

Transforming Education for the Future: Leadership, Technology, and Learner Development

Editor

Dr. S. Karthiyayini,
M.Sc., M.Ed., M.Phil., Ph.D. (Education)
Head of the Department, School of Education
Vels Institute of Science, Technology and
Advanced Studies (VISTAS),
Pallavaram, Chennai

ESN PUBLICATIONS

Edition 2026

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Editor:

Dr. S. Karthiyayini

ISBN: 978-81-69400-07-7

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Published By:

ESN PUBLICATIONS,
3/151-A, Muthuramalingapuram,
Kalloorani Post, Aruppukottai
Taluk, Virudhunagar District, Tamil
Nadu, India, Pincode - 626 105
Ph: +91-8838173189

ABOUT THE EDITOR



Dr. S. Karthiyayini,

M.Sc., M.Ed., M.Phil., Ph.D. (Education)

Head of the Department, School of Education
Vels Institute of Science, Technology and Advanced
Studies (VISTAS), Pallavaram, Chennai

Dr. S. Karthiyayini is the Head of the Department in the School of Education at Vels Institute of Science, Technology and Advanced Studies (VISTAS), Pallavaram, Chennai. She possesses 19 years of teaching experience at the university level and 7 years of teaching experience at the school level.

An accomplished academician and researcher, Dr. Karthiyayini has presented more than 50 research papers in peer-reviewed and UGC CARE-listed journals and has actively participated in over 25

national and international conferences. She has authored one book and has been recognized with more than 10 awards for her contributions to the field of education.

As a dedicated research supervisor, she has successfully guided six Ph.D. scholars who have been awarded their doctoral degrees, while three scholars have submitted their theses and nine scholars are currently pursuing their Ph.D. under her supervision. In addition, she has guided more than 30 M.Ed. dissertations, demonstrating her commitment to fostering academic excellence and educational research.

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Understanding the Concept of Teaching

Dr. S. KARTHIYAYINI

**HOD, School of Education, Vels Institute of Science,
Technology and Advanced Studies(VISTAS), Pallavaram,
Chennai 600 117.**

Email id: karthirmp73@gmail.com

Introduction:

In teacher education programmes – and in continuing professional development – a lot of time is devoted to the ‘what’ of teaching – what areas we should we cover, what resources do we need and so on. The ‘how’ of teaching also gets a great deal of space – how to structure a lesson, manage classes, assess for learning for learning and so on. Sometimes, as Parker J. Palmer (1998: 4) comments, we may even ask the “why” question – ‘for what purposes and to what ends do we teach? ‘But seldom, if ever’, he continues: ‘do we ask the “who” question – who is the self that teaches?’

The thing about this is that who, what, why and how of teaching cannot be answered seriously without exploring the nature of teaching itself.

Meaning of Teaching:

In much modern usage, the words ‘teaching’ and ‘teacher’ are wrapped up with schooling and schools. One way of approaching the question ‘What is teaching?’ is to look at what those called ‘teachers’ do – and then to draw out key qualities or activities that set them apart from others. The problem is that all sorts of things are bundled together in job descriptions or roles that may have little to do with what we can sensibly call teaching.

Another way is to head for dictionaries and search for both the historical meanings of the term, and how it is used in everyday language. This brings us to definitions like:

Impart knowledge to or instruct (someone) as to how to do something; or

Cause (someone) to learn or understand something by example or experience.

Concept of Teaching:

Teaching is a process in which one individual teaches or instruct another individual. Teaching is considered as the act of imparting instructions to the learners in the classroom situation. It is watching systematically.

Dewey: considers it as a manipulation of the situation, where the learner will acquire skills and insight with his own initiation.

Modern **concept: Teaching** is to cause the pupil to learn and acquire the desired knowledge, skills and also desirable ways of living in the society. It is a process in which learner, **teacher**, curriculum and other variables are organised in a systematic and psychological way to attain some pre-determined goals.

Aims of Teaching:

Aims are what **teachers** (and learners) want to achieve in a lesson or a course. **Aims** on lesson plans often describe what the **teacher** wants learners to be able to do by the end of a lesson, or what they will have done during it. **Teachers** can tell learners their lesson **aims**, or involve learners in setting them.

Definition of Teaching:

Teaching is one of the instruments of education and is a special **function** is to impart understanding and skill. The main **function** of **teaching** is to make learning effective. The

learning process would get completed as a result of **teaching**. So, **teaching** and learning are very closely related.

Teaching is the process of attending to people's needs, experiences and feelings, and intervening so that they learn particular things, and go beyond the given.

Interventions commonly take the form of questioning, listening, giving information, explaining some phenomenon, demonstrating a skill or process, testing understanding and capacity, and facilitating learning activities (such as note taking, discussion, assignment writing, simulations and practice).

H C Morrison: - Teaching is an intimate contact between the more mature personality and a less mature one.

Jackson: - Teaching is a face to face encounters between two or more persons, one of whom (teacher) intends to effect certain changes in the other participants (students).

N.L.Gage (Democratic point of view):- Teaching is interpersonal influence aimed at changing the behavior potential of another person.

Clerk: - Teaching refers to activities that are designed and performed to produce in student's behavior.

J.B.Hough and James K Duncan:

Teaching is an activity with four phases, a curriculum, planning phase, an instructing phase and an evaluating phase. This definition presents the organizational aspect by which we can describe and analyze the teaching process

We can define teaching according to the following three viewpoints.

- (a) Authoritarian
- (b) Democratic
- (c) Laissez faire.

(a) Authoritarian:

According to this viewpoint-

- Teaching is an activity of memory level only.
- This teaching does not develop thoughts and attitude in the students.
- Is known as thoughtless teaching.
- This teaching is teacher's centric criticism of the teachers.

(b) Democratic teaching:

According to this-

- Teaching is done at understanding level.
- Memory level teaching is the prerequisite (concept) is first memorized and then understand
- Such teaching is known as thoughtful teaching.
- According to this point of view, teaching is an interactive process, primarily involving classroom talks which takes place between teachers and student.
- Here students can ask questions and criticize the teachers.
- Here students can ask the questions and self-disciplined is insisted.

(c) Laissez faire:

According to this-

- It is known as reflective level teaching.

- It is more difficult than memory level and understanding level of teaching.
- Memory level and understanding level teaching are must for the reflective level of teaching.
- It is highly thoughtful activity.
- In this level both students and teachers are participants.
- This level produces insights.

Principles of Teaching:

- Encourage contact between students and faculty.
- Develop reciprocity and cooperation among students.
- Encourage active learning.
- Give prompt feedback.
- Emphasize time on task.
- Communicate high expectations.
- Respect diverse talents and ways of learning.

Nature and Characteristic of teaching:

Teaching is a social and cultural process, which is planned in order to enable an individual to learn something in his life. We can describe the nature and characteristics of teaching in following way:-

(1) Teaching is a complete social process.

Teaching is undertaken for the society and by the society. With ever changing social ideas, it is not possible to describe exact and permanent nature of teaching.

(2) Teaching is giving information.

Teaching tells students about the things they have to know and students cannot find out themselves. Communication of knowledge is an essential part of teaching.

(3) Teaching is an interactive process

Teaching is an interactive process between the student and the teaching sources, which is essential for the guidance, progress, and development of students.

(4) Teaching is a process of development and learning.

(5) Teaching causes a change in behavior.

(6) Teaching is art as well as science.

(7) Teaching is face to face encounter.

(8) Teaching is observable, measurable and modifiable.

(9) Teaching is skilled occupation:- Every successful teacher is expected to know the general methods of teaching-learning situations.

(10) Teaching facilitates learning

(11) Teaching is both conscious and an unconscious process.

(12) Teaching is from memory level to reflective level.

(13) Teaching is a continuum of training, conditioning, instruction, and indoctrination.

Separation of teaching from other similar concepts:

Inorder to understand the meaning of teaching, it is essential to understand the difference between teaching and other similar concepts like conditioning, training, instruction, and indoctrination. Here, a brief description is given below:-

TeachingVS Conditioning

Teaching

- Teaching aims at the development of potential and intellect.
- It has broader scope.
- Reinforcement is not necessary for teaching.
- In teaching repetition of the taught subject matter is not necessary.
- In teaching, there is a curriculum that is very comprehensive.
- In teaching qualitative and quantitative techniques are used for evaluation.

- Teaching is abroad process with various levels.

Conditioning

- It aims at modification of behavior and learning habits.
- Scope of conditioning is relatively narrow
- Reinforcement plays a vital role here.
- Conditioning is done by the repetition of behavior to be acquired.
- In conditioning, curriculum is fixed.
- Evaluation in conditioning is done on the basis of the acquisition of a behavior or a habit.
- Conditioning is considered as the lowest level of the entire process of teaching.

Training VS Teaching

Teaching

Teaching is mostly theoretically oriented

- Teaching fills the mind.
- Teaching provides new knowledge to the people.
- Teaching continues for a long time.
- Teaching is the broader area.
- Teaching does not follow very rigid approach.
- Teaching usually refers to classroom learning.

Training

- Training is practical orient.
- Training shapes habits.
- Training helps already knowledgeable people to learn tools and techniques to apply them.
- Training is for few days or a few months.
- Training is for specific areas.
- Training follows rigid and systematic approach.

- Training refers to workshops, seminars, role-plays, simulations etc.

Training is a specific programme of skill development. It is a planned and systematic sequence of instruction under a competent trainer. It is a time-bound process.

Instruction VS Teaching

Instruction is the act of telling the learner what to do or what not to do.

Teaching

- Scope is wide.
- It is both formal and informal.
- Teaching is a continuum for modification of behavior.
- Teaching means the development of potential of an individual.
- Range of methods used in teaching is very wide.
- Teaching is imparted in school, library, political group etc.

Instruction

- Its scope is narrow and limited.
- Instruction is always formal.
- Instruction is a part of teaching.
- Instruction means to impart knowledge of specific subjects.
- Instruction is generally confined to the classroom.

Indoctrination VS Teaching

Indoctrination is the process of forming certain beliefs. Some ideas are infused in the mind of the learner from the beginning. These ideas are continuously put in the minds of the learners and thus such ideas become their firm beliefs.

Teaching

- The scope is broad.
- Aims at the development of the potential of the learner.
- Teaching points out that there are different solutions, often to the Same problem
- It provides freedom to the child to learn.
- Discipline is democratic and social discipline is emphasized.

Indoctrination

- Scope is very narrow.
- It aims at changing some belief and attitudes.
- Indoctrination poses the belief that there is only one solution to problem.
- There is no freedom to the child.
- Discipline is very rigid.

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Education System AI in Today's Classroom

Dr.V.Girija, Professor, School of Education, VELS Institute of Science, Technology and Advanced Studies

Abstract Artificial Intelligence (AI) has emerged as one of the most transformative forces in contemporary education. The integration of AI into classrooms has reshaped teaching methodologies, learning experiences, assessment practices, and educational administration. AI-driven technologies such as intelligent tutoring systems, adaptive learning platforms, virtual assistants, automated assessments, and data analytics are enabling personalized, efficient, and accessible learning environments. The modern classroom is gradually transitioning from traditional teacher-centered instruction to learner-centered and technology-supported educational ecosystems. This chapter explores the role of AI in today's classroom, examining its applications, benefits, challenges, ethical concerns, and future implications for teachers, students, and educational institutions. It also discusses how AI supports inclusive education, collaborative learning, and lifelong learning while emphasizing the importance of balancing technological innovation with human values and pedagogical principles.

Introduction Education has always evolved alongside human civilization and technological advancement. In the twenty-first century, Artificial Intelligence (AI) has become one of the most influential innovations shaping the future of education. AI refers to the ability of machines and computer systems to perform tasks that typically require human intelligence, such as learning, reasoning, problem-solving, language understanding, decision-making, and pattern recognition.

The modern classroom is no longer confined to blackboards, textbooks, and traditional lectures. Digital technologies, internet connectivity, and AI-powered tools have transformed educational spaces into interactive and learner-centered environments. AI is enabling teachers to personalize instruction, automate routine tasks, analyze learner performance, and provide immediate feedback.

Today's students belong to a digitally connected generation that learns through multimedia, online platforms, virtual interactions, and mobile technologies. AI has become a valuable educational partner capable of supporting diverse learners, improving educational access, and enhancing the quality of teaching-learning processes.

The integration of AI into classrooms is not intended to replace teachers but to empower them with tools that improve instructional effectiveness and learner engagement. As educational systems continue to adapt to rapid technological change, understanding the role of AI in today's classroom becomes increasingly important.

Understanding Artificial Intelligence in Education Artificial Intelligence in education refers to the use of intelligent computer systems and algorithms to facilitate teaching, learning, assessment, administration, and educational decision-making. AI technologies in classrooms can: Analyze student learning patterns, Provide personalized instructional support, Automate administrative tasks, Predict learner performance, Offer real-time feedback, Facilitate interactive and immersive learning, Support inclusive and accessible education. AI systems learn from data and continuously improve their performance through machine learning and deep learning techniques. Educational institutions worldwide are increasingly adopting AI-powered tools to improve learning outcomes and institutional efficiency.

Evolution of Classroom Technology The classroom has undergone significant technological transformation over the past century.

Traditional Classroom Traditional classrooms relied heavily on textbooks, lectures, memorization, and teacher-centered instruction. Teachers were the primary source of information, and students played relatively passive roles.

Technology-Enhanced Classroom The introduction of projectors, computers, television, radio, and internet technologies gradually modernized classrooms. Digital content, multimedia presentations, and online learning platforms improved instructional delivery.

Smart Classroom Today's classrooms are increasingly becoming smart classrooms equipped with: Interactive whiteboards, Tablets and laptops, Learning management systems., Virtual learning platforms, AI-powered educational software, Internet-connected learning devices. Smart classrooms promote collaboration, engagement, flexibility, and interactive learning experiences.

AI Applications in Today's Classroom AI is being applied in multiple dimensions of classroom teaching and learning.

Personalized Learning One of the most significant contributions of AI in education is personalized learning. Every learner has unique abilities, interests, learning styles, and learning speeds. Traditional classrooms often struggle to address individual differences effectively. AI-powered adaptive learning systems analyze learner data and customize educational content according to individual needs.

Personalized learning platforms can: Recommend suitable learning materials, Adjust difficulty levels, Identify strengths and

weaknesses, Track learner progress, Provide customized learning pathways. Students can learn at their own pace without feeling pressured or left behind.

Intelligent Tutoring Systems Intelligent Tutoring Systems (ITS) simulate human tutoring by providing individualized instruction and guidance. These systems can: Answer student queries., Diagnose learning difficulties., Provide explanations, Offer practice exercises, Monitor student performance. AI tutors are available anytime, enabling continuous learning support beyond classroom hours.

Automated Assessment and Evaluation Assessment is an essential component of education. AI has simplified assessment processes through automated grading and evaluation systems. AI tools can evaluate: Multiple-choice questions, Objective tests, Assignments, Essays, Coding tasks, Language proficiency. Automated assessment provides instant feedback, helping students improve quickly while reducing teacher workload.

AI-Powered Chatbots and Virtual Assistants Educational chatbots and virtual assistants support students by answering questions, providing reminders, explaining concepts, and guiding learning activities. These systems help students access information instantly and improve communication between teachers and learners. Examples include: Virtual academic advisors, AI teaching assistants, Student support chatbots, Interactive learning companions.

Learning Analytics AI-based learning analytics collects and analyzes educational data to improve learning outcomes. Teachers can monitor: Student participation, Attendance, Performance trends, Learning difficulties, Engagement levels. Learning analytics helps educators identify at-risk students and provide timely intervention.

Language Learning Support AI tools support language learning through: Speech recognition, Pronunciation analysis, Translation systems, Grammar correction, Conversational practice. Language learning applications powered by AI make language acquisition more interactive and personalized.

Virtual Reality and Augmented Reality AI integrated with Virtual Reality (VR) and Augmented Reality (AR) creates immersive learning experiences. Students can: Explore historical places virtually, Conduct virtual science experiments, Experience simulated environments, Interact with 3D educational models. Immersive technologies improve conceptual understanding and learner engagement.

Benefits of AI in Today's Classroom AI offers numerous benefits for students, teachers, institutions, and educational systems.

Enhanced Learning Experience AI enables interactive, engaging, and learner-centered educational experiences. Multimedia resources, gamified learning, and adaptive content improve student motivation and participation.

Individual Attention In large classrooms, teachers may find it difficult to provide individual attention to every learner. AI systems help address this challenge through personalized support and adaptive instruction.

Immediate Feedback AI-powered systems provide real-time feedback on assignments, quizzes, and learning activities. Immediate feedback helps learners identify mistakes and improve continuously.

Increased Accessibility AI promotes inclusive education by supporting learners with disabilities and diverse learning needs. Examples include: Speech-to-text systems, Text-to-speech tools,

Visual recognition systems, Language translation technologies, Assistive learning applications. AI helps make education more accessible for all learners.

Reduced Administrative Burden Teachers spend considerable time on administrative tasks such as grading, attendance management, scheduling, and documentation. AI automates **many** routine tasks, allowing teachers to focus more on teaching and student interaction.

Data-Driven Decision Making Educational institutions can use AI-generated insights for curriculum planning, performance monitoring, institutional management, and educational policy development.

Support for Lifelong Learning AI-powered online platforms enable flexible and continuous learning opportunities for individuals across different age groups and professions.

Role of Teachers in AI-Enabled Classrooms The integration of AI changes the traditional role of teachers. Teachers are no longer merely information providers. Instead, they become: Facilitators of learning, Mentors and guides, Designers of learning experiences, Motivators and counselors, Evaluators and innovators. AI cannot replace the emotional intelligence, empathy, creativity, and ethical guidance provided by teachers.

Skills Required for Teachers Teachers in AI-enabled classrooms require: Digital literacy, Technological competence, Data interpretation skills, Creative instructional design, Critical thinking, Adaptability, Ethical awareness. Professional development and teacher training programs are essential for preparing educators for technology-integrated classrooms.

AI and Student Learning AI significantly influences student learning experiences.

Active Learning AI encourages active participation through interactive simulations, adaptive activities, and collaborative platforms.

Self-Paced Learning Students can learn according to their individual speed and preferences. Self-paced learning reduces anxiety and supports better understanding.

Improved Engagement Gamification, multimedia content, and immersive technologies increase learner engagement and motivation.

Development of Future Skills AI-integrated learning environments help students develop: Critical thinking, Creativity, Communication, Collaboration, Digital literacy, Problem-solving abilities. These skills are essential for success in the twenty-first century.

AI in Inclusive Education Inclusive education aims to provide equal learning opportunities for all students regardless of physical, social, economic, linguistic, or cognitive differences. AI supports inclusive education through assistive technologies and adaptive learning systems.

Support for Learners with Disabilities

AI-based assistive tools help learners with disabilities participate effectively in educational activities. Examples include: Screen readers for visually impaired learners. Speech recognition tools for students with physical disabilities, AI-supported sign language recognition, Personalized learning aids for learners with special educational needs.

Bridging Educational Gaps AI-powered online learning platforms help reach learners in remote and underserved **areas**. Digital education can reduce educational inequalities by increasing access to quality learning resources.

Challenges of AI in Today's Classroom Despite its advantages, AI integration also presents several challenges.

Digital Divide Not all students and institutions have equal access to digital technologies, internet connectivity, and AI tools. The digital divide can widen educational inequalities between urban and rural areas and between economically advantaged and disadvantaged groups.

Privacy and Data Security AI systems collect large amounts of learner data. Concerns arise regarding: Data privacy, Student surveillance Cybersecurity, Unauthorized access to information. Educational institutions must ensure ethical and secure use of educational data.

Dependence on Technology Excessive reliance on AI and digital devices may reduce face-to-face interaction, social development, and independent thinking. Technology should complement rather than dominate learning experiences.

Ethical Concerns AI systems may reflect biases present in training data. Bias in AI algorithms can affect: Student evaluation, Recommendations, Educational opportunities, Ethical AI practices are essential to ensure fairness and transparency.

Teacher Resistance and Training Needs Some educators may resist AI integration due to lack of technological skills or fear of change. Continuous professional development and institutional support are necessary for successful AI adoption.

Ethical Dimensions of AI in Education Ethics play a crucial role in the responsible implementation of AI in classrooms.

Human-Centered Education Education should prioritize human values such as empathy, compassion, ethics, creativity, and social responsibility. AI must support human development rather than replace human interaction.

Transparency and Accountability Educational AI systems should be transparent in their functioning and decision-making processes. Institutions must ensure accountability for AI-based decisions affecting students.

Equity and Fairness AI should promote equitable educational opportunities for all learners without discrimination.

Responsible Digital Citizenship Students must be educated about responsible technology use, digital ethics, online behavior, and information literacy.

Future of AI in Education The future of AI in education is likely to be highly transformative.

Smart Learning Ecosystems Educational institutions may evolve into interconnected smart learning ecosystems where AI supports every aspect of teaching, learning, and administration.

Predictive Education AI systems may predict learner needs, performance outcomes, and career pathways with greater accuracy.

Global Learning Networks AI-powered platforms can facilitate global collaboration and cross-cultural learning experiences.

Lifelong and Flexible Learning Future educational systems will increasingly support lifelong learning through flexible and personalized educational pathways.

Human-AI Collaboration The future classroom will likely involve collaboration between teachers, students, and intelligent systems. Human creativity and emotional intelligence combined with AI efficiency can create powerful educational experiences.

Strategies for Effective AI Integration in Classrooms Successful integration of AI in classrooms requires thoughtful planning and implementation.

Infrastructure Development Educational institutions must provide adequate technological infrastructure, internet access, and digital resources.

Teacher Training Teachers should receive continuous training in educational technology and AI applications.

Curriculum Reform Curricula should incorporate digital literacy, AI awareness, coding, computational thinking, and ethical technology use.

Policy and Governance Governments and educational institutions should develop clear policies regarding AI implementation, data protection, and ethical standards.

Student Awareness Students should be guided to use AI responsibly for learning, creativity, and problem-solving.

Conclusion Artificial Intelligence is transforming today's classrooms by reshaping teaching methods, learning experiences, assessment systems, and educational administration. AI-powered technologies provide personalized learning, intelligent tutoring,

automated assessment, immersive learning experiences, and data-driven educational support. The integration of AI has created opportunities for more inclusive, flexible, efficient, and learner-centered educational systems. Teachers are empowered with tools that **enhance instructional effectiveness, while students benefit from adaptive and engaging learning environments.**

However, the adoption of AI in education also raises important concerns related to ethics, privacy, equity, accessibility, and overdependence on technology. Educational institutions must ensure that AI is implemented responsibly and inclusively. The future of education should not focus solely on technological advancement but also on preserving the human values that define meaningful learning. Creativity, empathy, collaboration, critical thinking, and ethical responsibility remain essential qualities that cannot be replaced by machines.

AI should be viewed as a supportive partner in education rather than a substitute for teachers. The successful classroom of the future will be one where technology and humanity work together to create enriching, equitable, and transformative learning experiences for all.

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LEADERSHIP IN EDUCATION: INSTRUCTIONAL VS TRANSFORMATIONAL LEADERSHIP

S. RAMESH

Research Scholar
School of Education
VISTAS, Pallavaram,
Chennai 600 117.

Dr. S. KARTHIYAYINI

HOD
School of Education,
VISTAS, Pallavaram,
Chennai 600 117.

1. Introduction to Educational Leadership

Educational leadership can be understood as a dynamic process through which individuals influence the functioning and direction of educational institutions to achieve defined learning goals. Unlike routine administration, which focuses on maintaining systems, leadership emphasizes vision, innovation, and improvement in teaching–learning processes. It involves not only those in formal authority positions such as principals but also teachers and other stakeholders who contribute to institutional development. The significance of leadership in education is widely acknowledged in research literature. Effective leadership contributes to establishing clear goals, maintaining academic standards, and fostering a collaborative culture among educators. According to Kenneth Leithwood and colleagues, leadership is one of the most influential school-related factors affecting student learning, second only to classroom instruction (**Leithwood et al., 2008**). This highlights that leadership is not peripheral but central to educational success.

Furthermore, leadership plays a critical role in responding to changing educational demands, including curriculum reforms, technological integration, and inclusive education practices. In the Indian context, initiatives such as the National Education Policy 2020 emphasize the need for visionary and adaptive leadership to transform schools into learner-centered environments. Educational leaders, therefore, act as facilitators of change, ensuring that institutional practices align with national and global expectations.

2. Leadership as a Driver of School Effectiveness

School effectiveness refers to the extent to which an educational institution achieves its intended academic and developmental outcomes. Leadership is a key determinant of such effectiveness, as it influences both organizational processes and classroom practices. Effective leaders articulate a shared vision, set high expectations, and create conditions that support continuous improvement.

Research indicates that leadership affects student outcomes both directly and indirectly. While leaders may not engage in classroom teaching, they influence instructional quality by supporting teachers, monitoring academic progress, and promoting professional development. **Viviane Robinson (2011)** emphasizes that leadership practices focused on teaching and learning have a significant impact on student achievement.

In addition, leadership contributes to building a positive school climate characterized by trust, collaboration, and mutual respect. Such an environment enhances teacher motivation and commitment, which in turn improves student engagement and performance. Leaders also play a crucial role in decision-making by utilizing data to identify gaps and implement targeted interventions.

Resource management is another important dimension through which leadership drives school effectiveness. Efficient use of financial, human, and material resources ensures that schools can provide quality education even in constrained settings. Particularly in developing contexts, the adaptability and problem-solving skills of leaders are essential for overcoming systemic challenges.

Overall, educational leadership integrates vision, people, and processes to enhance institutional performance. It serves as a catalyst for improving teaching quality, strengthening school culture, and achieving desired educational outcomes.

3.Understanding Instructional Leadership

3.1.Definition and Core Principles

Instructional leadership refers to the leadership practices that focus primarily on improving teaching and learning processes within educational institutions. It is concerned with the actions of school leaders aimed at enhancing classroom instruction, strengthening curriculum implementation, and improving student learning outcomes. Unlike broader administrative leadership, instructional leadership places teaching–learning at the centre of all school improvement efforts.

Instructional leadership is grounded in the belief that school leaders directly and indirectly influence student achievement by shaping the conditions under which teaching occurs. According to Hallinger (2011), instructional leadership is a structured approach in which leaders define the school mission, manage instructional programs, and promote a positive learning climate. Core principles include a clear academic vision, high expectations for teaching and learning, continuous monitoring of instruction, and professional support for teachers.

Another key principle is accountability, where leaders ensure that instructional practices align with curricular goals and student learning standards. Additionally, collaboration and continuous professional development are essential, as instructional leadership promotes collective responsibility for student success.

3.2. Focus on Teaching–Learning Process

The central focus of instructional leadership is the enhancement of the teaching–learning process. This involves ensuring that classroom practices are effective, student-centered, and aligned with curriculum objectives. Instructional leaders emphasize evidence-based pedagogical strategies that improve student engagement and achievement.

Effective instructional leadership requires continuous attention to instructional quality, including lesson planning, classroom interaction, assessment practices, and differentiated instruction. Leaders support teachers in adopting innovative teaching methods and integrating technology to meet diverse learner needs. By prioritizing instructional improvement, leaders create an academic environment where learning becomes the core institutional priority.

Furthermore, instructional leadership emphasizes data-informed decision-making. Student performance data, classroom assessments, and feedback are used to identify learning gaps and implement targeted interventions. This ensures that teaching strategies are responsive and adaptive to student needs.

3.3. Role of the Principal as Instructional Leader

The principal plays a central role in instructional leadership and is often considered the key driver of school improvement. As an instructional leader, the principal is responsible for setting

academic goals, guiding curriculum implementation, and ensuring effective teaching practices across classrooms.

Rather than functioning solely as an administrator, the principal actively engages with teachers to support instructional improvement. This includes mentoring teachers, facilitating professional learning opportunities, and fostering a collaborative school culture focused on student achievement. According to Leithwood et al. (2008), principals significantly influence teaching quality by shaping the conditions that enable effective instruction.

The principal also serves as a bridge between policy and practice, ensuring that curricular reforms and educational policies are effectively implemented at the school level. In addition, they motivate teachers, recognize good practices, and create an environment of trust and professional growth.

3.4. Key Functions of Instructional Leadership

- i. Curriculum Supervision; Curriculum supervision involves ensuring that the prescribed curriculum is effectively implemented in classrooms. Instructional leaders review lesson plans, monitor syllabus coverage, and ensure alignment between learning objectives and classroom practices. This function ensures consistency and academic rigor across the institution. Supervisory practices are developmental in nature, aimed at improving teacher competence rather than merely inspecting performance.
- ii. Classroom Observation: Classroom observation is a critical function of instructional leadership. Through systematic observation, leaders gain insights into teaching practices, student engagement, and classroom dynamics. Observations may be formal or informal and are used to identify strengths and areas for improvement in instruction. Effective

observation focuses on constructive evaluation rather than fault-finding, thereby supporting teacher growth.

- iii. **Feedback Mechanisms:** Providing timely and meaningful feedback is essential in instructional leadership. Feedback helps teachers reflect on their instructional practices and make necessary improvements. Effective feedback is specific, evidence-based, and supportive in nature. It encourages professional dialogue and fosters continuous improvement in teaching quality. Feedback also strengthens trust between teachers and school leaders, contributing to a positive professional culture.

4. Understanding Transformational Leadership

4.1. Definition and Core Dimensions

Transformational leadership refers to a leadership approach in which leaders inspire, motivate, and intellectually stimulate individuals to exceed expected levels of performance and contribute to organizational change. In educational settings, it emphasizes long-term development, collective vision, and capacity building rather than routine supervision or task compliance.

James MacGregor Burns originally introduced the concept of transformational leadership, describing it as a process in which leaders and followers raise one another to higher levels of morality and motivation. Later, Bernard M. Bass expanded the model and identified core dimensions that define transformational leadership in practice. These include idealized influence (role modeling), inspirational motivation (vision sharing), intellectual stimulation (encouraging innovation), and individualized consideration (attention to individual needs).

In education, these dimensions collectively contribute to creating schools that are adaptive, innovative, and learner-centered.

4.2. Vision Building and School Culture

A central function of transformational leadership is the development of a shared vision that guides institutional goals and practices. Educational leaders articulate a compelling vision that reflects high expectations for teaching, learning, and student development. This vision acts as a unifying force that aligns teachers, students, and stakeholders toward common objectives.

Transformational leaders also play a significant role in shaping school culture. They foster an environment characterized by trust, collaboration, inclusiveness, and continuous improvement. Such a culture encourages innovation in teaching practices and openness to change. Over time, this contributes to the development of a positive institutional identity where learning and growth are prioritized.

By embedding values such as equity, excellence, and participation into the school culture, transformational leaders ensure that schools become dynamic learning communities rather than rigid administrative structures.

4.3. Motivation and Teacher Empowerment

Transformational leadership strongly emphasizes motivation and empowerment of teachers. Leaders inspire teachers by recognizing their contributions, encouraging professional autonomy, and involving them in decision-making processes. This enhances teachers' sense of ownership and commitment to school goals. Teacher empowerment is achieved through professional development opportunities, collaborative planning, and supportive leadership practices. Instead of relying on control mechanisms, transformational leaders build trust and encourage initiative among teachers. This leads to improved job satisfaction and higher levels of professional engagement.

Motivation in this leadership style is not merely extrinsic but deeply intrinsic, as teachers are encouraged to connect their personal values with institutional goals. As a result, teachers become active contributors to school improvement rather than passive implementers of policies.

4.4. Emotional and Social Influence in Leadership

Transformational leadership is deeply rooted in emotional and social influence. Leaders in this approach are sensitive to the emotional needs of teachers and students and demonstrate empathy, respect, and ethical behavior. Emotional intelligence plays a critical role in building strong interpersonal relationships within the school. Social influence is exercised through role modeling and relationship building. Leaders demonstrate integrity, commitment, and fairness, which inspires trust and respect among staff members. This relational approach strengthens school cohesion and fosters a supportive working environment.

Additionally, transformational leaders manage change effectively by addressing resistance through communication, encouragement, and shared decision-making. Their ability to influence both emotional and social dynamics makes them effective in sustaining long-term institutional improvement.

5. Comparison of Instructional Leadership and Transformational Leadership

Basis of Comparison	Instructional Leadership	Transformational Leadership
Core Focus	Focuses directly on teaching-learning processes and classroom instruction	Focuses on vision, change, and overall school transformation
Primary Objective	Improve student learning through effective instruction	Transform school culture and build long-term institutional development
Nature of Leadership	Task-oriented and academic performance driven	Vision-oriented and change-driven
Leader's Role	Supervisor of instruction and curriculum implementation	Vision builder, motivator, and change agent
Key Activities	Classroom observation, curriculum monitoring, teacher feedback	Inspiring teachers, fostering collaboration, building shared vision
Focus of Attention	Teaching quality and student academic outcomes	Organizational culture, teacher morale, and innovation
Teacher Relationship	Professional supervision and instructional support	Empowerment, motivation, and emotional support
Decision-Making Style	More structured and data-driven	Collaborative and participative
Change Orientation	Focuses on incremental improvement in instruction	Focuses on deep, systemic, and cultural change
Role of Principal	Instructional leader overseeing teaching practices	Transformational leader shaping vision and culture
Basis of Influence	Expertise in curriculum and pedagogy	Charisma, vision, trust, and emotional intelligence

Outcome Orientation	Improved classroom instruction and student achievement	Enhanced school effectiveness and organizational transformation
Evaluation Method	Student performance data, lesson quality, instructional standards	School climate, innovation, teacher satisfaction, and engagement

Instructional leadership ensures what happens in the classroom is effective, while transformational leadership ensures the school as an organization evolves and improves over time. In practice, effective school leaders often integrate both approaches to achieve sustainable educational improvement.

6. Leadership in the Context of Indian Education

Leadership in Indian education is increasingly viewed as a multidimensional construct that extends beyond administrative supervision to include academic stewardship, institutional transformation, and community engagement. In a diverse and rapidly evolving system, school leaders act as mediators between policy intentions and classroom realities, ensuring that educational reforms translate into meaningful learning outcomes. Within the Indian context, educational leadership is deeply influenced by socio-cultural diversity, linguistic plurality, infrastructural disparities, and varying governance structures across states. Consequently, effective leadership requires contextual intelligence, adaptive decision-making, and a strong alignment with national reform agendas.

6.1 Role of School Leadership under National Education Policy (NEP) 2020

The introduction of the National Education Policy 2020 marks a significant shift in the role of school leadership in India. The policy positions school leaders as key change agents responsible for implementing holistic, competency-based, and learner-centred education.

Key leadership responsibilities under NEP 2020 include:

- **Curricular Transformation:** Facilitating the shift from rote learning to competency-based and experiential learning.
- **Foundational Literacy and Numeracy (FLN):** Ensuring early-grade outcomes through structured school leadership interventions.
- **Inclusive Education:** Promoting equity and access for learners from diverse socio-economic and linguistic backgrounds.
- **Technology Integration:** Leading the adoption of digital tools and blended learning models.
- **Teacher Professional Development:** Encouraging continuous capacity building through mentoring, collaboration, and reflective practices.
- **School Governance Autonomy:** Strengthening School Management Committees (SMCs) and decentralized decision-making structures.

Thus, NEP 2020 reframes leadership from administrative compliance to instructional and transformational leadership.

6.2. Challenges in Indian School Administration

School leadership in India faces a complex set of challenges that impact educational quality and equity:

- **Resource Inequality:** Significant disparities in infrastructure, funding, and learning resources across regions.
- **Teacher Shortages and Capacity Gaps:** Inadequate recruitment and uneven professional development opportunities.
- **Policy Implementation Gaps:** Difficulties in translating national and state policies into classroom practice.
- **Administrative Burden:** Excessive non-academic workload limiting instructional leadership time.
- **Digital Divide:** Unequal access to technology and internet connectivity, especially in rural areas.
- **Accountability Pressures:** Balancing compliance requirements with innovation and pedagogical improvement.
- **Socio-cultural Diversity:** Managing multilingual classrooms and varied learner backgrounds effectively.

Addressing these challenges requires strengthening leadership capacity through training, mentoring systems, and distributed leadership models.

7. Conclusion

Leadership in Indian education has undergone a significant transformation, moving from a predominantly administrative function to a more dynamic, instructional, and transformational role. In the context of contemporary reforms, particularly the National Education Policy 2020, school leaders are now envisioned as key drivers of educational quality, equity, and innovation.

The comparative dynamics between government and private school leadership highlight the diversity of operational contexts, where leaders must navigate varying degrees of autonomy, accountability, and resource availability. However, Indian school

administration continues to face persistent challenges such as resource disparities, teacher capacity constraints, digital inequities, and administrative overload. These challenges underscore the need for sustained investment in leadership development, decentralised decision-making, and systemic support mechanisms. In essence, the future of Indian education depends significantly on strengthening school leadership as a professional practice grounded in vision, inclusivity, and continuous improvement. Effective leadership, aligned with national educational goals, holds the potential to transform schools into equitable, innovative, and learner-centred spaces.

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A Study on Mathematics Phobia and Performance in Mathematics among High School Students

Dr. J. Lizzie

Professor in Education

Indhira college of education, Thiruvallur

Abstract

The present study was conducted to investigate the relationship between Mathematics Phobia and Performance in Mathematics among High School Students. Mathematics phobia refers to the feelings of fear, anxiety and stress that students experience while learning or solving mathematical problems, which can negatively influence their academic performance. The study employed the survey method and a random sample of 300 IX standard students was selected from different high schools in Tiruvallur District. Data were collected using a Mathematics Phobia Questionnaire developed by the investigator and mathematics marks obtained from school records. The collected data were analyzed using statistical techniques such as percentage analysis, mean, standard deviation, t-test and correlation analysis. The results indicated that the level of mathematics phobia among high school students was moderate, whereas their performance in mathematics was found to be average. The findings further revealed that there was no significant difference in mathematics phobia based on gender, type of family and locality. However significant differences were identified in students' mathematics performance with regard to gender, type of family and locality. The correlation analysis showed a negative relationship between mathematics phobia and performance in mathematics. The study emphasizes that minimizing mathematics phobia through effective teaching strategies, encouraging learning environments and parental support can enhance students' confidence and academic achievement in mathematics.

Key words: *Mathematics Phobia, Performance in Mathematics, Anxiety, Stress and Feelings of Fear*

INTRODUCTION

Many high school students struggle with mathematics not due to a lack of ability but because of mathematics phobia an intense fear or anxiety associated with learning and performing in math. This emotional response can negatively impact students' confidence, interest, and overall academic performance in the subject. Despite the importance of mathematics in academic and career development, the influence of math phobia on student achievement remains a significant concern. Therefore, this study seeks to examine the relationship between mathematics phobia and performance in mathematics among high school students, aiming to identify patterns and suggest effective intervention strategies.

The topic of the present research study has been framed as **“A Study of Mathematics Phobia and Performance in Mathematics among High School Students.”**

NEED FOR THE STUDY

Mathematics is a core subject in school education and a foundation for many academic and career pathways. However, many high school students experience mathematics phobia an intense fear or anxiety related to learning or performing in mathematics. This emotional barrier often hampers their ability to engage with mathematical concepts effectively, resulting in poor academic performance.

High school is a critical stage where students form lasting academic attitudes and make important decisions about their future careers. Mathematics phobia during this period can negatively influence not only academic achievement but also students' confidence and willingness to pursue math-related fields.

Furthermore, societal pressures, fear of failure and negative past experiences with mathematics can exacerbate this phobia.

OBJECTIVES OF THE STUDY

- To find out the level of Mathematics Phobia and Performance in Mathematics among High School students.
- To find out the significant difference in the Mathematics Phobia and Performance in Mathematics mean scores of High School Students based on Gender, Locality and Medium
- To find out the relationship between Mathematics Phobia and Performance in Mathematics among High School Students.

HYPOTHESES

- The level of Mathematics Phobia among High School students is moderate.
- The level of Performance in Mathematics among High School students is average.
- There is no significant difference in the Mathematics Phobia and Performance in Mathematics among High School Students based on Gender, Locality and Medium
- There is no significance relationship between Mathematics Phobia and Performance in Mathematics among High School Students.

METHOD ADOPTED IN THE PRESENT STUDY

The investigator has selected normative survey method for this study.

TOOLS USED

The following tools are used to collect data relevant to the

1. **Mathematics Phobia** questionnaire prepared by investigator
2. **Performance in Mathematics** –marks average taken from the school record.

SAMPLE

Random sampling Technique has been adopted to choose the sample. Random sample of 300 Students from IX standard were selected from different High schools of Tiruvallur District.

STATISTICAL TECHNIQUES USED

The following statistical measures were used.

- A. Descriptive analysis (Mean Percentage, mean, S.D.)
- B. Differential analysis (t -test)
- C. Correlation analysis

DESCRIPTIVE ANALYSIS

HYPOTHESIS 1

Mathematics Phobia among High School Students is Moderate.

Table 1

Frequency and Percentage of students in each category of Mathematics Phobia

Variable	Categories	Range	Frequency	Percentage
Mathematics Phobia	Low	39-62	79	26.3%
	Moderate	63-69	138	46.0%
	High	70-117	83	27.7%

INFERENCE

From the table 1, it is observed that more number of students lie in the moderate category showing that the Mathematics Phobia among high school students is moderate as hypothesized.

HYPOTHESIS 2

Performance in Mathematics among High School Students is Average.

Table 2

Frequency and Percentage of Students in each category of Performance in Mathematics

Variables	Categorie s	Rang e	Frequenc y	Percentag e
Performanc e in Mathematic s	Low	0-35	80	26.7%
	Average	36-75	141	47.0%
	High	76-100	79	26.3%
			100	

INFERENCE

From the table 2, it is observed that Performance in Mathematics among high school students is average as hypothesized. Since, maximum no of students lie in this category.

DIFFERENTIAL ANALYSIS

HYPOTHESIS 3

There is no significant difference in the Mathematics Phobia among High School Students based on Gender, Types of Family and Locality.

Table 3

Mean, Standard Deviation and t- value for Mathematics Phobia – Gender, Types of Family and Locality Wise

Mathematics Phobia	Sub Sample	N	Mean	S.D	t-value	L.S
Gender	Male	150	89.95	10.25	1.66	NS
	Female	150	87.95	10.54		
Types of Family	Nuclear	85	88.118	11.28	0.13	NS
	Joint	215	89.284	10.08		
Locality	Rural	100	89.35	10.27	0.469	NS
	Urban	200	88.75	10.52		

INFERENCE

From the above table it is observed that the Mathematics Phobia score of Male High school students is (89.95) and Female High school students is (87.95). The t-value (1.66) is less than table value at (1.96) at (0.05) level showing no significant difference between Male and Female Students. Hence the null hypothesis is accepted.

It is observed that Mathematics Phobia score of students belongs to Nuclear family is (88.11) and students belongs to Joint family is (10.08). The t-value (0.13) is less than table value at (1.96) at (0.05) level showing no significant difference between Nuclear and Joint family High School Students. Hence the null hypothesis is accepted.

It is observed that the Mathematics Phobia score of Rural High school students is (89.35) and Urban High school students is (88.75). The t-value (0.469) is less than table value at (1.96) at (0.05) level showing

no significant difference between Rural and Urban Students. Hence the null hypothesis is accepted.

HYPOTHESIS 4

There is no significant difference in Performance in Mathematics among High School Students based on Gender, Types of Family and Locality.

Table 4

Mean, Standard Deviation and t-value for Performance in Mathematics – Gender, Types of Family and Locality wise

Performance in Mathematics	Sub	N	Mean	S.D	t- value	L.S
Sample						
Gender	Male	150	69.14	13.69	3.70	S at 0.01
	Female	150	62.78	15.98		
Types of Family	Nuclear	85	60.36	14.13	4.23	S at 0.01
	Joint	215	68.17	15.06		
Locality	Rural	100	58.12	12.60	7.16	S at 0.01
	Urban	200	69.88	14.89		

INFERENCE

From the above table it is observed that Performance in Mathematics mean score of Male High school students is (69.14) greater than the mean score of Female High school students (62.78). The t-value (3.70) is greater than the table value at (2.58) at (0.01) level showing significant difference between Male and Female Students. Hence the null hypothesis is rejected.

It is observed that Performance in Mathematics mean score of students belongs to Joint family is (68.17) is higher than that of students belongs to Nuclear family is (60.36). The t-value (4.23) is greater than the table value at (2.58) at (0.01) level showing significant difference between Nuclear and Joint family High School Students. Hence the null hypothesis is rejected.

It is observed that the Mathematics Phobia score of Urban High school students is (69.88) higher than that of Rural High school students is (58.12). The t-value (7.16) is greater than the table value at (2.58) at (0.01) level showing significant difference between Rural and Urban Students. Hence the null hypothesis is rejected.

CORRELATION ANALYSIS

HYPOTHESIS 5

There is no significant relationship between Mathematics Phobia and Performance in Mathematics among High School Students.

Table 5

Correlation between Mathematics Phobia and Performance in Mathematics among High School Students

VARIABLE	N	r value	L.S
Mathematics Phobia	300	-0.026	S
Performance in Mathematics			

INFERENCE

From the above table, it is observed that there is a negative relationship between Mathematics Phobia and Performance in Mathematics among high school students.

FINDINGS

- ❖ The level of Mathematics Phobia among High School Students is moderate.
- ❖ The level of Performance in Mathematics among High School Students is average.
- ❖ There is no significant difference in their Mathematics Phobia among High School Students based on Gender Types of Family and Locality.
- ❖ There is significant difference in their Performance in Mathematics among High School Students based on Gender Types of Family and Locality.
- ❖ There is negative relationship between Mathematics Phobia and Performance in Mathematics among high school students.

IMPLICATIONS OF THE STUDY

Mathematics phobia, characterized by feelings of fear, tension, and anxiety toward learning or performing mathematics, is a growing concern among high school students. It negatively affects students' interest, confidence, and performance in the subject. Since mathematics is a core subject and a prerequisite for many academic and career opportunities, addressing mathematics phobia is crucial. The educational implications of this issue are far-reaching, impacting teaching methods, curriculum development, teacher training, student support systems, and assessment practices. Parental involvement also plays a crucial role. Parents should be educated about the impact of mathematics phobia and guided to create a supportive home environment. They should avoid pressuring children over marks and instead encourage effort, persistence, and a positive attitude towards learning.

CONCLUSION

The study highlights the importance of understanding and mitigating mathematics phobia to enhance performance in mathematics. Since math phobia is not confined to any specific demographic group, educational strategies must focus on fostering positive attitudes toward mathematics through effective pedagogy, supportive learning environments and psychological interventions. Additionally, since performance varies based on gender, locality, school management and family type targeted measures may be required to bridge these performance gaps. Overall, reducing mathematics phobia can lead to better student outcomes and greater confidence in tackling mathematical challenges.

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Self-Efficacy and Achievement Motivation among Higher Secondary Students: A Correlational Study in Thiruvallur District.

Dr.M.P.Rama Priya

**Assistant Professor, Indhira College of Education, Tiruvallur
Dist, TN, India**

Email: prakvinrama17@gmail.com

ABSTRACT

This study explores the connection between achievement motivation and self-efficacy among higher secondary students in the Thiruvallur District. Self-efficacy pertains to learners' confidence in successfully executing academic assignments, whereas achievement motivation signifies their ambition to achieve success and excellence through dedication and perseverance. The research utilized the survey approach, incorporating the standardized Self-Efficacy Scale created by Chen, Gully, and Eden (2001) along with the revised Deo-Mohan Achievement Motivation Scale (1995). A group of 300 higher secondary students from chosen schools in Thiruvallur District was selected using stratified random sampling. Statistical methods including mean, standard deviation, t-test are utilized for analyzing data. The results indicated that self-efficacy levels were evenly spread across low and high groups, whereas the majority of students demonstrated moderate achievement motivation. Notable disparities were observed in self-efficacy and achievement motivation related to gender and language of instruction. Achievement motivation varied notably depending on the kind of school administration. The research also demonstrated a significant positive relationship between self-efficacy and achievement motivation ($r = 0.75$), suggesting that students possessing higher self-efficacy are likely to exhibit increased achievement motivation. The findings emphasize the significance of bolstering students' confidence and

motivation via supportive teaching methods, mentoring, and counseling initiatives to improve academic performance.

Key words:

Self-Efficacy, Achievement Motivation, stratified random sampling and positive correlation.

INTRODUCTION

Students' academic paths are significantly shaped by the interaction between self-efficacy and success drive, especially at the upper secondary level where the groundwork for future academic and professional courses is established. Understanding these psychological concepts can offer important insights into improving student performance and well-being in the Thiruvallur District, a place that reflects the varied socioeconomic environment of India.

Based on Bandura's social cognitive theory, self-efficacy is described as a person's confidence in their ability to carry out the actions required to achieve particular performance goals. It is crucial in deciding how engaged, persistent, and successful students are in their academic pursuits. The urge to succeed and attain competence, which includes goal orientation and the tenacity to overcome challenges, is referred to as achievement motivation. This study intends to identify important characteristics that impact educational results by examining the levels of these constructs among higher secondary students. This will lay the groundwork for focused interventions to improve student development.

SELF EFFICACY

Self-efficacy refers to an individual's confidence in their capacity to achieve success in particular circumstances or complete a task. This idea, presented by psychologist Albert Bandura in 1977, emphasizes belief in one's ability to plan and perform actions required for achieving desired results.

Self-efficacy signifies the belief in one's ability to manage motivation, behavior, performance, and social surroundings to reach objectives. It is distinct from overall self-confidence by being specific to tasks, like academic or athletic self-efficacy, instead of being a general characteristic.

Robust self-efficacy influences goal planning, effort, perseverance, and resilience, resulting in improved performance in domains such as academics, relationships, and health. It originates from factors such as previous achievements (mastery experiences), watching others (vicarious experiences), encouragement from others, and stress management. Limited self-efficacy can constrain motivation, whereas elevated levels encourage proactive actions.

ACHIEVEMENT MOTIVATION

Achievement motivation refers to the impetus to seek and achieve difficult objectives, frequently associated with a yearning for excellence and self-mastery. It indicates a person's inclination to pursue achievement by putting in effort and remaining determined in tasks of intermediate challenge.

Individuals with strong achievement motivation tend to favor challenges that strike a balance between risk and skill—not overly simple or unfeasible—and actively pursue feedback for self-improvement. It relates to self-efficacy from earlier conversations, as confidence in one's skills propels this motivational push towards objectives in education, employment, or athletics. Low levels can result in avoiding challenges, whereas high levels encourage resilience and creativity.

SIGNIFICANCE

This research is important as it offers empirical data to assist educators and policymakers in shifting from broad teaching approaches to data-informed, evidence-based tactics customized to the unique socio-economic environment of the Thiruvallur District. By recognizing the motivational profiles of students, the study

provides school counselors practical insights for offering tailored guidance and assistance that helps adolescents manage the essential shift from high school to higher education. Additionally, the research tackles educational inequalities by emphasizing the impact of environmental conditions and types of school management on student performance, thus serving as a critical resource for reforms, fair distribution of resources, and the creation of inclusive initiatives that enhance both self-efficacy and motivation to succeed. Ultimately, by connecting localized results with wider educational theories, this research provides crucial insights that enable stakeholders to develop a more nurturing learning atmosphere, cultivating a generation of self-assured and driven learners.

REVIEW

Research conducted by Ogbodo et al. (2024) explored the connection between academic self-efficacy and the achievements of secondary school students. The results showed a statistically significant connection, validating that increased academic self-efficacy is a strong indicator of enhanced student performance.

Research conducted by Priya (2025) examined the connection between achievement motivation and the challenges faced by adolescents (such as educational, social, and emotional issues). The study revealed a notable negative correlation, showing that students who exhibit greater achievement motivation generally experience fewer problems with adolescent adjustment, implying that motivation serves as a protective psychological element.

STATEMENT OF THE PROBLEM

Students in higher secondary education within Thiruvallur District encounter significant academic pressures in a competitive learning environment, where self-efficacy and achievement motivation play vital roles in determining success, persistence, and performance. Nonetheless, the degree of their relationship is still

insufficiently examined in this area, especially concerning gender, stream (arts/science), and socio-economic aspects, even though there is proof of beneficial connections in other contexts. The current research is named “Self-Efficacy and Achievement Motivation among Higher Secondary Students: A Correlational Study in Thiruvallur District.”

OBJECTIVES

- To find out whether there is a significant difference in the Self Efficacy and Achievement Motivation among Higher secondary School students based on Gender, Medium of instruction and Type of Family.
- To find out the relationship between Self Efficacy and Achievement Motivation among Higher secondary School students.

HYPOTHESES

- There is no significant difference in the Self Efficacy and Achievement Motivation among Higher Secondary students based on Gender, Medium and Type of Family.
- There is no significant relationship between Self Efficacy and Achievement Motivation among Higher secondary School students.

METHOD UTILIZED IN THE CURRENT RESEARCH

The researcher has chosen the survey method for the study named "Self Efficacy and Achievement Motivation of Higher Secondary Students in Thiruvallur District." The survey method analyzes and explains what currently exists. It pertains to current circumstances or relationships, dominant practices, convictions, mindsets in progress, and the arising trends. This study evaluates the existing state of Self Efficacy and its influence on Achievement Motivation.

TOOLS USED

Self-Efficacy Scale: The standardized Self Efficacy scale by Chen, G., Gully, S.M., & Eden, D. (2001) was employed to assess the Self Efficacy Strategy of students in Higher Secondary Schools.

Achievement Motivation Scale: Adapted version of the DEO-Mohan Achievement Motivation Scale (DMAMAS), Deo. The current study adopted the work of **Mohan A (1995).**

SAMPLE

The participants for this study were higher secondary students enrolled in chosen schools within Tiruvallur District. A sum of 300 students was chosen for the research. The sample consisted of boys and girls enrolled in Classes XI and XII. The Stratified Random Sampling Method was utilized to guarantee sufficient representation of the students

DATA ANALYSIS AND INTERPRETATION

There is no significant difference in their Self-Efficacy and Achievement Motivation of Higher Secondary School Students based on Gender.

Table 1
Mean, S.D and t value of Self-Efficacy and Achievement Motivation based on Gender, Medium and Type of Family.

Variable	SUB VARIABLE		N	Mean	S.D	't' Value	L.S
Self-Efficacy	Gender	Male	150	33.4	4.05	3.13	0.01
		Female	150	34.7	2.70		
Achievement Motivation		Male	150	142.8	5.61	2.07	0.05
		Female	150	141.4	5.98		
Self-Efficacy	Medium	Tamil	184	34.07	3.73	0.56	NS
		English	116	34.17	3.09		

		Tamil	184	141.2	6.33	3.41	0.01
Achievement Motivation		English	116	143.4	4.67		
Self-Efficacy	TYPE	Nuclear	191	33.87	3.79	1.66	NS
	OF	Joint	109	34.52	2.87		
	FAMILY	Nuclear	191	141.7	6.10	1.64	NS
Achievement Motivation		Joint	109	142.8	5.28		

INFERENCE

The table presents the comparison of Self-Efficacy and Achievement Motivation among Higher Secondary students based on gender, medium of instruction, and type of family.

Gender

Female students (Mean = 34.73) exhibit greater Self-Efficacy compared to male students (Mean = 33.49). The calculated t value (3.134) is significant at the 0.01 level, showing a notable difference in Self-Efficacy between male and female students.

In Achievement Motivation, male students (Mean = 142.83) had a marginally higher score compared to female students (Mean = 141.43). The t value (2.079) is noteworthy at the 0.05 level, indicating a meaningful difference in Achievement Motivation between male and female students.

Medium of Instruction

There is no notable difference in Self-Efficacy among Tamil medium students (Mean = 34.07) and English medium students (Mean = 34.17), since the calculated t value (0.567) is not significant.

Nonetheless, students in the English medium (Mean = 143.47) exhibit greater Achievement Motivation compared to

those in the Tamil medium (Mean = 141.29). The t value (3.417) shows significance at the 0.01 level, revealing a notable difference in Achievement Motivation depending on the medium of instruction.

Type of Family

Students from joint families (Mean = 34.52) demonstrate marginally greater Self-Efficacy compared to those from nuclear families (Mean = 33.87), yet the t value (1.669) is not significant. Therefore, there is no meaningful variation in Self-Efficacy depending on the type of family.

In a similar manner, students hailing from joint families (Mean = 142.83) achieved slightly better scores in Achievement Motivation compared to those from nuclear families (Mean = 141.73), yet the t value (1.648) is not significant. Consequently, there is no notable difference in Achievement Motivation according to family type.

There is no significant relationship between Self-Efficacy and Achievement Motivation of Higher Secondary students.

Table 2

Correlation between Self-Efficacy and Achievement Motivation			
Variable	N	Correlation Coefficient	L.S
Self-Efficacy	300	0.75	0.01
Achievement Motivation			

INFERENCE

The above table 4, shows positive relationship between Self-Efficacy and Achievement Motivation of Higher Secondary students. Hence the null hypothesis is not accepted.

FINDINGS

1. Female students demonstrated notably greater Self-Efficacy compared to male students.
2. Male students demonstrated considerably greater Achievement Motivation compared to female students.
3. No substantial difference in Self-Efficacy was found between students studying in Tamil medium and those in English medium.
4. Students in English medium demonstrated considerably greater Achievement Motivation compared to those in Tamil medium.
5. No notable difference existed in Self-Efficacy and Achievement Motivation among students from nuclear and joint families.
6. A significant correlation was identified between Self-Efficacy and Achievement Motivation in Higher Secondary students. As a result, the null hypothesis was rejected.

EDUCATIONAL IMPLICATIONS

1. Educators ought to promote activities that enhance students' Self-Efficacy and Achievement Motivation.
2. Programs for guidance and counseling can assist students in building self-assurance and fostering positive attitudes toward learning.
3. Schools ought to establish an encouraging and nurturing learning atmosphere for every student.
4. Parents and educators need to collaborate to boost students' academic drive and self-assurance

SUGGESTIONS FOR FURTHER RESEARCH

1. Similar studies may be conducted with larger samples from different districts or states.
2. Future research may compare Self-Efficacy and Achievement Motivation among students of different educational levels.
3. Other variables such as academic achievement, emotional intelligence, and parental support may also be included.

CONCLUSION

The research validates that self-efficacy and achievement motivation are crucial indicators of student success. Educators and policymakers ought to utilize these insights to develop supportive environments that tackle socio-economic and gender-related inequalities, ultimately improving educational achievement in the Thiruvallur District and elsewhere.

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STUDY ORGANIZATION AND ACADEMIC ACHIEVEMENT AMONG HIGHER SECONDARY STUDENTS

Dr.D.JAYAKUMARI

**ASSISTANT PROFESSOR IN EDUCATION
INDHIRA COLLEGE OF EDUCATION, PANDUR,
THIRUVALLUR**

Email: jayakumari2006@yahoo.in

Abstract

The present study focuses on study organization and academic achievement among higher secondary students. Study organization plays a vital role in improving students' learning behaviour, time management, concentration, and academic success. In the present educational scenario, students face various distractions and academic pressures that affect their performance in examinations. Therefore, organized study practices are essential for achieving better academic outcomes. The main objective of the study is to examine the relationship between study organization and academic achievement among higher secondary students. The study also aims to identify differences in study organization based on selected demographic variables. The normative survey method was adopted for the study. A sample of higher secondary students was selected using appropriate sampling techniques. Data were analyzed using suitable statistical techniques such as mean, standard deviation, t-test, and correlation analysis. The findings of the study are expected to reveal that students with better study organization possess higher academic achievement. The study highlights the importance of developing effective study organization skills among students to improve educational performance and overall academic growth.

Keywords

Study Organization, Academic Achievement, Higher Secondary Students, Learning Behaviour, Time Management, Educational Performance.

INTRODUCTION

Education is considered one of the most powerful tools for individual and social development. In the modern educational system, academic achievement is regarded as an important indicator of students' success. Academic achievement reflects the knowledge, skills, understanding, and competencies acquired by students through the learning process. Several factors influence academic achievement, among which study organization plays a significant role.

Study organization refers to the ability of students to plan, arrange, and manage their learning activities effectively. It includes maintaining a study schedule, organizing study materials, setting academic goals, managing time properly, and following systematic learning practices. Students who possess good study organization skills are usually more disciplined, motivated, and academically successful. Proper organization of study activities helps students reduce stress, improve concentration, and utilize learning time efficiently.

At the higher secondary level, students experience greater academic pressure due to public examinations, competitive environments, and future career expectations. Many students struggle to balance schoolwork, tuition classes, assignments, and personal responsibilities. In such situations, study organization becomes highly essential for effective learning and academic progress. Students with poor study organization often face difficulties in completing assignments, revising lessons, and performing well in examinations.

NEED AND SIGNIFICANCE OF THE STUDY

The higher secondary stage is a crucial period in students' academic life because it determines their higher education opportunities and future career development. Academic achievement at this stage greatly influences students' confidence, aspirations, and social mobility. However, many students experience academic difficulties due to improper study practices, lack of planning, poor time management, and ineffective learning strategies. Hence, study organization has become an important area of educational research.

In the present educational context, students are exposed to multiple distractions such as social media, online entertainment, and

excessive mobile phone usage. These factors may negatively affect students' concentration and academic performance. Therefore, understanding the role of study organization in academic achievement is essential for teachers, parents, and educational institutions.

The study is significant because it may help educators identify the importance of organized study practices in improving students' academic performance. The findings of the study may provide guidance for teachers to implement effective learning strategies and study skills training programmes. Parents may also become aware of the importance of creating a supportive home environment that encourages systematic study habits.

The present study holds educational and social significance in improving students' academic achievement and overall personality development.

REVIEW OF RELATED LITERATURE

Eilam and Aharon (2011) focused on students' planning behaviour in the process of self-regulated learning. The researchers examined how planning and organized learning strategies influence students' academic activities. The findings showed that students who effectively planned and organized their study activities demonstrated better understanding, improved concentration, and higher academic performance. The study highlighted the importance of systematic learning practices in educational achievement.

Plant, Ericsson, Hill, L., and Asberg, K. (2011) investigated the relationship between study time and grade point average among college students. The findings indicated that merely spending more time studying does not guarantee better academic performance. Instead, students who practiced organized and deliberate learning strategies achieved higher academic success. The study highlighted the importance of effective study organization over the duration of study time.

OBJECTIVES

- ✓ To find out whether there is a significant difference in the Study Organization and Academic Achievement among Higher Secondary students based on Gender, Medium, Family Type.

- ✓ To find out the relationship between Study Organization and Academic Achievement among Higher Secondary Students.

HYPOTHESES

- There is a significant difference in the Study Organization and Academic Achievement among Higher Secondary students based on Gender, Medium, Family Type.
- There is no relationship between Study Organization and Academic Achievement among Higher Secondary Students.

METHOD ADOPTED IN THE PRESENT STUDY

The investigator has selected survey method for this study entitled A STUDY ORGANIZATION AND ACADEMIC ACHIEVEMENT AMONG HIGHER SECONDARY STUDENTS. Survey is a method in which data are systematically collected from a population through some form of direct solicitation such as presenting of questionnaires.

TOOLS USED

The following tools are used to collect data relevant to the

Study Organization Tool Prepared by Investigator.

Academic Achievement – First term marks taken from the school record.

SAMPLE

Random sampling Technique has been adopted to choose the sample. Random sample of 300 Students from XI standard were selected from different Higher Secondary schools of Tiruvallur District.

DATA ANALYSIS AND INTERPRETATION

There is no significant difference in the Study Organization mean scores of Higher Secondary School Students based on Gender, Medium and Family Type.

TABLE 1**MEAN, STANDARD DEVIATION AND T- VALUE FOR STUDY ORGANIZATION – GENDER, MEDIUM AND FAMILY TYPE**

STUDY ORGANIZATION		N	MEAN	S.D	t-VALUE	L.S
GENDER	MALE	150	139.07	14.583	1.992	NS
	FEMALE	150	145.99	15.151		
MEDIUM	ENGLISH	101	137.34	13.505	0.805	NS
	TAMIL	199	145.13	15.434		
FAMILY TYPE	NUCLEAR	122	139.19	14.433	1.163	NS
	JOINT	178	144.78	15.405		

Table 1 presents the mean, standard deviation, and t-value of study organization scores of higher secondary students based on gender, medium of instruction, and family type.

With regard to gender, the mean score of female students ($M = 145.99$) is higher than that of male students ($M = 139.07$). However, the obtained t-value (1.992) is not statistically significant at the chosen level of significance. Hence, there is no significant difference in the study organization scores of higher secondary students based on gender.

Regarding medium of instruction, Tamil medium students obtained a higher mean score ($M = 145.13$) than English medium students ($M = 137.34$). The calculated t-value (0.805) is found to be not significant. Therefore, there is no significant difference in the study organization scores of higher secondary students based on medium of instruction.

In terms of family type, students belonging to joint families secured a higher mean score ($M = 144.78$) than students from nuclear families ($M = 139.19$). The obtained t-value (1.163) is not significant. Hence, there is no significant difference in the study organization scores of higher secondary students based on family type.

Thus, it can be inferred that gender, medium of instruction, and family type do not significantly influence the study organization of higher secondary students.

HYPOTHESIS 4

There is no significant difference in the Academic Achievement mean scores of Higher Secondary School Students based on Gender, Medium and Family Type.

Mean, standard deviation and t-test have been calculated and presented in Table 4

TABLE 2

MEAN, STANDARD DEVIATION AND T- VALUE FOR ACADEMIC ACHIEVEMENT – GENDER, MEDIUM AND FAMILY TYPE

ACADEMIC ACHIEVEMENT		N	MEAN	S.D	t-VALUE	L.S
GENDER	MALE	150	73.60	15.004	0.468	NS
	FEMALE	150	74.40	14.603		
MEDIUM	ENGLISH	101	73.80	14.453	1.167	NS
	TAMIL	199	74.10	14.989		
FAMILY TYPE	NUCLEAR	122	75.06	14.535	1.031	NS
	JOINT	178	73.28	14.955		

Table 2 presents the mean, standard deviation, and t-value of academic achievement among higher secondary students based on gender, medium of instruction, and family type.

With regard to gender, female students ($M = 74.40$) have a slightly higher mean score than male students ($M = 73.60$). The calculated t-value (0.468) is found to be not statistically significant at the selected level of significance. Hence, there is no significant difference in the academic achievement of higher secondary students based on gender.

In terms of medium of instruction, Tamil medium students ($M = 74.10$) scored marginally higher than English medium students ($M =$

73.80). However, the obtained t-value (1.167) is not significant. Therefore, there is no significant difference in academic achievement among higher secondary students based on medium of instruction.

Regarding family type, students from nuclear families ($M = 75.06$) obtained slightly higher mean scores than students from joint families ($M = 73.28$). The calculated t-value (1.031) is not statistically significant. Hence, there is no significant difference in academic achievement among higher secondary students based on family type.

Therefore, it can be inferred that gender, medium of instruction, and family type do not significantly influence the academic achievement of higher secondary students.

There is no significant relationship between Study Organization and Academic Achievement among Higher Secondary School Students.

TABLE 3

CORRELATION BETWEEN STUDY ORGANIZATION AND ACADEMIC ACHIEVEMENT

VARIABLE	N	r VALUE	L.S
STUDY ORGANIZATION	300	0.105	S 0.05
ACADEMIC ACHIEVEMENT			

Table 3 shows the correlation between study organization and academic achievement among higher secondary students. The obtained correlation coefficient value is 0.105, which indicates a positive relationship between study organization and academic achievement. The result is found to be statistically significant at the selected level of significance.

This indicates that students with better study organization tend to achieve better academic performance. Although the degree of relationship is low, the positive correlation suggests that effective planning, systematic study practices, and proper organization of learning activities contribute to improved academic achievement among higher secondary students.

Therefore, the null hypothesis stating that there is no significant relationship between study organization and academic achievement among higher secondary students is rejected. It can be inferred that study organization has a significant positive relationship with academic achievement among higher secondary students.

FINDINGS OF THE STUDY

- ✓ There was no significant difference in the study organization of higher secondary students based on gender.
- ✓ There was no significant difference in the study organization of higher secondary students based on medium of instruction.
- ✓ There was no significant difference in the study organization of higher secondary students based on family type.
- ✓ There was no significant difference in the academic achievement of higher secondary students based on gender.
- ✓ There was no significant difference in the academic achievement of higher secondary students based on medium of instruction.
- ✓ There was no significant difference in the academic achievement of higher secondary students based on family type.
- ✓ A significant positive relationship was found between study organization and academic achievement among higher secondary students.

EDUCATIONAL IMPLICATIONS

- ❖ The study emphasizes the importance of study organization in improving students' academic achievement. Schools should encourage students to develop systematic and organized study practices.
- ❖ Teachers may provide proper guidance on time management, study planning, note preparation, and examination strategies to enhance students' learning efficiency.
- ❖ Educational institutions may organize workshops, orientation programmes, and counselling sessions related to effective study organization and learning skills.
- ❖ Parents should create a supportive home environment that promotes disciplined study habits and proper academic planning among students.

- ❖ School counsellors may identify students with poor study organization and provide necessary academic support and motivation.

CONCLUSION

The present study examined the relationship between study organization and academic achievement among higher secondary students. The findings revealed that the majority of students possess a moderate level of study organization and an average level of academic achievement. The study also found that gender, medium of instruction, and family type do not significantly influence students' study organization and academic achievement.

Further, the study established a significant positive relationship between study organization and academic achievement. This indicates that students who organize their studies effectively tend to perform better academically. Organized study practices such as proper planning, time management, systematic learning, and regular revision play an important role in enhancing academic success.

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Empathy among Higher Secondary Students: An Educational Survey in Tiruvallur District

Dr. N. Mohana Kannan

Assistant Professor, Indhira College of Education, Tiruvallur District, TN, India.

Email: mohan2kannan@gmail.com

Abstract

This study focuses on the level of empathy among higher secondary students in Tiruvallur District. Empathy is an important psychological trait that allows individuals to understand and share the feelings of others, which helps build healthy relationships and social harmony. The research used a normative survey method to assess empathy levels among students studying in government, aided, and private schools. Data were gathered through a standardized empathy scale from a representative group of students. The results indicate that students have a moderate level of empathy. The study also found differences in empathy levels based on certain demographic factors. The findings highlight the importance of developing empathy in adolescents to improve emotional balance, social adaptation, communication abilities, and positive actions in educational settings. This research may assist teachers, parents, and administrators in creating supportive environments that promote emotional and social growth among students.

Keywords:

Empathy, Higher Secondary Students, Tiruvallur District, Survey Method, Adolescents, Emotional Development, Social Adjustment, Communication Skills, School Education.

Introduction

Empathy is one of the key emotional and social traits that support the healthy development of adolescents. It is the ability of an individual to understand, share, and respond to the emotions and experiences of others. In today's educational environment, empathy is especially important as it helps students develop

positive relationships, emotional stability, cooperation, and a sense of social responsibility. Higher secondary students are at an important stage of adolescence where emotional maturity and social awareness greatly affect their academic performance and personal actions. Thus, fostering empathy among students has become a key concern in education.

Schools play an important role in promoting empathy through classroom activities, peer interactions, and value-based learning. Students who have high levels of empathy are more likely to show kindness, tolerance, effective communication, and positive social adjustment. In contrast, a lack of empathy can result in conflicts, stress, and behavioural issues. In recent years, the fast-paced changes in society and technology have also affected students' emotional and social behaviour, making the study of empathy more relevant than ever.

The present study aims to examine the level of empathy among higher secondary students in Tiruvallur District. The results of this study may help teachers, parents, and educational officials better understand students' emotional needs and create supportive learning environments that encourage emotional intelligence and social harmony.

Empathy

Empathy is understood differently by different scholars and psychologists. Generally, it refers to the ability to understand and share the feelings, thoughts, and experiences of another person. Some definitions focus on showing care and concern for others, while others emphasize recognizing another person's emotions and responding in an appropriate way. Empathy also involves the ability to imagine oneself in another person's situation and understand their perspective. The meaning of empathy is closely connected with the understanding of emotions. If emotions are viewed as feelings expressed through body language and facial expressions, empathy involves recognizing and interpreting those signals. If emotions are understood through thoughts, beliefs, and desires, empathy requires understanding another person's mental

and emotional state. Therefore, empathy combines emotional awareness, understanding, and sensitivity towards others.

Empathy is not the same for all individuals. It varies from person to person and can differ in intensity and accuracy. A highly empathetic interaction occurs when one person correctly understands another person's feelings, actions, and experiences in a supportive and acceptable way. Such understanding helps in building positive relationships and effective communication.

Human beings naturally have the ability to identify emotions through facial expressions, tone of voice, and body movements. This ability is believed to have an innate basis, though it can be improved through learning, practice, and social interaction. Training and life experiences can strengthen empathetic skills and enable individuals to respond better to the emotions and needs of others.

Empirical Review

Ville Paananen, Mohammad Sina Kiarostami, Lik-Hang Lee, Tristan Braud, and Simo Hosio (2022) conducted a systematic review titled “From Digital Media to Empathic Reality: A Systematic Review of Empathy Research in Extended Reality Environments.” The study explored the role of digital and virtual environments in developing empathy. The findings showed that technological environments can significantly influence emotional understanding, social interaction, and empathic behaviour among adolescents and young adults.

Gayatri Bhatia and Jyoti V. Shetty (2023) conducted a study titled “Trends of Change in Empathy Among Indian Medical Students: A Two-Year Follow-Up Study.” The study examined the level of empathy among medical students in India over a period of two years. The findings revealed that empathy is an essential component in interpersonal relationships and professional development. The study emphasized the importance of emotional understanding and empathetic behaviour among students for effective social interaction and academic growth.

Value of the Study

This study is significant as it examines the level of empathy among higher secondary students in Tiruvallur District. Empathy is essential for developing emotional maturity, social adjustment, and positive interpersonal relationships among adolescents. The study helps teachers, parents, and educational administrators understand students' emotional behaviour and social sensitivity. The findings may support the implementation of value-based education and emotional development programs in schools. The study is also useful for counsellors in guiding students towards healthy social interaction and responsible behaviour. Since few studies have focused on empathy among higher secondary students in Tiruvallur District, this research contributes valuable insights to educational literature.

Area of Investigation

The present study is titled as “Empathy among Higher Secondary Students: An Educational Survey in Tiruvallur District”

Objectives

- To determine the level of empathy among higher secondary students
- To assess whether there is a significant difference in the level of empathy among higher secondary students based on gender, medium of instruction, type of family, co-curricular activities, and parents' qualification

Hypotheses

- The level of empathy among higher secondary students is moderate
- There is no significant difference in the level of empathy among higher secondary students based on gender, medium of instruction, type of family, co-curricular activities, and parents' qualification

Research Procedure and Tools

The study adopted the Normative Survey Method to examine empathy among higher secondary students. A stratified random sampling technique was used to select 300 students from

Government, Government-Aided, and Private schools. Data were collected using the *Empathy Inventory* standardized by Dr. Paruvathambal M. and Dr. Kannan B. (2018). The tools consisted of three response options namely “Always,” “Sometimes,” and “Never.” For positive items, scores of 2, 1, and 0 were assigned respectively, while reverse scoring was followed for negative items. A pilot study was conducted to establish the reliability and validity of the tools. The collected data were analysed using Mean, Standard Deviation, t-test and ANOVA techniques.

Research Participants

The participants of the study consisted of 300 higher secondary students selected from Government, Government-Aided, and Private schools through stratified random sampling technique. The sample included students from different categories such as gender, medium of instruction, type of family, co-curricular activities, and parents’ educational qualification to ensure proper representation.

Interpretation of Research Data

The total sample obtained a mean score of 34.62, and the corresponding mean percentage for empathy among higher secondary students was found to be 11.54%.

Table 1

Frequency and Percentage distribution of higher secondary students were analysed category-wise with respect to their level of empathy.

Variable	N	Range	Category	Frequency	Percentage
Empathy	300	05-25	Low	82	27.3%
		26-44	Moderate	143	47.7%
		45-59	High	75	25.0%

From the above table, it is observed that the number of Higher Secondary Students in the Moderate category is found to be more, hence it is concluded that the level of Empathy among Higher Secondary Students is Moderate as hypothesized.

Table 2

Mean, S.D & t - values for Empathy of Higher Secondary Students based on Gender, Medium of Instruction and Type of Family

Grouping Variable		N	Mean	SD	t – value	L.S
Gender	Male	150	33.77	13.59	1.111	NS
	Female	150	35.48	13.12		
Medium of Instruction	Tamil	150	32.54	14.33	2.72	S 0.01
	English	150	36.71	12.00		
Type of Family	Joint Family	115	34.82	13.04	0.200	NS
	Nuclear Family	185	34.50	13.59		

Female students obtained a slightly higher mean empathy score than male students. However, the calculated t-value was not significant, indicating that gender did not produce a significant difference in empathy among higher secondary students. English medium students showed higher empathy scores than Tamil medium students, and the obtained t-value was significant at the 0.01 level. This reveals that medium of instruction had a significant influence on students' empathy. Students belonging to joint and nuclear families showed only minimal variation in their mean scores. The obtained t-value was not significant, indicating that type of family did not significantly influence empathy among higher secondary students.

Table 3

ANOVA TEST for Empathy – Co-curricular Activities and Parents Qualification

Grouping Variable	Source of variance	df	Sum of Squares	MSS	f value	LS
Co-curricular Activities	Between groups	2	370.37	185.1	1.03	NS
	Within groups	297	53038.0	178.5		
Parents Qualification	Between groups	2	1201.60	600.8	3.41	S 0.05
	Within groups	297	52206.8	175.7		

The analysis of variance revealed that there was no significant difference in empathy among higher secondary students based on co-curricular activities, as the obtained F-value (1.037) was not statistically significant. This indicates that participation in different co-curricular activities did not have a notable influence on students' empathy levels. In contrast, a significant difference was observed in empathy based on parents' educational qualification. The obtained F-value (3.418) was significant at the 0.05 level, indicating that the educational background of parents had a significant influence on the empathy of higher secondary students.

Findings of the Study

1. The majority of higher secondary students (47.7%) possessed a moderate level of empathy, while 27.3% had low empathy and 25.0% showed a high level of empathy.
2. Female students obtained slightly higher mean empathy scores than male students; however, the difference was not statistically significant.
3. A significant difference was found in empathy based on medium of instruction, with English medium students

- exhibiting higher empathy scores than Tamil medium students.
4. No significant difference was observed in empathy between students belonging to joint and nuclear families.
 5. Co-curricular activities did not produce any significant difference in the empathy levels of higher secondary students.
 6. Parents' educational qualification showed a significant influence on students' empathy, indicating that empathy varied according to the educational background of parents.

Implications of the Study

The findings of the study emphasize the need to promote empathy among higher secondary students through educational practices and school activities. Teachers should create supportive classroom environments that encourage cooperation, emotional understanding, and positive interpersonal relationships among students. Value-based education, group discussions, role play, and collaborative learning activities may help students develop empathetic behaviour. Since medium of instruction and parents' educational qualification showed significant influence on empathy, schools should provide equal opportunities for emotional and social development to all learners irrespective of their background. Parents should also be encouraged to participate in students' emotional development through proper guidance and communication at home. School counsellors and educators may organize awareness programmes, life skill training, and guidance sessions to strengthen empathy among adolescents. Developing empathy in students can contribute to better social adjustment, improved communication skills, emotional balance, and a positive school climate.

Conclusion

The present study examined the level of empathy among higher secondary students in Tiruvallur District and provided valuable insights into the emotional and social behaviour of adolescents. The findings indicated that most students possessed a

moderate level of empathy, reflecting the need for continuous efforts to strengthen emotional understanding and interpersonal skills in school education. Empathy plays a crucial role in promoting social adjustment, positive relationships, communication skills, and emotional well-being among students. Therefore, schools should encourage supportive classroom environments, value-based education, and activities that foster cooperation and mutual respect. Teachers, parents, and educational administrators should work together to guide students towards responsible and compassionate behaviour. The study contributes to educational research by emphasizing the importance of emotional development among adolescents and highlights the need for integrating empathy-oriented practices in the teaching-learning process.

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Future-Ready Education: Integrating Leadership, Technology and Learning

Dr.R.Sudha

Associate Professor, Department of Chemistry, School of Basic Sciences, VISTAS, Chennai.

Abstract

The rapid advancement of technology, globalization, and evolving workforce demands have significantly transformed the educational landscape. Traditional teaching and learning models are being replaced by learner-centered approaches supported by digital technologies and innovative leadership practices. Educational leaders play a critical role in fostering institutional transformation, promoting digital literacy, and ensuring equitable access to quality education. Simultaneously, emerging technologies such as Artificial Intelligence (AI), Learning Management Systems (LMS), Virtual Reality (VR), and data analytics are reshaping instructional delivery and assessment practices. This chapter explores the interconnected roles of leadership, technology, and learner development in creating future-ready educational systems. It examines current trends, challenges, opportunities, and strategic approaches for fostering holistic learner development and sustainable educational transformation. The chapter concludes that visionary leadership combined with technological integration can cultivate adaptive, skilled, and lifelong learners capable of thriving in the knowledge-driven society of the twenty-first century.

Keywords: Educational Leadership, Digital Transformation, Artificial Intelligence, Learner Development, Technology-Enhanced Learning, Future Education, Lifelong Learning.

1. Introduction

Education serves as the cornerstone of social and economic development. In the twenty-first century, unprecedented technological innovations and changing societal needs have necessitated a rethinking of conventional educational practices. The emergence of digital technologies, online learning environments, and artificial intelligence has fundamentally altered the way knowledge is created, shared, and consumed.

The COVID-19 pandemic accelerated the adoption of digital learning worldwide, highlighting both opportunities and challenges in educational systems. Institutions increasingly recognize the need to prepare learners with critical thinking, creativity, collaboration, communication, and digital competencies. Consequently, educational transformation requires not only technological infrastructure but also effective leadership and learner-centered pedagogical approaches.

Educational leaders are expected to guide institutions through complex transitions by fostering innovation, supporting professional development, and creating inclusive learning environments. Simultaneously, learners must develop adaptability, self-regulation, and lifelong learning skills to succeed in dynamic professional and social contexts.

This chapter investigates how leadership, technology, and learner development collectively contribute to the transformation of education for the future.

2. Leadership in Educational Transformation

2.1 Visionary Leadership

Visionary leaders establish clear goals and inspire stakeholders toward educational innovation. They create strategic plans that align institutional objectives with technological advancements and societal expectations.

Key Functions:

- Developing a shared vision for digital transformation.
- Promoting innovation and continuous improvement.
- Encouraging collaborative decision-making.
- Supporting faculty and student engagement.

2.2 Transformational Leadership

Transformational leadership motivates educators and learners to embrace change and achieve higher levels of performance.

Characteristics:

- Inspirational motivation.
- Intellectual stimulation.
- Individualized support.
- Ethical and inclusive practices.

2.3 Distributed Leadership

Distributed leadership recognizes that educational transformation requires collective efforts from administrators, teachers, students, and community stakeholders.

Benefits:

- Enhanced participation.
- Improved institutional adaptability.
- Greater innovation and problem-solving capacity.

3. Technology as a Catalyst for Educational Change**3.1 Digital Learning Environments**

Technology has expanded access to education through online platforms, virtual classrooms, and blended learning models.

Advantages:

- Flexibility and accessibility.
- Personalized learning experiences.
- Increased learner engagement.
- Global collaboration opportunities.

3.2 Artificial Intelligence in Education

AI-powered tools support teaching and learning through intelligent tutoring systems, automated assessment, and predictive analytics.

Applications:

- Personalized learning pathways.
- Adaptive assessments.
- Learning analytics.
- Academic performance prediction.

3.3 Emerging Technologies

Virtual and Augmented Reality

- Immersive learning experiences.
- Enhanced conceptual understanding.
- Virtual laboratories and simulations.

Internet of Things (IoT)

- Smart classrooms.
- Real-time monitoring of learning environments.

Block chain Technology

- Secure credential management.
- Transparent academic records.

4. Learner Development in Future Education

4.1 Twenty-First Century Skills

Future-ready learners require competencies beyond traditional academic knowledge.

Essential Skills:

- Critical thinking.
- Creativity.
- Communication.
- Collaboration.
- Problem-solving.
- Digital literacy.

4.2 Personalized Learning

Technology enables individualized learning experiences tailored to students' needs, interests, and learning styles.

Benefits:

- Improved motivation.
- Better academic performance.
- Enhanced learner autonomy.

4.3 Lifelong Learning

Continuous learning has become essential in rapidly changing professional environments.

Strategies:

- Self-directed learning.
- Micro-credentialing.
- Professional development programs.
- Online learning platforms.

5. Challenges in Educational Transformation

Despite significant progress, several challenges hinder effective transformation:

Technological Challenges

- Digital divide.
- Infrastructure limitations.
- Cybersecurity concerns.

Leadership Challenges

- Resistance to change.
- Limited professional development.
- Policy constraints.

Learner Challenges

- Digital literacy gaps.
- Motivation and engagement issues.
- Information overload.

Addressing these challenges requires coordinated efforts among governments, institutions, educators, and industry partners.

6. Results and Discussion

The analysis of recent educational transformation initiatives demonstrates that successful integration of leadership and technology significantly enhances learner outcomes. Institutions adopting transformational leadership practices exhibit higher levels of innovation, teacher engagement, and student satisfaction.

Technology-enhanced learning environments have improved accessibility and flexibility, enabling students from diverse backgrounds to participate in educational opportunities. Artificial intelligence and learning analytics facilitate personalized learning experiences, resulting in improved academic performance and retention rates.

Furthermore, learner-centered pedagogies supported by digital technologies foster critical thinking, collaboration, and problem-solving abilities. These competencies are increasingly recognized as essential for employability in knowledge-based economies.

However, the findings also reveal persistent challenges related to technological infrastructure, digital inequality, and educator readiness. Institutions with strong leadership support and continuous professional development programs demonstrate greater success in overcoming these barriers.

The integration of leadership, technology, and learner development creates a synergistic framework that promotes educational excellence, adaptability, and sustainability. Educational transformation should therefore be viewed as a holistic process involving organizational culture, technological innovation, and human development.

7. Future Directions

Future educational systems should focus on:

- Expanding equitable access to digital resources.

- Strengthening AI-driven personalized learning.
- Enhancing digital citizenship education.
- Promoting interdisciplinary and experiential learning.
- Supporting continuous professional development for educators.
- Building resilient and sustainable educational ecosystems.

Collaboration among educational institutions, governments, industries, and communities will be essential for achieving these objectives.

8. Conclusion

The future of education depends on the successful integration of visionary leadership, advanced technologies, and learner-centered development strategies. Educational leaders must create innovative and inclusive environments that support digital transformation while ensuring equitable learning opportunities. Technology serves as a powerful enabler of personalized, flexible, and engaging learning experiences. Simultaneously, learners must develop critical competencies that prepare them for lifelong learning and participation in an increasingly complex global society.

Transforming education is not merely a technological endeavour but a comprehensive process involving cultural, organizational, and pedagogical change. By aligning leadership practices, technological innovation, and learner development, educational institutions can build resilient systems capable of meeting future challenges and fostering sustainable human development.

Evolution of Rural Development

Dr. Suhirtha Rani R.

Assistant Professor, School of Education,
VELS Institute of Science, Technology and Advanced Studies,
Chennai

Email: julietsuhirtharani@gmail.com

Mob: 9884749363

Abstract

Rural development is a multidimensional process aimed at improving the economic, social, and environmental conditions of rural communities. This chapter examines the evolution of rural development from the past to the present and explores future prospects and strategies. In the early stages, rural development mainly focused on agriculture, land reforms, and poverty reduction. During the post-independence period, several programmes such as community development initiatives, cooperative movements, and the Green Revolution contributed to agricultural growth and rural transformation. Over time, the concept expanded to include education, healthcare, infrastructure development, women empowerment, employment generation, and environmental sustainability.

Introduction

Rural development refers to the process of improving the quality of life and economic well-being of people living in rural areas. It includes agriculture, infrastructure, education, healthcare, employment generation, environmental sustainability, social justice, and technological advancement. Rural development is essential because a large proportion of the population in developing countries still depends on rural economies for livelihood.

Historically, rural development focused mainly on agricultural productivity. Over time, the concept expanded to include poverty alleviation, human development, gender equality, sustainability, digital inclusion, and climate resilience. In the future, rural development is expected to become more technology-driven, environmentally sustainable, and socially inclusive.

Rural Development in Historical Context

Rural Social Systems in Ancient Periods

In ancient civilizations, rural areas formed the backbone of the economy. Agriculture, animal husbandry, handicrafts, and cottage industries were the primary occupations. Rural communities were largely self-sufficient and depended on traditional knowledge systems.

Foundation of Rural Development in the Post-Independence Era

Strategic Objectives

After independence, several measures were introduced to improve rural development. The main objective was to reduce poverty in rural areas. Efforts were also made to modernize agriculture through improved farming methods. Rural development programmes aimed to generate employment opportunities for people. Social welfare measures were introduced to improve the living conditions of rural communities.

Major Strategies

1. Land Reforms

Land reforms were implemented to improve the condition of farmers. Intermediaries between farmers and the government were abolished. Tenancy reforms were introduced to protect the rights of tenants. Land redistribution was carried out to reduce inequality among farmers.

2. Community Development Programmes

Community development programmes encouraged people's participation in rural development activities. Local governance systems were strengthened to improve rural administration. Efforts were also made to develop infrastructure facilities such as roads and water supply systems.

3. Cooperative Movements

Cooperative movements played an important role in rural development. Dairy cooperatives were formed to support milk production and marketing. Credit societies provided financial assistance to rural people. Marketing cooperatives helped farmers sell their agricultural products at fair prices.

4. Green Revolution and Agricultural Growth

The Green Revolution during the 1960s and 1970s brought major changes in agricultural production. High-yielding variety (HYV) seeds were introduced to increase crop output. Chemical fertilizers were widely used to improve soil fertility and agricultural productivity. Irrigation facilities were expanded to provide sufficient water for cultivation. Mechanization introduced machines and modern equipment into farming practices.

Rural Welfare Programmes in the Late 20th Century

During the late 20th century, the concept of rural development expanded from agricultural growth to integrated rural development. Several development schemes were introduced to improve the living conditions of rural people. The Integrated Rural Development Programme (IRDP) was launched to reduce rural poverty. Rural employment schemes provided job opportunities for people in villages. Women empowerment programmes were implemented to improve the social and economic status of women. Literacy missions were also started to increase education and awareness among rural communities.

Modern Trends in Rural Development

Modern rural development focuses on different aspects of people's welfare and overall community progress. It includes improvements in education, healthcare, infrastructure, employment, technology, and environmental sustainability.

Present Rural Challenges

Rural areas currently face several economic, social, environmental, and technological challenges. Many rural people suffer from unemployment and underemployment, which affect their standard of living. Farmers often experience agricultural distress due to low productivity, rising costs, and uncertain market conditions. Farm income remains low in many regions, and market prices are often unstable and unpredictable.

Social challenges also continue to affect rural communities. Many people migrate from villages to cities in search of better employment and living conditions. Gender inequality still exists in several rural areas, limiting opportunities for women. Educational opportunities are limited in many villages, and access to quality healthcare facilities remains inadequate.

Environmental challenges have become more serious in recent years. Climate change affects agriculture and rural livelihoods through irregular rainfall and extreme weather conditions. Water scarcity is a major issue in many rural regions. Soil degradation reduces agricultural productivity, while biodiversity loss negatively impacts the natural environment.

Technological challenges also hinder rural development. A digital divide exists between rural and urban areas, limiting access to information and opportunities. Many villages have limited access to modern technology, and poor internet connectivity affects communication, education, and digital services.

Current Dimensions of Rural Development

A. Agricultural Development

Governments have introduced several initiatives to support farmers and agricultural development. Crop insurance schemes protect farmers from financial losses caused by natural disasters and crop failures. Soil health cards help farmers understand soil conditions and improve crop management. The Minimum Support Price (MSP) ensures fair prices for agricultural produce, while Farmer Producer Organizations (FPOs) support collective farming and marketing activities.

B. Rural Infrastructure Development

Infrastructure plays a vital role in rural economic development. Rural roads improve transportation and connectivity between villages and markets. Electrification provides power supply to rural households and supports economic activities. Safe drinking water facilities improve public health, while sanitation facilities promote hygiene and cleanliness.

C. Rural Education

Education plays an important role in empowering rural people and improving their quality of life. Efforts are being made to provide universal primary education for all children. Digital learning methods are increasingly used to improve educational access and quality. Vocational education helps students develop practical and employment-related skills, while skill-based training improves job opportunities for rural youth.

D. Rural Healthcare

Healthcare facilities are still unevenly distributed in many rural areas. Primary health centers provide basic healthcare services to rural communities. Telemedicine enables patients to receive medical advice through digital technology, especially in remote areas. Mobile medical units bring healthcare services directly to

villages, while maternal and child healthcare programmes improve the health of women and children.

E. Women Empowerment in Rural Areas

Women play a major role in agriculture and family welfare in rural communities. Various development programmes have been introduced to empower women socially and economically. Self-help groups (SHGs) encourage savings and income-generating activities among women. Microfinance institutions provide financial support to rural women for small businesses and self-employment. Skill training programmes help women develop professional skills, and political participation through local governance strengthens women's role in decision-making.

F. Rural Employment and Livelihood

Diversification of livelihood sources has become increasingly important in rural areas. Agriculture continues to be a major source of employment, while dairy farming provides additional income for rural families. Fisheries create employment opportunities in coastal and inland regions. Handicrafts support traditional occupations, and rural tourism generates income and promotes local culture. Small enterprises also encourage business development in villages.

G. Digital Rural Development

Digital technologies are transforming rural life in many ways. E-governance helps people access government services online, reducing delays and improving transparency. Online education supports learning through digital platforms, while digital banking makes financial transactions easier and safer. Telemedicine provides healthcare consultation through technology, and e-commerce platforms help farmers market and sell their products online.

Sustainable Rural Development

Sustainable rural development focuses on economic growth, social welfare, and environmental protection. It aims to improve the quality of life of rural people while protecting natural resources for future generations.

Role of Institutions in Rural Development

Institutions play an important role in promoting rural development and improving the living conditions of rural communities. Governments formulate policies and implement programmes for rural welfare and development.

Non-Governmental Organizations (NGOs) also contribute significantly to rural development. They encourage community participation in development activities and create awareness about education, health, sanitation, and social welfare.

Cooperatives support the economic development of rural communities. They help farmers through collective marketing of agricultural products and provide credit support to rural people. Cooperative societies strengthen rural economies by encouraging mutual support and collective action.

The private sector also contributes to rural development in various ways. It promotes rural entrepreneurship and supports employment generation through investments in agriculture and rural industries.

Future of Rural Development

The future of rural development will depend on technology, sustainability, inclusiveness, and resilience. Modern innovations and environmentally sustainable practices are expected to transform rural economies and improve the quality of life of rural people.

Emerging Trends in Rural Development

A. Smart Villages

Smart villages combine modern technology with rural development to improve living standards and economic growth. Digital connectivity improves communication and access to information in villages. E-governance improves access to government services, while online education and healthcare services enhance rural welfare.

B. Artificial Intelligence and Agriculture

Artificial Intelligence (AI) is becoming an important tool in modern agriculture. AI helps farmers monitor crop growth and crop health more effectively. Weather prediction systems support better farming decisions and help reduce risks caused by climate change. Pest detection technologies help minimize crop damage, while precision irrigation improves water management in agriculture.

The use of AI in agriculture is expected to increase agricultural productivity and improve farming efficiency.

C. Climate-Resilient Rural Development

Climate change is becoming a major challenge for rural development and agriculture. Therefore, climate-resilient strategies are essential for protecting rural livelihoods and natural resources.

D. Renewable Energy-Based Rural Economy

Renewable energy can improve rural livelihoods and development.

- Solar energy provides clean electricity in rural areas.
- Wind energy is used as an alternative source of power.
- Biomass energy utilizes organic materials for energy production.
- Biogas plants convert waste into useful fuel.

E. Rural Entrepreneurship and Innovation

Innovation will play an important role in future rural economies.

- Agri-tech startups introduce new technologies in agriculture.
- Food processing industries add value to agricultural products.
- Rural tourism creates income and employment opportunities.
- Handicrafts can be marketed through e-commerce platforms.

Support Systems

- Incubation centers support new business ideas and startups.
- Digital marketplaces help rural producers reach wider markets.
- Skill training programmes improve entrepreneurial abilities.

Future Policy Priorities

1. Inclusive Growth

Development policies should include all sections of society.

- Women should receive equal opportunities in development programmes.
- Small farmers need support for improving their livelihoods.
- Tribal communities should be included in development activities.
- Rural youth should be encouraged through education and employment opportunities.

2. Strengthening Local Governance

Decentralized governance will become more important in the future.

Focus Areas

- Participatory planning encourages people to take part in decision-making.

- Financial autonomy helps local bodies manage resources effectively.
- Community-based decision-making strengthens local development.

3. Human Capital Development

Investment in education and health is necessary for rural progress.

Future Priorities

- Digital literacy helps people use modern technology effectively.
- Technical education improves professional and vocational skills.
- Rural research institutions support innovation and development.

4. Sustainable Natural Resource Management

Natural resources must be protected for future generations.

- Water conservation is essential for sustainable development.
- Soil protection helps maintain agricultural productivity.
- Forest conservation supports environmental balance.
- Biodiversity protection preserves plants and animal species.

5. Digital Inclusion

Internet access will become essential for rural development.

Future Technologies

- 5G connectivity will improve communication and digital services.
- The Internet of Things (IoT) will support smart farming practices.
- Blockchain technology can improve transparency in agriculture.
- Digital finance systems will make financial services more accessible.

Challenges Ahead

Several challenges still affect rural development despite progress.

Economic

- Income inequality exists among rural people.
- Price fluctuations affect farmers' income and stability.
- Rural indebtedness remains a serious issue in villages.

Environmental

- Climate disasters create risks for agriculture and livelihoods.
- Water scarcity affects farming and daily life.
- Land degradation reduces soil productivity.

Social

- Many rural youth migrate to urban areas for employment.
- The rural population is gradually aging in some regions.
- Social exclusion affects marginalized communities.

Technological

- Many rural people lack digital literacy skills.
- High implementation costs limit technological development in villages.

5. Conclusion

Rural development has changed greatly over time. Earlier, it mainly focused on agriculture and poverty reduction. Today, it includes education, healthcare, infrastructure, digital services, environmental protection, and social welfare.

The future of rural development will depend on technology, sustainability, and inclusive growth. Smart villages, renewable energy, climate-resilient agriculture, and digital governance will play an important role in rural progress.

Governments, communities, private organizations, and international institutions must work together for balanced rural development. Strong rural development contributes to economic growth, social stability, and national progress.

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HOME ENVIRONMENT, EXAMINATION ANXIETY AND ACADEMIC ACHIEVEMENT OF HIGHER SECONDARY STUDENTS

Sindhu K.
Research Scholar
School of Education, VISTAS,
VISTAS Pallavaram, Chennai.

Dr.S. Poonguzhali
Assistant Professor,
School of Education.
Pallavaram, Chennai

Abstract

Education plays a significant role in shaping the future of individuals and society. Academic achievement among higher secondary students is influenced by several psychological, social, and environmental factors. Among these, home environment and examination anxiety are considered highly influential. A supportive home environment contributes positively to the emotional stability, confidence, and academic performance of students, whereas examination anxiety may negatively affect concentration, memory, and performance during examinations. This paper aims to examine the relationship between home environment, examination anxiety, and academic achievement among higher secondary students. The study also highlights the importance of parental support, emotional balance, and stress management techniques in enhancing student performance. The paper concludes with suggestions for educators, parents, and policymakers to create a healthy educational atmosphere that promotes academic excellence and emotional well-being among students.

Introduction

Education is one of the most powerful instruments for social transformation and individual development. The higher

secondary stage is a crucial period in the life of students because it determines their future educational and career opportunities. At this stage, students experience increased academic pressure, parental expectations, competition, and emotional challenges. Their academic achievement is not merely determined by intelligence but also by several environmental and psychological factors.

Among the many influencing factors, home environment plays a vital role in shaping students' attitudes, behaviour, emotional stability, and learning habits. The home is the child's first school, and parents are the first teachers. A peaceful, encouraging, and resourceful home environment can motivate students toward better academic performance.

On the other hand, examination anxiety has become a common issue among higher secondary students. Fear of failure, pressure to score high marks, competition, and parental expectations often create stress and anxiety among students. Moderate anxiety may motivate students to study harder, but excessive anxiety negatively affects concentration, confidence, and academic achievement.

This study focuses on understanding how home environment and examination anxiety influence the academic achievement of higher secondary students and emphasizes the need for balanced emotional and educational support.

Concept of Home Environment

Home environment refers to the physical, emotional, social, and intellectual atmosphere within the family that influences the growth and development of children. It includes parental attitudes, family relationships, communication patterns, educational support, socio-economic status, and availability of learning resources.

A positive home environment generally includes:

- * Emotional support and encouragement
- * Healthy parent-child relationships
- * Proper study atmosphere
- * Availability of educational materials
- * Parental involvement in education
- * Motivation and appreciation
- * Discipline and moral guidance

A negative home environment may include:

- * Family conflicts
- * Lack of parental attention
- * Financial stress
- * Emotional neglect
- * Excessive pressure on children
- * Lack of educational support

Students who grow up in supportive homes tend to develop confidence, discipline, emotional stability, and better academic habits.

Examination Anxiety

Examination anxiety refers to the feelings of fear, tension, nervousness, and worry experienced by students before or during examinations. It is a psychological condition that affects students' mental balance and academic performance.

Examination anxiety may arise due to several reasons such as:

- * Fear of failure
- * High parental expectations
- * Lack of preparation

- * Poor time management
- * Competitive educational environment
- * Negative thinking
- * Low self-confidence

Symptoms of Examination Anxiety

Physical Symptoms

- * Sweating
- * Rapid heartbeat
- * Headache
- * Fatigue
- * Sleep disturbances

Emotional Symptoms

- * Fear and nervousness
- * Irritability
- * Lack of confidence
- * Mood swings

Cognitive Symptoms

- * Poor concentration
- * Memory blocks
- * Negative thoughts
- * Confusion during exams

Excessive anxiety can reduce students' efficiency and lead to poor academic performance despite adequate preparation.

Academic Achievement

Academic achievement refers to the level of success attained by students in their educational activities, generally

measured through examination scores, grades, and performance assessments.

Academic achievement is influenced by several factors including:

- * Intelligence
- * Study habits
- * Motivation
- * Teaching methods
- * School environment
- * Home environment
- * Emotional stability
- * Mental health

Good academic achievement enhances self-confidence, future educational opportunities, and career prospects.

Relationship between Home Environment and Academic Achievement

Research studies have consistently shown a strong relationship between home environment and academic achievement. Students from supportive families often perform better academically than those from stressful or unstable homes.

Positive Effects of a Healthy Home Environment

1. Emotional Security

Students feel emotionally stable and confident when they receive love and support from parents.

2. Motivation for Learning

Parents who encourage and appreciate their children create interest in learning.

3. Better Study Habits

A calm and disciplined home environment helps students develop regular study routines.

4. Educational Support

Parents who monitor homework and academic activities contribute positively to student achievement.

5. Reduced Stress

Healthy family relationships reduce emotional stress and improve concentration.

In contrast, family conflicts, neglect, and pressure can create emotional disturbances that negatively affect academic performance.

Relationship Between Examination Anxiety and Academic Achievement

Examination anxiety directly influences students' academic performance. Mild anxiety can motivate students to prepare well, but severe anxiety negatively affects memory, concentration, and confidence.

Negative Effects of Examination Anxiety

- * Difficulty in recalling learned information
- * Poor concentration during examinations
- * Reduced confidence

- * Mental stress and emotional imbalance
- * Lower academic performance

Students experiencing high anxiety may underperform despite having adequate knowledge and preparation.

Interaction Between Home Environment and Examination Anxiety

Home environment and examination anxiety are closely interconnected. A positive home environment can reduce examination anxiety, whereas a stressful home atmosphere can increase anxiety levels among students.

How Positive Home Environment Reduces Anxiety

- * Parents provide emotional reassurance
- * Encouragement improves confidence
- * Proper guidance reduces fear
- * Healthy communication supports emotional balance

How Negative Home Environment Increases Anxiety

- * Excessive expectations create pressure
- * Family conflicts disturb concentration
- * Lack of support leads to insecurity
- * Criticism lowers self-esteem

Thus, home environment indirectly affects academic achievement through examination anxiety.

Role of Parents in Improving Academic Achievement

- Parents play an important role in shaping students' educational success and emotional well-being.

- Suggestions for Parents
- Encourage Rather Than Pressure
- Parents should motivate children positively rather than compare them with others.
- Create a Study-Friendly Environment
- A peaceful atmosphere at home helps students concentrate better.
- Maintain Healthy Communication
- Children should feel free to express their fears and difficulties.
- Appreciate Efforts
- Recognition and appreciation improve students' confidence.
- Monitor Emotional Health
- Parents should observe signs of stress and anxiety among children.
- Promote Balanced Lifestyle
- Adequate sleep, healthy food, recreation, and physical activity are essential.

Role of Teachers and Schools

Schools and teachers also have a major responsibility in reducing examination anxiety and improving academic achievement.

Responsibilities of Teachers

- * Provide emotional support to students
- * Use student-friendly teaching methods
- * Conduct counselling sessions
- * Encourage interactive learning
- * Reduce fear-oriented evaluation methods
- * Teach stress management techniques

Responsibilities of Schools

- * Organize awareness programmes on mental health
- * Provide counselling services
- * Promote co-curricular activities
- * Create supportive learning environments

Stress Management Techniques for Students

Students can adopt several techniques to reduce examination anxiety and improve academic performance.

- Effective Techniques
- Time Management
- Preparing a proper timetable helps reduce last-minute stress.
- Regular Revision

- Consistent revision improves memory retention.
- Positive Thinking
- Developing self-confidence and optimistic attitudes reduces fear.
- Relaxation Techniques
- Meditation, yoga, and deep breathing exercises help maintain emotional balance.
- Physical Exercise
- Regular exercise improves mental health and concentration.
- Adequate Sleep
- Proper rest is essential for memory and learning efficiency.
- Educational policies should encourage holistic student development.

Conclusion

Home environment and examination anxiety are two important factors influencing the academic achievement of higher secondary students. A positive and supportive home environment contributes significantly to students' emotional stability, confidence, and educational success. On the other hand, excessive examination anxiety can negatively affect concentration, memory, and academic performance.

Parents, teachers, and educational institutions must work together to create a supportive atmosphere that promotes both academic excellence and emotional well-being. Instead of imposing excessive pressure on students, emphasis should be placed on encouragement, understanding, counselling, and balanced development. A healthy educational environment can help students overcome anxiety, realize their potential, and achieve success in life.

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A Graph Neural Network Approach to Total Coloring Minimization in Path Graph Variants

A. Punitha

Assistant Professor, Department of Mathematics,
Vels Institute of Science, technology and advanced studies
(VISTAS), Chennai-117.

Email id: punithasokan@gmail.com

Abstract

Total coloring, the simultaneous assignment of colors to vertices and edges such that no incident or adjacent elements share the same color, remains a foundational NP-hard problem. While exact algorithms exist for restricted classes, they often fail to scale or generalize to complex path graph variants. This paper proposes a novel Graph Neural Network (GNN) framework, Path Total-Net, designed to approximate the total chromatic number $\chi''(G)$ in variants such as caterpillar graphs, firecracker graphs, and rooted path trees. By leveraging a custom loss function that penalizes monochromatic adjacency in the total graph $T(G)$, our model learns a latent representation of structural constraints. Experimental results on synthetic datasets demonstrate that Path Total-Net achieves near-optimal solutions with a significantly lower computational overhead compared to traditional backtracking heuristics, offering a scalable bridge between deep learning and discrete combinatorial optimization.

Keywords: Total Coloring, Graph Neural Networks, Combinatorial Optimization, Path Graphs, NP-Hardness.

Introduction

Graph coloring is a cornerstone of discrete mathematics with profound implications in scheduling, frequency allocation, and network design. Among its variants, Total Coloring, where both vertices V and edges E are colored—is notoriously difficult. The

total coloring Conjecture (Behzad, 1965) suggests that $\chi''(G) \in \{\Delta(G) + 1, \Delta(G) + 2\}$, where $\Delta(G)$ is the maximum degree.

Despite this theoretical bound, determining whether a graph is of Type 1 ($\chi'' = \{\Delta(G) + 1\}$) or Type 2 ($\chi'' = \{\Delta(G) + 2\}$) is NP-complete. For a standard path graph P_n with $n \geq 2$, the maximum degree is $\Delta = 2$, yielding an exact total chromatic number of $\chi''(P_n) = 3$. Traditional heuristics, such as Tabu search or greedy coloring, often struggle with structural nuances in path graph variants. In this work, we pivot from deterministic algorithms to a learning-based paradigm.

Research Gap

While standard path graphs are analytically trivial, calculating total colorings for massive, dynamic path variants such as routing paths in telecommunication networks or high-throughput lane assignments, undergoes combinatorial explosions when real-world noise or auxiliary constraints are introduced. Traditional heuristic approaches like greedy strategies or Tabu search scale poorly. This study introduces machine learning to learn total coloring invariants directly from graphs structural properties, paving the way for fast, approximate, or exact solutions in subgraphs path structures.

Mathematical Preliminaries

Total Coloring

Let $G = (V, E)$ be a simple graph. A total coloring is a mapping $\varphi: V \cup E \rightarrow \{1, 2, \dots, k\}$ such that:

1. For all $u, v \in V, \{u, v\} \in E \rightarrow \varphi(u) \neq \varphi(v)$
2. For all $e_1, e_2 \in E$ incident to the same vertex, $\varphi(e_1) \neq \varphi(e_2)$
3. For all $v \in V, e \in E$ incident to v , $\varphi(v) \neq \varphi(e)$

Path Graph Variants

We focus on three specific structures where total coloring has unique properties:

- Caterpillar Graphs: Trees where removing leaves results in a path.
- Firecracker Graphs: Obtained by the graph concatenation of stars and paths.
- Rooted Path Trees: Hierarchical tree structures where paths branch from a central node.

Proposed Methodology: Path Total-Net

To solve the total coloring minimization problem on a graph $G = (V, E)$, we must simultaneously color vertices $v \in V$, and edges $e \in E$ such that no two adjacent or incident elements share a color. Traditional Graph Neural Networks (GNNs) restrict message passing to node-to-node neighborhoods. To elevate edges to first-class citizens, we construct a Dual-Element Incidence graph $G = \mathbf{v}_{total} \mathbf{e}_{incident}$.

The Dual-Element Graph Construction

We define the super-vertex set $\mathbf{v}_{total} = \mathbf{V} \cup \mathbf{E}$. The cardinality of this unified set is $|\mathbf{v}_{total}| = |\mathbf{V}| + |\mathbf{E}|$. The new adjacency tensor (incidence mapping) $\mathcal{A} \in \mathbb{R}^{|\mathbf{v}_{total}| \times |\mathbf{v}_{total}|}$ is structured block-wise:

$$\mathcal{A} = \begin{pmatrix} A_V & I_E \\ I_E^T & A_E \end{pmatrix}$$

Where:

- $A_V \in \mathbb{R}^{|\mathbf{V}| \times |\mathbf{V}|}$ is the standard vertex adjacency matrix.
- $I_E \in \mathbb{R}^{|\mathbf{V}| \times |\mathbf{E}|}$ is the unsigned vertex-edge incidence matrix, where $(I_E)_{i,j} = 1$ if vertex v_i is an endpoint of edge e_j .

- $A_E \in \mathbb{R}^{|E| \times |E|}$ is the line graph adjacency matrix, where $(A_E)_{i,j} = 1$ if edges e_i and e_j shares a common vertex.

Vertex-Edge Dual Messaging (VEDM) Equations

Let $h_i^{(l)}$ denote the hidden state of an element $i \in \mathcal{V}_{total}$ at layer l . The structural propagation step splits into two distinct message channels before aggregation:

Vertex-to-Edge and Edge-to-Vertex Projection

$$\mathbf{m}_{j \rightarrow i}^{(l)} = \mathbf{W}_{type(j) \rightarrow type(i)}^{(l)} \cdot h_j^{(l)}$$

Where $type(\cdot) \in \{\text{Vertex}, \text{Edge}\}$. This yields four structural transformation matrices: $\mathbf{W}_{V \rightarrow V}$, $\mathbf{W}_{E \rightarrow V}$, $\mathbf{W}_{V \rightarrow E}$ and $\mathbf{W}_{E \rightarrow E}$.

Anisotropic Spatial Aggregation

To capture long-range dependencies across the spine of path graph variants (like caterpillars and lobsters), we utilize a normalized symmetric aggregation coupled with leaky structural attention weights α_{ij} :

$$h_i^{(l+1)} = \sigma \left(\mathbf{W}_{self}^{(l)} \cdot h_i^{(l)} + \sum_{j \in \mathcal{N}(i)} \alpha_{ij}^{(l)} \cdot \mathbf{m}_{j \rightarrow i}^{(l)} \right)$$

$$\alpha_{ij}^{(l)} = \frac{\exp \left(\text{LeakyReLU} \left(\mathbf{a}^T \left[\mathbf{W}_s h_i^{(l)} \mid \mid \mathbf{W}_s h_j^{(l)} \right] \right) \right)}{\sum_{k \in \mathcal{N}(i)} \exp \left(\text{LeakyReLU} \left(\mathbf{a}^T \left[\mathbf{W}_s h_i^{(l)} \mid \mid \mathbf{W}_s h_k^{(l)} \right] \right) \right)}$$

Where $\sigma(\cdot)$ represents the ELU activation function, $\mathcal{N}(i)$ denotes the neighbourhood in the dual graph $\mathcal{G}$, and $\mathbf{a}$ is the attention weight vector.

Differentiable Relaxed Chromatic Loss Function

Because discrete color assignment is non-differentiable, the network outputs a soft assignment matrix $\mathbf{P} \in \mathbb{R}^{|\mathcal{V}_{total}| \times C_{max}}$, and $C_{max} = \Delta(G) + 2$.

$$\mathbf{P}_i = \text{Softmax}\left(\text{MLP}\left(h_i^{(L)}\right)\right)$$

The loss function $\mathcal{L}_{total}$ minimizes structural collision while driving down the overall palette index:

$$\mathcal{L}_{total} = \sum_{i \in \mathcal{V}_{total}} \sum_{j \in \mathcal{N}(i)} \langle \mathbf{P}_i, \mathbf{P}_j \rangle + \lambda \sum_{i \in \mathcal{V}_{total}} \sum_{c=1}^{C_{max}} \mathbf{P}_{i,c} \cdot \log(c)$$

The internal product $\langle \mathbf{P}_i, \mathbf{P}_j \rangle$ acts as a soft penalty for adjacent/incident elements possessing identical colors, while the second term forces the allocation probability toward lower index colors (c).

We model the total coloring problem by constructing the Total Graph $T(G)$, where $V(T(G)) = V(G) \cup E(G)$. Adjacencies in $T(G)$ represent all constraints in the total coloring definition.

Architecture

- Input Layer: Adjacency matrix $A \in \mathbb{R}^{n \times n}$ and node feature matrix X .
- Message Passing (GCN Layers): We employ 6 layers of Graph Convolutional Networks (GCN) to capture local structural constraints:

$$H^{(l+1)} = \sigma(\tilde{D}^{-1/2} \tilde{A} \tilde{D}^{-1/2} H^{(l)} W^{(l)})$$

- Constraint Embedding: A secondary MLP captures the edge-vertex incidence relations, explicitly penalizing violations of the Behzad-Vizing conditions.

Loss Function

To guide the optimization, we define the Total Coloring Loss L_{TC} :

$$L_{TC} = \alpha \sum_{u \sim v} \text{ReLU}(\phi(u) - \phi(v)) + \beta \|\text{Prediction} - \chi''_{target}\|^2$$

Where the first term minimizes edge conflicts and the second enforces convergence to the chromatic number.

Experimental Setup

- Dataset: We generated 10,000 instances of path variants with sizes ranging from $N = 50$ to $N = 500$.
- Baseline: Comparisons were made against a standard greedy coloring heuristic and a backtracking search algorithm.
- Hyperparameters: Learning rate \$0.001\$, Dropout \$0.2\$, Adam optimizer, and 500 epochs.

Results and Discussion

Graph Type	Greedy Coloring	Backtracking	PathTotal-Net (Ours)
Caterpillar (N=100)	4.2 colors	3.0 colors	3.01 colors
Firecracker (N=250)	6.8 colors	5.0 colors	5.12 colors

Graph Type	Greedy Coloring	Backtracking	PathTotal-Net (Ours)
Rooted Path (N=500)	9.4 colors	7.0 colors	7.25 colors

Our model demonstrates a 98% accuracy in identifying Type 1 graphs, significantly outperforming greedy methods and matching the precision of exact solvers in a fraction of the time.

Conclusion

This paper demonstrates that GNNs are not merely tools for classification but powerful engines for combinatorial optimization. *Path Total-Net* provides a scalable framework to approximate total coloring, proving particularly effective for path-based graph topologies. Future work will investigate the scalability of this model to non-planar and random graphs.

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