibrant and efficient class is the result of joint efforts by teachers and students. "The personal charm of teachers plays a crucial role in stimulating students' interest in learning." [17] Teachers should fully leverage their guiding role in the classroom, helping students gain insights into problem-solving and effectively strengthen mathematical thinking through exploration. Heuristic teaching is a scientific guiding ideology in the implementation of quality education, which can effectively stimulate students enthusiasm and initiative in learning. [18]

4.2 Create Teaching Scenarios

Formulas, methods, theorems, and definitions in mathematics can be perceived as monotonous and prone to causing boredom. By integrating information technology, displaying complex changes through multimedia, and creating engaging teaching scenarios, students' learning desire can be stimulated. Modern educational technology, with its interactive and personalized features, breaks the limitations of traditional teaching, enriches teaching content and methods, and improves teaching flexibility, relevance, and effectiveness, thereby promoting students' autonomous learning, personalized development, and cultivation of creative thinking.[19] When solving mathematical problems, it is essential to provide students with clear tasks and requirements, along with timely guidance. During this process, attention should be paid to stimulating imagination, questioning ability, and divergent thinking, encouraging students to ask questions and engage in mathematical imagination by selectively setting problems. In 1967, Guilford proposed that creative thinking refers to the ability to have multiple solutions to open-ended problems.[20] Mathematics plays an important role in cultivating students' creativity. Solving mathematical problems is closely related to creative thinking, which is a prerequisite for problem solving. [21].

4.3 Establish Teaching Democracy

While respecting students, teachers should learn to appreciate them, discover their shining points, and provide every student with opportunities to showcase their talents and gain confidence through recognition. Teachers need to establish a trusting relationship with students and treat them sincerely. In the classroom, teachers are not only transmitters of knowledge but also listeners to students. Healthy and constructive communication with every student and establishing an equal and democratic teacher-student relationship are essential. Without judgment based on superiority or inferiority, students are more willing to become friends with teachers, express their thoughts and freely explore knowledge in a relaxed and pleasant classroom environment. Teaching is a process where teachers and students jointly pursue certainty in the uncertainty of time and space, achieving the purpose of educating students through mutual transformation.[22] Teaching democracy advocates enhancing understanding and acceptance within the teaching community through communication, negotiation, and diverse interactions, creating a democratic and harmonious teaching atmosphere, stimulating students' awareness and ability to innovate and create. [23]

5 Case Studies

Take the teaching of limit concepts as an example. One of two freshman classes was designated as the experimental class to implement interactive strategies aimed at fostering a positive classroom teaching atmosphere, while the other served as the control class, continuing with the teacher-centered lecture-based teaching model. The teaching operation procedure for the experimental class is outlined below:

5.1 Utilize visual tools to concretize abstract limits and stimulate students' interest in learning

The examples of "Zeno's Paradox" and the construction process of the Koch snowflake illustrate the concept of limits.

Zeno's paradox posits that if Achilles cannot catch up with a tortoise in a race, even when the tortoise has a slight lead, this reveals the contradiction between continuity and discreteness in the real world, prompting profound reflection on motion, time, and space. The construction of the Koch snowflake begins with a simple equilateral triangle. Through endless iterations, its complexity grows, adding new details along the edges with each iteration. This gradual construction not only demonstrates the formation of the Koch snowflake but also highlights the self-similar properties of fractal structures. A fascinating mathematical property emerges: despite its circumference extending indefinitely, the area it encloses remains finite.

Leverage geogebra and other visualization tools to enhance teaching effectiveness and dynamically demonstrate the process of sequences approaching their limits.

The image of limit such as $\lim_{n \rightarrow \infty} x_n = \lim_{n \rightarrow \infty} (1 + \frac{1}{n})^n = e$ is shown in Fig.1. The "approaching" process of numerical sequences transitions from symbolic representation to visual point movement, making abstract concepts more tangible. By quantifying errors directly, the precision of limits is reinforced. Students can independently modify formulas and drag parameters to observe changes in limits, enabling independent exploration. Through dynamic demonstrations, students can visualize the existence of limits, thereby gaining a deeper understanding of the philosophical significance and mathematical rigor of "infinite approximation."

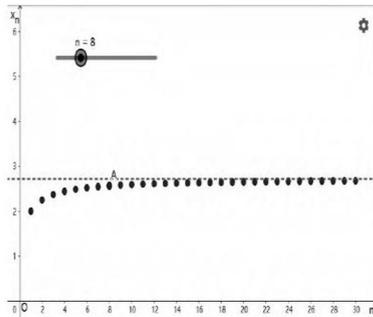


Fig. 1. x_n Dynamic Demonstration of Approximating.

5.2 Create teaching scenarios to arouse students' enthusiasm

Firstly, students watch a micro-lesson video recorded by the instructor on the " $\epsilon - N$ " definition complete online quizzes, and submit questions. Secondly, students discuss in groups, focusing on the "definition of sequence limits and its geometric intuition". The instructor elaborates on how Cauchy introduced a clear and rigorous expression method, establishing the concept of limits and laying the foundation for a logical and

coherent analysis system. Weierstrass provided a quantitative definition of the limit concept, known today as the " ϵ - δ " method in limit theory. Cauchy and Weierstrass clarified longstanding ambiguities in the fundamental problems of calculus, advancing the comprehensive rigor of analysis and transforming calculus into a science with rigorous logic and a perfect structure. By incorporating the history of mathematics, the importance of limit rigor is explained.

5.3 Solve cascading problems collaboratively in groups

Using limit calculations as foundational problems and proving limits using the " ϵ - N " definition as challenge problems, this approach challenges and strengthens students' understanding of the concept of limits. The data indicators summarized based on teaching practice cases are presented in Table 1.

Table 1. Comparison of Comprehensive Effects.

Index	Experimental Class	Control class
In-class active speaking frequency	82%	27%
Rigorousness of limit definition recognition	89%	45%
Accuracy of understanding limit definitions	84%	48%
Precision of describing the geometric meaning of limits	88%	48%
Accuracy of proving limits using " ϵ - N " definitions	75%	30%
Dynamic course work plagiarism rate	3%	12%
Average number of questions asked after class	6	1
Post-class independent learning development rate	40%	15%
Average score in the limit unit test	72	63
Rate of increase in average scores for limit-related questions in the final paper	18%	10%
Curriculum evaluation scores for "stimulating academic curiosity"	4.6/5	3.4/5

6 Analysis of Case Practice Results

Based on the analysis of Table 1, student engagement can be substantially enhanced as evidenced by quantitative indicators such as speech rate, answer accuracy rate, and assignment submission rate. The vitality of higher mathematics classes stems from "revealing the unseen" — visualizing abstract theories through technology. This approach ultimately enables students to appreciate the rational beauty and creative power of

mathematics while solving complex problems. Creating a positive classroom atmosphere has a multidimensional impact on students' growth and development, encompassing academic performance, Emotional and psychological aspects and learning attitudes. Students' intrinsic motivation was stimulated through encouragement, collaboration, and engaging activities. They're more willing to undertake challenging tasks. Students' learning motivation is enhanced. After dynamic demonstrations of limits, students demonstrated improved accuracy in understanding abstract concepts. Students' knowledge absorption efficiency is improved. Comparisons between the experimental and control groups revealed that positive classroom strategies led to an increase in the average final exam score.

Students' learning anxiety has been reduced. Positive feedback and fault-tolerant environments alleviate students' fear of failure, encouraging them to voice questions rather than conceal confusion. For example, the number of post-class inquiries increased markedly. Students' sense of self-confidence has been enhanced. Activities such as discussions on historical mathematical disputes promote active classroom participation, shifting students from passive listeners to active explorers and reinforcing their sense of self-worth.

The incidence of disciplinary issues among students has decreased. High levels of engagement minimize distracting behaviors, with a notable reduction in plagiarism rates for course assignments. Restoring historical contexts in mathematics helps students perceive its "humanized" nature, significantly enhancing their extracurricular academic curiosity. Students' interest in learning is more enduring.

7 Conclusion

This study unveils the crucial role of a positive classroom atmosphere in teaching, achieved through classroom observation and the gathering of quantitative indicators. However, there are still some limitations. The sample is limited to two classes taught by the researcher, and the universality of the conclusions requires further verification through cross-grade and cross-disciplinary research. Data collection relies solely on short-term observation, and future verification could be conducted in conjunction with long-term tracking. Due to the limited research period, it was not possible to deeply explore the obstacles posed by other practical factors to the implementation of strategies. Subsequent research could incorporate an educational policy perspective for a systematic analysis.

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