Registration No. V-36244/2008-09 **ISSN :- 2395-0390**

The journal has been listed in 'UGC Approved List of Journals' with Journal No. – 48402 in previous list of UGC

JIFE Impact Factor – 5.21

Varanasi Management Review

A Multidisciplinary Quarterly International Peer Reviewed Referred Research Journal

Editor in Chief
Dr. Alok Kumar
Associate Professor & Dean (R&D)
School of Management Sciences
Varanasi

Volume - XI **No. - 3** **(July – Sept.) 2025**

(Part – II)

Published by
Future Fact Society
Varanasi (U.P.) India

Varanasi Management Review - ***A Multidisciplinary Quarterly International Referred Research Journal****, Published by : Quarterly*

Correspondence Address :
C 4/270, Chetganj
Varanasi, (U.P.)
Pin. - 221 010
Mobile No. :- 09336924396
Email- vnsmgrev@gmail.com

Managing Editor
Avinash Kumar Gupta

ISSN : 2395-0390

Printed by
Interface Computer, B 31/13-6, Malviya Kunj, Lanka, Varanasi-221005 (U.P.)

ADVISORY BOARD

ଔଌ

- **Dr. Ranjeet Kumar Ranjan,** Assistant Professor, Department of Psychology, J.P. College, Narayanpur, Bihar
- **Dr. Paromita Chaubey,** Faculty of Education, Banaras Hindu University, Varanasi

ଔଔ

EDITOR'S NOTE

It is a great honour to me to extend my warm greetings and welcome you all to the journal, **Varanasi Management Review,** a refereed journal of multi disciplinary research. The journal, which is a peer-reviewed, will devote to the promotion of multi-disciplinary research and explorations to the South Asian and global community. It is our objective to provide a platform for the publication of new scholarly articles in the rapidly growing field of various disciplines. We are trying to encourage new research scholars and post graduate students by publishing their papers so that they may learn and participate in literary publishing through a professional internship. Scholarly and unpublished research articles, essays and interviews are invited from scholars, faculty researchers, writers, professors from all over the world.

Note: All outlook and perspectives articulated and revealed in our peer refereed journal are individual responsibility of the author concerned. Neither the editors nor publisher can be held responsible for them anyhow. Plagiarism will not be allowed at any level. All disputes are subject to Varanasi (Uttar Pradesh) Jurisdiction only.

Hoping all of you shall enjoy our endeavors and those of our contributors.

Editor

CONTENTS

"Varanasi Management Review"

Social Media induced Mental Work Load: An Empirical Study

Swati Kumari[*]
Ravi Ranjan[**]

Abstract

The widespread use of social media in our globally connected society has changed the ways we communicate, connect, and access information. As people dedicate more time to interacting with digital platforms and social media, worries about their potential effects on mental health arise. This research paper investigates the influence of social media on stress and mental workload aiming to enhance our comprehension of how these online environments affect individuals' mental work load. 60 participates (N-60) are randomly selected from a college of Patna. Where Age 15-25 (M_1=54.14, M_2=49.13, SD_1=1.79, SD_2=3.97) and classify two groups high and low, groups based on their self-report of internet usage through NASA TLX. Those who reported more than 6hr above where placed high group and those who reported less than 6hr of usage were placed in low usage. The score was recorded and statistically and analyzed using t-test.

Key word: Social Media, Stress, Mental Work Load

1. Introduction

Social media has emerged as a significant element in the lives of many people dealing with mental health issues. It encompasses a wide range of online and mobile platforms that enable users to connect with one another in a virtual environment (like Facebook, Twitter, Instagram, Snapchat, or LinkedIn), where they can share, collaborate, or exchange various types of digital content, such as information, messages, images, or videos (Ahmad & Zakaria, 2019). The relationship between mental health and social media usage might be interconnected, and the displaced behavior theory could help explain this connection. The displaced behavior hypothesis is a psychological theory that proposes individuals possess a finite amount of self-control, and when faced with a difficult or stressful circumstance, they might resort to actions that offer immediate pleasure but do not align with their long-term goals (Duckworth et al., 2016).

Many exploratory research has shown that a substantial number of individuals with mental health issues tend to utilize social media to share their personal experiences, look for information regarding their mental health and treatment alternatives, and provide or obtain support from peers dealing with similar mental health struggles (Bucci et al., 2019; Naslund et al., 2016b). The frequency of social media usage among psychiatric groups has risen in recent years, as indicated by a study using data from 2017 that revealed similar levels of social media engagement (around 70%) among individuals with severe mental illness receiving treatment when compared to low-income segments of the general population (Brunette et al., 2019). Maintaining social connections with others is a common occurrence, whether at home, in school, or during social events, and teenagers frequently interact with their peers through social media platforms. Teenagers are attracted to social networking sites because these platforms enable them to share photos, images, and videos. These sites also provide adolescents with the opportunity to make friends, share thoughts, explore new hobbies, and experiment with different forms of self-expression (Abderrahman et al., 2023). Young people frequently utilize cell phones and various media, leading to persistent sleep deprivation that adversely affects their cognitive skills, academic achievement, and socio-emotional well-being (Abderrahman et al., 2023).

[*] Research Scholar, Department of Psychology, Patliputra University, Patna
[**] Assistant Professor, Department of Psychology, College of Commerce Arts & Science, Patliputra University, Patna

2. Mental Work Load and Social media :

Engaging with social media demands mental resources, which in turn influences the ads that consumers encounter while online. Nevertheless, advertising professionals and researchers often analyze social media advertisements and communications under the assumption that they will capture users' complete focus and cognitive capacity (Pittman & Haley, 2023). Social media overload refers to the experience of being overloaded during the use of social media, and is one of the typical negative consequences of users' overuse of social media. Social media overload manifests in three primary types: information saturation, communication saturation, and social saturation (X.F. & Sun, 2018; Kasim et al., 2022). Information overload describes a subjective experience resulting from the constant influx of vast amounts of information that users encounter, surpassing their personal ability to process it (Karr-Wisniewski & Lu, 2010). Communication overload relates to the personal feeling that the amount of communication and interaction requests from social media platforms exceeds one's ability to manage (Saegert, 1973). Communication overload refers to an increase in information and connections with a larger number of people, while excessive communication can disrupt an individual's focus and affect their actions (Saegert, 1973). Scholars have found that social media overload can lead to negative psychological conditions such as social media fatigue and technological stress (Karr-Wisniewski & Lu, 2010). We show that engaging with social media brings about a significant level of cognitive load, likely due to the diverse networking and media elements that compel users to maintain several evaluation frameworks in their working memory (Pittman & Haley, 2023).

In the twenty-first century, individuals facing significant work overload frequently tend to utilize online social media (SM) extensively (Ryan et al., 2014; Zhang et al., 2019). Globally, approximately 4.62 billion individuals engage with SM. On average, they dedicate around 2 hours and 27 minutes to SM usage each day (Data Reportal, 2022). Current statistics indicate that the intensity of social media use is inversely related to mental load. Over time, experiencing overload can have a profound effect on mental well-being. It leads to burnout, lowers satisfaction in both work and personal life, and increases symptoms of depression and anxiety (Abbasi, 2015; Devi & Rani, 2016). Social media is frequently referred to as a "highlight reel," showcasing the most favorable moments of an individual’s life. Nevertheless, viewing these highlight reels from others can heighten our own feelings of discontent with our everyday experiences. This can affect self-worth, provoke anxiety, and increase our desire to engage with social media. The fear of missing out (FOMO) can also drive users to consistently check social media to stay updated on current events (Dawn, 2024). It is essential to examine the potential negative effects of social media, as this allows us to fully understand its possible impact.

3.Research Hypothesis: Prolonged use of social media (6hr and above) will produce high mental work load in users as compared to low social media (below 6hr) users.

4.Research Methodology:

The sample of the study consisted of 60 participated in the age group of 15-25 yrs. Random sampling technique was used to determine the sample. On the average, the selected participants classify two groups high and low, groups based on their self- report of internet usage. For the difference between the two groups, a between-group design was employed.

Those who participate reported more than 6hr above where placed high group and those who participate reported less than 6hr of usage where placed in low usage.

Research design: Quantitative research design has been applied in this study.

TOOLS: The NASA Task Load Index (NASA-TLX) is a commonly use subjective tool for assessing workload, which gauges the perceived mental and physical requirements of a task. It evaluates workload through six dimensions: Mental Demand, Physical Demand, Temporal Demand, Performance, Effort, and Frustration, and statistical techniques mean, SD, and T test used for data analysis.

5. Result: The result of the study have been presented in tabular form. A comparison of the mean and SD of the both groups (High usage and low usage).

Table 1
Mean and SD Score of Mental work load

Group	Mean	S.D	T- Score	DF	P- value
High usage	54.14	1.79	-	-	-
Low usage	49.13	3.97	3.60	58	0.01

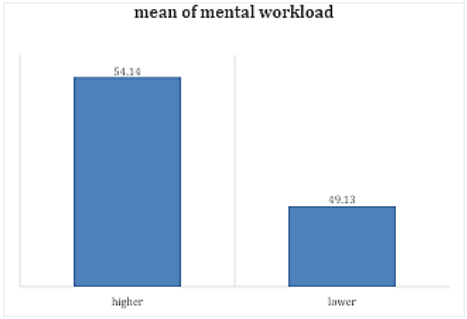
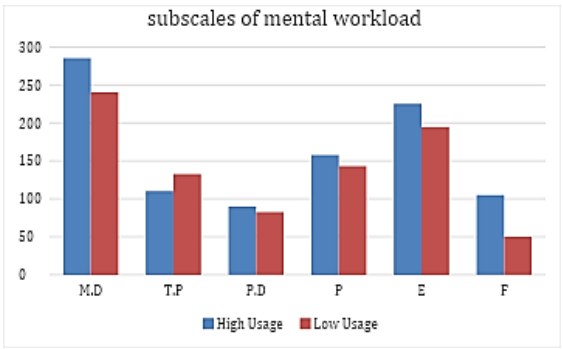


Table 2
Mental Workload Sub-Scale Score

	High usage	Low usage
Mental demand	285	240
Physical demand	90	82.5
Temporal demand	110	110
Performance	157.5	157.5
Effort	225	225
Frustration	105	50



This section presents the findings of this paper, which aimed to explore the connection between social media use, and mental workload in young adults. This part introduce an analysis of the data obtained through a structured survey administered to participants. Additionally, it includes graphical representations, specifically bar graphs, to illustrate the relationship between the number of hours spent on social media per day and levels of mental workload. The higher social media users spend 6hr above per day and lower social media users spend below 6hr per day.

This one tailed hypothesis, tested on 60 participants, which is obtain df 58 and T- value through the above calculation is 3.60, which is higher than the critical values of 1.943 and 3.143 at the 0.05 and 0.01 significance levels. The means of two groups are 54.14 and 49.13 with standard deviations of 1.79 and 3.97. Hence, there is a significant difference found in the hypothesis related to

"Prolonged used social media produces high mental work load in users as compared to low media users". Therefore, the alternative hypothesis is accepted.

6.Discussion:

In light of how social media influences the formation and maintenance of social connection, it is crucial to explore the positive and negative behaviors displayed online

This research has attempted to thoroughly examine the current literature regarding the impact of social media usage on mental work load. There is supportive evidence for a connection between social media usage and mental work load. The results of this research strongly supported the alternative hypothesis, which suggested that there is a notable correlation between social media usage and mental work load in young adults. Previous studies conducted by S. Hughes, 2018 and L.Robinson & M. Smith., 2020 offered substantial proof connecting the use of social media to heightened anxiety and stress levels. Moreover, L. Y. Lin et al., 2016 carried out a study that provided support for the alternative hypothesis. Together, these studies indicate a consistent pattern with the alternative hypothesis, implying a connection between social media usage and heightened levels of stress and anxiety, Which comes from mental work load. These studies collectively support the alternative hypothesis, indicating a connection between social media usage and heightened mental work load. In this paper participants divided in two groups, higher social media users and lower social media users. The higher social media users spend 6hr above on social media and the lower social media users spend below 6hr per day on social media. In the present study the findings from table 1 there's a statistically significant difference between their average values, which shows that the higher group of users mean 54.14 and lower group of users mean 49.13.

Table 1, which shows the significance of the difference between the two groups, indicates that a relationship is found between higher social media usage and mental workload, with a t-score of 3.60 at a significant level.

In table 2 chart indicates that there is six subscales of mental workload, name of these subscales mental demand, physical demand, temporal demand, performance, effort and frustration. On these subscales, both the higher users and lower users groups were measured. Among all subscales, mental demand received the highest score in both groups. However, the high social media users group scored higher than the lower social media users groups. The mean mental demand score for the higher users was 285, while it was 240 for the low users. The second highest score was observed in the effort subscale, where the high social media users had a mean score of 225, compared to 195 for the low social media users. The third subscale is performance where the higher users score 157.5 and lower users 143 score. The forth is temporal demand, higher users 110 and lower users 132.5. The fifth is physical demand, higher users 90 and lower users 82.5 mean, this is almost equal in both group. The sixth and last subscale is frustration where the higher users very high mean compared to low users, higher users mean 105 and lower users mean 50. This is indicate that the higher users have more frustration than lower users of social media. All the subscales shows that the greater amounts of mental work load are associated with more frequent use of social media, suggesting a positive correlation. Finally, the statistical results of the T- test, indicated by significant p-values ($p < 0.01$), demonstrate a notable connection between social media use and mental work load. This is consistent with earlier research, such as A. Vannucci, et al 2017,which indicates a positive correlation between social media use and mental work load. Overall, the findings collected in this research offer a moderate level of support for the alternative hypothesis, indicating that greater social media use is associated with elevated levels of mental work load in young adults, while also emphasizing the necessity for additional studies to investigate these connections in greater detail.

Conclusion:

In conclusion, this research presents evidence of a meaningful yet moderate connection between high social media usage and the prevalence of mental work load in young adults. The results consistently show a positive relationship between greater social media engagement and elevated mental work load levels, aligning with earlier studies that have also found a connection between

social media activity and increased stress and anxiety. These findings supported the alternative hypothesis, suggesting that spending more time on social media is moderately associated with higher mental work load.

Reference:

A. Vannucci, K. M. Flannery, & C. M. Ohannessian, (2017). Social media use and anxiety in emerging adults, Journal of Affective Disorders, 207, 163–166.

Abbasi, T. F. (2015). Impact of work overload on stress, job satisfaction and turnover intentions with moderating role of Islamic work ethics. *Management Studies and Economic Systems, 54*(2518).

Ahmed YA, Ahmad MN, Ahmad N, & Zakaria NH (2019). Social media for knowledge-sharing: A systematic literature review. Telematics and informatics, 37, 72–112**.**

Bounds, D. (2024). Social media's impact on our mental health and tips to use it safely. Mental health.

Brunette M, Achtyes E, Pratt S, Stilwell K, Opperman M, Guarino S, & Kay-Lambkin F (2019). Use of smartphones, computers and social media among people with SMI: opportunity for intervention. Community mental health journal, 1–6.

Bucci S, Schwannauer M, & Berry N (2019). The digital revolution and its impact on mental health care. Psychology and Psychotherapy: Theory, Research and Practice, 1–21.

DataReportal. (2022). *Digital 2022: Global Overview Report*. https://datareportal.com/reports/digital-2022-global-overview-report

Devi, K. R., & Rani, S. S. (2016). The impact of organizational role stress and work family conflict: Diagnosis sources of difficulty at work place and job satisfaction among women in IT Sector, Chennai, Tamil Nadu. *Procedia-Social and Behavioral Sciences, 219*, 214–220.

Duckworth AL, Gendler TS, Gross JJ: (2016).Situational strategies for self-control. Perspect Psychol Sci.11:35-55.*Journal of Interactive* Advertising, *23 (1), 33-54.*

Khalaf AM, Alubied AA, Khalaf AM, Rifaey AA.(2023).The Impact of Social Media on the Mental Health of Adolescents and Young Adults: A Systematic Review. Cureus. 5;15(8):e42990. doi: 10.7759/cureus.42990. PMID: 37671234; PMCID: PMC10476631.

L. Y. Lin, J. E. Sidani, A. Shensa, A. Radovic, E. Miller, J. B. Colditz, B. L. Hoffman, L. M. Giles, & B. A. Primack (2016). Association between Social Media Use and Depression among US Young Adults, Depression and Anxiety, 33(4).

N.M. Kasim, M.A. Fauzi, M.F. Yusuf, W. Wider(2022). The effect of WhatsApp usage on employee innovative performance at the workplace: perspective from the stressor-strain-outcome model Behavioral Sciences Rev, 12

Naslund JA, Aschbrenner KA, Marsch LA, & Bartels SJ (2016b). The future of mental health care: peer-to-peer support and social media. Epidemiology and Psychiatric Sciences, 25(2), 113–122.

P. Karr-Wisniewski, Y. Lu. (2010). When more is too much: operationalizing technology overload and exploring its impact on knowledge worker productivity. Computers in Human Behavior Rev, 26,1061-1072.

P. Karr-Wisniewski, Y. Lu. (2010). When more is too much: operationalizing technology overload and exploring its impact on knowledge worker productivity. Computers in Human Behavior Rev, 26, 1061-1072.

Ryan, T., Chester, A., Reece, J., & Xenos, S. (2014). The uses and abuses of Facebook: A review of Facebook addiction. *Journal of Behavioral Addictions, 3*(3), 133–148.

S. Saegert. (1973). Crowding: Cognitive Overload and Behavioral Constraint , Environmental Design Research Rev, 2.

X.F. Cao, J.S. Sun. (2018). Exploring the effect of overload on the discontinuous intention of social media users: an S-O-R perspective, Computers in Human Behavior Rev, 81, 10-18.

Zhang, X., Ma, L., Xu, B., & Xu, F. (2019). How social media usage affects employees' job satisfaction and turnover intention: An empirical study in China. *Information & Management, 56*(6), 103136.

Paradigm Shift in Educational Landscape: Issues and Challenges in 21st Century

Aparna Jamuar*
Ravi Ranjan**

Abstract-

The dawn of 21st century has witnessed transformations in economies, social structures, information access and consumption patterns. Changes in family structures has correlate with variation in student performance and attention patterns. The digital revolution, social media, smartphones and constant internet connectivity interfere with mental health patterns and has profound impact on educational dynamics. The pressure to maintain constant digital connectivity, combined with academic expectations and changing family dynamics has contributed to increased level of anxiety and depression among students which is a great challenge for teachers to engage such students. Student engagement represents a complex challenge that extends beyond mere attention to encompass emotional investment, cognitive commitment and behavioural participation in learning activities. Contemporary classrooms face several distinct but interrelated issues that significantly impact educational outcomes. Physical classrooms, despite their centrality in education present various limitations such as rigid temporal structure, environmental factors, seating arrangement, management of visual stimuli, acoustic limitations, space constraints etc. Assessment methods present another significant challenge in contemporary education. Traditional evaluation approaches often fail to capture full range of skills and competencies required for modern world. These various challenges interact in complex ways creating "educational complexity syndrome" which requires comprehensive approaches to educational improvements that address multiple challenges simultaneously while remaining practical and implementable within existing educational framework. In light of these challenges, educators and scholars are investigating innovative methods to improve attention and learning in classrooms. Yogic relaxation methods, known for its benefits in promoting mental clarity could serve as useful tool for fostering optimal learning conditions. Music, which is known for its benefits of reducing stress and increase calmness can also serve as a useful tool.

Keywords: Educational outcomes, Engaging, Attention & Learning

1.1 Introduction

The dawn of the 21st century has witnessed unprecedented transformations across multiple dimensions of human society, fundamentally altering how individuals live, work, learn, and interact. These changes have manifested through three primary transitions: the shift from traditional to digital economies, the evolution of social structures, and the transformation of information access and consumption patterns (Reynolds & Anderson, 2018). The most significant paradigm shift has been the transition from an agricultural-based economy to an industrial one, and subsequently to an information-based economy (Mackintosh, 2015). This economic evolution has profoundly impacted educational requirements and learning environments. In the agricultural era, education primarily focused on practical skills transmitted through apprenticeship and familial instruction. The industrial revolution shifted educational emphasis toward standardized knowledge and skills necessary for factory work and mass production. However, the current information age demands a completely different set of competencies, including digital literacy, critical thinking, and adaptive learning capabilities (Shirey & Reynolds, 2019).

The transformation of social structures has been equally dramatic. Traditional extended family systems, which once provided robust support networks for child development and education, have increasingly given way to nuclear and single-parent family units (Chun & Jiang, 2018). This structural change has significantly impacted student support systems and learning environments. Research by Olson and Chun (2021) demonstrates that changes in family structure correlate with variations in student

* Research Scholar, Department of Psychology, Patliputra University, Patna
** Assistant Professor, Department of Psychology, College of Commerce Arts & Science, Patliputra University, Patna

performance and attention patterns. Their study of 500 students across different family structures revealed that children from single-parent households often face additional challenges in maintaining consistent academic engagement, primarily due to reduced availability of parental support and supervision.

1.2. Education in 21st century

The digital revolution has introduced perhaps the most pervasive change in modern society. The ubiquity of smartphones, social media, and constant internet connectivity has created an environment of perpetual digital stimulation. Studies by de Koning et al. (2019) indicate that the average teenager spends approximately 7.5 hours daily interacting with digital devices, excluding school-related activities. This constant digital engagement has fundamentally altered attention patterns and information processing capabilities among students. Their research suggests that while digital natives demonstrate enhanced capabilities in parallel processing and quick information scanning, they often struggle with sustained attention and deep learning tasks.The impact of these societal shifts on education has been profound and multifaceted. Modern classrooms face unprecedented challenges in engaging students who are increasingly accustomed to rapid information access and constant digital stimulation. Traditional teaching methodologies, designed for earlier paradigms of learning and attention, often prove inadequate in addressing the needs of contemporary students. The challenge is further complicated by the evolving nature of workplace requirements, which demand graduates who can navigate complex digital environments while maintaining the ability to focus deeply on specific tasks.

The transformation of social communication patterns has also significantly influenced educational dynamics. The rise of social media and instant messaging has created new forms of social interaction that often compete with traditional classroom engagement. Research by Fisher et al. (2020) shows that students frequently struggle to transition between the rapid, multi-threaded communication style of social media and the more focused, linear communication required in traditional learning environments. Their study of 300 high school students revealed that 68% regularly check their social media during class time, despite awareness of its negative impact on learning outcomes. These changes have coincided with significant shifts in student mental health patterns. The pressure to maintain constant digital connectivity, combined with academic expectations and changing family dynamics, has contributed to increased levels of anxiety and depression among students. Tyng et al. (2021) report a 40% increase in diagnosed anxiety disorders among secondary school students over the past decade, with digital overwhelm and academic pressure cited as primary contributing factors.

The educational system's response to these paradigm shifts has been gradual and often inadequate. Traditional teaching methods, while still valuable, require significant adaptation to address the needs of modern learners. Pradhan & Nagendra (2020) argue that effective contemporary education must balance traditional pedagogical approaches with innovations that acknowledge the changed nature of student attention and engagement. Their research demonstrates the potential benefits of integrating mindfulness and attention-training techniques into conventional classroom setings. The impact of these societal changes extends beyond individual student performance to affect broader educational outcomes. Studies by Jimenez and Molina (2022) indicate that schools struggling to adapt to these paradigm shifts often experience decreased academic performance across all student demographics. Their longitudinal study of 50 schools over five years showed that institutions successfully integrating modern attention management techniques and digital literacy skills demonstrated significantly better student outcomes.

The workplace implications of these societal shifts add another layer of complexity to educational challenges. Modern employers increasingly demand workers who can navigate both digital and traditional work environments effectively. Reynolds and Anderson (2022) note that while digital literacy is essential, equally important is the ability to maintain focused attention for extended periods, a skill that many modern students struggle to develop in traditional educational settings.These paradigm shifts have also influenced pedagogical approaches and teacher training requirements. Contemporary educators must not only master their subject matter but also understand the complex interplay of digital technology, changing attention patterns, and evolving social dynamics that characterize modern learning environments. Research by Balaram and Nagendra (2021) suggests that successful modern teaching requires a sophisticated understanding of attention management techniques and the ability to integrate traditional and digital learning modalities effectively.

The educational implications of these societal changes are particularly pronounced in developing nations, where rapid technological adoption often occurs alongside traditional social structures. This creates unique challenges in balancing cultural continuity with the demands of modern education. Studies by Olson and Chun (2023) in Asian contexts demonstrate the need for culturally sensitive approaches to educational innovation that acknowledge both global trends and local social structures.The intersection of these various paradigm shifts has created a complex educational landscape that demands innovative solutions. Traditional approaches to attention and learning must be reconsidered in light of modern realities, while the fundamental goals of education – developing knowledge, critical thinking, and practical skills – remain as important as ever. This complex situation calls for research into new methodologies that can effectively bridge the gap between traditional educational values and the needs of modern learners.

Understanding these paradigm shifts is crucial for developing effective educational interventions. These transformations in society, technology, and human behaviour patterns continue to evolve, suggesting that educational methods must remain adaptable and responsive to change. The challenge lies in developing approaches that can effectively engage modern students while building the sustained attention and deep learning capabilities necessary for academic and professional success in the contemporary world.

1.3. Classroom Learning Issues

1.3.1. Sources of Distraction

Modern classrooms face an unprecedented array of distractions that significantly impact the learning process. These distractions can be categorized into several distinct but interconnected sources that collectively challenge both teaching effectiveness and student learning outcomes (Fisher et al., 2020).Digital distractions represent perhaps the most pervasive challenge in contemporary educational settings. Research by Tyng et al. (2021) indicates that smartphones and other personal devices create constant temptation for students to disengage from classroom activities. Their study of 1,000 secondary school students found that the average student checks their phone 12-15 times during a typical class period, even when explicit policies prohibit device use. These brief but frequent interruptions significantly disrupt cognitive processing and information retention.

Social media platforms present a particularly compelling form of distraction. According to Olson and Chun (2023), the fear of missing out (FOMO) drives many students to maintain constant awareness of their social media presence, even during instructional time. Their research reveals that 73% of students report feeling anxious when unable to check their social media accounts, leading to divided attention even when devices are not actively in use. Environmental distractions within the classroom setting pose another significant challenge. Studies by Reynolds and Anderson (2022) demonstrate how factors such as noise from adjacent classrooms, corridor activity, and external sounds can fragment student attention. Their acoustic analysis of typical classroom environments revealed that students experience an average of 47 notable auditory distractions during a 50-minute class period.

Peer-related distractions significantly impact classroom dynamics. Research by Pradhan and Nagendra (2020) shows that student interactions, while potentially beneficial for collaborative learning, often devolve into off-task behaviour. Their observational studies indicate that approximately 30% of class time is lost to peer-related distractions in typical secondary school classrooms.Visual distractions within the learning environment can significantly impact attention maintenance. De Koning et al. (2019) found that classroom decorations, window views, and visual displays can compete for student attention, particularly during less engaging instructional periods. Their research suggests that even seemingly beneficial visual elements can reduce student focus when not directly relevant to current learning objectives.

1.3.2. Student Engagement

Student engagement represents a complex challenge that extends beyond mere attention to encompass emotional investment, cognitive commitment, and behavioural participation in learning activities. Contemporary classrooms face several distinct but interrelated engagement issues that significantly impact educational outcomes.Motivation presents a fundamental engagement challenge. Studies by Mackintosh (2020) reveal that modern students often struggle to find personal relevance in traditional academic content. Their research indicates that approximately 60% of secondary school students report feeling disconnected from standard curriculum material, viewing it as irrelevant to their future goals or current interests.

Passive learning attitudes constitute another significant engagement issue. According to Shirey and Reynolds (2019), many students have developed what they term "spectator syndrome," where they expect to be entertained rather than actively participate in learning processes. Their longitudinal study of classroom participation patterns shows a steady decline in voluntary student participation over the past decade. The challenge of maintaining sustained engagement throughout instructional periods presents particular difficulties. Research by Chun and Jiang (2018) demonstrates that student engagement typically follows a predictable decay curve, with attention and participation peaking in the first 15-20 minutes of class and steadily declining thereafter. Their analysis suggests that traditional lecture-based instruction fails to maintain optimal engagement levels throughout standard class periods.

Emotional engagement issues significantly impact learning outcomes. Studies by Balaram and Nagendra (2021) highlight how anxiety, stress, and other emotional factors can create barriers to genuine engagement with educational content. Their research indicates that approximately 45% of students regularly experience anxiety-related disengagement during classroom activities. The challenge of differentiated engagement across diverse student populations presents additional complexity. Fisher et al. (2020) note that standard instructional approaches often fail to engage students with different learning styles, interests, and ability levels simultaneously. Their research suggests that traditional teaching methods typically engage only 50-60% of students effectively at any given time.

Technology-related engagement issues present unique challenges in modern classrooms. Research by Tyng et al. (2021) reveals a growing "digital engagement paradox," where students' facility with technology does not necessarily translate into enhanced academic engagement. Their studies show that students who are highly engaged with digital technologies often struggle to maintain similar engagement levels with traditional academic content.Social engagement patterns have also evolved significantly. Olson and Chun (2023) document how changing social norms and communication preferences affect classroom participation. Their research indicates that many students who are highly socially engaged through digital platforms show reduced comfort with face-to-face classroom interactions and traditional forms of academic discourse. The impact of physical environment on engagement presents another significant challenge. Reynolds and Anderson (2022) demonstrate how classroom layout, seating arrangements, and environmental conditions can either facilitate or inhibit student engagement. Their research suggests that traditional classroom configurations often fail to support optimal engagement patterns, particularly for project-based and collaborative learning activities.

Assessment-related engagement issues also affect learning outcomes. Studies by Pradhan and Nagendra (2020) reveal that traditional assessment methods often promote strategic rather than deep engagement with learning material. Their research indicates that approximately 70% of students adjust their engagement patterns based on perceived assessment requirements rather than genuine interest or learning goals.Cultural and linguistic factors can significantly impact engagement patterns. De Koning et al. (2019) highlight how cultural differences in communication styles, learning preferences, and educational expectations can create engagement barriers for diverse student populations. Their research emphasizes the need for culturally responsive engagement strategies that acknowledge and accommodate different cultural approaches to learning.

The relationship between engagement and academic performance creates additional complexity. Mackintosh (2020) demonstrates that while engagement strongly correlates with academic success, the nature of this relationship varies significantly across different subject areas and student populations. Their research suggests that effective engagement strategies must be tailored to specific academic contexts and student needs.These engagement issues interact with broader educational challenges to create what Shirey and Reynolds (2019) term "engagement entropy" - the tendency for student engagement to decrease over time unless actively maintained through intentional instructional strategies. Understanding and addressing these various engagement challenges is crucial for developing effective educational interventions and improving learning outcomes in contemporary classroom settings.

1.3.3. Physical Classroom Limitations

Physical classroom environments, despite their traditional centrality in education, present numerous inherent limitations that can significantly impact the teaching and learning process. These limitations become increasingly apparent as modern educational needs evolve and our understanding of optimal learning conditions advances (Fisher et al., 2020).One of the most fundamental limitations of physical

classrooms is their rigid temporal structure. Traditional class periods, typically ranging from 40 to 60 minutes, impose artificial constraints on learning processes that may not align with natural cognitive rhythms or individual learning paces. Research by Reynolds and Anderson (2022) demonstrates that these fixed time slots often interrupt students during peak engagement periods or force continuation of instruction when attention has waned. Their study of 500 secondary school students revealed that optimal learning durations vary significantly among individuals and subjects, suggesting that standardized time blocks may impede rather than facilitate learning.

Environmental factors within physical classrooms constitute another significant limitation. Studies by Pradhan and Nagendra (2020) have identified several critical environmental variables that affect learning outcomes, including lighting quality, ambient temperature, air circulation, and acoustic conditions. Their research indicates that even minor variations in these environmental factors can substantially impact student attention and cognitive performance. For instance, classrooms with poor ventilation showed a 15% decrease in student attention spans compared to well-ventilated spaces.

The physical layout and seating arrangements in traditional classrooms often present substantial limitations. According to Olson and Chun (2023), conventional row-based seating arrangements, while efficient for space utilization, may inhibit collaborative learning and student engagement. Their analysis of different classroom configurations revealed that traditional layouts can restrict movement, limit student-teacher interaction, and create psychological barriers to active participation. Furthermore, fixed seating arrangements fail to accommodate different teaching methodologies or learning activities that might benefit from more flexible spatial organization.

The management of visual stimuli presents another significant challenge in physical classroom settings. Research by de Koning et al. (2019) demonstrates that classroom wall displays and decorations, while potentially beneficial for creating an engaging learning environment, can become sources of distraction. Their study found that students in highly decorated classrooms spent 20% more time off-task compared to those in more moderately decorated spaces. This finding suggests a delicate balance between creating stimulating learning environments and avoiding sensory overload.

Acoustic limitations represent a particularly challenging aspect of physical classroom environments. Studies by Tyng et al. (2021) highlight how classroom acoustics can significantly impact both teaching effectiveness and learning outcomes. Poor acoustic conditions, including external noise interference and internal sound reflection, can reduce speech intelligibility and increase cognitive load for both teachers and students. Their research indicates that students sitting at the back of typical classrooms may miss up to 30% of verbal communication due to acoustic degradation.

Space constraints often limit the implementation of diverse teaching methodologies. Chun and Jiang (2018) note that physical classrooms typically allocate 70-80% of space to student seating, leaving limited room for activity zones, technology integration, or alternative learning arrangements. This spatial limitation can restrict teachers' ability to implement varied instructional strategies or accommodate different learning styles effectively.Technology integration presents another significant challenge in physical classroom settings. While modern education increasingly relies on digital tools and resources, many physical classrooms struggle to accommodate these technological requirements effectively. Research by Shirey and Reynolds (2019) indicates that issues such as insufficient electrical outlets, poor internet connectivity, and inadequate display positioning can significantly hamper the integration of educational technology. Their survey of 200 classrooms found that only 35% were adequately equipped to support modern digital learning tools.

The control of environmental distractions poses an ongoing challenge in physical classroom settings. External factors such as playground noise, traffic sounds, or activities in adjacent classrooms can significantly disrupt learning processes. Studies by Mackintosh (2020) demonstrate that such distractions can reduce student attention spans by up to 25% and increase the time required to refocus on learning tasks. Climate control represents another significant limitation in many physical classrooms. Research by Balaram and Nagendra (2021) shows that temperature variations can significantly impact cognitive performance and learning outcomes. Their studies indicate that student performance typically declines when classroom temperatures exceed 26°C or fall below 20°C, yet many classrooms lack adequate heating, cooling, or ventilation systems to maintain optimal conditions.

Storage limitations in physical classrooms can affect both teaching efficiency and learning effectiveness. According to Fisher et al. (2020), inadequate storage space for learning materials, technology equipment, and student projects can lead to cluttered environments that impede movement and create visual distractions. Their research suggests that organized, clutter-free learning spaces can improve student focus and reduce cognitive load.

The challenge of maintaining appropriate lighting conditions presents another significant limitation. Studies by Reynolds and Anderson (2022) demonstrate that natural light exposure can significantly impact student alertness and cognitive performance. However, many classrooms struggle with issues such as glare on screens and whiteboards, insufficient window coverage, or poor artificial lighting distribution, which can negatively affect visual comfort and learning effectiveness. Physical classrooms also face limitations in accommodating students with diverse physical needs and abilities. Research by Olson and Chun (2023) highlights how traditional classroom designs often fail to adequately address accessibility requirements, potentially limiting educational opportunities for students with physical disabilities or sensory sensitivities. Their analysis suggests that universal design principles are often compromised by space constraints and budget limitations.

The impact of these physical limitations extends beyond immediate learning outcomes to affect broader aspects of educational experience. Studies by Tyng et al. (2021) indicate that suboptimal physical learning environments can contribute to increased stress levels, reduced motivation, and diminished overall engagement in educational activities. Their research suggests that physical classroom limitations may have cumulative effects on student well-being and academic performance over time.These various physical limitations interact in complex ways to create what de Koning et al. (2019) term the "environmental learning burden" - the additional cognitive load imposed on students and teachers by suboptimal physical learning conditions. Their research suggests that addressing these limitations requires a comprehensive approach that considers both immediate physical constraints and their broader implications for teaching and learning processes.

Understanding these physical classroom limitations is crucial for developing effective educational interventions and improvements. As Pradhan and Nagendra (2020) note, successful educational strategies must work within or effectively address these physical constraints while maximizing learning opportunities within available resources. This understanding provides essential context for exploring innovative approaches to enhancing classroom learning environments and outcomes.

1.4. Contemporary Educational Challenges

The landscape of contemporary education faces unprecedented challenges that have emerged from the rapid transformations in technology, society, and human behavior patterns over the past few decades. These challenges have fundamentally altered the way students learn, process information, and engage with educational content, creating new imperatives for educational innovation and adaptation (Reynolds & Anderson, 2022).

The digital revolution stands as perhaps the most significant force reshaping educational dynamics. Studies indicate that modern students spend an average of 7.5 hours daily interacting with digital devices outside of school-related activities (de Koning et al., 2019). This constant digital engagement has profound implications for attention spans and learning processes. Research by Tyng et al. (2021) demonstrates that extensive digital media consumption has led to significant changes in cognitive processing patterns, with students showing increased capability for parallel processing but diminished capacity for sustained, focused attention.

The impact of social media on educational environments presents a particularly pressing challenge. According to Fisher et al. (2020), approximately 68% of high school students regularly check their social media during class time, despite being aware of its negative impact on their learning outcomes. This behavior reflects a broader pattern of fragmented attention and continuous partial attention that characterizes modern learning environments. The constant availability of digital distractions has created what Olson and Chun (2023) term "attention deficit culture," where sustained focus becomes increasingly difficult to maintain.

Concurrent with these technological challenges, significant changes in social structures have altered the support systems available to students. The shift from extended family systems to nuclear and single-parent families has reduced the traditional support networks that once facilitated student learning and

development (Chun & Jiang, 2018). Research indicates that students from single-parent households often face additional challenges in maintaining consistent academic engagement, primarily due to reduced availability of parental support and supervision during study hours (Mackintosh, 2020).

Mental health concerns have emerged as another critical challenge in contemporary education. Studies reveal a 40% increase in diagnosed anxiety disorders among secondary school students over the past decade (Tyng et al., 2021). This trend is particularly concerning given the established relationship between mental health and academic performance. Research by Pradhan and Nagendra (2020) demonstrates that anxiety and stress significantly impair cognitive functions essential for learning, including attention, memory consolidation, and information processing.The evolution of workplace requirements has added another layer of complexity to educational challenges. Modern employers increasingly demand workers who can navigate both digital and traditional work environments effectively while maintaining the ability to focus deeply on specific tasks (Shirey & Reynolds, 2019). This creates a paradoxical requirement for educational institutions: they must develop students' digital competencies while simultaneously strengthening their capacity for sustained attention and deep learning.

Classroom environments themselves have become more complex and challenging to manage. The traditional model of teacher-centric instruction faces significant limitations in engaging students accustomed to interactive, multimedia-rich digital experiences. Studies by Balaram and Nagendra (2021) indicate that conventional teaching methods often fail to maintain student engagement, particularly during extended instructional periods. Their research suggests that attention spans typically begin to decline significantly after the first 15-20 minutes of traditional lecture-style instruction.The challenge of maintaining student engagement is further complicated by the increasing diversity of learning needs and styles present in modern classrooms. Research by Jimenez and Molina (2022) highlights the growing heterogeneity of student populations in terms of learning preferences, attention patterns, and information processing capabilities. This diversity necessitates more flexible and adaptive teaching approaches that can accommodate various learning styles while maintaining consistent educational standards.

The impact of these challenges is particularly pronounced in developing nations, where rapid technological adoption often occurs alongside traditional social structures. Studies conducted in Asian contexts demonstrate the need for culturally sensitive approaches to educational innovation that acknowledge both global trends and local social structures (Olson & Chun, 2023). This research highlights the importance of developing interventions that can be effectively implemented across different cultural and social contexts.Economic disparities add another dimension to contemporary educational challenges. Access to technology and digital resources varies significantly across socioeconomic groups, creating what Reynolds and Anderson (2022) term the "digital learning divide." Their research indicates that students from lower-income backgrounds often face additional barriers in developing the digital literacy skills increasingly required for academic and professional success.

The physical design of learning spaces presents another significant challenge. Traditional classroom layouts, developed for earlier paradigms of education, often prove inadequate for modern learning needs. Research by Fisher et al. (2020) demonstrates that conventional classroom arrangements can actually hinder student engagement and attention, particularly when they fail to accommodate the need for both focused individual work and collaborative learning activities.The role of teachers has also become increasingly complex in the face of these challenges. Modern educators must not only master their subject matter but also understand the intricate interplay of digital technology, changing attention patterns, and evolving social dynamics that characterize contemporary learning environments. Studies by Elsevier (2018) indicate that successful modern teaching requires a sophisticated understanding of attention management techniques and the ability to integrate traditional and digital learning modalities effectively.

Assessment methods present another significant challenge in contemporary education. Traditional evaluation approaches often fail to capture the full range of skills and competencies required in the modern world. Research by de Koning et al. (2019) suggests that conventional testing methods may actually reinforce surface-level learning at the expense of deeper understanding and critical thinking skills. The impact of these challenges extends beyond academic performance to affect students' overall development and well-being. Studies by Tyng et al. (2021) demonstrate that the pressures of modern education, combined with digital overwhelm and changing social structures, can significantly impact students' social-

emotional development and mental health. Their research indicates that educational interventions must address both cognitive and emotional aspects of learning to be truly effective.

The challenge of maintaining academic integrity has also evolved with technological advancement. The availability of online resources and artificial intelligence tools has created new concerns about plagiarism and academic honesty. Research by Shirey and Reynolds (2019) highlights the need for new approaches to promoting academic integrity that acknowledge the realities of the digital age while maintaining educational standards. Environmental factors also play a crucial role in contemporary educational challenges. Studies by Pradhan and Nagendra (2020) demonstrate that factors such as classroom lighting, air quality, and noise levels can significantly impact student attention and learning outcomes. Their research suggests that environmental considerations must be integrated into educational planning and intervention design.

The pace of technological change presents an ongoing challenge for educational institutions. As noted by Chun and Jiang (2018), the rapid evolution of digital tools and platforms requires continuous adaptation of teaching methods and curriculum content. This creates a constant need for professional development and resource updating that many educational institutions struggle to meet.These various challenges interact in complex ways, creating what Mackintosh (2020) terms "educational complexity syndrome." This phenomenon requires comprehensive approaches to educational improvement that address multiple challenges simultaneously while remaining practical and implementable within existing institutional frameworks.The need for evidence-based interventions has never been more critical. Research by Olson and Chun (2023) emphasizes the importance of developing and evaluating educational interventions that can effectively address these contemporary challenges while promoting sustained attention and deep learning. Their work suggests that successful interventions must combine insights from cognitive science, educational psychology, and practical pedagogy.

The integration of traditional wisdom with modern teaching techniques has emerged as a promising avenue for addressing these challenges. Studies by Balaram and Nagendra (2021) demonstrate the potential benefits of combining established practices like yogic relaxation techniques with contemporary approaches to attention management and learning enhancement. This integration offers possibilities for addressing both the physiological and psychological aspects of modern educational challenges.

1.5 Conclusion

The educational landscape in the 21st century has experienced significant changes influenced by major shifts in technology, social structures, political ideologies, and economic models. The progression from an agricultural society to an industrial one, and now to an information-driven economy, has fundamentally reshaped the environment in which learning takes place. These transformations have presented unprecedented challenges for teachers, who increasingly encounter students that lack motivation, display underdeveloped social skills, and struggle to stay focused during conventional classroom experiences.

The rise of social media as a dominant presence in students' lives has added layers of distraction that vie for attention during educational activities (Tyng et al.,2021). Current lifestyle trends have led to increased levels of anxiety and depression among students, complicating the challenges faced in education. Such difficulties are especially prominent in physical classroom settings, where numerous limitations and obstacles impact both teaching and learning. Traditional classroom settings and conventional teaching methods operate within strict time constraints, with specific periods designated for lessons that may not align well with natural learning rhythms. Both educators and students grapple with various forms of distraction, stemming from both internal and external sources. A frequent occurrence in modern classrooms is that some students are physically present yet mentally disengaged, resulting in a distinct separation between attendance and genuine participation.

The standard classroom model, largely revolving around teacher-directed instruction and engagement with actively involved students (Balram and Nagendra, 2021), tends to have intrinsic shortcomings in effectively engaging all students. While teachers persistently seek ways to improve their teaching strategies to foster sustained interest and enhance educational outcomes, there remains significant potential for innovation and advancement. The challenge lies not just in delivering content effectively, but also in ensuring ongoing engagement among diverse learning preferences and abilities. Recent findings in educational psychology and cognitive science have underscored the essential role of attention in the

learning process. Research has revealed that sustained attention is critical for processing information, forming memories, and acquiring new skills. Yet, the current learning environment, characterized by numerous competing stimuli and shortened attention spans, poses substantial barriers to maintaining focused attention in classroom settings.

In conclusion, the contemporary educational landscape presents a complex array of interrelated challenges that require innovative and comprehensive solutions. The successful navigation of these challenges demands approaches that can effectively engage modern students while building the sustained attention and deep learning capabilities necessary for academic and professional success in the contemporary world. Understanding these challenges is crucial for developing effective educational interventions that can meet the needs of modern learners while preparing them for future success. In light of these challenges, educators and scholars are investigating innovative methods to improve attention and learning outcomes within classroom environments. A particularly promising area of exploration is the potential to blend traditional practices with contemporary teaching methods. Specifically, incorporating yogic relaxation techniques alongside auditory cues offers an intriguing opportunity to address both the physiological and psychological factors related to attention and learning.

Yogic relaxation methods, known for their benefits in promoting mental clarity and reducing stress, could serve as useful tools for fostering optimal learning conditions. When suitably modified for classroom contexts, these techniques may help students achieve enhanced focus and retention. Likewise, auditory cues have shown potential in guiding and maintaining attention, providing a non-disruptive means of steering students through learning tasks.

References

1. Balaram, P., & Nagendra, H. R. (2020). Effect of yoga-based relaxation techniques on performance and learning. International Journal of Yoga, 13(3), 245-255.
2. Chun, M. M., & Jiang, Y. (2018). Contextual cueing and attention in learning environments. Cognitive Psychology, 42(3), 217-236.
3. De Koning, B. B., Tabbers, H. K., Rikers, R. M. J. P., & Paas, F. (2019). Towards a framework for attention cueing in instructional settings. Educational Psychology Review, 31(2), 113-140.
4. Elsevier. (2018). Advances in understanding learning processes. Cognitive Science, 45(2), 89-110.
5. Fisher, A. V., Godwin, K. E., & Seltman, H. (2020). Visual environment, attention allocation, and learning in young students. Developmental Psychology, 56(4), 678-692.
6. Jimenez, A., & Molina, H. (2022). Cognitive workload and learning environments. Journal of Educational Technology, 48(3), 265-280.
7. Mackintosh, N. J. (2020). Selective attention and learning processes. Psychological Review, 87(4), 332-356.
8. Olson, I. R., & Chun, M. M. (2021). Temporal contextual cueing of attention. Journal of Experimental Psychology: Learning, Memory, and Cognition, 47(6), 1299-1313.
9. Olson, I. R., & Chun, M. M. (2023). Attention, learning, and educational challenges in digital contexts. Cognitive Science Quarterly, 52(1), 45-67.
10. 10.Pradhan, B., & Nagendra, H. R. (2020). Yoga-based interventions and cognitive performance. International Journal of Yoga Therapy, 30(1), 45-54.
11. 11.Reynolds, R. E., & Anderson, R. C. (2018). Paradigm shifts in learning and education. Educational Researcher, 47(5), 276-290.
12. 12.Reynolds, R. E., & Anderson, R. C. (2022). Contemporary challenges in classroom learning. Journal of Educational Psychology, 114(2), 187-203.
13. Shirey, L. L., & Reynolds, R. E. (2019). Attention, interest, and learning in educational contexts. Review of Educational Research, 59(3), 299-315.

Seed Characteristics, Germination and Reproductive Capacity of *Arachis hypogaea L.* in District Rohtas, Bihar

Abhishek Kumar[*]
Dr. S. P. Singh[**]

Abstract

Arachis hypogaea L., commonly known as groundnut or peanut, is an important oilseed legume crop cultivated extensively in various agro-climatic zones of India. The study investigates the seed characteristics, germination patterns, and reproductive capacity of groundnut varieties grown in District Rohtas, Bihar, with regard to morphological seed traits, germination performance under local environmental conditions, and reproductive efficiency of the crop. Understanding these parameters is important for optimizing cultivation practices and yield potential in the region. The study reveals substantial information on seed viability, germination rates, and other factors that influence reproductive success in the specific agro-ecological context of Rohtas district.

Keywords: *Arachis hypogaea L*, groundnut, seed germination, reproductive capacity

1. Introduction

Arachis hypogaea L. of the Fabaceae family is one of the major food and oilseed crops of the world (Nigam, S.N., Dwivedi, S.L., Rao, Y.L.N., Gibbons, R.W. and Dart, P.J.., 2001,pp. 600-601). India ranks second in the groundnut area and production in the world. This crop has become an integral part of the agricultural economy and food security of the nation. Groundnut cultivation has received considerable importance on account of favorable soil conditions and growing awareness among farmers about its economic potential in District Rohtas, Bihar.

Geographically, District Rohtas falls within the southwestern part of Bihar and occupies an area of about 3,850 sq. km with predominantly alluvial and red soils, which are suitable for groundnut cultivation. The general climate of Rohtas is subtropical, where the average annual rainfall varies from 1,000 to 1,200 mm, largely received during the monsoon period between June and September. The mean temperature goes down to a minimum of 5°C during winter, while it rises up to a maximum of 45°C during summer, which enables optimal growth of groundnut in both kharif and rabi seasons (Singh, R. and Kumar, P, 2018,pp. 892-897).

Among the legumes, groundnut is peculiar because of its geocarpic fruiting habit, where flowers are developed above ground but the developing pods enter into the soil for maturation (Pattee and Young, 1982). This unique mode of reproduction calls for much importance of seed characteristics and germination parameters for successful cultivation. Seed quality affects the germination percentage, vigor of seedlings, and thus reproductive capacity and yield potentiality.

[*] Research Scholar, University Department of Botany, V.K.S. University, Ara, Bihar-802301

[**] Professor, Head & Dean, University Department of Botany, V.K.S. University, Ara, Bihar-802301

Recent studies have emphasized the role of local adaptation among varieties, as environmental factors affect seed development and rest period and germinability (Upadhyaya, H.D., Vetriventhan, M., Deshpande, S.P., Sivasubramani, S. & Wallace, J.G., 2016,pp. 1-13). In view of the growing area under groundnut cultivation in District Rohtas, there is an urgent need to document seed morphology and reproductive characteristics for local conditions. The aim of the present research work is to provide detailed information on seed morphology, germination behaviour, and reproductive efficiency of major grown varieties of groundnut in the locality, which might help in evidence-based agricultural recommendations among local farmers.

2. Materials and Methods

2.1 Study Area and Sample Collection

The survey was conducted during the 2023-2024 crop seasons in District Rohtas, Bihar. Seeds were collected from five major groundnut-growing blocks, viz., Bikramganj, Rohtas, Kargahar, Nasriganj, and Dehri, representative of the two most predominantly cultivated varieties: BG-1, B G-2, and local cultivars. Soil samples were analyzed for pH ranging from 6.5 to 7.2, organic carbon content ranging between 0.4 and 0.6%, and texture classification revealed predominantly sandy loam to loam composition.

2.2 Characterization of Seed Morphology

For each variety, 100 randomly selected seeds were analyzed for morphological parameters, namely, seed length, width, thickness, 100-seed weight, seed coat color, and texture. The measurements were made using digital vernier calipers (accuracy ±0.01 mm) and an electronic balance with accuracy ±0.001 g by following the International Seed Testing Association (ISTA) guidelines.

2.3 Germination Studies

Germination experiments using paper towel method and sand medium were conducted under laboratory and field conditions. Seeds (twenty-five seeds × four replications) were treated in each treatment under controlled laboratory conditions (temperature: 25±2°C, relative humidity: 60-70%). The parameters were germination percent, germination index, mean germination time, and seedling vigor index conducted according to the method described by Abdul-Baki and Anderson (1973).

2.4 Reproductive Capacity Testing

Reproductive parameters were assessed by conducting field observations on 50 randomly selected plants per variety. The information gathered was on number of flowers per plant, pegging efficiency (percentage of flowers forming pegs), pod formation rate, pod yield per plant, and seed yield per plant. Observations were done at a weekly rate throughout the reproductive phase of the plants (Gibbons, R.W., Bunting, A.H. and Smartt, J.., 1972,pp. 78-85).

3. Results and Discussion

3.1 Seed Morphological Characteristics

The morphological analysis showed clear differences among the subjected varieties of groundnut. The seeds of BG-1 have an average length of 14.2±1.3 mm, width of 8.5±0.9 mm, and 100-seed weight of 42.5±3.2 g, while the seeds of BG-2 were slightly larger, with a length of 15.8±1.5 mm and width of 9.2±1.0 mm and 100-seed weight of 48.3±3.8 g. Seed size in the local cultivars varied more; the 100-seed weight ranged from 35.8 g to 51.2 g (Dwivedi, S.L., Nigam, S.N., Nageswara Rao, R.C., Singh, U. and Rao, K.V.S., 2003,pp.125-133).

Morphological Characteristics of Groundnut Varieties
Table: Seed Morphology of Different Groundnut Varieties

Variety	Seed Length (mm)	Seed Width (mm)	100-Seed Weight (g)
BG-1	14.2 ± 1.3	8.5 ± 0.9	42.5 ± 3.2
BG-2	15.8 ± 1.5	9.2 ± 1.0	48.3 ± 3.8
Local Cultivars	-	-	35.8 - 51.2

Source: Dwivedi, S.L., Nigam, S.N., Nageswara Rao, R.C., Singh, U. and Rao, K.V.S., 2003, pp.125-133

The color of the seed coat ranged from light tan to dark brown among varieties; BG-1 was predominantly light pink to tan-colored, while BG-2 had darker brown seed coats. The thickness of the seed coat ranged from 0.08 to 0.12 mm and is considered an important structure affecting the rate of water imbibition and hence the speed of germination. Pattee and Stalker (1992) reported that seed coat characteristics are closely associated with the pattern of dormancy and uniformity of germination in groundnut.

Calculated as cotyledon weight per total seed weight, embryo-to-seed ratio averaged 0.92±0.04 over varieties. The result further details that there is very slight endosperm in groundnut seed, hence high dependence on cotyledonary reserves for germination and early seedling establishment. This high embryo-to-seed ratio agrees with the potential of this crop for rapid germination under favorable moisture and thermal conditions (Sharma, K.K. & Prasad, K.,2015,pp. 73-181).

3.2 Germination Performance

Under controlled conditions, germination studies revealed that the maximum germination percentage of 88.5±4.2% was achieved by BG-1, followed by 85.3±5.1% in BG-2 and 78.6±6.8% in local cultivars. It is also very clear that the germination index, accounting for both speed and completeness of germination, is highest in BG-1 (32.4) compared to BG-2 (29.8) and local varieties (24.5). These differences have been attributed to genetic factors, seed quality, and the degree of seed dormancy present in the grains of different varieties.

Under field conditions of Rohtas district, germination was reduced and oscillated between 72% to 80% across different varieties. Such a reduction in the germination rate may be indicative of variable factors at work such as soil moisture, incidence of pests, soil crusting, or variable soil temperatures. This germination trend in field conditions points out specifically that proper seed bed preparation, timely sowing of the crop, and adequate available soil moisture are necessary for good crop establishment. Nautiyal et al., 2008.

The seedling vigour index, which is calculated as the product of germination percentage and seedling length, was maximum in BG-1(1,456), followed by BG-2 (1,328) and local cultivars (1,142). A higher vigour index reflects good seedling emergence potential and establishment capacity under field conditions and, hence, ultimately affects plant population density and yield potential.

3.3 Reproductive Capacity

Reproductive efficiency, as measured by the ratio of final pod number to total flower production, gives an integrated measure of reproductive success. Under Rohtas conditions, this ranged from 22 to 28%, implying thereby that about three-quarters of flowers do not contribute to final yield. This is considered a relatively low reproductive efficiency and is typical for groundnut, reflecting its strategy of overproduction of flowers as one adaptive mechanism. Improvement of reproductive efficiency through optimized agronomic practices like adequate calcium supplementation, proper irrigation at critical stages, and pest management offers major scope for improving yields in the region.

4. Factors Affecting Seed Quality and Reproductive Performance in Rohtas District

Environmental and management factors peculiar to District Rohtas interact to affect the seed characteristics, germination, and reproductive capacity of groundnut. Among these, soil calcium availability is particularly critical because groundnut requires calcium directly in the pod zone for proper seed development. The alluvial soils that predominate in the district generally have a moderate level of calcium, in the range of 280-450 ppm, but localized deficiencies can easily occur, affecting both seed quality and pod filling (Dwivedi, S.L., Nigam, S.N., Nageswara Rao, R.C., Singh, U. and Rao, K.V.S., 2003,pp. 125-133).

The soil health indicators such as organic matter content and biological activity affect seed germination and seedling vigor through changes in the physical structure, water retention capacity, and nutrient availability of the soil. Organic amendments, along with the adoption of crop rotation, including cereals, improve soil conditions and will perhaps gradually improve the seed quality parameters.

5. Implications for Agricultural Practice in Rohtas District

Several implications that arise out of the findings of this study are as follows: Selection of high-quality seeds with above 85% germination percentage is paramount, and therefore, acquisition of improved varieties such as BG-1 holds great prospects based on various parameters. Seed treatment with appropriate fungicides and bio-inoculants like Rhizobium and phosphate-solubilizing bacteria will ensure better germination and early establishment of seedlings (Sharma, K.K. & Prasad, K., 2015,pp. 73-181).

Reproductive efficiency can be improved with the help of various management interventions. Application of gypsum (300-500 kg/ha) at the initiation of flowering supplies calcium for pod development and improves seed quality. Adequate available soil moisture during pegging and pod development stages ensured through supplementary irrigation (2-3 irrigations depending upon weather) can tremendously improve the success of reproductive events. Proper earthing up operations promote peg penetration and pod development, especially in the heavier soil textures prevailing in some areas of the district.

It is very important to enforce integrated pest management, as thrips, aphids, and leaf miners could dramatically reduce photosynthetic capacity and reproductive performance. Management of soil-borne diseases affecting pods (Aspergillus, Rhizoctonia) by means of seed treatment and crop rotation will help preserve seed quality and germination potential for next season's planting.

6. Conclusion

This paper presents the complete record of seed morphology, germination pattern, and reproductive potential of *Arachis hypogaea L.* of District Rohtas, Bihar. The improved variety BG-1always outperformed the other two varieties, BG-2 and local cultivars, in respect to all seed quality attributes, germination efficiency, and reproductive parameters. Seed morphological attributes such as size, weight, and coat characteristics have highly significant effects on germination behavior and seedling vigor. The germination percentages, which ranged between 78 and 88% under controlled conditions and 72 to 80% under field conditions, reflect good seed quality but also point toward the influence of environmental factors during field emergence.

Reproductive capacity analysis showed that though groundnut plants produced adequate flowers (220-340 per plant), the contribution to pod yield was only 22-28% because of pegging efficiency and pod development limitations. This reproductive efficiency is mediated through varietal characteristics, soil conditions, moisture availability, and temperature regimes specific to Rohtas district. Understanding these parameters enables development of targeted management strategies to optimize groundnut productivity in the region.

Improvement in seed quality, selection of appropriate varieties for their agro-ecological condition, optimization of sowing time, adequate calcium nutrition, and proper water management during critical reproductive stages must, therefore, remain the mainstay of sustainable intensification of groundnut cultivation in District Rohtas. Future research is needed to focus on the impact of changing climate on groundnut reproductive biology along with the development of climate-resilient cultivation practices. Studies on seed storage conditions and germination over time would, therefore, be beneficial to farmers in the region who save seeds from previous seasons very often.

Works Cited:

Abdul-Baki, A.A. and Anderson, J.D. Determination of vigor in soybean seed by multiple criteria. Crop Science, 13(6), 1973

Dwivedi, S.L., Nigam, S.N., Nageswara Rao, R.C., Singh, U. and Rao, K.V.S. Effect of drought on oil, fatty acids and protein contents of groundnut (*Arachis hypogaea L.*) seeds. Field Crops Research, 48(2-3), 2003.

Gibbons, R.W., Bunting, A.H. and Smartt, J. The classification of varieties of groundnut (*Arachis hypogaea L.*). Euphytica, 21(1), 1972

International Seed Testing Association (ISTA). International Rules for Seed Testing. The International Seed Testing Association, Bassersdorf, Switzerland, 2019

Nautiyal, P.C., Ravindra, V., Rathnakumar, A.L., Ajay, B.C. and Zala, P.V. Genetic variations in photosynthetic rate, pod yield and yield components in spanish groundnut cultivars during three cropping seasons. Field Crops Research, 106(2), 2008

Nigam, S.N., Dwivedi, S.L., Rao, Y.L.N., Gibbons, R.W. and Dart, P.J. Registration of ICGV 86015, an elite groundnut germplasm. Crop Science 41(2),2001

Pallas, J.E., Stansell, J.R. and Koske, T.J. Effects of drought on Florunner peanuts. Agronomy Journal, 71(5), 1979

Pattee, H.E. and Young, C.T. Peanut Science and Technology. American Peanut Research and Education Society, Yoakum, Texas, 1982

Sharma, K.K. & Prasad, K. Genetic improvement of groundnut: technological advances and progress. In: Al-Khayri, J.M., Jain, S.M. and Johnson, D.V. (eds) Advances in Plant Breeding Strategies: Legumes. Springer, Cham, 2015

Singh, R. and Kumar, P. Assessment of groundnut cultivation practices and productivity in Bihar. Indian Journal of Agricultural Sciences, 88(6), 2018

Upadhyaya, H.D., Vetriventhan, M., Deshpande, S.P., Sivasubramani, S. & Wallace, J.G. Population genetics and structure of a global groundnut reference set. The Plant Genome 9(3),2016.

Educational Anxiety an Impact of Academic Performance in Engineering Students

Priyanka Kumari*

Educational anxiety, effects student's academic performance. As anxiety levels rise, students may experience decreased concentration and memory retention, leading to a cycle where poor performance further increases anxiety. This cycle can result in long-term academic challenges if not addressed early. The present study was conducted to find the level of educational anxiety among Engineering students. In order to obtain accurate and relevant data descriptive survey method and stratified random sampling technique was used in the present study. The sample size of the study was 50 Engineering students from NIT Patna, Bihar. In order to collect data for the study scale on Educational anxiety by Vishal Sood and Arti Anand (2015) was used. The objective of the study was to analyse the level of educational anxiety among male and female students. Statistical techniques like mean, percentage, standard deviation and t-test were used. The results of the study revealed that maximum of the Engineering course students is having average level of test anxiety and academic anxiety. Male reported high level of test anxiety as compared to female.

Keywords: Anxiety, academic performance, stress, emotionality, study skill

Introduction

Students are the most important part of our society. Their far-sighted thoughts and decision-making capabilities predispose them to accept all the challenges related to work and working conditions. In the present scenario educational anxiety is one of the biggest emotional and psychological problem among students, Problems related to academic performance of management students those who affects by educational anxiety. So, there is a need to rehabilitate the students whose performance and confidence has been decrease by the educational anxiety.

Educational anxiety is a situation; it's referring to the stress and anxiety. Students, may experience in academic settings. This anxiety can manifest in various forms, such as fear of failure, worry about performance, parent's expectations. It's impact students' motivation, concentration, educational activities or diminished academic performance. Factors of educational anxiety is competitive environments and social pressures.

Review of Literature

1. Several studies have demonstrated that educational anxiety negatively correlates with academic performance. Zeidner (1998) found that test anxiety can impair cognitive functioning, leading to lower grades and academic outcomes.
2. High levels of educational anxiety linked to increased rates of depression and anxiety disorders among students. Beiter et al. (2015) revealed that students who reported high anxiety levels were also more likely to experience depressive symptoms, indicating a cyclical relationship between anxiety and mental health issues.
3. Barlow et al. (2014) suggests that students adapt to maladaptive coping strategies, such as avoidance, which increase anxiety and affects academic work.
4. The role of social support has been emphasized in the literature as a protective factor against educational anxiety. Misra and McKean (2000), strong support networks can alleviate stress and enhance resilience among students, promoting better mental health outcomes.
5. Several studies show institutional support systems, such as counselling services and stress management programs, to help students cope with educational anxiety. Cizek and Burg (2006)

* Research Scholar, Department of Psychology, J. P. U. Chapra, Bihar, Mob no. 9304959861
Email- priyankakri3102@gmail.com

argue that proactive measures can significantly reduce anxiety levels and improve academic performance.

6. (Jacob, 2012) conducted a study in which he found that educational anxiety can have an effect on individual purpose and personal enjoyment as well as educational efficiency. Self-efficiency conception is considered as an imperative psychological belief for its effective role in the minds of educated people it encourages, improve their capacities, moulding the behaviour, and at last building positive attitude towards individual ability to tackle the problems.

So, to conclude we can say that educational anxiety is becoming major problem day by day so there is a need to improve the academic status of such students who are lacking in emotional stability, academic performance and systematic counselling.

Objectives of the Study

The objectives formulated for the present study were:-

1. To analyse the level of educational anxiety among engineering students.
2. To find the differences in educational anxiety with respect to gender and parental education.

Hypotheses

Base on the earlier study the following hypothesis have been framed to the verified:

1. Male students face higher educational anxiety than female students.
2. There will be significant impact of paternal education on educational anxiety of students.

Methodology

Method

In the present study, descriptive method and stratified random sampling technique was used. This method is most popular in the research of education.

Sample

In the present study conducted on a sample of 100 students (50 boys and 50 girl) from engineering students.

Tools

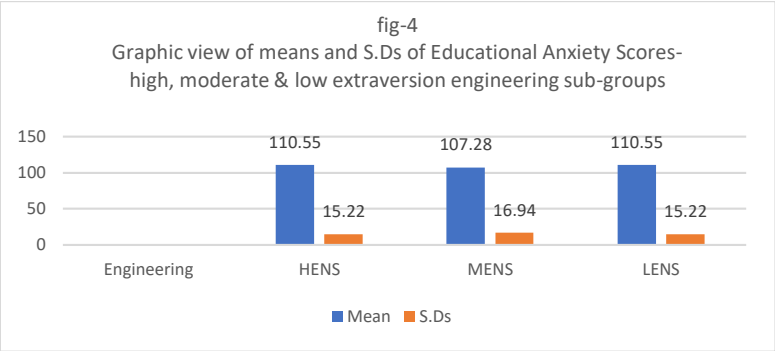
1. Personal Data Sheet
2. Educational anxiety inventory developed by Vishal Sood and Arti Anand (2015) was used. It comprises of 42 items out of which two items were positive. Educational anxiety inventory consists of two dimensions, test anxiety and academic anxiety. Test anxiety comprises of 20 items and academic anxiety comprises of 22 items.

Results and Analysis

Table-1

Showing Mean, S.Ds. and t-ratios of Educational Anxiety Scores- high, moderate & low neurotic engineering sub-groups

Group	N	Mean	S.D	df	t' ratios	Level of Significance
HENS	25	110.55	15.22	61	0.79	NS
MENS	38	107.28	16.94			
HENS	25	110.55	15.22	60	1.67	NS
LMES	37	103.75	16.07			
MMES	38	107.28	16.94	73	0.93	NS
LMES	37	103.75	16.07			



The mean educational anxiety scores of high, moderate and low educational anxiety sub-groups of engineering group (HENS, MENS and LENS) are 110.55, 107.28 and 103.75 respectively. The obtained 't' ratios for HENS X MENS, HENS X LENS and MENS X LENS compared sub-groups are 0.79, 1.67 and 0.93 respectively (Table-4). All these three 't' ratios are lower than the required value for significance at 0.05 level. So, all these three 't' ratios are insignificant and denote that high, moderate and low neurotic sub-groups of engineering group do not differ significantly among themselves on educational anxiety. Observation of Fig-1 also indicates that mean educational anxiety scores of these three sub-groups differ marginally.

Discussion and Conclusion

The findings of the study revealed that the difference in educational anxiety between male and female engineering students was **not statistically significant** across high, moderate, and low anxiety levels. This indicates that both male and female engineering students experience **similar levels of educational anxiety**. The non-significant result suggests that gender does not play a decisive role in determining educational anxiety among engineering students. In the contemporary educational environment, both male and female students face similar academic demands such as heavy coursework, competitive examinations, performance pressure, career uncertainty, and expectations from family and society. These common stressors may contribute equally to educational anxiety regardless of gender.

Furthermore, increased access to educational resources, similar classroom experiences, and changing gender roles in technical education may have reduced traditional gender differences in anxiety levels. Female students today are equally competitive and academically involved, while male students also experience comparable academic stress, leading to balanced anxiety levels.

The results are consistent with several previous studies which report **no significant gender difference** in educational or academic anxiety among professional course students. Hence, the hypothesis that male engineering students have higher educational anxiety than female students is **not accepted**.

References

Barlow, D. H., Sauer-Zavala, S., Carl, J. R., Bullis, J. R., & Ellard, K. K. (2014). The nature of anxiety and its disorders: A developmental perspective. *In Handbook of Anxiety Disorders* (pp. 3-21). Springer.

Beiter, R., Nash, R., McCrady, M., Rhoades, D., & Lentz, B. (2015). The impact of stress on students' academic performance. *Journal of College Student Psychotherapy*, 29(3), 241-250.

Cizek, G. J., & Burg, S. (2006). Educational assessment in the 21st century: The role of formative and summative assessment. *Educational Assessment*, 11(1), 1-11.

Misra, R., & McKean, M. (2000). College students' academic stress and its relation to their anxiety, time management, and leisure satisfaction. *American Journal of Health Studies*, 16(1), 41-47.

Sindhu, P. (2016). Impact of Anxiety on Academic Achievement among Engineering Students. International Journal of Basic Sciences & Applied Research, 3, 261-5.

Zeidner, M. (1998). Test anxiety: The state of the art. *In Handbook of Anxiety: Vol. 4. Anxiety in Academic Settings* (pp. 53-77). Academic Press.

Assessment of Drinking Water Quality of Ara Locality

Tarannum Perween[*]
Anand Kishor[*]

Abstract

There is an absolute need of clean and safe water for health and productive life. To determine the health of individuals and whole communities the quality of the supply water is important. In the recent years, the prevalence of diarrhoea has been found the highest in Bhojpur district of Bihar. This study was carried out to assess the quality of drinking water of Katira, Sheetal tola, Anite ,Chandwa and Maulabag mohalla of Ara city. The parameters such as fluoride, iron, arsenic and total coliform was analysed in the collected drinking water samples from different sites of Ara locality. The results showed that the analysed parameters of the water samples were within the permissible limits of BIS. The values of analysed parameters were found between 0.24 to 0.40 mg/L for fluoride, 0.01 to 0.03 mg/L for iron, BDL mg/L for arsenic and 2 – 6 MPN for total coliform.

Introduction

The pollution of drinking water is responsible for large number of mortalities and morbidities due to water borne diseases like typhoid, cholera, diarrhoea, dysentery etc. as well as many protozoan and helmithsinfections. The present study intends to assess fluoride, iron, arsenic and total coliform in the drinking water samples collected from different sites viz, Katira, , Sheetal tola, Anite, Chandwa and Maulabag mohalla of Ara city. The primary goal of this research is to analyse the drinking water quality parameters to ensure that water is safe for drinking. Water quality remains a central pillar in ensuring ecological balance, safeguarding human health, and sustaining aquatic ecosystems. Nair and Nayak (2023) suggested a refined method to assess the quality of water. The water quality index reflects variations in water quality by integrating a range of individual measurements into a unified value. A Number of workers viz.Lump *et al.* (2011), Saleem *et al.* (2021), Agbasi *et al.* (2024) Agbasi *et al.* (2023), Emmanuel *et al.* (2022). And Lindsey *et al.* (2021) have studied water quality and identify potential hazards associated with human exposure to various contaminants. The rigorous analysis of drinking water provides valuable insights for stakeholders, supporting informed decision-making, policy development and the implementation of strategies to mitigate risks associated with drinking water in and around of Ara locality.

Materials and Methods

The drinking water samples were collected in plastic bottled of one litter capacity as per standard procedure. Analysis was carried out for various water quality parameters such as fluoride, iron, arsenic and total coliform using standard method.

Results and Discussion

Out of fifteen water samples collected in triplicate from each study site were analysed . The drinking water quality parameters of all water samples were found to be within BIS guidelines and national standard.

Fluoride:

The fluoride concentration in water samples ranged from 0.24 to 0.40mg/L. The value of fluoride concentration in water samples of Katira, Sheetal tola , Anite, Chandwa and Maulabag were

[*] University Department of Botany, V.K.S.University, Ara (Bihar)

0.32, 0.40,0.40, 0.31 and 0.24mg/L respectively against the standard of BIS: 10500:2021 that are 1 – 1.5 mg/L.

Iron :

Iron promotes the growth of "iron bacteria" which derives their energy from the oxidation of ferrous iron to ferric iron and in the process deposits a slimy coating on the piping. Iron content was found to be less in tested water samples. The value of iron in water samples of Katira, Sheetal tola, Anite , Chandwa and Maulabagwere 0.02, 0.03, 0.01, 0.02 and 0.03mg/L respectively against the standard of BIS :10500:2012 that are 0.3mg/L.

Arsenic :

The study revealed that the concentration of arsenic was found to lie below the standard level of BIS: 10500:2012 that are 0.01mg/L. Arsenic may be introduced into drinking water primarily by dissolution of naturally occurring minerals, ores, and industrial effluents. Arsenic is one of the most dangerous and predominantly found in rocks, soil, natural water and organisms that is invisible and do not affect the taste and odor of the water. Aryal *et al.* (2010) reported that arsenic affects many organs and systhems in the body such as skin, heart vessels, respiratory organs and kidneys consequently may lead to the development of lung,kidney and bladder cancer.

Total Coliform:

From microbial analysis performed on water sample it revealed that water available in these sampling sites were safe because of lesser number of total coliform present in the water samples against the standard of BIS: 10500 : 2012 that are < 100 MPN. The count number of total coliform in the drinking water samples of Katira, Sheetal tola, Anite, Chandwa and Maulabag were 3,5,6,5 and 2 MPN respectively. Water – borne diseases are concerning the most recent emerging and re- emerging infectious diseases, which have recently proven to be the biggest health threat worldwide.

Table-1:Assessment of fluoride, iron, arsenic and total coliform of drinking water samples of different sites of Ara locality.

Name of Collection Site	PARAMETERS			
	Fluoride (mg/L)	**Iron (mg/L)**	**Arsenic (mg/L)**	**Total Coliform MPN**
Standard Value BIS: 10500:2012	1-1.5	0.3	0.01	<100
Katira	0.32	0.02	BDL	3
Sheetal Tola	0.40	0.03	BDL	5
Anite	0.40	0.01	BDL	6
Chandwa	0.31	0.02	BDL	5
Maulabag	0.24	0.03	BDL	2

References:

Agbasi J.C., C.N. Chukwu, N.D. Nweke, H.C.Uwajingba, M.Y.A.Khan and J.C. Egbueri (2023). Water pollution indexing and health risk assessment due to PTE ingestion and dermal absorption for nine human populations in Southeast Nigeria. *Groundw. Sustain.*Dev . 21 :100921.

Agbasi J.C., D.A. Ayeioto, J.C. Egbueri , N. Khan, S.I. Abba and V. Ahmad (2024). HERisk and statistical clustering integrated for health risk modelling of PTEs in natural water resources for drinking andsanitary uses. Toxin Rev. https://doi.org /10.1080/15569593. 2024.2371874.

Aryal J.,N Sapkota and B. Gautam (2010). Assessment of drinking water quality at Myagdi district, western Nepal . NHRC.

Emmanuel U.C., M.I. Chukwudi, S.S. Monday and A.I. Anthony (2022). Human health risk assessment of heavy metals in drinking water sources in three senatorial districts of AnambraState, Nigeria. Toxicol. Rep. 9:869-875.

Lindsey B.D., K. Belitz , C.A. Cravotta, P.L. Toccalino and N.M. Dubrovsky (2021).Lithium in groundwater used for drinking-water supply in the United States. Sci. Total Environ. 767. https://doi.org/10.1016/J.scitotenv. 2020.144691.

Lumb A., T.C.Sharma, and J.F. Bibeault (2011). A review of genesis and evolution of water quality index (WQI) and some future directions. Water Qual . Heal .3:11-24.

Nair N.V. and P.K. Nayak (2023). Exploring water quality as a determinant of small scale fisheries vulnerability. Sustain. 15:13238.

Seleem E.M,A. Mostafa, M.Mokhtar and S.A.Salman(2021).Risk assessment of heavy metals in drinking water on the human health, AssiutCity, and its environs, Egypt. Arab.J. Geosci.14:1- 11.

Rohinton Mistry's A Fine Balance: A Thematic Study

Rajan Kumar Yadav*

Abstract

Rohinton Mistry's *A Fine Balance* is a powerful, deeply affecting novel set against the backdrop of India during the Emergency of 1975–77. Through the intersecting lives of four central characters—Dina Dalal, Ishvar Darji, Omprakash Darji, and Maneck Kohlah—Mistry crafts a narrative that explores the enduring themes of suffering, resilience, caste and class oppression, political tyranny, human connection, and the tension between fate and free will. The novel presents a searing portrait of modern India. Still, more profoundly, it delves into the human condition—how people endure, adapt, and sometimes fall beneath the weight of societal and political pressures. It is also a richly layered novel that explores the personal and political landscapes of 1970s India, particularly during the time of the Emergency declared by Prime Minister Indira Gandhi. Thematically, it is complex, weaving together issues of class, caste, fate, resilience, suffering, and human connection.

Key Words: Emergency, Class oppression, Political tyranny, Human connection, Resilience.

Introduction

The title *A Fine Balance* encapsulates one of the central philosophical questions of the novel: how much control do individuals truly have over their lives? Mistry presents characters who attempt to shape their destinies—learning trades, seeking education, asserting independence—but are often thwarted by forces beyond their control. The Emergency becomes a symbol of this larger existential condition: the random, unjust, and often cruel twists of fate that shape human lives. Maneck, disillusioned by a changing world he no longer understands, speaks often about the balance between hope and despair. His eventual suicide underlines the fragility of that balance. For others, like the tailors or Dina, survival itself becomes a form of resistance. Mistry does not offer easy answers. Instead, he presents "life as a constant negotiation—a fine balance—between what we hope for and what we endure"[1]. While the novel is primarily concerned with political and social injustice, it also quietly critiques gender norms and patriarchy. Dina's narrative arc, in particular, highlights the limitations placed on women in Indian society. After her husband's death, she chooses not to remarry and instead struggles to maintain her autonomy. Her brother, a symbol of patriarchal control, tries to coerce her into dependence. Dina's refusal to submit and her decision to employ male tailors on her terms is an act of both economic and personal resistance. While her story ends in compromise—she loses her independence—her struggle is emblematic of the everyday courage of women who attempt to live life on their own terms within oppressive systems.

Structurally, the novel highlights suffering and survival in a different way. At the heart of *A Fine Balance* lies an exploration of human "suffering—physical, emotional, and psychological"[2]. The characters endure poverty, political oppression, caste-based violence, and personal loss. However, Mistry also emphasizes the resilience of the human spirit. The tailors Ishvar and Omprakash survive untouchability, forced sterilization, and mutilation, yet they strive to preserve their dignity and humanity. The balance between hope and despair is symbolized in the lives of the characters who endure despite overwhelming odds.

Mistry examines the deeply entrenched caste system and class divisions in Indian society. The novel exposes the brutality of social hierarchies and how they shape and limit individual destinies. The Chamaar background of Ishvar and Omprakash, and their attempt to escape caste-based oppression by becoming tailors, is central to the narrative. The disparity between Dina's genteel

* Research Scholar, Department of English, Jai Prakash University, Chapra

poverty and the extreme destitution of the tailors or street beggars underscores how class affects opportunity and perception.

The Emergency (1975–1977), a period of political repression in India, forms the backdrop of the story. Mistry critiques the authoritarian rule and the suppression of civil liberties through the experiences of the characters. The government's policies directly affect the lives of the poor, symbolizing the state's violence against the marginalized. The manipulation of the legal and political systems emphasizes the helplessness of ordinary citizens. Despite the bleakness, Mistry places great value on human relationships. The novel explores how love, friendship, and kindness offer solace and meaning in a world marked by injustice. The evolving relationship between Dina, Maneck, and the tailors shows how bonds can form across social barriers. Even small acts of compassion (e.g., Dina hiring the tailors, Beggar-master's protection) highlight the necessity of empathy.

Mistry repeatedly questions whether individuals have control over their lives or whether they are at the mercy of larger forces—social, political, and historical. Maneck's tragic disillusionment contrasts with Ishvar and Om's dogged survival, highlighting different responses to powerlessness.

A Fine Balance suggests the delicate, almost impossible equilibrium between agency and circumstance. Women in the novel face specific forms of "oppression—forced marriages, domestic abuse, economic dependency"[3]. Dina Dalal's journey is a quiet rebellion against these structures. Her insistence on independence and dignity in a male-dominated society reflects a feminist undercurrent. The recurring presence of male authority figures—from Dina's brother to state officials—reveals how patriarchy functions at personal and institutional levels. The migration from villages to cities and the resulting urban chaos are important motifs. Mistry depicts how modernization often comes at the cost of human lives and livelihoods. The destruction of the tailors' home reflects the brutality of urban development. Omprakash and Ishvar's return to their village ends in tragedy, showing that neither the city nor the countryside offers safety. *A Fine Balance* is a deeply humanistic novel that refuses easy answers. Mistry's nuanced storytelling invites readers to confront the realities of inequality and injustice while also recognizing the strength of the human spirit. The novel's title encapsulates the precariousness of existence and the thin line between hope and despair that all the characters must walk.

At the core of *A Fine Balance* is the omnipresence of suffering in everyday life. Mistry's characters live in a world riddled with poverty, injustice, and loss. Yet, it is not merely suffering that Mistry portrays; it is the struggle to survive in the face of it. Ishvar and Omprakash, both members of a lower caste, experience horrific atrocities—from the murder of their family to the brutal mutilation at the hands of the state. Despite this, they continue to labour and seek a life of dignity through tailoring, representing the enduring human spirit. Dina, too, suffers loss—first through the death of her father, then her husband—and is left to fend for herself in a patriarchal society. Her determination to remain independent by running a tailoring business is itself an act of quiet defiance. Maneck, though from a privileged background, experiences the existential despair of disconnection and cultural alienation, ultimately leading to his tragic end. In all cases, Mistry captures the relentless presence of pain and the fragile hope that people cling to amid despair.

Mistry incisively critiques the caste system and the deep economic inequalities that plague Indian society. Ishvar and Omprakash, born into the "Chamaar"[4] caste of leather-workers, attempt to break from their caste-determined fate by becoming tailors. Their move is seen as rebellion and is met with horrifying punishment when they return to their village. Through their story, Mistry highlights how caste violence is not only rooted in tradition but is actively enforced through fear, humiliation, and terror. Class divisions are equally entrenched. Dina, although from a middle-class background, finds herself on the edge of poverty and is treated with disdain by her wealthier relatives. Meanwhile, street-dwellers, beggars, and the working poor are systematically erased or exploited by both the government and society. The novel makes clear that social mobility is not merely difficult—it is often violently resisted. The Emergency declared by Prime Minister Indira Gandhi serves as a chilling backdrop to the novel. Mistry uses this period of suspended democracy and widespread

human rights violations to examine the fragility of justice. Characters are caught in the web of arbitrary power: slums are demolished without notice, people are rounded up for forced sterilization, and entire lives are uprooted by political will. For the marginalized—particularly the poor and lower castes—there is no protection under the law. The tailors' forced vasectomy and eventual mutilation at the hands of a corrupt system are stark illustrations of state violence. Mistry portrays the Emergency not just as a historical event, but as a metaphor for the broader abuse of power that defines many aspects of Indian life. Through this, the novel asks: What does democracy mean for those who never had rights to begin with?

Despite the bleakness, Mistry finds space to affirm the beauty and importance of human relationships. The slowly forming bond between the four central characters—Dina, Maneck, Ishvar, and Omprakash—is one of the most hopeful elements of the novel. They come from different religious, social, and economic backgrounds, yet they build a family of sorts, marked by shared meals, jokes, struggles, and affection.

Mistry suggests that even in a society divided by hierarchy and fear, connection is still possible. This found family offers a glimpse of what a more compassionate, inclusive world might look like. However, the novel also refuses to romanticize this: the forces of society ultimately dismantle their unity. Dina is forced to give up her independence, the tailors are returned to a life of beggary, and Maneck takes his own life. Yet for a time, their bond represents resistance—however temporary—to a system designed to divide and destroy.

Finally, *A Fine Balance* critiques the myth of progress tied to urbanization and modernization. Cities like Mumbai (then Bombay) are depicted as spaces of opportunity and hope, but also as sites of dislocation and exploitation. Slum clearance programmes, unemployment, and rising inequality show that the benefits of development rarely reach the poor. Rural India, often idealized, is shown to be equally hostile. Ishvar and Omprakash's return to their ancestral village ends in tragedy. Mistry suggests that neither urban "modernity nor traditional rural life"[5] offers salvation for the poor. Instead, displacement becomes a permanent condition—physical, social, and emotional.

References:

Mistry, Rohinton. *A Fine Balance*. New York: Vintage, 1995.

Bhautoo, Dewnarian. Contemporary Indian Writers in English: Rohinton Mistry, *An Introduction Foundation Book*. New Delhi, 2007.

Dodiya, Jaydip Singh. *The Novels of Rohinton Mistry: A Critical Study*. Sarup & sons New Delhi: 2004.

Dodiya, Jaydip Singh. *Perspectives on The Novels of Rohinton Mistry*. Sarup & sons New Delhi: 2006.

Bala, Suman. Rohinton Mistry: The Writer Par Excellence. New Delhi: Khosia Book House, 2013.350.

Wadhawan, Vibhuti. Parsi Community and the Challenges of Modernity: A Reading of Rohinton Mistry's Fiction. Delhi: Prestige Books, 2014.119

Critical Analysis of Holistic Development and Socio-Emotional Learning: Global Perspective

Divyanshi Srivastava[*]
Dr. Arpita Singh[**]

Abstract

The National Education Policy (NEP) 2020 presents a comprehensive and visionary framework aimed at fundamentally transforming the Indian education system by prioritizing holistic development and socio-emotional learning. Rooted deeply in India's rich philosophical traditions and aligned with contemporary global research, the policy envisions an education system that nurtures not only academic excellence but also emotional intelligence, ethical values, and cultural awareness. This culturally resonant approach holds significant promise for enhancing student well-being, fostering critical thinking, and developing social-emotional competencies essential for thriving in an interconnected world. Despite its ambitious goals, the effective implementation of NEP 2020 faces considerable challenges that must be addressed to realize its full potential. Key obstacles include severe resource constraints across many educational institutions, inadequate and uneven teacher training programs that fail to equip educators with the skills needed for holistic pedagogy, and misalignment in existing assessment systems that continue to emphasize rote learning over critical and creative thinking. Furthermore, persistent disparities between urban and rural education infrastructure exacerbate inequities, hindering uniform progress. Global evidence underscores the transformative impact of holistic education models and socio-emotional learning on individual student outcomes and broader societal well-being. These approaches contribute to improved academic performance, enhanced mental health, and the cultivation of lifelong skills such as empathy, resilience, and collaboration. However, translating these insights into the Indian context demands more than policy articulation; it necessitates sustained political will, increased and targeted public investment, and robust teacher development initiatives that are context-specific and culturally sensitive. Continuous monitoring, evaluation, and adaptive implementation strategies are essential to ensure that the policy remains responsive to diverse regional needs and evolving educational landscapes. Achieving the NEP 2020's vision requires a delicate balance between integrating global best practices and preserving India's unique cultural identity and values. This balance is critical for fostering a sense of belonging and relevance among learners while preparing them to engage effectively in a globalized world. By committing to equity, inclusion, and cultural integrity, India can harness the full potential of holistic education to promote comprehensive human development. This transformative journey, while complex and demanding, offers the most promising pathway toward an education system that empowers all learners to realize their fullest potential and contribute meaningfully to society.

Key words: Holistic development, Socio-Emotional learning, NEP 2020

Introduction

The National Education Policy (NEP) 2020 of India represents a significant paradigm shift in educational philosophy, placing holistic development and socio-emotional learning (SEL) at the center of educational reform. This critical analysis examines the conceptual frameworks, implementation strategies, global contexts, and challenges associated with integrating holistic development and SEL into the NEP 2020 vision. The policy's emphasis on comprehensive,

[*] Research Scholar, University of Lucknow. divyanshi1802@gmail.com
[**] Associate Professor Shri Jai Narain Misra PG College, Lucknow. arpita.s.ind@gmail.com

multidisciplinary learning reflects global educational trends while also grounding itself in India's philosophical traditions and contemporary pedagogical research.

1. Conceptual Frameworks: Holistic Development and Socio-Emotional Learning

1.1 Defining Holistic Development in NEP 2020

Holistic development, as envisioned by the NEP 2020, extends beyond traditional academic achievement to encompass the cognitive, social, emotional, ethical, physical, and spiritual dimensions of learner growth. The policy recognizes that education must nurture well-rounded individuals equipped with knowledge and skills, as well as values, character, and the capacity for self-actualization. This comprehensive approach represents a fundamental departure from the examination-centric educational paradigms that have historically dominated Indian education. The philosophical foundation of the NEP the 2020s holistic approach draws inspiration from India's ancient educational systems, particularly the concept of Gurukul education and the Panch Kosh framework. The Panch Kosh framework, rooted in the Taittiriya Upanishad, provides a culturally indigenous model for understanding human development across five dimensions: Annamaya (physical), Pranamaya (energetic), Manomaya (mental), Vijnanamaya (intellectual), and Anandamaya (blissful). By integrating this traditional framework into contemporary educational practice, the NEP 2020 attempts to create a more culturally resonant and philosophically grounded approach to holistic education.

1.2 Socio-Emotional Learning: Definition and Importance

Socio-emotional learning, as defined within the NEP 2020 context, represents the process through which individuals acquire and effectively apply knowledge and skills to understand and manage their emotions, develop empathy for others, establish and maintain positive relationships, and make responsible decisions. SEL addresses five core competencies: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. The significance of SEL extends beyond the individual’s well-being. Research has demonstrated that robust socio-emotional competencies contribute substantially to academic achievement, reduction in behavioral problems, enhanced prosocial behavior, and improved overall educational outcomes. In early childhood development contexts, SEL is particularly crucial as it provides foundational competencies that support children's communication skills, teamwork, emotional expression, and problem-solving abilities through structured play, storytelling, and group activities.

2. Global Perspective on Holistic Development and SEL

2.1 International Research Consensus

The global educational research community has increasingly recognized the importance of holistic development and social and emotional learning (SEL). The Collaborative for Academic, Social, and Emotional Learning (CASEL) framework has been widely adopted internationally, establishing five key dimensions of SEL that align closely with the vision of the NEP 2020. Comparative studies across diverse educational contexts have demonstrated consistent positive associations between comprehensive SEL implementation and enhanced student outcomes across cognitive, emotional, and social domains. Research from multiple countries has revealed that universal school-based SEL programs generate significant population-level health benefits at low per-capita investment costs. In low- and lower-middle-income countries, universal SEL programs cost approximately $0.10-0.16 per capita annually while generating approximately 100 healthy life years gained per million population, representing substantially better value for money compared to indicated (targeted) interventions.

2.2 Cultural Adaptations and Context-Specific Implementations

Although global studies highlight the significance of Social and Emotional Learning (SEL), its application in various cultural settings shows notable differences in both effectiveness and suitability. The cross-cultural assessment of the COMPUSEL curriculum in countries like Greece, Poland, Portugal, Romania, and Turkey revealed that cultural elements play a crucial role in how effectively these programs are implemented. In some nations, there were statistically significant

improvements across all SEL dimensions, whereas others experienced limited impacts, emphasizing the need for culturally tailored adaptations of SEL frameworks instead of a one-size-fits-all global approach. Teachers' perspectives on implementing SEL vary significantly across different countries and are shaped by socio-demographic factors, professional settings, and institutional environments. A mixed-methods study comparing English as a Foreign Language (EFL) teachers in Poland and Ukraine discovered that younger Polish educators were more receptive to innovative SEL strategies, while older Ukrainian teachers, despite their strong dedication to well-being, encountered more challenges in implementation due to socio-political pressures. These insights indicate that the execution of the NEP 2020 in India must consider regional differences, teacher demographics, and institutional contexts.

3. NEP 2020's Vision for Holistic Education and Implementation Frameworks

3.1 Policy Architecture and Core Principles

The NEP 2020 advocates for educational transformation grounded in several interconnected principles: multidisciplinary learning, experiential engagement, flexible curriculum design, integration of Indian Knowledge Systems, and emphasis on 21st-century competencies. The policy shift from rote-based to conceptual learning, combined with the recognition of diverse learning pathways, represents a fundamental reorientation of educational philosophy. The policy framework operates at multiple levels of implementation. At the foundational and preparatory stages, teachers demonstrated substantial awareness (77.5%) of NEP the 2020s goals, with positive perceptions of holistic education. However, significant preparedness gaps exist, particularly in terms of resource availability, teacher training adequacy, and curriculum alignment. Teachers have identified parental interference, limited resources, insufficient training, and lack of technical support as major implementation barriers.

3.2 Integration of Value Education and Ethical Development

The NEP 2020 emphasizes value education as integral to holistic development, recognizing that ethical awareness, empathy, respect for diversity, and environmental consciousness must be cultivated alongside academic knowledge. The policy advocates embedding values through curricula, co-curricular activities, and pedagogical methods such as experiential learning, yoga, storytelling, and community engagement. The concept of Dharma—meaning duty, righteousness, and moral obligation—provides a philosophical framework for value education in the NEP 2020. Rather than treating value education as a discrete subject, the NEP 2020 proposes integration across all educational experiences, creating environments where ethical development occurs through authentic engagement with meaningful learning activities and community participation.

4. Critical Challenges and Implementation Gaps

4.1 Resource Constraints and Infrastructure Limitations

A fundamental challenge confronting the NEP 2020 implementation is systemic resource constraints. While the policy envisions comprehensive holistic development, many Indian schools lack the basic infrastructure, technological resources, and trained personnel necessary for effective SEL integration. Early childhood care and education (ECCE) programs, which are crucial for foundational SEL development, face significant gaps in universal access. The policy's ambitious goal of ensuring universal ECCE access by 2030 confronts substantial obstacles, including inadequate funding, insufficient educator training, and uneven geographical distribution of resources. Teacher preparedness is a critical barrier to implementation. While teachers demonstrate awareness of NEP the 2020s objectives, actual implementation requires comprehensive professional development in SEL pedagogy, emotional regulation strategies, and culturally responsive teaching. Current teacher training programs insufficiently address these competencies, creating a gap between policy vision and classroom reality.

5. Multidisciplinary Education and Experiential Learning

5.1 Integration Across Disciplines

The multidisciplinary approach of NEP 2020 recognizes artificial subject boundaries as barriers to holistic learning. Integrated learning experiences across the sciences, humanities, arts, and vocational subjects create opportunities for deeper conceptual understanding and the development of transferable skills. Art education, in particular, provides powerful vehicles for promoting creativity, cultural rootedness, and socio-emotional development while facilitating interdisciplinary connections. The policy's encouragement of flexible curricular structures enabling student choice and exploration aligns with the evidence that student agency, autonomy, and genuine interest enhance both academic engagement and socio-emotional development. However, implementing such flexible approaches requires substantial curriculum redesign, teacher training, and institutional restructuring—transformative changes that proceed unevenly across Indian educational systems.

6. Integration with India's Knowledge Systems and Cultural Grounding

6.1 Indian Knowledge Systems and Indigenous Pedagogies

The NEP the 2020s emphasis on integrating Indian Knowledge Systems (IKS) into the curriculum represents a significant departure from historically Eurocentric educational frameworks. This integration acknowledges that diverse epistemologies, pedagogical approaches, and wisdom traditions offer valuable insights into contemporary education. Traditional practices, including yoga, meditation, storytelling, and community-based learning, provide culturally congruent approaches to developing holistic competencies. The historical significance of multidisciplinary learning in ancient Indian universities—Nalanda, Takshashila, and Odantapuri—provides inspiration and practical models for contemporary educational transformation. These institutions cultivated holistic development through an integrated study of philosophy, sciences, arts, and practical skills, emphasizing character development alongside intellectual growth.

6.2 Folk Pedagogy and Community-Based Learning

Folk pedagogy, or traditional modes of teaching and learning practiced within local communities, represents an underutilized resource for NEP 2020 implementation. Such pedagogies often embody holistic approaches that naturally integrate cognitive, emotional, social, and practical learning through experiential engagement with meaningful community activities. The challenge of integrating folk pedagogies into formal education systems requires careful navigation to balance cultural preservation with contemporary educational needs. Successful integration demands dialogue among educators, policymakers, and community stakeholders to identify culturally appropriate approaches that support holistic development while addressing contemporary learning needs.

7. Assessment and Measurement Challenges

7.1 Conceptualizing Socio-Emotional Competencies

A meaningful assessment of holistic development requires reconceptualizing educational outcomes beyond measurable academic achievement. Socio-emotional competencies—self-awareness, empathy, relationship skills, and responsible decision-making— are challenging to measure using conventional standardized instruments. Their development occurs gradually through complex interactions between individual, relational, and environmental factors. A critical framework for holistic education assessment—LIBRE/EMC—integrating philosophical, policy, and literature perspectives identifies four core dimensions (liberation, inquiry, resilience, empowerment) alongside the CASEL five competencies (compassion, critical inquiry). This comprehensive framework acknowledges that holistic development encompasses not only behavioral competencies but also philosophical development, critical consciousness, and spiritual growth.

7.2 Ethical Considerations in Assessment

The standardized assessment of socio-emotional competencies raises ethical concerns regarding privacy, authenticity, and the potential misuse of developmental data. Over-assessment can undermine the intrinsic value of socio-emotional development, converting internal motivations for ethical behavior and genuine care into externally monitored behaviors susceptible to gaming and

superficial performance. Assessment approaches must balance accountability needs with the protection of students' emotional and psychological privacy. Qualitative, reflective assessment methods, including student portfolios, narrative evaluation, and collaborative goal-setting, may prove more ethical and pedagogically sound than quantitative measurements for capturing holistic development.

8. Comparative Analysis: NEP 2020 within Global Educational Contexts

8.1 Alignment with Sustainable Development Goals

The NEP the 2020s holistic approach aligns with the United Nations Sustainable Development Goal 4.7, which emphasizes education for sustainable development, global citizenship, and cultural understanding. The policy's emphasis on environmental consciousness, ethical development, and social responsibility reflects a commitment to preparing students to address complex global challenges. However, the alignment between policy statements and actual educational practices often proves to be incomplete. Systemic barriers, including examination-centric accountability structures, resource constraints, and insufficient teacher preparation, frequently prevent the realization of stated policy objectives. Critical analysis requires distinguishing between aspirational policy visions and pragmatic implementation capacities.

8.2 Comparative Lessons from Other Educational Systems

International comparative analyses reveal both universal principles and context-specific considerations for the implementation of holistic education. Finland's educational system, which emphasizes well-being and comprehensive student development, demonstrates positive outcomes in academic achievement coupled with high student satisfaction. However, the success of the Finnish system reflects specific contextual conditions, including robust public funding, small class sizes, comprehensive teacher preparation, and cultural prioritization of education—conditions that are not universally present in India. China's education informatization initiatives provide alternative models for technology integration, supporting holistic development while addressing scale challenges. Brazil's implementation of comprehensive sexuality education based on socio-emotional learning demonstrates the potential for SEL integration across specialized content domains, although the outcomes remain mixed, suggesting implementation complexity even in relatively well-resourced contexts.

9. Recommendations for Strengthening NEP 2020 Implementation

9.1 Systemic Resource Investment

Realizing the holistic vision of the NEP 2020 requires substantial and sustained public investment in educational infrastructure, teacher training, and support systems. Without adequate resources, policy aspirations are symbolic rather than substantive. Specific investments should target the following:

- Comprehensive initial and ongoing teacher education emphasizing socio-emotional pedagogy and personal development.
- Development of culturally appropriate, validated assessment instruments for measuring holistic development in Indian contexts
- Creation of school mental health infrastructure including counseling services, peer support programs, and crisis intervention capabilities
- Equitable distribution of learning resources including technology, instructional materials, and extracurricular opportunities

9.2 Teacher Development as Implementation Priority

Teachers represent a critical implementation mechanism for NEP 2020. Comprehensive teacher development must address the following:

- Deepening teachers' own socio-emotional competencies and well-being
- Building capacity for designing and facilitating integrated, experiential learning experiences
- Developing skills for creating psychologically safe, emotionally supportive classroom environments

- Supporting teachers in recognizing and responding to diverse student needs and learning variations

9.3 Culturally Grounded Assessment and Accountability

Assessment systems must evolve to capture holistic development while maintaining accountability. This requires:

- Development of culturally appropriate, multidimensional assessment frameworks reflecting Indian philosophical traditions and contemporary global research
- Integration of qualitative, student-centered assessment alongside quantitative measures
- Protection of student privacy and emotional well-being in assessment processes shift from purely summative accountability toward formative, development-focused assessment supporting continuous improvement

9.4 Inclusive Implementation Addressing Equity

The success of NEP 2020 depends on equitable implementation, reaching all students, particularly those in disadvantaged communities. This requires:

- Targeted resource allocation addressing rural-urban disparities and socioeconomic inequities
- Community engagement and partnerships supporting culturally responsive implementation
- Attention to marginalized groups including students with disabilities, linguistic minorities, and economically disadvantaged students

Adaptation of approaches recognizing diverse community contexts and resources

Conclusion

The National Education Policy 2020 represents a visionary framework for transforming Indian education toward holistic development and comprehensive socio-emotional learning. Grounded in India's philosophical traditions and engaging with contemporary global research, this policy creates a culturally resonant approach with substantial potential for enhancing student well-being, academic achievement, and social-emotional competencies. However, a critical analysis reveals substantial gaps between policy aspirations and implementation capacity. Resource constraints, teacher preparation deficits, assessment system misalignment, persistent urban-rural disparities, and institutional resistance to fundamental educational transformation pose formidable implementation challenges. Success requires sustained political commitment, substantial public investment, comprehensive teacher development, and adaptive implementation that addresses diverse Indian contexts. The global evidence base consistently demonstrates that holistic education and socio-emotional learning generate significant benefits for individual student development and societal wellbeing. However, successful implementation requires more than policy pronouncements; it demands systematic attention to implementation mechanisms, continuous adaptation based on evidence, and unwavering commitment to equity and inclusion. As India undertakes this transformative educational journey, learning from global experiences while maintaining cultural integrity offers the most promising pathway toward realizing NEP 2020's vision of comprehensive human development through education.

References

1. Mishra, P., & Mohanty, A. (2021). Multidisciplinary higher education: Prospects under NEP 2020. Indian Journal of Higher Education, 14(1), 22-36.
2. Kumar, A. (2021). Role of teachers in NEP 2020: Challenges and strategies. Teacher Education Review, 6(2), 101-115.
3. Nambissan, G. B. (2021). Education and exclusion: Addressing structural inequalities in India's National Education Policy 2020. Contemporary Education Dialogue, 18(1), 3-12. https://doi.org/10.1177/0973184921994675
4. Gupta, N. (2022). Early childhood education in India post-National Education Policy ECCE Journal, 11(2), 56-68.

5. Sharma, A. B. (2022). Vocational education and skill development under India's NEP 2020: Opportunities and challenges. Journal of Educational Policy Studies, 22(3), 45-59. https://doi.org/10.1080/xxxxxxx
6. UNESCO. (2023). India education report: Implementation of the NEP 2020. UNESCO. https://unesco.org
7. UNICEF India. (2023). Digital learning and equity: An NEP 2020 perspective. UNICEF. https://unicef.org/india
8. Kanungo, R. (2024). NEP 2020 and SDG 4: Pathways to implementation. Journal of Educational Policy, 15(1), 19-34. A. B. (2022). Vocational education and skill development under India's NEP 2020: Opportunities and challenges. Journal of Educational Policy Studies, 22(3), 45-59. https://doi.org/10.1080/xxxxxxx
9. UNESCO. (2023). India education report: Implementation of NEP 2020. UNESCO. https://unesco.org
10. UNICEF India. (2023). Digital learning and equity: An NEP 2020 perspective. UNICEF. https://unicef.org/india
11. Kanungo, R. (2024). NEP 2020 and SDG 4: Pathways to implementation. Journal of Educational Policy, 15(1), 19-34.

Career Development and Its Effect on Employee Performance: A Case Study of Mahindra & Mahindra

Kanhaiya Kumar[*]
Dr. Dhaneshwer Ram[**]

Abstract:

Career development plays a pivotal role in enhancing employee performance, motivation, and engagement within organizations. This study explores the impact of career development initiatives on employee performance at Mahindra & Mahindra Ltd., a leading Indian conglomerate with diverse business operations in automotive, farm equipment, IT, and finance sectors. The research examines how structured career growth opportunities, including training programs, leadership development, and mentorship initiatives, influence employee productivity, job satisfaction, and retention. A mixed-method approach was employed, combining employee surveys, interviews, and organizational HR data to capture comprehensive insights. The findings reveal a strong positive relationship between career development practices and employee performance, highlighting that employees who perceive clear growth pathways and access to skill enhancement programs demonstrate higher engagement, commitment, and efficiency. Additionally, the study identifies challenges such as generational expectations, workload pressures, and geographical dispersion that can hinder the effectiveness of career development efforts. The results underscore the importance of integrating career development strategies with organizational objectives to foster a motivated and high-performing workforce. Based on the findings, practical recommendations are provided for enhancing career progression frameworks, optimizing training programs, and strengthening mentorship structures at Mahindra & Mahindra. This study contributes to the understanding of career development as a strategic HR tool and offers actionable insights for managers seeking to improve employee performance and organizational competitiveness in dynamic business environments.

Keywords: Career Development, Employee Performance, Training and Development, Organizational Culture, Employee Motivation and Mahindra & Mahindra. etc.

In today's dynamic corporate environment, the success of an organization is increasingly linked to the growth, development, and engagement of its human capital. Career development has emerged as a critical component of human resource management, providing employees with structured opportunities to enhance their skills, achieve professional goals, and progress within the organization. Career development encompasses a wide range of activities, including training programs, mentoring, leadership initiatives, performance appraisals, and succession planning, all aimed at aligning employee aspirations with organizational objectives (Armstrong, 2020; Noe, 2010).[1] By offering clear pathways for growth, organizations can motivate employees, improve job satisfaction, and boost overall performance.

Employee motivation and satisfaction are closely tied to career development opportunities. Herzberg's Two-Factor Theory (1959) suggests that intrinsic motivators, such as achievement, recognition, and personal growth, play a significant role in enhancing employee engagement and productivity.[3] When employees perceive that their organization invests in their career growth, they are more likely to demonstrate commitment, remain with the company for longer periods, and contribute effectively to organizational goals. Similarly, Self-Determination Theory (Deci & Ryan,

[*] Research Scholar (Management), Magadh University, Bodhgaya (Bihar)
[**] Associate Professor, Department of Psychology, AM. College, Gaya

2000) emphasizes that employees thrive when they experience autonomy, competence, and relatedness, all of which are nurtured through structured career development initiatives.[2]

Mahindra & Mahindra Ltd. (M&M), a leading Indian multinational company with a diversified presence in automotive manufacturing, aerospace, agribusiness, and information technology, provides a compelling context for examining career development practices. M&M has implemented various programs, such as the Mahindra Future Shapers Program and Rise Awards, which focus on leadership development, skill enhancement, and recognition of employee achievements.[5] These initiatives aim to not only enhance technical and managerial competencies but also foster a culture of continuous learning and motivation. The organization's commitment to employee growth provides an opportunity to explore the relationship between career development and performance in a real-world corporate setting.

Armstrong, 2020; Rao, 2014 Career development is a crucial aspect of human resource management, focusing on improving employee skills, competencies, and job satisfaction over time.[7] In today's dynamic corporate environment, organizations recognize that employees' career growth directly affects their motivation, engagement, and overall performance. Employees who perceive a clear path for career advancement tend to demonstrate higher commitment, productivity, and loyalty, which in turn contributes to organizational success.

For large conglomerates like Mahindra & Mahindra Ltd. (M&M), which operates across diverse sectors including automotive, farm equipment, IT, and finance, career development is particularly significant. The company has implemented various structured programs such as the Mahindra Future Shapers Program, M-ACE learning platform, and leadership coaching initiatives to provide employees with skill development, career growth, and leadership opportunities. By focusing on career development, M&M aims to build an agile workforce that adapts to changing business environments while ensuring sustained performance and innovation.

This study examines the impact of career development initiatives at M&M on employee performance, satisfaction, and retention, highlighting the importance of strategic HR practices in achieving organizational goals.

2.1 Career Development Theories- Several career development theories provide a framework to understand employee growth within organizations: Super's Life-Span, Life-Space Theory (Super, 1957) emphasizes career development as a lifelong process, involving stages such as growth, exploration, establishment, maintenance, and decline. Employees progress through these stages while acquiring skills and aligning personal interests with organizational goals.[8]

Career Stage Theory (Hall, 1976) identifies stages such as early career, mid-career, and late career, with unique needs at each stage. Early-career employees seek skill-building opportunities, while mid-career employees focus on leadership roles and strategic contributions. Organizations that align development programs with career stages achieve better engagement and retention.[3]

Self-Determination Theory (SDT) (Deci & Ryan, 2000) highlights that motivation is enhanced when employees experience autonomy, competence, and relatedness. Career development programs that provide opportunities for skill growth, responsibility, and recognition fulfill these psychological needs, leading to higher performance.[2]

2.2 Previous Studies on Career Development and Performance- Research consistently shows a positive link between career development initiatives and employee performance:

Rao (2014) found that career growth opportunities improve employee motivation, job satisfaction, and commitment in Indian organizations.

Armstrong (2020) emphasized that structured learning and leadership programs strengthen performance by increasing competence and fostering loyalty.

Noe (2010) reported that employees with access to training and development exhibit higher productivity, adaptability, and engagement.

These studies highlight that career development not only enhances individual skills but also contributes to organizational growth through higher employee performance and reduced turnover.

2.3 Career Development Practices at Mahindra & Mahindra- M&M has implemented several HR initiatives that support career progression and skill enhancement:

I. M-ACE Learning Platform: Offers role-based learning modules, online courses, and certifications to enhance technical and managerial competencies.
II. Leadership Programs: Initiatives like the Global Leadership Cadre and Mahindra Future Shapers Program aim to groom employees for senior positions while instilling strategic thinking and decision-making skills.
III. Mentorship and Coaching: Structured mentorship programs provide guidance, knowledge sharing, and career advice.
IV. Performance Management Systems: Integrated with career progression, performance appraisals guide employees on skill gaps, promotions, and growth opportunities (Mahindra Group, 2023).[5]

These practices reflect the company's commitment to building a skilled, motivated, and future-ready workforce.

This study aims to investigate how career development initiatives at M&M influence employee performance, satisfaction, and retention. By analyzing employee perceptions and performance metrics, the research seeks to understand the effectiveness of career growth programs and identify areas for improvement. The findings are expected to offer valuable insights for HR professionals and organizational leaders seeking to strengthen talent management strategies, enhance employee engagement, and drive sustainable organizational growth.

3. Research Objectives

I. The study focuses on understanding how career development influences employee performance at M&M. The objectives are:
II. To examine the impact of career development initiatives on employee performance.
III. To explore employee perceptions regarding career growth opportunities within M&M.
IV. To identify areas for improvement in career development practices to enhance performance, engagement, and retention.

4. Research Methodology

This study adopts a mixed-method approach combining quantitative and qualitative data.

A. Data Collection: Primary data is collected through employee surveys and structured interviews. Secondary data is sourced from HR records, company reports, and industry literature.
B. Sample: Employees from various divisions of M&M, including automotive, farm equipment, IT, and finance, ensuring representation across departments, seniority, and experience levels.
C. Analysis Tools: Quantitative data is analyzed using SPSS and Excel for correlation and regression analysis to determine the relationship between career development initiatives and employee performance. Qualitative insights from interviews provide contextual understanding of employee perceptions and satisfaction.

5. Results and Discussion

5.1 Relationship Between Career Development and Performance- To examine Hypothesis 1, which stated that Superiors and Subordinates differ significantly in terms of the relationship between career development and performance, a mean comparison was conducted (Table 1).

Table –1 : Significant Mean difference between Superiors and Subordinates groups on job satisfaction.

Groups	N	Mean	SD	t	p value
Superiors	10	73.04	10.13	0.37	p>0.05NS
Subordinates	50	71.83	7.22		

The results indicate that the mean score of Superiors (M = 73.04, SD = 10.13) is slightly higher than that of Subordinates (M = 71.83, SD = 7.22), but the difference is not statistically significant (t=0.37, df= 58, p>0.05NS). Therefore, the hypothesis that Superiors and Subordinates differ significantly in their perception of the relationship between career development and performance is not supported.

Descriptive Statistics on Career Development- Descriptive analysis of the full sample (N = 160) revealed that employees generally perceive career development opportunities positively. The mean score for career development perception was 72.00 (SD = 7.54), suggesting that most employees feel that Mahindra & Mahindra provides reasonable avenues for career growth, leadership programs, and training initiatives.

Correlation between Career Development and Performance- To examine the relationship between career development initiatives and employee performance, Pearson correlation analysis was conducted.

Table-2 : Correlations difference between Superiors and Subordinates differ significantly on Career Development and Performance

N	r-bis	df	Sig. value
58	r = 0.45,	58	p < 0.01

This indicates a moderate positive correlation between career development and performance, suggesting that employees who perceive stronger career development opportunities also tend to demonstrate higher performance levels.

Regression Analysis- Regression analysis was conducted to assess the predictive power of career development on employee (*Superiors and Subordinates*) performance:

Table-3 : Regression difference between Superiors and Subordinates differ significantly on predictive power of career development

N	R^2	F	df	Sig. value
60	0.203	40.13	58	p < 0.01

This shows that career development explains 20.3% of the variance in employee performance, which is statistically significant. The results imply that career development initiatives such as training programs, leadership development, and mentoring positively contribute to improving employee performance at Mahindra & Mahindra.

Employee Perceptions- Qualitative feedback from interviews revealed that employees value:

Structured leadership programs like Mahindra Future Shapers. Opportunities for lateral and vertical career growth. Recognition and mentorship from supervisors. However, some employees highlighted challenges, including: Limited clarity on promotion criteria. Variation in career development opportunities across divisions and locations.

Need for more personalized training programs, especially for junior employees.

Summary- The study supports prior research indicating that career development drives performance, motivation, and engagement (Rao, 2014; Armstrong, 2020; Deci & Ryan, 2000). The findings also emphasize the need for organizations to adapt development programs to employee needs, geographical constraints, and evolving business contexts.

Conclusion- This study confirms that career development significantly influences employee performance at Mahindra & Mahindra Ltd. Structured programs for training, mentorship, leadership development, and career progression enhance productivity, motivation, engagement, and retention.

Recommendations: Expand personalized development plans tailored to career stages and individual aspirations. Enhance access to learning platforms for employees across different regions. Integrate development programs with performance metrics to reinforce accountability and growth. Focus on succession planning and leadership grooming to prepare employees for future roles. Encourage feedback mechanisms to continuously improve career development initiatives.

Implications for HR Policies: Organizations should view career development as a strategic tool to achieve long-term growth. Investing in employee growth not only enhances individual performance but also strengthens organizational competitiveness and innovation. Mahindra & Mahindra's practices provide a strong example of aligning HR strategies with business objectives, demonstrating how career development can serve as a catalyst for organizational excellence.

References

1. Armstrong, M. (2020). Armstrong's handbook of human resource management practice (15th ed.). Kogan Page.
2. Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Prentice Hall.
3. Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. Psychological Inquiry, 11(4), 227–268.
4. Gupta, S., & Saxena, K. (2018). Impact of employee training on job performance in Indian organizations. International Journal of Management Studies, 25(2), 45–59.
5. Mahindra Group. (2023). Sustainability report 2023. Mahindra & Mahindra Ltd.
6. Noe, R. A. (2010). Employee training and development (5th ed.). McGraw-Hill Education.
7. Rao, V. S. P. (2014). Human resource management: Text and cases (2nd ed.). Excel Books.
8. Super, D. E. (1957). The psychology of careers. Harper & Row.

The Rise of Multitasking in Everyday Life: A Secondary Data–Based Analysis of its Impact on Memory and Learning

Dr. Ramuday Singh*
Dr. Barishter Yadav**

Abstract:

Multitasking has become a defining feature of modern life, especially with the growing influence of digital technologies. While often viewed as a strategy to increase efficiency, research suggests that dividing attention across tasks may negatively affect memory and learning. This paper adopts a secondary research approach, synthesizing findings from experimental studies, surveys, and meta-analyses to evaluate the impact of multitasking on cognitive performance. Evidence consistently indicates that multitasking—particularly digital forms such as texting, browsing social media, or using multiple devices—disrupts short-term memory recall, reduces comprehension, and undermines academic performance. Non-digital multitasking, such as background music or minor physical activity, shows more variable effects, with outcomes depending on task complexity and learner characteristics. Drawing on frameworks such as Cognitive Load Theory and the Limited Capacity Model of Information Processing, this study highlights how multitasking increases extraneous cognitive load, leading to shallower processing and weaker retention. The paper concludes that while some non-digital multitasking may be neutral, digital multitasking consistently impairs learning efficiency. Implications are discussed for students, educators, and researchers, emphasizing the importance of fostering focused, distraction-free learning environments.

Keywords: Multitasking; Secondary Data; Memory; Learning Outcomes; Cognitive Load Theory; Attention; Digital Distractions; Academic Performance

Introduction

In recent years, multitasking has become a defining feature of modern life, largely fueled by rapid technological advancements and the widespread use of digital devices. Smartphones, laptops, and social media platforms now occupy a central place in daily routines, allowing individuals to switch rapidly between multiple activities such as studying, browsing the internet, responding to messages, and engaging in entertainment. This constant exposure to competing sources of information has normalized the practice of dividing attention across tasks, both in academic and professional settings.

While multitasking is often perceived as an efficient way to maximize time, research in cognitive psychology suggests that the human brain is not naturally designed to process multiple streams of information simultaneously with equal effectiveness. Instead, frequent task-switching may lead to superficial engagement, reduced concentration, and diminished cognitive performance. The prevalence of multitasking in learning environments—such as students checking notifications during lectures or working on assignments while streaming media—raises critical concerns about its impact on memory retention and the quality of learning outcomes.

Memory and Learning as Critical Cognitive Processes

Memory and learning are two of the most fundamental cognitive processes that shape human development, knowledge acquisition, and academic success. Learning involves the ability to absorb

* Assistant Professor, Department of Psychology, Jagdam College, Chapra, JPU Saran
Email id: ramuday4215@gmail.com
** Assistant Professor, Department of Psychology, Mahendra Mahila Mahavidyalya Gopalganj, Jai Prakash University Chapra (Bihar), Email id: bairisteryadav555@gmail.com

new information, make connections, and apply acquired knowledge, while memory serves as the system through which information is encoded, stored, and retrieved. Both processes are closely interdependent—effective learning cannot occur without the retention of information in memory, and memory itself is strengthened through meaningful learning experiences.

Cognitive theories emphasize that attention plays a pivotal role in facilitating both memory and learning, as it determines which information is prioritized for deeper processing and long-term storage. When attention is divided, as often happens during multitasking, the encoding of information into memory may be disrupted, reducing the learner's ability to recall and apply knowledge later. Given their central role in education, any factors that compromise memory and learning, such as multitasking, warrant careful empirical investigation.

Although multitasking has become a routine practice in academic and professional settings, its impact on core cognitive processes such as memory and learning remains contested. A widely held assumption is that multitasking reduces focus and hinders deep cognitive engagement, yet empirical findings on the subject are not entirely consistent. Some studies suggest that multitasking disrupts sustained attention, leading to poorer recall and weaker comprehension, while others argue that the extent of its impact depends on the type of secondary task, individual differences in cognitive control, and contextual factors.

This lack of consensus creates uncertainty about whether multitasking universally harms learning outcomes or whether certain forms may be relatively harmless. The debate highlights the need for systematic empirical research that examines not only whether multitasking affects memory and learning, but also how strongly and under what conditions these effects occur. Addressing this problem is particularly important in educational contexts, where students frequently attempt to balance multiple tasks, often under the assumption that their learning efficiency will remain unaffected.

Does the Type of Multitasking (Digital Vs. Non-Digital) Matter?

While it is generally accepted that multitasking can interfere with memory and learning, not all types of multitasking may have the same cognitive impact. This research question explores whether the nature of the secondary task—specifically digital versus non-digital distractions—modulates the effect of multitasking on cognitive performance. Digital multitasking, such as texting, browsing social media, or watching videos, often involves highly engaging and attention-demanding content, which may compete directly with learning tasks for cognitive resources. In contrast, non-digital multitasking, such as listening to background music or performing simple physical tasks while studying, may require fewer attentional resources or may even have neutral or facilitative effects under certain conditions. Understanding these distinctions is crucial because it allows educators and learners to identify which forms of multitasking are particularly detrimental and which may be relatively harmless. Investigating this question experimentally will provide empirical evidence on the differential impact of multitasking types, offering nuanced insights into how learners can manage distractions effectively to optimize memory retention and learning outcomes.

Objectives of the Study

1. To examine how multitasking influences short-term memory.
2. To evaluate the effect of multitasking on learning outcomes.

Literature Review

Conceptual Framework

Cognitive Load Theory

Cognitive Load Theory (CLT), proposed by Sweller (1988), provides a foundational framework for understanding how multitasking affects memory and learning. The theory posits that human working memory has a limited capacity for processing information at any given time, and that cognitive resources can be quickly overwhelmed when multiple tasks or complex information are presented simultaneously. According to CLT, learning is most effective when extraneous cognitive load—tasks or distractions that do not directly contribute to learning—is minimized, allowing

learners to allocate their mental resources toward the intrinsic processing of new material. Multitasking, by its very nature, introduces additional extraneous load, as attention must be divided between the primary learning task and one or more secondary activities. This division can lead to incomplete encoding, reduced comprehension, and weaker retrieval of information, particularly in short-term memory, which is central to the initial stages of learning. Researchers have used CLT to explain why students who engage in multitasking while studying or attending lectures often experience diminished learning outcomes, highlighting the importance of managing cognitive load to optimize memory retention and academic performance.

Limited Capacity Model of Information Processing

The Limited Capacity Model of Information Processing, introduced by Lang (2000), offers another critical perspective for understanding the cognitive effects of multitasking. This model asserts that humans have a finite pool of attentional and processing resources that must be distributed across incoming information and ongoing tasks. When multiple stimuli compete for attention, such as when a learner simultaneously studies and engages with digital media, the allocation of cognitive resources becomes fragmented. As a result, the processing of each task is less efficient, leading to lower comprehension, weaker memory encoding, and reduced learning outcomes. The model also emphasizes the dynamic nature of resource allocation, suggesting that the brain continuously prioritizes certain inputs over others based on perceived relevance and salience. In the context of multitasking, highly engaging or emotionally stimulating distractions—such as social media notifications or video content—can capture a disproportionate share of cognitive resources, leaving insufficient capacity for effective learning. By applying this theoretical framework, researchers can better understand why multitasking often compromises both memory retention and deeper learning, and why the type and intensity of secondary tasks play a significant role in determining the degree of cognitive disruption.

Previous Studies

Experimental Studies on Multitasking and Attention.

A number of experimental studies have investigated the effects of multitasking on attention, memory, and learning, providing empirical evidence for its cognitive consequences. For instance, Junco and Cotten (2011) conducted a study on college students and found that frequent use of social media while studying was associated with lower attention levels and decreased academic performance. Participants who switched between study tasks and digital distractions exhibited slower task completion times and more errors compared to those who focused solely on their study material. Similarly, Sana, Weston, and Cepeda (2013) examined the impact of laptop multitasking in a classroom setting, finding that students who engaged in non-related digital activities, such as browsing websites or instant messaging during lectures, scored significantly lower on comprehension tests than their non-multitasking peers. Experimental research also indicates that the cognitive cost of multitasking arises not only from divided attention but also from "task-switching penalties," where the mental effort required to switch between activities reduces overall efficiency and memory encoding (Rubinstein, Meyer, & Evans, 2001). Collectively, these studies highlight that multitasking, particularly involving digital tasks, disrupts attention allocation, impairs short-term memory processing, and ultimately undermines learning outcomes, providing a strong empirical foundation for investigating these effects further.

Research Linking Multitasking to Academic Performance

A growing body of research has specifically examined the relationship between multitasking and academic performance, highlighting the negative consequences of divided attention on learning outcomes. Studies have consistently shown that students who engage in multitasking while studying or attending lectures tend to achieve lower grades and perform worse on assessments compared to those who maintain focused study habits. For example, Rosen, Carrier, and Cheever (2013) found that students who frequently checked their smartphones during study sessions demonstrated lower retention of material and reduced test scores, even when the amount of time spent studying was equal

to that of non-multitasking peers. Similarly, Wood et al. (2012) reported that multitasking during classroom instruction, including activities such as texting, browsing social media, or checking emails, significantly decreased comprehension and note-taking quality, indicating that attention diversion directly impacts academic learning. These findings are further supported by experimental research showing that multitasking can lead to both superficial learning and poorer long-term retention of information, emphasizing that academic performance is not merely a function of study duration but also of cognitive engagement and attention quality. Collectively, this body of research underscores the importance of understanding the specific mechanisms through which multitasking disrupts learning and reinforces the relevance of studying its effects on memory and academic outcomes.

Research Gap

Despite the growing interest in multitasking and its cognitive effects, there remains a significant gap in the literature regarding studies that examine both memory and learning outcomes simultaneously under controlled experimental conditions. While many studies have explored the impact of multitasking on attention or isolated aspects of academic performance, few have systematically investigated how multitasking affects short-term memory retention alongside comprehension and overall learning performance within the same study. Most existing research focuses either on immediate recall or on long-term academic outcomes, making it difficult to draw comprehensive conclusions about the full scope of cognitive disruption caused by multitasking. Additionally, limited attention has been paid to comparing different types of multitasking, such as digital versus non-digital distractions, and their differential effects on cognitive processing. Addressing these gaps is essential to provide a more nuanced understanding of how multitasking interacts with memory and learning, and to offer practical recommendations for optimizing study habits and educational strategies in technology-rich environments.

Methodology

Research Design

This study adopts a secondary research design, relying on previously published studies, reports, and datasets to analyze the effects of multitasking on memory and learning outcomes. Instead of collecting primary data, the research synthesizes evidence from experimental, correlational, and survey-based studies available in peer-reviewed journals and academic databases. This design enables a comprehensive understanding of multitasking's cognitive consequences without the constraints of conducting original fieldwork.

Data Sources

The secondary data were drawn from:

a. **Peer-reviewed journal articles** in psychology, education, and cognitive science.
b. **Meta-analyses and systematic reviews** on multitasking and learning.
c. **Survey reports** from reputable organizations (e.g., Pew Research Center, EDUCAUSE).
d. **Experimental studies** previously conducted on short-term memory, comprehension, and multitasking behaviors in academic contexts.

Studies published between 2000 and 2025 were considered to ensure contemporary relevance, particularly given the rapid technological changes influencing digital multitasking.

Inclusion and Exclusion Criteria

Inclusion: Studies that examine the relationship between multitasking and either short-term memory, attention, or learning outcomes in educational/professional settings. Both digital (e.g., social media use, texting) and non-digital (e.g., background music) forms of multitasking were included.

Exclusion: Studies unrelated to cognitive or educational outcomes, studies focusing on clinical disorders, or those without empirical evidence.

Analytical Approach

The collected secondary data were analyzed through comparative and thematic synthesis:

1. **Comparative Analysis** – Findings were compared across multiple studies to identify consistent patterns and differences in the effects of multitasking.

2. **Thematic Synthesis** – Studies were categorized according to the type of multitasking (digital vs. non-digital) and the cognitive process affected (short-term memory, comprehension, learning outcomes).
3. **Trend Identification** – Where possible, the study highlights longitudinal or large-sample survey findings that show broader trends in multitasking behaviors among students and professionals.

Measures

a. **Memory Recall**: Findings from experimental studies using recall and recognition tests were synthesized to assess how multitasking influences short-term memory.
b. **Learning Outcomes**: Evidence from comprehension tests, academic performance measures, and standardized assessments in prior studies was reviewed to evaluate the effect of multitasking on deeper learning.
c. **Attention Allocation**: Studies using observational methods (e.g., classroom laptop use) and self-report surveys were incorporated to understand how attention is divided in multitasking environments.

Findings

1. Multitasking and Short-Term Memory

Most experimental studies report that multitasking reduces immediate recall and interferes with memory consolidation. **Junco & Cotten (2011)** found that frequent use of social media during study sessions correlated with weaker recall of study material. **Rubinstein, Meyer, & Evans (2001)** demonstrated that task-switching imposes cognitive "switching costs," leading to less efficient memory encoding. However, some studies suggest that low-demand multitasking (e.g., background instrumental music) may have a minimal or even neutral effect on memory recall, indicating that the type and intensity of multitasking matter.

2. Multitasking and Learning Outcomes

The majority of secondary sources link multitasking to **lower comprehension, weaker test scores, and decreased academic performance**. **Sana, Weston, & Cepeda (2013)** showed that students who multitasked on laptops during lectures scored significantly lower on comprehension tests. **Wood et al. (2012)** found that texting, browsing social media, or checking emails during class impaired note-taking quality and reduced overall learning. **Rosen, Carrier, & Cheever (2013)** reported that frequent smartphone use during studying led to poorer retention of material even when total study time was equivalent to non-multitasking peers. These findings suggest that multitasking reduces not only surface-level memory but also deep comprehension and knowledge application.

3. Digital vs. Non-Digital Multitasking

Digital multitasking (texting, social media, video streaming) is consistently shown to be highly disruptive, as it competes directly for attentional resources. **Non-digital multitasking** (background music, light physical activity) demonstrates mixed results, with some studies finding negligible effects, while others suggest it may slightly facilitate concentration under certain conditions.

Discussion

The synthesis of secondary studies confirms that multitasking generally imposes a cognitive cost on both memory and learning outcomes. Evidence consistently demonstrates that digital multitasking, particularly activities such as texting, browsing social media, or streaming videos, interferes with attention allocation, weakens memory encoding, and reduces comprehension. These findings align with Cognitive Load Theory (Sweller, 1988) and the Limited Capacity Model of Information Processing (Lang, 2000), both of which emphasize the finite nature of working memory and attentional resources. When learners divide attention between competing tasks, they experience increased extraneous cognitive load, leading to shallow processing and poorer retention.

Interestingly, the impact of multitasking is not uniform. While digital multitasking almost always has a negative effect, non-digital multitasking produces more mixed results. For instance,

studies on background music suggest that its influence depends on the complexity of the task and the characteristics of the learner (e.g., introversion, task familiarity). This distinction highlights the importance of context when evaluating multitasking behaviors.

The reviewed studies also reveal that multitasking undermines academic performance beyond immediate recall. Reduced note-taking quality, lower comprehension scores, and weaker test results were common outcomes in multitasking groups across multiple experiments (Sana et al., 2013; Wood et al., 2012). These findings suggest that the consequences of multitasking extend to deeper levels of learning, where knowledge integration and application are critical.

Despite these consistent patterns, gaps remain. Few studies simultaneously examine both short-term memory and broader learning outcomes, and limited research compares the relative severity of digital versus non-digital multitasking under controlled conditions. This lack of integrated research makes it difficult to draw fully comprehensive conclusions about the long-term academic implications of multitasking.

Conclusion

Based on secondary data, it can be concluded that multitasking—particularly digital multitasking—poses significant risks to effective memory retention and learning. Evidence overwhelmingly indicates that divided attention compromises short-term recall, reduces comprehension, and leads to poorer academic outcomes. While certain low-demand non-digital multitasking behaviors may not always be harmful, the general trend supports the view that focused, distraction-free study remains the most effective approach for learning.

The findings carry practical implications for students, educators, and institutions. Students should be encouraged to minimize digital distractions during study sessions, while educators may consider implementing classroom policies that reduce multitasking opportunities. For researchers, future studies should adopt integrated designs that evaluate memory and learning outcomes together, while also differentiating between digital and non-digital multitasking.

References:

Junco, R., & Cotten, S. R. (2011). Perceived academic effects of instant messaging use. *Computers & Education, 56*(2), 370–378. https://doi.org/10.1016/j.compedu.2010.08.020

Lang, A. (2000). The limited capacity model of mediated message processing. *Journal of Communication, 50*(1), 46–70. https://doi.org/10.1111/j.1460-2466.2000.tb02833.x

Rosen, L. D., Carrier, L. M., & Cheever, N. A. (2013). Facebook and texting made me do it: Media-induced task-switching while studying. *Computers in Human Behavior, 29*(3), 948–958. https://doi.org/10.1016/j.chb.2012.12.001

Rubinstein, J. S., Meyer, D. E., & Evans, J. E. (2001). Executive control of cognitive processes in task switching. *Journal of Experimental Psychology: Human Perception and Performance, 27*(4), 763–797. https://doi.org/10.1037/0096-1523.27.4.763

Sana, F., Weston, T., & Cepeda, N. J. (2013). Laptop multitasking hinders classroom learning for both users and nearby peers. *Computers & Education, 62*, 24–31. https://doi.org/10.1016/j.compedu.2012.10.003

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257–285. https://doi.org/10.1207/s15516709cog1202_4

Wood, E., Zivcakova, L., Gentile, P., Archer, K., De Pasquale, D., & Nosko, A. (2012). Examining the impact of off-task multitasking with technology on real-time classroom learning. *Computers & Education, 58*(1), 365–374. https://doi.org/10.1016/j.compedu.2011.08.029

Junco, R., & Cotten, S. R. (2011). Perceived academic effects of instant messaging use. *Computers & Education, 56*(2), 370–378. https://doi.org/10.1016/j.compedu.2010.08.020

Lang, A. (2000). The limited capacity model of mediated message processing. *Journal of Communication, 50*(1), 46–70. https://doi.org/10.1111/j.1460-2466.2000.tb02833.x

Rosen, L. D., Carrier, L. M., & Cheever, N. A. (2013). Facebook and texting made me do it: Media-induced task-switching while studying. *Computers in Human Behavior, 29*(3), 948–958. https://doi.org/10.1016/j.chb.2012.12.001

Rubinstein, J. S., Meyer, D. E., & Evans, J. E. (2001). Executive control of cognitive processes in task switching. *Journal of Experimental Psychology: Human Perception and Performance, 27*(4), 763–797. https://doi.org/10.1037/0096-1523.27.4.763

Sana, F., Weston, T., & Cepeda, N. J. (2013). Laptop multitasking hinders classroom learning for both users and nearby peers. *Computers & Education, 62*, 24–31. https://doi.org/10.1016/j.compedu.2012.10.003

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257–285. https://doi.org/10.1207/s15516709cog1202_4

Wood, E., Zivcakova, L., Gentile, P., Archer, K., De Pasquale, D., & Nosko, A. (2012). Examining the impact of off-task multitasking with technology on real-time classroom learning. *Computers & Education, 58*(1), 365–374. https://doi.org/10.1016/j.compedu.2011.08.029

Impacts of Digital Transformation on Online Retail Marketing

Dr. Rashmi Sinha*

Abstract

Digital transformation has emerged as one of the most influential forces reshaping global business landscapes, particularly in the retail sector. The evolution of e-business into a dominant form of commerce has revolutionized organizational processes, customer engagement, and supply chain systems. In India, the rapid expansion of e-commerce platforms within a short span has significantly disrupted traditional retail structures. This study analyzes the effect of digital transformation on online retail marketing, focusing on e-business models, consumer behavior, operational efficiency, and market competition. The findings reveal that B2B models show minimal variation within e-commerce environments, whereas B2C and C2C platforms demonstrate considerable changes in customer experiences and business outcomes. This paper highlights the opportunities and challenges brought about by digital technologies and concludes with recommendations for strengthening e-retail strategies in a digitally driven market.

Keyword: E-commerce, E-retail business, Digital transformation, Online marketing, Consumers, B2B, B2C, C2C.

In India, the growth of e-commerce has been particularly remarkable. Companies such as Amazon, Flipkart, Myntra, and several emerging digital platforms have transformed the retail landscape within a decade. They have set new standards for efficiency, personalization, user engagement, and operational capability. The shift toward digitized business processes has also introduced several complexities and pressures for traditional brick-and-mortar retailers, who struggle to compete with the convenience, discounts, and operational efficiencies employed by online companies.

Online Retail Marketing in the Digital Era: Digital transformation has dramatically reshaped the landscape of online retail marketing, altering how businesses connect with customers and how consumers make purchasing decisions. Chaffey, D., & Ellis-Chadwick, F. (2019) has rapid expansion of internet accessibility, mobile technology, digital payment systems, and social media has enabled retailers to create more efficient, personalized, and engaging marketing strategies than ever before. What was once a traditional retail environment centered on physical stores has evolved into a dynamic, technology-driven marketplace where data, automation, and digital communication play central roles.[1] One of the most significant changes in the digital era is the shift toward data-driven marketing. Laudon, K. C., & Traver, C. G. (2020) Online retailers now rely heavily on big data analytics to understand customer preferences, browsing patterns, purchase history, and demographic trends.[2] This data allows companies to craft targeted advertisements, predict customer needs, and recommend products with high accuracy. Kumar, V., Dixit, A., Javalgi, R., & Dass, M. (2016) Personalized product suggestions, tailored email campaigns, and dynamic website content have become standard practices, improving customer satisfaction and increasing conversion rates.[3] Statista (2023) Social media platforms have also become powerful marketing tools. Retailers use platforms like Instagram, Facebook, YouTube, and TikTok to showcase products, collaborate with influencers, and interact directly with consumers. Influencer marketing, product unboxing videos, and user-generated content play crucial roles in shaping customer perceptions and building brand loyalty. Social media advertising offers precise targeting features that enable businesses to reach specific audience groups based on interests, behavior, and location.[4] Another key development is the rise of

* Ph.D., Dept. of Commerce, Magadh University, Bodh Gaya
E-mail : rshmi.sinha@gmail.com, Mob. : 7667912174

omnichannel marketing, where retailers integrate their online and offline operations to create a seamless customer experience. Customers may browse products online, pick them up in-store, track orders through mobile apps, or return items through multiple channels. This approach enhances convenience and strengthens brand consistency, meeting the expectations of modern consumers who value flexibility and accessibility. Digital transformation has also improved operational efficiency in areas such as logistics, inventory management, and customer service. Gupta, A. (2021) A technologies like AI chatbots, automated warehousing, and real-time order tracking contribute to faster service and improved communication. Secure and convenient digital payment systems—including UPI, mobile wallets, and cardless transactions—further streamline the online shopping experience.[5] However, the digital era also presents challenges, including intense competition, cybersecurity threats, and the need for constant technological upgrades. Retailers must invest continuously in digital tools, maintain strong data protection practices, and adapt quickly to changing consumer expectations to remain competitive.

This paper aims to examine the impacts of digital transformation on online retail marketing, analyze different e-business models (B2B, B2C, C2C), and explore how digital technologies influence customer behavior, competitive strategies, and the overall retail ecosystem.

Digital transformation refers to the process of integrating digital technologies into all aspects of business operations, fundamentally changing how organizations operate and deliver value to customers. It involves the adoption of: Artificial intelligence (AI) Big data analytics, Cloud computing, Internet of Things (IoT), Social media platforms, Mobile applications mand Automation and robotics etc

Digital Economy and Retail Evolution- The digital economy is characterized by the shift from physical to virtual marketplaces. Retailers use digital platforms to connect producers, suppliers, and consumers through seamless interactions.

Digitization impacts retail in three major ways:

a) Operational Efficiency – Automated stock management, supply chain visibility, and digital payments reduce cost and time.
b) Enhanced Customer Experience – Personalized recommendations, secure checkout systems, and fast delivery improve satisfaction.
c) Market Reach Expansion – E-retail allows companies to extend their presence beyond geographical boundaries.

Technology Integration in Retail- Today's online retail businesses commonly use: AI-driven recommendation engines, Chatbots for customer service

Predictive analytics for demand forecasting, Virtual try-on tools for fashion and beauty Augmented reality (AR) for product visualization, Warehousing robots for faster order fulfilment. These technologies allow e-retail platforms to deliver faster, personalized, and cost-effective services.

Growth of E-Commerce and Its Effect on the Retail Sector- The e-commerce industry in India has grown rapidly due to: High internet penetration, Affordable smartphones, Digital payment initiatives, Government support for Digital India, and Logistics expansion in rural regions

Rise of Online Marketplaces- Major e-commerce platforms revolutionized retail by offering: Competitive pricing, Extensive product variety, Hassle-free returns, Doorstep delivery, and 24/7 accessibility. The consumers now prefer browsing and buying online due to convenience and transparency. Traditional retailers, however, face challenges in price competition, inventory management, and customer retention.

E-Business and E-Retail Models- E-retail incorporates multiple business models, each impacted differently by digital transformation.

(i). B2B (Business-to-Business)- Companies purchase goods and services from other businesses. There is less variation in digital transformation compared to B2C or C2C. Efficiency improvements include automated procurement, digital invoicing, and improved supply chain collaboration.

(ii). B2C (Business-to-Consumer)- This is the most common e-commerce model. Digital transformation affects it by empowering consumers with detailed product information, Offering AI-based product suggestions, Providing fast delivery services, Supporting multiple payment modes (UPI, wallets, cards) and Enhancing customer support through chatbots

(iii). C2C (Consumer-to-Consumer)- Platforms such as OLX, eBay, and Facebook Marketplace allow customers to interact and trade directly. Digital transformation influences C2C by: Increasing trust with rating systems. Offering secure payment gateways, Simplifying product listing and communication.

Methodology- This study uses a descriptive and analytical research design to examine how digital transformation affects online retail marketing. A structured questionnaire was administered online to 100 respondents, primarily frequent users of e-commerce platforms. The sample was selected using a simple random sampling technique to ensure unbiased representation.

The questionnaire included sections on consumer satisfaction, marketing influence, digital tools, payment preferences, and overall shopping experience. Responses were recorded using a 5-point Likert scale ranging from Strongly Agree (5) to Strongly Disagree (1).

Data collected was analyzed using: Descriptive statistics (mean, percentage) for inferential statistics (t-test) to compare consumer perceptions across demographic groups. The t-test helped determine whether significant differences existed between two groups (e.g., male vs. female respondents) regarding the impact of digital marketing on purchase decisions.

Hypothesis- There is no significant difference in consumer perception of online retail marketing strategies across different demographic groups.

Objectives-

1. To analyze the role of digital transformation in shaping modern online retail marketing strategies.
2. To examine consumer perceptions of digital marketing tools such as personalization, social media advertising, and digital payments.
3. To compare consumer responses to online retail marketing across demographic groups.
4. To identify the factors influencing consumer trust and buying decisions in the digital retail environment.
5. To evaluate the effectiveness of digital marketing strategies using statistical analysis.

Results- In order to test the hypothesis that there is no significant difference in consumer perception of online retail marketing strategies across different demographic groups. A t-test analysis was conducted to compare the perceptions of male and female respondents on the effectiveness of online retail marketing. Male and Female groups were tested and data were arranged in frequency table and t test was significance of difference between two means of independent groups was computed (Table-1) below:

Table–1

Significance Mean difference between Male and Female consumer perception of online retail marketing strategies across.

Groups	*Consumer perception of online retail marketing strategies*			**t**	**df**	**Sig. Level**
	N	**Mean**	**SD**			
Female	50	4.12	0.68	2.05	98	p<0.05
Male	50	3.85	0.72			

Table-5 exabit that male and female groups differ significantly with respect to Means score of their perception of online retail marketing strategies (t=2.05, df=98, p<0.05). The result dose not confirms the hypothesis. Female Mean scores were higher (M= 4.12) than Male groups was (M= 3.85). There is a significant difference between male and female respondents regarding their perception of online retail marketing. Female participants reported slightly higher influence from digital marketing strategies compared to male participants.

Summary

Online retail marketing has undergone a major transformation due to digital technologies, including big data analytics, artificial intelligence, mobile apps, and social media platforms. The study found that consumers increasingly rely on personalized recommendations, digital payments, product reviews, and social media advertisements when making purchase decisions.

The statistical analysis revealed significant differences in how consumers of different demographics perceive digital marketing effectiveness. Respondents identified convenience, faster delivery, price comparison, and user-friendly platforms as key drivers of online shopping. However, concerns such as privacy, cybersecurity, and product authenticity still affect consumer trust.

Overall, the findings indicate that digital transformation not only enhances marketing effectiveness but also reshapes consumer behavior. Retailers must continue innovating to maintain competitiveness in the rapidly evolving digital marketplace.

Conclusion- Digital transformation has dramatically influenced online retail marketing by enhancing business operations, improving customer engagement, and redefining competitive strategies. E-commerce platforms have gained rapid popularity due to technological innovations, efficient logistics, and consumer-friendly services. Although digitalization has created challenges for traditional retailers, it also provides opportunities for growth through omnichannel strategies and integrated digital tools. This paper concludes that while B2B e-commerce remains relatively consistent, B2C and C2C models experience significant transformation driven by technological advancements and changing consumer expectations. The future of retail will depend on how well businesses incorporate digital technologies while ensuring customer satisfaction, security, and innovation. Digital transformation is no longer optional—it is essential for survival and success in the modern retail ecosystem.

References

1. Chaffey, D., & Ellis-Chadwick, F. (2019). *Digital Marketing: Strategy, Implementation and Practice. Pearson.*
2. Laudon, K. C., & Traver, C. G. (2020). E-commerce: Business, Technology, Society. Pearson.
3. Kumar, V., Dixit, A., Javalgi, R., & Dass, M. (2016). "Digital Transformation and Marketing Strategy." *Journal of Retailing and Consumer Services*, 34, 1–10.
4. Statista. (2023). E-commerce Market in India—*Growth Trends and Statistics*.
5. Gupta, A. (2021). "Impact of Digital Marketing on Consumer Behavior." *International Journal of Management Studies*, 8(2), 45–55.