

ISSN 3048-5835
(ONLINE)

Volume 4 Issue 2
November 2025 - April 2026



JOURNAL OF STRIDES IN EDUCATION

(Peer - Reviewed Interdisciplinary e-Journal)



S N M TRAINING COLLEGE

Moothakunnam

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JOURNAL OF STRIDES IN EDUCATION (JSE)
E-Journal of SNM Training College, Moothakunnam
ISSN 3048-5835
Volume 4 Issue 2 November 2025 – April 2026

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EDITORIAL

We are delighted to present the latest issue of the *Journal of Strides in Education (JSE)*, which features a collection of research articles on important and emerging topics in education. This issue highlights different aspects of teaching and learning and offers valuable insights into current educational practices. The articles encourage educators, researchers, policymakers, and other stakeholders to reflect on new ideas, rethink existing practices, and contribute to the improvement of education.

The first article, Collaborative Learning Approaches and Their Influence on High School Students' Conceptual Understanding in Mathematics, examines the effectiveness of collaborative learning strategies in enhancing students' understanding of mathematical concepts. The study highlights how peer interaction, group problem-solving, and shared learning experiences contribute to deeper conceptual comprehension, improved communication, and greater engagement in mathematics learning.

The second article, Effectiveness of Socio-Emotional Learning on Metacognitive Awareness Among Secondary School Students, investigates the impact of socio-emotional learning programmes on students' metacognitive awareness. The article emphasizes the role of emotional regulation, self-awareness, and social skills in fostering reflective thinking, self-monitoring, and effective learning strategies among secondary school learners.

The third article, Stories That Teach: Narrative Pedagogy and Conceptual Understanding in Science Teacher Education, explores the potential of narrative pedagogy as an innovative instructional approach in science teacher education. It highlights how storytelling and narrative experiences can promote meaningful learning, deepen conceptual understanding, and help prospective teachers connect scientific ideas with real-life contexts.

The fourth article, Digital Divide in Finance: Online Financial Literacy and Financial Independence Among Elderly People in Kerala, examines the relationship between digital financial literacy and financial independence among the elderly population. The study discusses the challenges posed by the digital divide and highlights the importance of developing online financial competencies to empower older adults in managing their financial affairs effectively.

The fifth article, Positive Psychology in Education: The Role of Hope, Optimism, and Goal Setting in Enhancing Student Well-Being and Achievement, examines the contribution of positive psychological constructs to students' academic success and overall well-being. The article highlights how fostering hope, optimism, and purposeful goal setting can strengthen motivation, resilience, and achievement, thereby supporting holistic student development.

The sixth article, Effectiveness of the SECI Knowledge Management Model in Enhancing Critical Thinking, Information Literacy, and Career Readiness Skills among Higher Secondary School Students, investigates the application of the SECI knowledge management framework in educational settings. The study demonstrates how structured knowledge creation and sharing processes can enhance students' critical thinking, information literacy, and preparedness for future academic and career opportunities.

The seventh article, Sustainable Practices in Higher Education: Pathways Towards Institutional Transformation, explores the role of sustainability initiatives in transforming higher education institutions. The article discusses strategies for integrating sustainable practices into academic, administrative, and campus activities, emphasising their contribution to environmental responsibility, social development, and institutional effectiveness.

The articles in this issue contribute valuable ideas, research findings, and thoughtful analyses to the field of education. We believe that the studies presented will serve as a useful resource for educators, researchers, and policymakers who are committed to understanding and improving educational practices.

We sincerely thank the authors, reviewers, and members of the editorial team for their dedication and hard work in making this issue possible. We hope that these contributions inspire further research, discussion, and innovation in the pursuit of quality education.

The Editorial Team

Journal of Strides in Education

ABOUT THE JOURNAL

JOURNAL OF STRIDES IN EDUCATION (JSE), a biannual, peer-reviewed multidisciplinary journal published by SNM Training College, Moothakunnam highlights research in the broad areas of education. Original contributions, as well as review articles in important areas of Education, Humanities, and Social Sciences, that contribute to the development of knowledge across the broad field of education, are relevant to this journal. The Journal started in 2022 and is published twice a year. One issue is from May to October and another issue is from November to April.

DETAILS OF THE JOURNAL

Title	JOURNAL OF STRIDES IN EDUCATION (JSE) (Biannual, peer-reviewed interdisciplinary e-journal)
Frequency	Two issues per year
ISSN	3048-5835
Publisher	The Principal, SNM Training College, Moothakunnam
Chief Editor	Dr. Saritha V. K.
Copyright	SNM Training College, Moothakunnam
Starting Year	2022
Subject	Multidisciplinary
Language	English
Publishing Format	Online
Phone No.	0484-2482084
Email id	snmtrainingcollegemkm@gmail.com
Website	https://jse.snmtrainingcollege.org
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**COLLABORATIVE LEARNING APPROACHES AND THEIR INFLUENCE ON
HIGH SCHOOL STUDENTS' CONCEPTUAL UNDERSTANDING IN
MATHEMATICS**

Ankitha Mohan

Abstract

The study investigates the influence of collaborative learning approaches on high school students' conceptual understanding in mathematics. Collaborative learning emphasizes peer interaction, group discussions, cooperative problem-solving, and shared responsibility in the learning process. The study aimed to examine how collaborative learning strategies contribute to students' conceptual clarity, engagement, confidence, and problem-solving abilities in mathematics. A survey method was adopted, and data were collected from high school students in selected schools using a structured questionnaire administered through Google Forms. The collected data were analyzed using appropriate descriptive techniques. The findings revealed that collaborative learning positively influences students' conceptual understanding, logical reasoning, classroom participation, and retention of mathematical concepts. Students reported that group discussions, peer explanations, and cooperative activities helped them understand mathematical ideas more effectively and reduced their fear of the subject. The study also highlighted the significant role of teacher guidance, parental support, and effective classroom management in promoting successful collaborative learning experiences. The study concludes that collaborative learning creates an interactive, supportive, and learner-centered environment in mathematics classrooms and recommends the integration of collaborative learning strategies into regular mathematics instruction to enhance students' academic achievement and conceptual understanding.

Keywords: collaborative learning, conceptual understanding, mathematics education, peer learning, high school students

INTRODUCTION

Mathematics is often regarded as a difficult and abstract subject that requires logical reasoning, analytical thinking, and conceptual understanding. Traditional teacher-centered methods, which mainly rely on lectures and rote memorization, frequently fail to address the diverse learning needs of students. Many learners experience difficulties in understanding mathematical concepts when learning occurs in isolation without interaction or discussion.

In recent years, collaborative learning has emerged as an effective instructional strategy for improving students' participation, engagement, and conceptual understanding in mathematics classrooms. Collaborative learning refers to instructional approaches in which students work together in groups to solve problems, share ideas, and construct knowledge collectively. Approaches such as group discussions, peer tutoring, cooperative problem-solving, and team-based learning encourage students to actively participate in the learning process.

Collaborative learning is grounded in social constructivist theory, particularly the ideas proposed by Vygotsky, which emphasize that knowledge is constructed through social interaction and communication. Through peer discussions and shared activities, students are able to articulate their thoughts, clarify misconceptions, and understand concepts from multiple perspectives. Such interactions help students develop reasoning skills, confidence, and positive attitudes toward mathematics.

The present study focuses on understanding how collaborative learning approaches influence high school students' conceptual understanding in mathematics. It aims to explore students' perceptions, identify the benefits and challenges of collaborative learning, and examine how group interaction supports deeper understanding of mathematical concepts.

BACKGROUND OF THE STUDY

Mathematics education has undergone significant changes over the years, shifting from teacher-centered instruction toward learner-centered and activity-oriented approaches. As mathematical concepts become more abstract at the high school level, students require instructional methods that encourage active participation and meaningful engagement.

Collaborative learning has gained importance because it provides opportunities for students to learn through interaction, communication, and cooperation. Research studies have shown that students who participate in collaborative activities demonstrate better conceptual understanding, improved problem-solving skills, and increased motivation toward learning mathematics.

Despite the recognized benefits of collaborative learning, its effectiveness depends on several factors such as teacher facilitation, group dynamics, classroom environment, and student participation. Some students may face challenges such as unequal participation, lack of confidence, or ineffective communication within groups. Therefore, understanding students' perceptions and experiences regarding collaborative learning is essential for improving mathematics instruction. This study seeks to examine the influence of collaborative learning approaches on conceptual understanding among high school students and to provide insights for enhancing mathematics teaching practices.

NEED AND SIGNIFICANCE OF THE STUDY

The present study is significant for the following reasons:

- It helps in understanding how collaborative learning enhances conceptual understanding in mathematics.
- It emphasizes the importance of interactive and learner-centered teaching approaches.

- It provides insights into students' perceptions and experiences regarding collaborative learning.
- It supports teachers in designing effective collaborative activities and classroom strategies.
- It contributes to modern pedagogical practices that promote active learning and peer interaction.
- It identifies challenges faced during collaborative learning activities.
- It highlights the role of collaborative learning in improving confidence, reasoning skills, and academic performance.
- It provides guidance for curriculum developers and policymakers to integrate collaborative approaches into mathematics education.

OBJECTIVES OF THE STUDY

The objectives of the study were:

1. To investigate the influence of collaborative learning approaches on conceptual understanding in mathematics.
2. To examine students' perceptions and attitudes toward collaborative learning.
3. To identify collaborative strategies that contribute to conceptual understanding.
4. To analyze the role of peer interaction in developing reasoning and problem-solving skills.
5. To determine the extent to which collaborative learning promotes student engagement and participation.
6. To examine the influence of collaborative learning on students' confidence in mathematics.
7. To identify challenges faced during collaborative learning activities.
8. To evaluate the role of teacher facilitation in collaborative learning.

9. To compare collaborative learning with traditional teacher-centered instruction.
10. To provide recommendations for effective implementation of collaborative learning in mathematics classrooms.

DELIMITATIONS OF THE STUDY

1. The study is confined to high school students and does not include learners from primary or higher secondary levels. Therefore, the findings may not be generalizable to students at other educational stages.
2. The research focuses exclusively on mathematics education and examines the influence of collaborative learning approaches. Other teaching methods and subject areas are beyond the scope of this study.
3. Data were collected during a specific academic period, which limits the study's ability to assess long-term changes in students' conceptual understanding and perceptions of collaborative learning.
4. The study was conducted in a selected number of schools due to time and logistical constraints. Consequently, the findings may not represent the experiences of all high school students.
5. The investigation is based solely on students' perceptions and experiences. The perspectives of teachers, school administrators, and parents were not included in the study.
6. The collaborative learning activities examined were limited to those implemented during the study period and may not encompass the full range of collaborative strategies used in mathematics classrooms.

LIMITATIONS OF THE STUDY

1. The study relies on self-reported data collected through questionnaires. As a result, responses may be influenced by personal biases, individual interpretations, or social desirability factors.

2. The effectiveness of collaborative learning may vary according to students' prior experiences, communication skills, and willingness to participate in group activities, which may affect the findings.
3. Variations in classroom environments, teacher facilitation practices, and school culture may influence students' perceptions and experiences, thereby affecting the consistency of the results.
4. The duration of the study and the time allocated for collaborative learning activities may not have been sufficient to capture their long-term impact on conceptual understanding in mathematics.
5. Students' levels of motivation, interest in mathematics, and group dynamics may have influenced their responses, which could affect the accuracy and reliability of the findings.

METHODOLOGY

The study employed a survey method for collecting data. The research was conducted among high school students from random selected schools. A structured questionnaire consisting of questions related to collaborative learning and conceptual understanding in mathematics was prepared using Google Forms. The questionnaire was developed under the guidance of the project supervisor to ensure clarity, simplicity, and relevance.

The Google Form link was distributed to students through online platforms such as WhatsApp and email. Responses collected from the participants were organized, tabulated, and analyzed systematically to draw meaningful conclusions regarding the influence of collaborative learning approaches on mathematics learning.

ANALYSIS AND INTERPRETATION

The collected data were analyzed and interpreted based on students' responses to various statements related to collaborative learning and conceptual understanding in mathematics. The findings revealed that the majority of students viewed collaborative learning positively. Students reported that group discussions, peer interaction, and shared problem-

solving activities improved their understanding of mathematical concepts and enhanced logical reasoning skills.

A significant number of students agreed that collaborative learning improved their problem-solving ability, memory retention, and conceptual clarity. Students also stated that discussing mathematical problems with peers helped them identify and correct mistakes more effectively. The analysis further showed that teacher guidance and feedback during collaborative activities played an important role in supporting meaningful learning. Peer support and parental encouragement also contributed positively toward students' confidence and understanding in mathematics.

However, some students expressed neutral or negative responses, indicating that collaborative learning may not be equally effective for all learners. Issues such as unequal participation, lack of structure, and insufficient facilitation were identified as possible challenges. Overall, the findings suggest that collaborative learning approaches significantly contribute to improving conceptual understanding and engagement in mathematics among high school students.

MAJOR FINDINGS

The major findings of the study are as follows:

1. Collaborative learning is widely practiced in mathematics classrooms.
2. Group discussions improve conceptual understanding and reasoning skills.
3. Collaborative learning increases student interest and engagement in mathematics.
4. Peer interaction promotes confidence and active participation.
5. Collaborative activities reduce fear and anxiety toward mathematics.
6. Students learn multiple problem-solving strategies through teamwork.
7. Collaborative learning encourages meaningful learning instead of rote memorization.
8. Teacher guidance is essential for the success of collaborative activities.
9. Peer and parental support positively influence students' confidence in mathematics.

10. Collaborative learning enhances conceptual clarity and academic performance.

EDUCATIONAL IMPLICATIONS

The findings of the study have important implications for mathematics education:

1. Mathematics classrooms should adopt learner-centered and collaborative teaching approaches.
2. Teachers should integrate group discussions and cooperative problem-solving activities regularly.
3. Teacher education programs should provide training on collaborative teaching strategies.
4. Curriculum designers should include collaborative tasks in mathematics syllabi.
5. Positive classroom environments should be created to encourage communication and teamwork.
6. Assessment practices should focus on conceptual understanding and collaborative performance.
7. Schools should encourage parental support for collaborative learning practices.

CONCLUSION

The study titled “Collaborative Learning Approaches and Their Influence on High School Students’ Conceptual Understanding in Mathematics” examined the role of collaborative learning in enhancing mathematics learning among high school students. The findings clearly indicate that collaborative learning has a positive influence on students’ conceptual understanding, confidence, reasoning ability, and engagement in mathematics. Group discussions, peer interaction, and cooperative activities helped students develop deeper understanding and reduced dependence on rote memorization. The study also emphasizes the

importance of effective teacher facilitation, proper planning, and supportive classroom

environments for successful implementation of collaborative learning strategies.

In conclusion, collaborative learning approaches can significantly improve mathematics learning when implemented systematically and meaningfully. Therefore, integrating collaborative strategies into regular classroom practice can contribute to improved academic achievement and meaningful learning experiences among high school students.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are proposed:

1. Mathematics teachers should regularly use collaborative learning strategies in classrooms.
2. Group activities should be well-structured with clear objectives and roles.
3. Teachers should actively guide and monitor collaborative tasks.
4. Heterogeneous grouping should be encouraged to support peer learning.
5. Collaborative tasks should focus on conceptual understanding and real-life application.
6. Schools should organize training programs for teachers on collaborative learning methods.
7. Classroom environments should encourage discussion, participation, and mutual respect.
8. Parents should support collaborative study habits at home.
9. Curriculum planners should integrate collaborative learning activities into mathematics syllabi.

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**EFFECTIVENESS OF SOCIO-EMOTIONAL LEARNING ON
METACOGNITIVE AWARENESS AMONG SECONDARY SCHOOL STUDENTS**

Aswathy D. V. & Diya N. C.

Abstract

Socio-Emotional Learning (SEL) has gained considerable attention in contemporary education due to its potential to foster students' social, emotional, and cognitive development. The study aimed to determine whether instruction based on SEL could significantly enhance students' metacognitive awareness compared to instruction based on the Activity-Oriented Method. A quasi-experimental method employing a pre-test–post-test non-equivalent group design was adopted. The sample comprised 90 9th-standard students following the Kerala State Syllabus from Ernakulam district. The experimental group received instruction based on Socio-Emotional Learning, while the control group was taught using the Activity-Oriented Method. Metacognitive Awareness was measured using the Metacognitive Awareness Scale developed by Sindhu (2020). The collected data were analysed using descriptive statistics, independent sample t-test, paired sample t-test, Analysis of Covariance (ANCOVA), and effect size measures. The findings revealed a significant improvement in the Metacognitive Awareness of students exposed to SEL-based instruction.

Keywords: socio-emotional learning, metacognitive awareness, secondary school students

Introduction

Socio-Emotional Learning (SEL) emerged as a formal educational framework in 1994 through collaborative efforts of educators, researchers, and health professionals to enhance students' social, emotional, and academic competencies (CASEL, 2012; Weissberg et al., 2015). The CASEL framework identifies five core competencies—self-awareness, self-management, social awareness, relationship skills, and responsible decision-making—which enable students to regulate emotions, build positive relationships, make responsible choices, and engage effectively in social contexts (CASEL, 2003, 2015, 2020). Extensive research has demonstrated that SEL contributes significantly to academic engagement, improved classroom climate, enhanced social-emotional competence, and reduced behavioural and emotional problems (Durlak et al., 2011; Sklad et al., 2012). Meta-analytic evidence further indicates that the benefits of SEL interventions extend beyond programme completion, with positive effects persisting for at least six months (Taylor et al., 2017). The growing emphasis on student-centred and constructivist educational approaches has increased the relevance of SEL in promoting both academic and social-emotional development, particularly when SEL skills are explicitly taught, practised, and integrated with academic instruction (Martin, 2012; Weissberg et al., 2015; Elias et al., 1997). Closely associated with SEL is Metacognitive Awareness, which refers to learners' ability to monitor, regulate, and evaluate their own thinking and learning processes. Students with high metacognitive awareness are better able to plan, monitor, and assess their learning strategies, thereby becoming more effective and self-regulated learners. Research suggests that metacognitive awareness contributes significantly to independent learning, reflective thinking, problem-solving, and self-regulation (Flavell, 1979; Schraw & Dennison, 1994). Recent studies indicate that effective SEL programmes are those built around core competencies and implemented through flexible, evidence-based

approaches that support learners' cognitive and emotional development (Lawson et al., 2019). Furthermore, empirical validation of the CASEL framework among adolescents has confirmed the stability of its five-factor structure and its positive relationship with educational and developmental outcomes, supporting its applicability beyond elementary education (Ross & Tolan, 2018).

Need and Significance of the Study

Socio-Emotional Learning (SEL) plays a vital role in education by helping students regulate emotions, develop positive relationships, cope with challenges, and create supportive learning environments that foster both academic and personal growth. The Collaborative for Academic, Social, and Emotional Learning identified five core SEL competencies: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making (CASEL, 2020). Research indicates that SEL improves behaviour, motivation, confidence, engagement, and overall well-being. Closely related to SEL is Metacognitive Awareness, which encompasses metacognitive knowledge, metacognitive monitoring, and metacognitive regulation, enabling students to reflect on, monitor, and control their own learning processes (Flavell, 1979; Schraw & Dennison, 1994). These metacognitive processes contribute to effective learning strategies, self-regulated learning, and independent problem-solving. Although substantial evidence supports the individual benefits of SEL and metacognition, limited research has examined the influence of SEL on the development of metacognitive awareness among secondary school students. Kumari (2020) reported that a socio-emotional learning programme significantly improved students' openness and interpersonal interaction skills, thereby supporting their overall development. Similarly, Ross and Tolan (2018) provided evidence that SEL positively influences adolescents' developmental and educational outcomes. However, the effectiveness of SEL interventions depends greatly on the quality, sustainability, and systemic implementation of programmes within schools (Meyers

et al., 2019). Research further demonstrates that SEL strategies promoting self-awareness,

emotional regulation, interpersonal competence, and responsible decision-making positively affect student engagement, motivation, and learning experiences (Saroya & Buck, 2025). Moreover, metacognitive awareness has been found to be strongly associated with effective learning and self-regulation. Rahman et al. (2010) reported a significant positive relationship between metacognitive awareness and students' learning performance, indicating that learners with higher metacognitive awareness are better able to monitor and regulate their learning processes. Collectively, these findings suggest that SEL can create conditions that support the development of metacognitive awareness by fostering self-reflection, emotional regulation, responsible decision-making, and self-directed learning. Therefore, the present study is significant as it seeks to examine the effectiveness of Socio-Emotional Learning on Metacognitive Awareness among Secondary School Students. The findings may provide valuable insights for educators, curriculum developers, and policymakers in designing interventions that promote both socio-emotional competencies and metacognitive development.

Recent research has provided substantial evidence regarding the effectiveness of Socio-Emotional Learning (SEL) interventions in enhancing students' social, emotional, and cognitive development. Classroom-based, mindfulness-oriented, technology-assisted, culturally responsive, and physical education-based SEL programmes have consistently improved self-awareness, self-management, social awareness, relationship skills, and responsible decision-making among learners (Wintermantel et al., 2025; Carpendale et al., 2025; Sindiani et al., 2025; Yang et al., 2025; Cipriano et al., 2025). Studies further indicate that therapy dog-assisted interventions, mindfulness-based programmes, and teacher professional development initiatives contribute to emotional regulation, reflective thinking, stress reduction, and improved classroom engagement,

thereby creating conditions conducive to metacognitive development (Wepener & Moen, 2025; Konishi et al., 2025; Masry-Herzallah, 2025). The integration of digital technologies and artificial intelligence within SEL programmes has also demonstrated positive effects on empathy, emotional regulation, and responsible decision-making (Henriksen et al., 2025; Afridi et al., 2025; Candeias et al., 2025). Meta-analyses and systematic reviews consistently support the effectiveness of SEL in improving emotional awareness, behaviour, academic performance, and reflective capacities that are closely associated with metacognitive growth (Brunner et al., 2025; Stubbs & Sorensen, 2024; Campos, 2024; Palamar et al., 2024; Lim et al., 2024). Similarly, studies on Metacognitive Awareness have established its significant role in promoting self-regulated learning, reflective thinking, problem-solving, and academic success. Research demonstrates that pedagogical approaches such as flipped classrooms, POGIL, phenomenon-based learning, metacognitive instruction, and POEP models enhance students' metacognitive knowledge, monitoring, and regulation while simultaneously strengthening several SEL competencies (Chan et al., 2022; Ilma et al., 2022; Balashov et al., 2021; Bourdeaud'hui et al., 2021; Akkaş & Eker, 2021; Abdelrahman, 2020; Akaydın et al., 2020; Amin & Adiansyah, 2020; Bakkaloglu, 2020). Furthermore, higher levels of metacognitive awareness have been associated with improved reflective thinking, self-regulated learning, and effective problem-solving abilities (Çini et al., 2020; Rahayu & Hertanti, 2020; Novia et al., 2019; Limueco & Prudente, 2019; Cascolan, 2019; Adegoboye, 2019). Despite these findings, the literature reveals a notable gap in understanding the direct relationship between SEL and Metacognitive Awareness. While SEL competencies such as self-awareness, self-management, and responsible decision-making appear conceptually linked to metacognitive processes, most studies have examined these constructs independently. Furthermore, existing research is predominantly conducted in Western settings and frequently relies on correlational

designs, limiting causal interpretations and contextual applicability. Very few studies have employed experimental approaches to investigate whether SEL-based interventions can directly enhance Metacognitive Awareness among Secondary School Students, particularly in the Indian educational context. Therefore, there is a need for empirical studies examining the effectiveness of Socio-Emotional Learning in developing Metacognitive Awareness among Secondary School Students.

Objective of the Study

- To test the Effectiveness of Instruction Based on Socio-emotional Learning on Metacognitive Awareness of Secondary School Students over Instruction Based on Activity Oriented Method.

Hypothesis of the Study

- There will be a significant difference on Metacognitive Awareness of Secondary School Students taught through Instruction Based on Socio-emotional Learning compared to those taught through Instruction Based on Activity Oriented Method.

Methodology in Brief

The method adopted for the study was the experimental method. A pre-test post-test non-equivalent group design, which comes under quasi-experimental designs, was selected to examine the effect of Instruction based on Socio-emotional Learning. The study involved independent and dependent variables. The independent variables were Instruction Based on Socio-emotional Learning (SEL) and Instruction Based on an Activity-Oriented Method, while the dependent variable was Metacognitive Awareness. The population considered for the study was Secondary School Students, and the sample comprised 90, 9th standard students following the Kerala State Syllabus from Ernakulam district. A random sampling technique was used to

select the institutions, and intact classrooms were considered for forming the experimental and control groups. Materials used were Lesson Transcript in Chemistry Based on Socio-emotional Learning for 9th Standard Students (Diya & Aswathy, 2025) and Lesson Transcript in Chemistry Based on Activity-Oriented Method for 9th Standard Students. Tool used was adopted Metacognitive Awareness Scale (Sindhu P.G, 2020) (Investigator established the reliability and validity of the test before using it). The data collected for the study were analysed using the following statistical methods such as, Descriptive statistics like mean, median, mode, standard deviation, skewness and kurtosis, Standard error and Confidence interval of the sample statistics, Independent sample t –test, Paired sample t –test, Analysis of Covariance (ANCOVA) and Effect size (Cohen's d and Partial η^2).

Findings of the Study

Hypothesis 1: There will be a significant difference on Metacognitive Awareness of Secondary School Students taught through Instruction based on Socio-emotional Learning compared to those taught using Instruction based on Activity Oriented Method.

The above hypothesis is converted into null hypothesis for the purpose of statistical calculations. The hypothesis is rewritten as:

H₀: There will be no significant difference on Metacognitive Awareness of Secondary School Students taught using instruction based on Socio-emotional Learning compared to those taught using Instruction based on Activity-Oriented Method.

The mean score of the pre-test for the Experimental Group was $M = 130.09$, while the post-test mean increased to $M = 160.24$. The difference between pre-test and post-test scores was statistically significant ($t = 17.18$, $p < .01$), indicating a substantial improvement in Metacognitive Awareness. The calculated effect size (Cohen's $d = 2.40$) confirms a very large effect of the instructional intervention. Hence Metacognitive Awareness is significantly enhanced by Instruction Based on Socio-emotional Learning of Secondary School Students.

scored $M = 138.53$, with a significant difference ($t = 8.32$, $p < .01$, $d = 1.67$). The mean gain score was also greater for the Experimental group ($M = 30.15$) than the Control group ($M = 10.94$, $t = 7.96$, $p < .01$, $d = 1.79$), indicating markedly higher improvement. ANCOVA results controlling for pre-test scores revealed a significant instructional effect ($F = 154.91$, $p < .001$, partial $\eta^2 = 0.640$), with adjusted post-test means showing the Experimental group ($M = 165.36$) significantly outperforming the Control group ($M = 155.59$, mean difference = 9.768 , $t = 12.44$, $p < .001$). Hence Metacognitive Awareness of Secondary School Students is significantly higher when taught using Instruction Based on Socio-emotional Learning compared to the Activity-Oriented Method.

Conclusion based on the study is instruction based on Socio-emotional Learning is effective in enhancing Metacognitive Awareness of Secondary School Students compared to the Activity-Oriented Method. Hence null hypothesis is rejected, So the alternate Hypothesis is accepted. There is significant increase on Metacognitive Awareness of Secondary School Students taught using instruction based on Socio-emotional Learning compared to those taught using Instruction based on Activity-Oriented Method.

Discussion Based on Findings

The present study revealed that instruction integrating Socio-emotional Learning (SEL) significantly enhanced Secondary School Students' Metacognitive Awareness ($M = 160.24$ vs. 138.53) compared to Activity-Oriented Method, with large to very large effect sizes. These findings align with prior research demonstrating that SEL fosters self-awareness, self-management, and reflective thinking, which are crucial for developing Metacognitive Awareness (Ilma et al., 2022; Limueco & Prudente, 2019). While both SEL-based and Activity-Oriented Method contributed to learning gains, the Experimental group receiving SEL-based strategies showed markedly higher improvement, indicating that SEL enhances the effectiveness of learning beyond traditional activity-driven methods. These results are

consistent with studies emphasizing the link between SEL competencies and Metacognitive

Awareness (Yanik & Afat, 2022; Balashov et al., 2021; Cascolan, 2019). Integrating SEL into classroom instruction enabled students to regulate their emotions, reflect on learning strategies, and plan their problem-solving approaches less emphasized in Activity-Oriented Methods. Overall, SEL-based instruction proved more effective than Activity-Oriented Method in promoting Metacognitive development highlighting the value of Socio-emotional Learning for holistic learning.

Educational Implications of the Study

The findings of the study indicate that instruction based on Socio-emotional Learning (SEL) significantly enhances Metacognitive Awareness of secondary school students. Based on these outcomes, the following educational implications can be drawn. Teachers should integrate SEL principles such as self-awareness, emotional regulation, and responsible decision-making into science instruction to promote deeper learning and engagement. SEL-based instruction not only improves academic performance but also strengthens students' ability to monitor, regulate, and reflect on their own learning. Educators can use this approach to foster higher-order thinking skills and independent learning habits, leading to sustained academic improvement. Curriculum designers and school administrators may embed SEL-focused modules, activities, and teaching strategies into the science curriculum. This could include collaborative tasks, reflective exercises, and emotion-aware pedagogical approaches that enhance student motivation and understanding. Professional development programs should equip teachers with strategies to integrate socio-emotional competencies alongside traditional subject matter instruction. Teachers can leverage SEL strategies to address individual learning needs, foster a positive classroom climate, and reduce academic anxiety or stress. Large effect sizes in achievement suggest that SEL strategies increase student interest and engagement in learning. Teachers can design lessons that motivate students to participate actively, collaborate meaningfully, and persist in challenging tasks. Teachers can leverage SEL to promote self-directed learning, where students take ownership of their learning goals and strategies. SEL

fosters a supportive and emotionally responsive learning environment, teachers can reduce anxiety related to challenging subjects like chemistry, improving both achievement and confidence.

Conclusion

The present study investigated the Effectiveness of Socio-emotional Learning (SEL) on the Metacognitive Awareness of Secondary School Students. The findings indicate that instruction based on SEL significantly enhances Metacognitive Awareness compared to Activity-Oriented Methods. This result gives the importance of embedding SEL within the educational framework to foster holistic student development. By integrating cognitive, emotional, and motivational elements into classroom instruction, educators can create supportive learning environments that promote Metacognitive Growth. Overall, this study provides strong evidence that SEL is crucial for enhancing students Metacognitive Awareness, preparing them to become self-regulated, reflective, and motivated learners. The findings support the adoption of SEL-aligned teaching strategies across curricula and encourage further research to explore its long-term impact across diverse educational contexts.

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Stories That Teach: Narrative Pedagogy and Conceptual Understanding in Science

Teacher Education

Bindu David & Dan George

Abstract

Science teacher education has long privileged the logico-scientific mode of knowing, namely the transmission of verified fact, procedural demonstration, and analytical reasoning, at the expense of the narrative mode through which human beings most naturally make sense of the world. This narrative review examines thirty peer-reviewed studies published between 1986 and 2025, drawn from Scopus, ERIC, Web of Science, and Google Scholar, to theorise narrative pedagogy as a pedagogically powerful and underutilised approach to deepening conceptual understanding among pre-service science teachers. The review is organised thematically across three domains: the documented limitations of conventional science teacher education in building genuine conceptual understanding, the theoretical and empirical foundations of narrative pedagogy in science education, and the curricular implications of integrating narrative approaches into science teacher education programmes. Findings suggest that when scientific concepts are encountered through narrative structures, including historical accounts of discovery, case-based stories of scientific reasoning, and teacher-constructed narratives of natural phenomena, pre-service teachers develop deeper, more durable, and more transferable conceptual understanding than conventional expository instruction produces. Grounded in Bruner's narrative theory, Egan's story form model, and constructivist accounts of conceptual change, the review proposes a conceptual framework and calls for narrative pedagogy to be recognised as a structural component of science teacher education rather than a supplementary flourish.

Keywords: narrative pedagogy, science teacher education, conceptual understanding, storytelling, conceptual change, pre-service teachers

Introduction

There is a paradox at the heart of science teacher education. The discipline that is perhaps most animated by questions, by the restless human impulse to understand how the natural world works, why phenomena behave as they do, and what lies beyond the boundary of current knowledge, is routinely taught in ways that suppress precisely this spirit of inquiry. Pre-service science teachers are more often presented with conclusions than with the journeys that produced them. They receive the periodic table but rarely the story of the scientists whose rivalries, intuitions, and failures shaped it. They learn about cellular respiration as a metabolic pathway rather than as a conceptual achievement won over decades of painstaking and often bitterly contested research. In this way, science teacher education risks producing teachers who know the answers but have never truly inhabited the questions. This is not a trivial concern. A teacher who has never felt the conceptual difficulty of a scientific idea is poorly equipped to help students navigate that difficulty. Conceptual understanding, that is, understanding which is deep, flexible, and transferable rather than surface-level and quickly forgotten, is precisely what science teacher education must cultivate, and it is precisely what conventional instructional approaches frequently fail to produce (Loughran, 2006).

It is here that narrative pedagogy offers a theoretically grounded and empirically supported alternative. Bruner (1986) argued that human beings operate through two irreducible modes of thought: the logico-scientific, which seeks truth through argument and evidence, and the narrative, which seeks meaning through story, character, and event. These modes are not in competition. They are complementary, and education that draws only on the former impoverishes the learner in ways that are consequential. In science teacher education, the neglect of the narrative mode produces teachers who can explain scientific concepts but struggle to make those concepts genuinely intelligible to the students in front of them. Storytelling, in this view, is not a pedagogical embellishment. It is a cognitive necessity.

facilitate conceptual change, deepen engagement with scientific ideas, and support the kind of reflective understanding that pre-service teachers require if they are to teach science well (Hadzigeorgiou, 2016; Soares, 2023). Historical narratives of scientific discovery have been shown to help learners understand not only what scientists found but how and why they looked, and this understanding of scientific process is foundational to effective science teaching (Klassen, 2009). This narrative review draws on thirty peer-reviewed studies published between 1986 and 2025 to develop this argument. It does not argue that narrative pedagogy should displace other approaches. It argues that narrative pedagogy should be recognised as a structural component of science teacher education, one that addresses what expository and procedural instruction alone cannot reach.

Objectives

The present review is guided by the following objectives:

- To examine the documented limitations of conventional science teacher education with respect to the development of genuine conceptual understanding among pre-service teachers.
- To review the theoretical and empirical foundations of narrative pedagogy and its relationship with conceptual learning in science teacher education.
- To propose a conceptual framework for integrating narrative pedagogy into science teacher education programme design.

Methodology

This review adopts a narrative review methodology to examine the relationship between narrative pedagogy and conceptual understanding in science teacher education. Thirty peer-reviewed studies published between 1986 and 2025 were drawn from Scopus, ERIC, and Web of Science, with Google Scholar consulted supplementarily to capture practitioner scholarship and theoretically significant foundational works not consistently indexed in these databases.

understanding, pre-service science teachers, conceptual change, Bruner narrative, Egan story form, historical narratives in science, and science teacher identity, used independently and in combination. Studies were included on the basis of peer-reviewed status, relevance to science teacher education or closely related fields, and direct applicability to the review's thematic objectives. The date range was extended to 1986 to accommodate foundational narrative theory alongside contemporary empirical literature. Initial results were screened by title, abstract, and full-text review before final selection. The analysis is thematic rather than statistical, reading selected studies in conversation with one another to allow a cumulative theoretical argument to emerge. It is acknowledged that the narrative pedagogy literature carries a disposition towards qualitative and humanistic methodologies, and findings should be interpreted with this orientation in mind.

The Conceptual Deficit in Conventional Science Teacher Education

Science teacher education programmes across the world share a recognisable structure. Pre-service teachers engage with subject content through lectures and laboratory sessions, study curriculum frameworks and pedagogical methods, complete supervised teaching practice, and are assessed on their ability to plan and deliver lessons that meet prescribed learning outcomes. This structure is not without merit. It produces teachers who are familiar with their subject content, aware of curriculum requirements, and practised in the basic routines of classroom management and lesson delivery.

What it less reliably produces is teachers with genuinely deep conceptual understanding of the science they are asked to teach. Research has consistently documented a troubling gap between pre-service science teachers' surface familiarity with scientific content and their capacity for flexible, generative conceptual thinking about that content (Loughran, 2006). Pre-service teachers frequently hold the same misconceptions about foundational scientific concepts as the school students they will teach, and conventional instructional approaches do not always succeed in dislodging these misconceptions because they address knowledge at the

surface level rather than at the level of conceptual structure (Posner et al., 1982). A student can memorise the definition of natural selection and still not understand why variation within a population is necessary for selection to operate. They can reproduce the equations governing gas behaviour and remain entirely unaware of the conceptual revolution that the kinetic-molecular theory represented when it displaced earlier accounts of heat. The reasons for this conceptual shallowness are not difficult to identify. Conventional science teacher education tends to privilege what Bruner (1986) calls the logico-scientific mode of thought, characterised by formal argument, empirical verification, and the systematic organisation of knowledge. This mode is indispensable to science, but it is not sufficient on its own for genuine conceptual understanding. Conceptual understanding requires not only the ability to reproduce correct answers but the capacity to feel the force of a scientific idea, to understand why it matters, what it replaced, and why the question it addresses is genuinely worth asking.

Conventional science teacher education offers pre-service teachers science as a finished product. Concepts arrive already formed, already verified, and already stripped of the human drama that produced them. Newton's laws appear without Newton. The double helix arrive without the competitive urgency of the race to discover it, without Rosalind Franklin's contribution and its complicated history, without the false starts and moments of sudden clarity that made it one of the most consequential scientific achievements of the twentieth century. When scientific knowledge is presented in this way, pre-service teachers have no reason to find it surprising, no framework for understanding why it was difficult, and no model for the kind of thinking that science actually requires. They learn to present science as it has been presented to them, and the conceptual shallowness is passed forward.

Narrative Pedagogy and Conceptual Understanding: Theoretical and Empirical Foundations

The theoretical case for narrative pedagogy in science education rests on several converging lines of argument. The most foundational is Bruner's (1986) distinction between

the logico-scientific and narrative modes of thought. For Bruner, the narrative mode is not a watered-down version of the logico-scientific. It is a distinct and irreplaceable cognitive tool, and it is the mode through which human beings most naturally construct understanding of complex, ambiguous, and unfamiliar phenomena. When pre-service teachers encounter a scientific concept through a narrative structure, they are invited to follow a line of reasoning, to understand the obstacles that made the concept difficult to reach, and to experience something of the intellectual movement that its discovery required. This is precisely the kind of encounter that facilitates conceptual change, the genuine restructuring of a learner's conceptual framework rather than the mere addition of new information to an existing but unchanged structure (Posner et al., 1982).

Kieran Egan's story form model extends this argument in directions particularly relevant to science teacher education. Egan (1986) proposed that the story form, with its fundamental structure of conflict, complication, and resolution, is a deep cognitive structure through which human beings make sense of experience across all domains. In science education, this means presenting concepts as answers to questions that were genuinely difficult to answer, as resolutions of problems that were genuinely hard to solve. The concept of evolution by natural selection becomes far more conceptually accessible when presented as the resolution of the great nineteenth-century problem of how species come to be so exquisitely fitted to their environments. When the problem is vivid, the solution becomes intelligible rather than merely memorisable. Hadzigeorgiou (2016) further argues that wonder, the sense of genuine surprise and curiosity that arises when the natural world exceeds one's expectations, is among the most powerful motivational forces in science learning, and that narrative is among the most reliable means of cultivating it. A pre-service teacher who has experienced wonder in the face of a scientific concept is more likely to cultivate that wonder in their own students than one who has encountered the same concept as an item of curriculum content.

substantial. Dahlstrom (2014) demonstrated that scientific information presented in narrative form is more readily assimilated, more accurately remembered, and more flexibly applied than equivalent information presented in expository form, because narrative provides a familiar cognitive scaffolding through which new and counterintuitive ideas can be anchored to existing understanding. Soares (2023) argues that narrative structures engage the learner's capacity for mental simulation: when following a story, the reader or listener constructs a mental model of the described events and participates imaginatively in their unfolding. This imaginative participation produces understanding that is qualitatively different from that produced by reading a textbook account, because it engages the learner as an active meaning-maker rather than a passive recipient of information.

The role of historical narratives of scientific discovery is particularly significant. Klassen (2009) reviewed a substantial body of research on their use in pre-service teacher education and found consistent evidence that such narratives improve both content knowledge and understanding of the nature of science. Pre-service teachers who engage with historical accounts of how scientists arrived at major conceptual breakthroughs demonstrate more sophisticated understanding of how scientific knowledge is constructed, more awareness of the role of creativity and social context in discovery, and a more nuanced grasp of the provisional and revisable character of scientific knowledge. A teacher who understands science as a human and historical process is far more capable of communicating its genuine character to students than one who understands it only as a body of established content.

Narrative pedagogy also supports the reflective practice that is central to professional development in teacher education. Gudmundsdottir (1995) argued that storytelling-as-pedagogy is not only a means by which teacher educators convey content to pre-service teachers, but also a means by which pre-service teachers construct and communicate their own pedagogical understanding. When pre-service science teachers are invited to narrate their own encounters with scientific concepts, to tell the story of a moment of conceptual difficulty and

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its resolution, or to construct a narrative account of a natural phenomenon for a hypothetical student audience, they engage in precisely the reflective transformation of subject knowledge into pedagogical content knowledge that Shulman (1987) identified as the hallmark of expert teaching. Research on digital storytelling in teacher education is particularly suggestive in this regard: pre-service teachers who create digital narratives about scientific concepts demonstrate deeper engagement with those concepts and greater metacognitive awareness of their own learning than those who engage with the same content through conventional methods (Ozudogru and Cakir, 2020).

Towards a Conceptual Framework: Integrating Narrative Pedagogy into Science Teacher Education

Any serious attempt to integrate narrative pedagogy into science teacher education must begin with a reconception of what conceptual understanding actually requires. It requires more than accurate recall of scientific definitions and procedures. It requires the capacity to think with a concept, to see new phenomena through its lens, to recognise where it applies and where it breaks down, and to explain it in ways that make its logic visible to others. This kind of understanding is not produced by transmission. It is produced by engagement, and narrative is among the most powerful forms of engagement available to teacher educators.

The first commitment of the proposed framework is to the use of historical narratives of scientific discovery as a regular and structured component of science teacher education curricula. This does not mean replacing systematic content instruction with biography or anecdote. It means placing the concepts that pre-service teachers must understand within the historical contexts that reveal why those concepts were needed, what problems they resolved, and what assumptions they required learners to revise. The concept of plate tectonics becomes conceptually richer when pre-service teachers understand the decades-long resistance that continental drift theory encountered, and the eventual evidence that compelled its acceptance.

These historical narratives do not simplify science. They reveal its genuine complexity, and in

doing so they equip pre-service teachers to convey that complexity honestly to their own students.

The second commitment is to pre-service teachers as storytellers rather than merely recipients of stories. Constructing a narrative account of a scientific concept is a demanding pedagogical task. It requires the teacher to understand the concept well enough to identify its essential logic, to know where a learner is likely to encounter difficulty, and to find a narrative structure that makes the conceptual movement from difficulty to understanding visible and followable. When pre-service teachers are asked to design narrative-based lessons, to write historical accounts of scientific discovery for a student audience, or to narrate their own developing understanding of a concept, they engage in exactly the transformative reflection that deepens conceptual understanding and builds pedagogical content knowledge simultaneously.

The third commitment is to narrative as a tool for conceptual consolidation rather than conceptual replacement. Narrative engagement, however effective, does not by itself produce the consolidated conceptual understanding that pre-service teachers require. It must be followed by opportunities for explicit conceptual reflection, for the articulation of what has been understood, for the identification of remaining confusions, and for the connection of narrative insight to systematic scientific knowledge. A teacher education curriculum that integrates narrative in this way, using story to open conceptual doors and structured reflection to secure what has been entered, is more likely to produce genuine and lasting conceptual understanding than one that relies on either approach alone.

Implementing this framework does not require the wholesale redesign of existing science teacher education programmes. Existing content sessions can be restructured around historical narratives without sacrificing conceptual rigour. Micro-teaching exercises can include narrative lesson design as a required component. Assessment tasks can invite pre-service teachers to narrate their conceptual development as well as to demonstrate their content

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knowledge. These are not additions to the curriculum. They are deepenings of it, achievable within the structural constraints that most science teacher education programmes operate under.

Conclusion

This review has addressed each of its three objectives in sequence. The first, concerning the conceptual limitations of conventional science teacher education, was met through an examination of the persistent gap between pre-service teachers' surface familiarity with scientific content and the depth of understanding that effective science teaching requires. The second, a review of the theoretical and empirical foundations of narrative pedagogy, drew on Bruner's narrative theory, Egan's story form model, Hadzigeorgiou's work on wonder, and the empirical research of Klassen, Dahlstrom, Soares, and Gudmundsdottir to establish a coherent case for narrative's role in producing genuine conceptual understanding among pre-service science teachers. The third, the proposal of a conceptual framework for integration, was elaborated through three commitments grounded in historical narrative, storytelling as teacher practice, and narrative as conceptual consolidation, accompanied by implementation strategies sensitive to the realities of existing science teacher education programmes. Science teacher education stands at an important crossroads. Pre-service science teachers who learn to receive stories, to tell them, and to design learning around them will be better equipped to cultivate genuine conceptual understanding in their own students than those trained entirely within the logico-scientific mode. Stories are not ornaments to scientific understanding. They are among its most powerful instruments, and science teacher education that takes conceptual depth seriously cannot afford to leave them at the margins. Future research should examine how narrative pedagogy interventions can be evaluated rigorously in science teacher education contexts, with particular attention to the long-term impact of narrative approaches on both conceptual retention and classroom teaching practice.

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**Digital Divide in Finance: Online Financial Literacy and Financial Independence Among
Elderly People in Kerala**

Dominic Joseph & Saritha V. K.

Abstract

The progressive digitalisation of financial services has fundamentally altered how citizens engage with banking, payment systems, and investment platforms. Yet the gains of this transformation are distributed unevenly across age cohorts, with elderly individuals frequently facing structural, cognitive, and affective obstacles. This study investigates online financial literacy and its consequences for financial independence among elderly residents of Kerala — a state distinguished by high overall literacy yet confronted with one of India’s fastest-ageing demographic profiles. Employing a descriptive survey design, data were gathered from 100 respondents aged 60 and above, drawn from the districts of Kottayam, Ernakulam, and Idukki using stratified sampling. Findings reveal a pronounced gap between awareness of digital financial services and their active, independent use. Critical obstacles include inadequate digital competence, fear of cyber fraud, interface usability failures, physical limitations, and linguistic barriers. The paper advocates for community-based digital literacy interventions, inclusive platform design standards, and collaborative policy action to bridge the digital financial divide among Kerala’s senior citizens.

Keywords: digital divide, online financial literacy, elderly people, financial independence, financial inclusion, cybersecurity awareness.

Introduction

The past decade has witnessed an accelerating shift in financial services — from branch-dependent, paper-based transactions to platform-mediated, real-time digital interactions. In India, this transition has been propelled by the Pradhan Mantri Jan Dhan Yojana, the Aadhaar biometric framework, and the Unified Payments Interface (UPI), which democratised instant fund transfers. The Reserve Bank of India (2023) reports UPI transactions alone exceeded nine billion per month by late 2023. Kerala, with its high literacy rate and active remittance economy, has been an early adopter of digital financial services. Yet within Kerala, the benefits of digital finance remain concentrated among younger, educated, and urban segments. The India Ageing Report (UNFPA, 2023) notes that Kerala has one of the highest proportions of elderly residents in India, lending particular urgency to questions about elderly financial inclusion. This study examines online financial literacy — defined as the knowledge, skills, and confidence required to engage with digital financial services effectively and securely — among elderly residents of Kerala, and explores how deficits in this literacy affect their capacity for financial independence.

Need and Significance of the Study

Digital financial services are progressively displacing physical banking channels as the primary conduit for pension disbursement, government benefit transfers, bill settlement, and retail transactions. For elderly individuals — whose financial interactions frequently cover pension management, medical payments, and inter-generational transfers — the stakes of digital exclusion are particularly high. Empirical research focusing specifically on the intersection of old age, digital literacy, and financial independence in the Kerala context remains limited. By centring analysis on the elderly in a high-literacy, high-connectivity state, this study isolates the skills and trust

dimensions of the digital divide from the infrastructure dimension, generating insights applicable to rapidly ageing, digitally transitioning societies worldwide.

Review of Related Literature

A substantial body of international and national research converges on the finding that older adults are systematically disadvantaged in digital financial environments relative to younger cohorts. The OECD (2022) found that older individuals frequently possess adequate offline financial knowledge but struggle to translate it into effective action within digital interfaces—attributed to platforms that prioritise transaction speed over usability. The OECD (2023) international survey identified a statistically significant negative correlation between age and digital financial capability scores, sharpest in the 65-and-above cohort. The World Bank’s Global Findex Database (2021) documented that while digital payment adoption surged globally between 2017 and 2021, older adults in low- and middle-income economies remained significantly less likely to have used a digital payment method, attributing this gap to lower comfort with app-based interfaces and higher risk aversion. Nationally, NCAER (2021) identified educational attainment and prior technological exposure as the strongest predictors of financial literacy scores. Within Kerala, Rajan and Mathew (2022) and Joseph and Thomas (2021) documented that fear of fraud and interface complexity are the two most frequently cited barriers to digital banking adoption among elderly non-users.

Conceptual Framework

- **The Digital Divide:** Contemporary scholarship distinguishes among first-level divides (physical access to devices and connectivity), second-level divides (skills and usage patterns), and third-level divides (tangible outcomes derived from digital engagement). For elderly populations, skill deficits and motivational resistance remain significant impediments to meaningful adoption even after access is secured. In the financial domain, the divide manifests as unequal capacity to access, navigate, and derive benefit from digital financial services—with consequences that are materially significant.

- **Online Financial Literacy:** Financial literacy, as defined by the OECD (2023), encompasses the knowledge, skills, attitudes, and behaviours required to make sound financial decisions. Online financial literacy extends this construct to encompass digital competencies—navigating banking applications, executing secure transactions, recognising phishing attempts, and understanding two-factor authentication—without which financial literacy cannot be operationalised in contemporary environments.
- **Financial Independence Among the Elderly:** Financial independence, in the context of elderly populations, refers to the capacity to manage one's own financial affairs without systematic dependence on others. Digital financial literacy is increasingly a precondition for such independence. The loss of financial independence is associated in the gerontological literature with diminished psychological wellbeing, heightened vulnerability to financial abuse, and reduced quality of life.

Objectives of the Study

1. To assess the level of awareness and utilisation of online financial services among elderly residents of Kerala.
2. To identify the primary barriers that constrain elderly people from participating effectively in digital financial activities.
3. To analyse how deficits in digital financial literacy affect the financial independence of older adults.
4. To propose evidence-informed measures for advancing digital financial inclusion among elderly citizens in Kerala.

Methodology

Research Design

A descriptive survey design was adopted for this investigation. This approach is well suited to studies that aim to systematically document the characteristics, attitudes, and behaviours of a defined population at a given point in time, without experimentally

manipulating variables.

Population and Sample

The study population comprised elderly individuals aged 60 years and above residing in the districts of Kottayam, Ernakulam, and Idukki in Kerala—selected to represent contrasting urban–rural compositions: Ernakulam (predominantly urban), Kottayam (semi-urban), and Idukki (predominantly rural). A stratified random sampling procedure yielded a total sample of 100 respondents.

Tool for Data Collection

Data were gathered using a structured questionnaire covering four thematic domains: (i) socio-demographic particulars, (ii) awareness and utilisation of online financial services, (iii) perceived challenges in digital financial engagement, and (iv) perceptions regarding the relationship between digital literacy and financial independence. The questionnaire was administered in Malayalam to ensure accessibility.

Analysis and Interpretation

Quantitative data were analysed through frequency counts, percentage distributions, and descriptive interpretation. Findings are presented in tabular form with analytical commentary.

Table 1

Demographic Profile of Respondents (N = 100)

Variable	Category	Frequency n (%)
Gender	Male	48
	Female	52
Age Group	60–69 years	58
	70–79 years	29
	80 years and above	13
Residence	Urban	47
	Rural	53

The sample is nearly evenly distributed by gender (52% female). The majority of respondents (58%) fall within the 60–69 age bracket, with rural respondents (53%) slightly outnumbering urban counterparts.

Table 2

Awareness and Utilisation of Online Financial Services Among Elderly Respondents (N = 100)

Online Financial Service	Aware (%)	User (%)	Gap (%)
Internet Banking	72	38	34
Mobile Banking Applications	65	31	34
UPI Payments (GPay, PhonePe, etc.)	60	27	33
ATM / Debit Card Services	88	74	14
Online Bill Payments	55	33	22
Online Investment Services	25	10	15

A consistent gap between awareness and active usage is observable across all service

categories. ATM and debit card services record the highest awareness (88%) and usage (74%), reflecting long-term normalisation. UPI-based payments are used independently by only 27%, reflecting the recency of the technology and steeper skill demands. Online investment services record the lowest penetration (10%).

Table 3

Major Challenges Faced by Elderly Respondents in Using Online Financial Services (N = 100)

Challenge	Frequency (n)	Percentage (%)
Insufficient digital skills and technical competence	78	78
Apprehension regarding online fraud and cyber threats	74	74
Complicated or non-intuitive banking interfaces	68	68
Declining vision and reduced motor coordination	56	56
Language and technical terminology barriers	52	52
Limited assistance from family or community	38	38

Insufficient digital skills constitute the most frequently reported barrier (78%), followed by apprehension about online fraud (74%) and discomfort with complicated banking interfaces (68%). These three leading barriers are structurally interrelated.

Discussion

The survey findings present a coherent account of digital financial exclusion among elderly Keralites. The evidence reveals that older adults are not uniformly unaware of digital financial tools — awareness rates for internet banking (72%) and mobile banking (65%) are reasonably high— but that awareness does not reliably convert into confident, independent use. Campaigns focused primarily on information dissemination are likely to yield minimal gains if not accompanied by structured skills development and sustained opportunities for supervised

practice. The primacy of fear of fraud as a barrier (74%) merits particular attention. Elderly individuals are disproportionately targeted by digital fraud schemes, and their lower baseline familiarity with platform interfaces makes them less equipped to distinguish legitimate from fraudulent communications. Addressing this barrier requires not only reassurance but genuine enhancement of digital security literacy. OECD (2022) similarly identifies cybersecurity education as a priority component of financial literacy programmes for older adults.

Physical limitations affecting more than half the sample (56%) highlight a dimension of digital financial exclusion often underweighted in policy discussions. Banking applications designed with small icons, low-contrast text, and rapid timeout features impose disproportionate burdens on users with declining visual acuity or fine motor difficulties. The language barrier finding (52%) is particularly striking in Kerala—the barrier is not literacy per se but the English-medium nature of most banking platforms, misaligned with users' Malayalam linguistic capabilities. Malayalam-language interfaces, voice-guided navigation, and regional-language customer support could substantially reduce this barrier without requiring any change in users' underlying capabilities.

Conclusion

This study has documented a significant digital financial divide among elderly residents of Kerala, persisting despite the state's comparatively strong literacy and digital infrastructure foundations. The divide is characterised not by a lack of awareness but by a persistent failure to convert awareness into confident, independent, and regular use of digital financial services—rooted in skill gaps, fear of fraud, design exclusivity, physical constraints, and linguistic barriers. As physical banking infrastructure continues to contract and as government benefits and pension payments shift progressively to digital channels, elderly individuals who lack digital financial literacy face a genuine risk of exclusion from the financial systems that underpin their material

welfare. Strengthening digital financial literacy among older adults is therefore an essential component of financial inclusion policy.

Recommendations

➤ Programme and Policy Interventions

State and district authorities should launch structured digital financial literacy programmes for senior citizens delivered through panchayat offices, community centres, and senior citizen associations, with content adapted to Malayalam and grounded in practical skill-building. Banks should maintain dedicated Malayalam-speaking customer support desks capable of providing patient, step-by-step guidance to elderly users.

➤ Design and Technology Standards

The Reserve Bank of India and NPCI should issue design guidelines for banking applications specifying minimum accessibility standards for elderly users, including minimum font sizes, high-contrast display options, simplified transaction flows, and Malayalam-language interfaces. UPI platform providers should develop a ‘senior mode’ feature offering voice-guided transaction confirmation and extended session timeouts.

➤ Community and Family Support Mechanisms

Intergenerational digital literacy support programs—pairing college students with elderly community members for supervised digital finance practice—should be formalised through panchayat or NGO coordination. Community organisations, religious institutions, and senior citizen associations should be engaged as trusted dissemination channels for cybersecurity awareness and digital finance education.

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**POSITIVE PSYCHOLOGY IN EDUCATION: THE ROLE OF HOPE,
OPTIMISM, AND GOAL SETTING IN ENHANCING STUDENT WELL-BEING
AND ACHIEVEMENT**

Priya Dominic

Abstract

In recent years, education has increasingly focused not only on academic achievement but also on students' emotional and psychological well-being. Within this shift, positive psychology has emerged as a meaningful framework that emphasises strengths, resilience, and human potential. This paper explores three central constructs—hope, optimism, and goal setting—and examines how they contribute to student well-being and academic achievement. Drawing on established theoretical perspectives and contemporary research, the paper examines how these constructs operate individually and in combination to influence motivation, persistence, and self-regulated learning. Rather than viewing these constructs as abstract psychological ideas, the paper situates them within real classroom experiences, where students continuously navigate challenges, expectations, and aspirations. The study further highlights pedagogical implications, suggesting that integrating these elements into teaching practices can foster more supportive and meaningful learning environments. Ultimately, the paper argues that education, when informed by positive psychology, can nurture learners who are not only academically competent but also emotionally resilient and future-ready.

Keywords: positive psychology, student well-being, achievement

Introduction

Today's classrooms ask more of pupils than ever before, reflecting a quickly changing world. Beyond academic expectations, now students are progressively expected to manage stress, uncertainty, and emotional challenges. Education cannot just be about passing on knowledge in this scenario; it must also address the students' inner lives. As a result of this change, positive psychology has become a popular method for fostering health, resilience, and growth. Martin Seligman argues that psychology, and consequently education, should concentrate on factors that promote human flourishing (Seligman, 2011). From this perspective, setting objectives, having hope, and having optimism are effective frameworks that directly influence how children learn and develop. It extends beyond the abstract philosophical concepts to shape the daily life of a classroom. Someone who maintains an effort despite a difficult assignment exhibits hope; someone who views failure as transient demonstrates optimism; and someone who plans stages for improvement engages in goal-setting. These procedures together determine how students learn, maintain their efforts, and deal with challenges. The purpose of this article is to examine these ideas by relating theory to real educational events. By examining their relationship and how they relate to classroom events, the study aims to provide a more human-centred perspective on learning. Students in this perspective actively attempt to understand the meaning and course of their educational experiences rather than merely act as performers.

Theoretical Foundations of Positive Psychology in Education

The basis of positive psychology is the scientific examination of human strengths and ideal functioning. Seligman's PERMA model describes the five core components of well-being: emotion, engagement, relationships, purpose, and achievement (Seligman, 2011). Achievement and significance are particularly important in educational settings when students

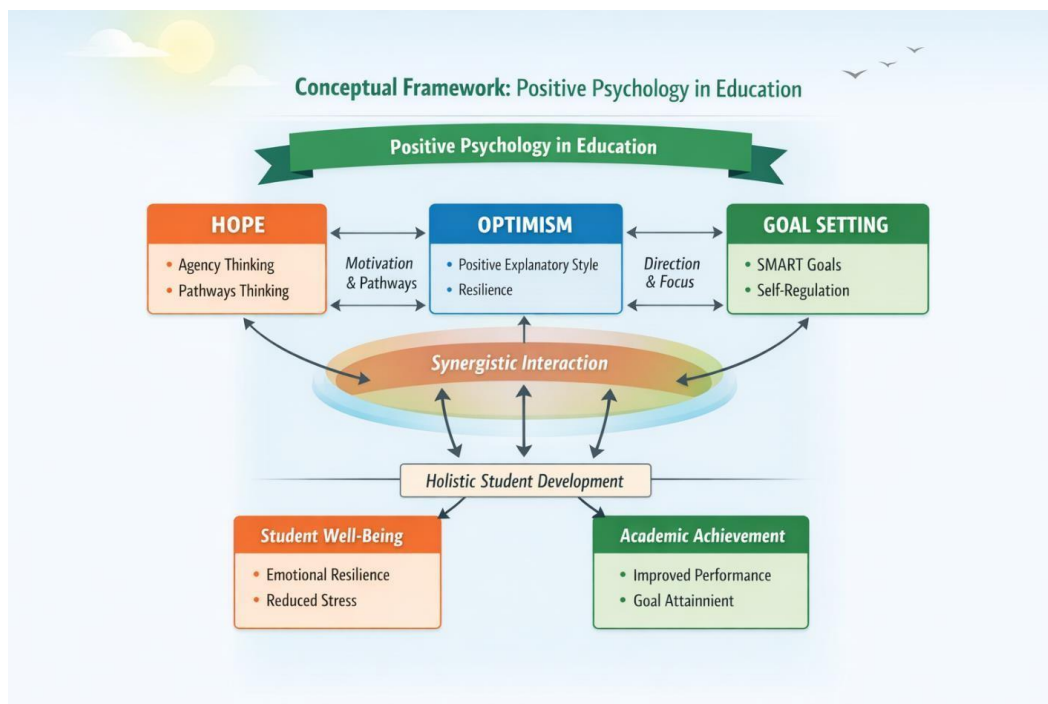
are completing tasks with a goal in mind, even if all of these criteria contribute to overall well-

being.

According to Charles R. Snyder's Hope Theory, hope is a mix of agency and pathways thinking (Snyder, 2002). In classrooms, this is evident where students are confident in their ability to succeed and can identify other ways to reach their goals. Rather than allowing obstacles to stop them, these students adapt and continue working toward their goals.

In the context of learned optimism, optimism refers to how people perceive and understand events in their lives (Seligman, 1998). In classroom contexts, optimistic students are more inclined to see challenges as fleeting and manageable. This point of view keeps them engaged when the learning is tough. Locke and Latham's goal-setting theory emphasises the significance of certain and difficult goals in improving performance (Locke & Latham, 2002). In classrooms, students may organise their studies and follow their progress by setting objectives.

These theoretical viewpoints offer a thorough explanation of how students think, feel, and behave in educational contexts. Additionally, they show that effective learning is not only cognitive but also significantly affected by psychological processes.



Hope as a Catalyst for Learning

Although often quietly present in educational settings, hope plays a crucial role in shaping student behaviour. It emerges when students persevere despite obstacles or believe that progress remains possible after setbacks. According to Snyder (2002), hope combines both the drive to reach goals and the capacity to identify pathways toward them. This dual nature makes it particularly relevant in education. Optimistic students approach learning tasks with determination and flexibility, exploring alternatives when one strategy fails instead of giving up. In today's classrooms—where learning increasingly emphasises inquiry, exploration, and problem-solving—such flexibility is essential. Research shows that optimistic students often achieve stronger academic performance and demonstrate superior coping skills (Snyder et al., 2002).

From a pedagogical standpoint, fostering hope involves cultivating a supportive environment where students feel capable. Teachers can encourage reflection on progress, recognition of effort, and the setting of achievable goals. As students begin to see themselves as capable of growth, hope becomes a sustaining force throughout their learning journey.

Optimism and Academic Resilience

Optimism shapes how students interpret their academic experiences, particularly when facing challenges. A student's response to failure depends less on the event itself than on how it is understood. Optimistic students tend to view setbacks as temporary and specific, which sustains their motivation and encourages continued effort. This perspective carries important implications for both emotional well-being and academic performance. Research indicates that optimism is associated with lower stress levels and greater engagement (Carver & Scheier, 2014). Students who maintain a positive outlook are better equipped to manage pressure and remain focused on their goals.

In classroom contexts, teachers can nurture optimism through subtle yet meaningful practices. Encouraging students to reflect on what they have learned rather than what they have

lost, and framing mistakes as integral to the learning process, helps reshape thinking patterns. Over time, such experiences foster resilience, enabling students to approach challenges with confidence

Goal Setting as a Mechanism for Achievement

Goal setting provides structure and direction to the learning process, helping students move from vague aspirations to concrete actions and making learning more purposeful and manageable. By setting goals, students become active participants in their own learning rather than passive recipients of instruction. Research distinguishes between mastery-oriented goals, which emphasise learning and understanding, and performance-oriented goals, which emphasise comparison with others (Pintrich, 2000). In educational contexts, mastery goals are particularly valuable because they foster deeper engagement and intrinsic motivation.

The process of setting and pursuing goals also strengthens self-regulation. Students learn to plan, monitor progress, and adjust strategies as needed skills that are essential not only for academic success but also for lifelong learning. Teachers can support goal setting by guiding students in defining clear objectives, providing regular feedback, and creating opportunities for reflection. Experiencing progress toward goals enhances students' sense of competence and motivation, reinforcing their engagement with learning.

Interrelationship Between Hope, Optimism, and Goal Setting

Hope, optimism, and goal setting do not operate in isolation; they are deeply interconnected and mutually reinforcing. Hope provides the motivation and pathways needed to pursue goals, while optimism sustains effort by fostering positive expectations. Goal setting, in turn, structures this process by defining clear directions for action.

In classroom practice, this interrelationship is evident in how students approach tasks. A student who sets a goal, believes in their ability to achieve it, and remains positive despite challenges is more likely to succeed. Each success builds confidence, further strengthening

hope and optimism, creating a continuous cycle that supports both academic achievement and

emotional well-being.

Pedagogical Implications

The findings of this study carry important implications for educational practice. First, teachers should intentionally cultivate classroom environments that foster hope, optimism, and goal-directed behavior. Through encouragement, constructive feedback, and opportunities for success, teachers can help learners build confidence in their abilities and sustain motivation during challenging situations. Positive psychology underscores the role of such practices in supporting student flourishing and well-being (Seligman, 2011).

Second, curricula should integrate activities that promote realistic goal-setting, reflection, and problem-solving. Approaches such as project-based learning, reflective journaling, self-assessment, and collaborative learning strengthen students' sense of agency and responsibility. Research demonstrates that hope enhances academic outcomes and coping mechanisms (Snyder et al., 2002).

Third, educational institutions must recognise the close connection between academic achievement and emotional well-being. Schools should therefore emphasise resilience, positive thinking, and self-regulation alongside cognitive development. Guidance and counselling services can play a vital role in this regard, as optimism is associated with lower stress and higher engagement (Carver & Scheier, 2014).

Furthermore, teacher education programmes should embed training in positive psychology principles, equipping future educators with strategies to nurture student well-being. When teachers understand how hope, optimism, and goal setting influence learning, they are better prepared to support diverse learners and foster inclusive classrooms. Evidence shows that goal setting improves self-regulation and achievement (Locke & Latham, 2002; Pintrich, 2000). Finally, educational policymakers should encourage holistic approaches to education that balance academic excellence with psychological well-being. Such approaches can create

confident, resilient, and lifelong learners prepared to meet the challenges of a rapidly changing

world.

Conclusion

Viewing education through the lens of positive psychology transforms it into a process that nurtures both intellect and the human spirit. The concepts of hope, optimism, and goal setting provide valuable insights into how students learn, persevere, and grow. By integrating these elements into classroom practice, educators can create environments that foster emotional resilience alongside academic achievement. In a world marked by uncertainty and rapid change, such an approach is not merely desirable but essential. When students learn to instil hope, sustain optimism, and set meaningful goals, they become better equipped to confront obstacles and confidently shape their futures.

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Effectiveness of the SECI Knowledge Management Model in Enhancing Critical Thinking, Information Literacy, and Career Readiness Skills among Higher Secondary School Students

Rejithkumar R. & Issac Paul

Abstract

In today's knowledge-based society, students need to develop critical thinking, information literacy, and career readiness skills to respond effectively to the changing demands of the employment sector. Therefore, educational practices should provide greater opportunities for the creation and application of knowledge rather than focusing solely on its transmission. This study examined the effectiveness of the SECI Knowledge Management (KM) model in enhancing critical thinking, information literacy, and career readiness skills among higher secondary students. A pre-test, post-test, follow-up test control group experimental design was adopted. Sixty higher secondary students were assigned to experimental and control groups. The experimental group received instruction through the SECI KM Model, whereas the control group was taught using the prevailing activity-based approach. The results showed significant improvements in critical thinking, information literacy, and career readiness skills among students in the experimental group. The follow-up test results indicated that these skills were retained over time. The findings suggest that the SECI KM model is effective in developing skills that are relevant to contemporary workplace requirements.

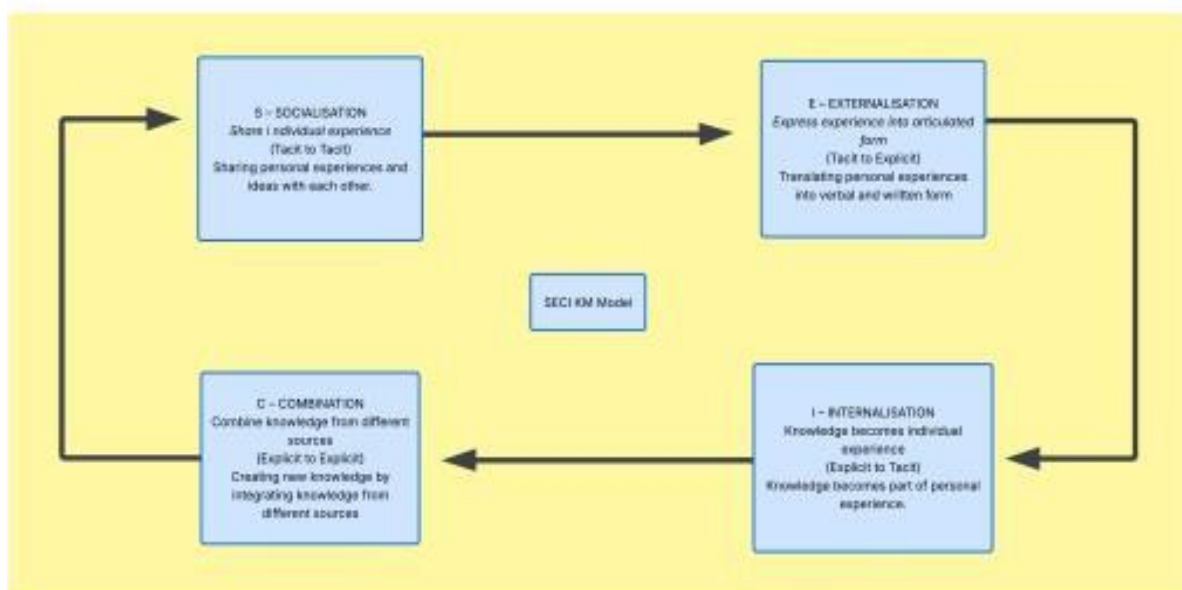
Keywords: SECI KM model, critical thinking, information literacy, career readiness

Introduction

The traditional view that knowledge alone is sufficient for success in life has gradually shifted toward an increased emphasis on the importance of skills. Students, once regarded primarily as consumers of knowledge, are now expected to function as creators and users of knowledge. In response to the changing demands of the global workforce, it is essential to equip students with skills that are relevant to contemporary professional and social contexts. The ability to evaluate, analyze, and apply knowledge has become increasingly important in the digital era.

One of the most widely recognized frameworks in the field of knowledge management is the SECI Model, developed by Nonaka and Takeuchi (1995). The model explains how tacit knowledge derived from personal experiences is transformed into explicit knowledge and subsequently internalized as tacit knowledge through individual experience. Learning within this framework is based on four interconnected processes: knowledge creation, knowledge sharing, knowledge integration, and knowledge application (Nonaka & Takeuchi, 1995).

Figure 1
SECI Knowledge Management Model – Knowledge Conversion Phases



Source: Adapted and prepared by the researcher based on Nonaka and Takeuchi (1995).

- Socialization - Sharing personal experiences and ideas among individuals.
- Externalization - Converting personal and collective experiences into oral and written forms.
- Combination - Generating new knowledge through the integration of knowledge acquired from multiple sources.
- Internalization - Internalizing knowledge as part of personal experience.

The Kerala Higher Secondary Education curriculum provides opportunities for students to collect, analyze, and interpret information and to draw conclusions based on evidence. However, the adoption of innovative teaching models remains limited. In many classrooms, teaching continues to rely primarily on textbook-centered lecture methods. Most studies based on the SECI Knowledge Management Model have been conducted in higher education settings, while experimental research at the higher secondary level remains scarce. In addition, only a limited number of studies have examined the effectiveness of the SECI model through follow-up assessments. The present study aims to address this gap in the literature.

Review of Related Literature

Nonaka and Takeuchi (1995) developed the SECI KM model to explain the process of transformation between individual and collective knowledge. Learning is a continuous social process that helps individuals create and develop knowledge (Nonaka & Takeuchi, 1995). The creation of new knowledge occurs through the integration of tacit and explicit knowledge (Nonaka & von Krogh, 2009). Communication, sharing experiences, and collaboration are important processes in knowledge creation. Knowledge is generated through active interaction between individuals and their social environment (Nonaka et al., 2000). Critical thinking helps students make informed decisions based on evidence by analyzing information obtained from a variety of sources. It enhances students' analytical and decision-making abilities (Facione,

1990). Critical thinking is an essential skill that students require in diverse learning situations. According to Halpern (1998), critical thinking can be developed through experiential learning and systematic training. Information literacy is an essential skill in today's digital society. ACRL (2016), which highlights the ability to collect, evaluate, organize, and effectively use information as an essential component of information literacy. Career readiness is achieved through the development of competencies such as communication, problem-solving, and collaboration. Dacre Pool and Sewell (2007); Succi & Canovi (2020) emphasized that employability is influenced by a combination of knowledge, skills, experience, and personal attributes.

Objectives

- To find out the effectiveness of the SECI model in developing critical thinking of higher secondary school students.
- To examine the effectiveness of the SECI model in developing information literacy of higher secondary school students.
- To find out the effectiveness of the SECI model in developing career readiness of higher secondary school students.
- To examine the long-term retention of critical thinking, information literacy, and career readiness skills among higher secondary school students through a follow up assessment.

Hypotheses

- There is no significant difference between the experimental group and the control group in the pre-test scores.
- There is no significant difference between the experimental group and the control group in the post-test scores.

- There is no significant difference between the experimental group and the control group in the follow-up test scores.
- There is no significant difference between the post test and follow up test scores of higher secondary school students exposed to the SECI knowledge management model.

Methodology

An experimental research method was adopted for the study. A pre-test, post-test, and follow-up test experimental design was employed to examine the effectiveness of the SECI Knowledge Management (KM) Teaching Model. The population comprised Plus Two students enrolled in Higher Secondary Schools in Kerala. A sample consisting of sixty Plus Two Humanities students from a Government School in Alappuzha District was selected for the study. The sample was chosen using purposive sampling and random assignment techniques. Data were analyzed using statistical measures such as the mean, standard deviation and t-test.

Procedure

Pre-test → SECI KM Model-Based Intervention (Experimental Group) / Activity-Based Teaching (Control Group) → Post-test → Follow-up Test → Data Analysis.

Tools

1. Critical Thinking Scale

The purpose of Critical Thinking Scale is to measure the dimensions of analysis, reasoning, evaluation, and interpretation among higher secondary school students. The scale was developed by the investigator.

2. Information Literacy

The purpose of this Information Literacy Scale is to measure the skills of selecting, evaluating, and applying information among higher secondary school students. The scale was developed by the investigator.

3. Career Readiness

The purpose of this Career Readiness Scale is to measure the communication,

ISSN 3048-5835 Volume 4 Issue 2 November 2025 – April 2026 Page 61

problem-solving, collaboration, decision-making and career awareness skills of higher secondary school students. The scale was developed by the investigator.

4. SECI KM based Instructional design

The SECI Knowledge Management (KM) Model-based instructional design was prepared in four phases. In the socialization phase, students share their own experiences with one another. The discussion presents the topic of study as a social problem. In the externalization phase, experiences are transformed into ideas and facts. Students engage in activities such as preparing concept maps, writing reflection notes, and conducting case analyses. In the combination phase, knowledge collected from various sources is integrated and organized. Students engage in activities such as data collection, digital resource integration, and report preparation. In the internalization phase, knowledge is applied to real-life situations. Students engage in problem-solving activities to facilitate the practical application of acquired knowledge.

Validity and Reliability

The scale and instructional design were developed after obtaining the opinions of experts in the fields of knowledge management and education. A pilot study was conducted, and the reliability of the scale was established using Cronbach's Alpha. The obtained Cronbach's Alpha values were above the acceptable level of 0.70, indicating satisfactory reliability of the instruments. The overall reliability coefficient of the scales was found to be 0.82. It reveals that the tools were reliable for the study.

Analysis and Interpretation

Table 1

Comparison of Pre-Test Scores in Critical Thinking, Information Literacy, and Career Readiness

Variables	Group	N	Mean	SD	t Value	p Value
Critical Thinking	Experimental	30	14.50	2.41	0.166	0.869
	Control	30	14.43	2.17		
Information Literacy	Experimental	30	14.47	2.42	0.220	0.827
	Control	30	14.33	2.28		
Career Readiness	Experimental	30	14.40	2.37	0.328	0.744
	Control	30	14.20	2.35		

The mean pre-test scores of the experimental and control groups for critical thinking were 14.50 (SD = 2.41) and 14.43 (SD = 2.17), respectively. Similarly, the mean pre-test scores for information literacy were 14.47 (SD = 2.42) and 14.33 (SD = 2.28), while the mean pre-test scores for career readiness were 14.40 (SD = 2.37) and 14.20 (SD = 2.35), respectively. The pre-test results revealed no significant differences between the experimental and control groups in critical thinking, $t(58) = 0.17$, $p = 0.869$; information literacy, $t(58) = 0.22$, $p = 0.827$; and career readiness, $t(58) = 0.33$, $p = 0.744$. These findings indicate that the groups were homogeneous prior to the intervention.

Table 2

Comparisons of Post-Test Scores in Critical Thinking, Information Literacy and Career Readiness

Variables	Group	N	Mean	SD	t Value	p Value
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Critical Thinking	Experimental	30	44.00	4.32	14.062	<0.001
	Control	30	30.62	2.80		
Information Literacy	Experimental	30	43.90	4.33	13.439	<0.001
	Control	30	30.79	3.02		
Career Readiness	Experimental	30	43.87	4.50	12.954	<0.001
	Control	30	30.83	3.07		

The mean post-test score for critical thinking was 44.00 (SD = 4.32) for the experimental group and 30.62 (SD = 2.80) for the control group. The difference between the groups was statistically significant, $t(57) = 14.06$, $p < 0.001$. Similarly, the mean post-test score for information literacy was 43.90 (SD = 4.33) for the experimental group and 30.79 (SD = 3.02) for the control group, with a statistically significant difference, $t(57) = 13.44$, $p < 0.001$. The mean post-test score for career readiness was 43.87 (SD = 4.50) for the experimental group and 30.83 (SD = 3.07) for the control group. The difference was also statistically significant, $t(57) = 12.95$, $p < 0.001$. These findings indicate that the experimental group performed significantly better than the control group on all three variables following the intervention. The SECI Knowledge Management (KM) Model-Based Instruction was found to be effective in enhancing critical thinking, information literacy, and career readiness among higher secondary school students.

Table 3

Comparisons of Follow up Test Scores in Critical Thinking, Information Literacy and Career Readiness

Variables	Group	N	Mean	SD	t Value	p Value
Critical Thinking	Experimental	30	43.53	4.49	14.169	<0.001
	Control	30	28.97	3.29		

Information Literacy	Experimental	30	43.57	4.53	14.306	<0.001
	Control	30	29.00	3.14		
Career Readiness	Experimental	30	43.23	4.64	11.868	<0.001
	Control	30	29.21	4.43		

The mean follow-up test score for critical thinking was 43.53 (SD = 4.49) for the experimental group and 28.97 (SD = 3.29) for the control group. The difference between the groups was statistically significant, $t(57) = 14.17$, $p < 0.001$. Similarly, the mean follow-up test score for information literacy was 43.57 (SD = 4.53) for the experimental group and 29.00 (SD = 3.14) for the control group, with a statistically significant difference, $t(57) = 14.31$, $p < 0.001$. The mean follow-up test score for career readiness was 43.23 (SD = 4.64) for the experimental group and

29.21 (SD = 4.43) for the control group. The difference was also statistically significant, $t(57) = 11.87$, $p < 0.001$. These findings indicate that the positive effects of the SECI Knowledge Management Model-Based Instruction on critical thinking, information literacy, and career readiness were sustained over time.

Findings

There was no significant difference between the pre-test scores of the experimental and control groups in critical thinking, information literacy, and career readiness. A significant increase was observed in the critical thinking, information literacy, and career readiness scores of the experimental group compared to the control group. These findings indicate that the SECI Knowledge Management (KM) Model is effective in enhancing critical thinking, information literacy, and career readiness among higher secondary school students. The experimental group was able to maintain the gains achieved in the post-test during the follow-up test. Critical thinking, information literacy, and career readiness among higher secondary school students

increased significantly in the experimental group and were sustained through the follow-up test. Therefore, the SECI Knowledge Management (KM) Model can be considered a novel instructional approach for higher secondary humanities education.

Discussion

The SECI Knowledge Management (KM) Model was found to be effective in developing critical thinking, information literacy, and career readiness skills among higher secondary school students. The evidence from the study showed that students in the experimental group obtained higher scores in both the post-test and the follow-up test compared to those in the control group. This improvement may be attributed to the active involvement of students in knowledge-sharing, knowledge-creation, knowledge-integration, and knowledge-application activities throughout the intervention.

The findings of the present study are consistent with the fundamental principles of the SECI Knowledge Management Model proposed by Nonaka and Takeuchi (1995). The findings of the present study are consistent with the views of Nonaka et al. (2000), who argued that collaborative learning environments facilitate knowledge sharing, knowledge creation, and meaningful learning experiences among learners. Such experiences may have contributed to the significant improvement observed among the students.

The significant enhancement in critical thinking skills is in line with the views of Facione (1990) and Halpern (1998), who emphasized the importance of analytical reasoning, evaluation, and evidence-based decision-making in the development of critical thinking. The SECI KM Model encouraged students to gather information, examine evidence, and draw logical conclusions, thereby promoting higher-order thinking skills. Similarly, information literacy skills improved significantly among students exposed to the SECI KM Model. The findings of the present study

support the views of ACRL (2016), which highlights the ability to collect, evaluate, organize, and effectively use information as an essential component of information literacy. These findings support the view that active engagement in knowledge-related activities contributes to the development of information literacy. The findings of the present study support the views of Dacre Pool and Sewell (2007) and Succi and Canovi (2020), who highlighted communication, collaboration, problem-solving and other employability skills as essential components of career readiness. The learning experiences provided through the SECI KM Model offered opportunities for students to practice and strengthen these competencies. Therefore, the findings of the present study support the view that knowledge-creation-based learning can contribute to the development of employability-related skills.

Overall, the SECI KM Model may be regarded as an innovative instructional approach that promotes knowledge creation and application among higher secondary school students. The model facilitates active participation in the learning process and contributes to the development of essential twenty-first-century skills.

Educational Implications

At the higher secondary level, subjects such as Humanities, which are often perceived as less interesting by students and are less frequently chosen by high-achieving students, can be taught effectively using the SECI Knowledge Management (KM) Model and model-based learning activities. It is beneficial to incorporate activities based on the SECI KM Model into teacher education programmes and in-service training programmes. The SECI KM Model views students as creators of knowledge rather than mere consumers of knowledge. Since the model is grounded in constructivist principles, it is compatible with the school curriculum in India. The SECI Knowledge Management (KM) Model aligns with the recommendations of India's National

Education Policy (NEP) 2020 and the vision of Mission 2047. The model promotes experiential learning, critical thinking, problem-solving, collaboration, and knowledge creation through learner-centred activities. Therefore, the SECI KM Model can serve as an effective instructional approach for achieving the educational goals envisaged in NEP 2020 and Mission 2047.

Conclusion

The study demonstrated that the SECI Knowledge Management (KM) Model had a significant impact on the development of critical thinking, information literacy, and career readiness. Its effectiveness was also found to be long-lasting, as evidenced by the follow-up test results. The findings provide empirical evidence that the SECI KM model is an effective pedagogical approach for fostering higher order thinking and employability skills among higher secondary school students. The model offers a practical framework for interacting knowledge creation, collaboration and application within school education.

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Sustainable Practices In Higher Education: Pathways Towards Institutional Transformation

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Abstract

Higher education institutions (HEIs) are pivotal to global sustainability due to their roles in education, research, and community engagement. This paper examines the landscape of sustainable practices in higher education, focusing on how institutions systematically integrate sustainability across curricular, operational, research, and governance domains. Drawing upon recent literature and global examples, we explore frameworks that align institutional practices with Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). Despite notable advancements—such as the rise of sustainability ranking participation and establishment of dedicated SDG cells—many universities still lack comprehensive, mission-wide sustainability integration. We propose an integrated institutional transformation model, highlighting best practices, barriers, and actionable pathways for embedding sustainability into academic programs, campus operations, and leadership strategies. The review underscores the need for collaborative governance, student engagement, and robust assessment mechanisms. By synthesizing insights from global research and policy, this paper offers a roadmap for HEIs to function as catalysts for sustainable development and societal transformation.

Keywords: sustainable practices, institutional transformation

1. Introduction

Sustainable development has emerged as a defining global priority in the twenty-first century due to escalating environmental challenges, social inequalities, and economic uncertainties. Higher education institutions (HEIs) occupy a strategic position in addressing these challenges because of their roles in education, research, innovation, and community engagement. The United Nations Sustainable Development Goals (SDGs) emphasize the need for transformative actions across all sectors, and HEIs are increasingly expected to contribute to these goals through teaching, research, campus operations, and societal outreach (Towards More Sustainable Universities, 2025).

Research indicates that HEIs serve as important catalysts for sustainable development by fostering sustainability literacy, generating knowledge, and promoting environmentally responsible practices within communities (Sahin, 2025). Universities contribute to SDG implementation not only through academic activities but also through institutional governance, resource management, and stakeholder engagement, making them critical actors in sustainability ecosystems (Towards More Sustainable Universities, 2025).

Scholars argue that sustainability should be embedded across all dimensions of institutional functioning rather than being treated as an isolated initiative. Although sustainability-related activities are increasingly visible in teaching, governance, and infrastructure, many institutions still lack a comprehensive and mission-driven sustainability strategy (Towards More Sustainable Universities, 2025). Furthermore, international assessment frameworks such as the Times Higher Education Impact Rankings and the UI GreenMetric World University Rankings have encouraged universities worldwide to align institutional practices with sustainability objectives and SDG achievement (Times Higher Education, 2024).

Against this backdrop, the present paper synthesizes current research and institutional practices to identify pathways for sustainability-oriented institutional transformation in higher education. Particular attention is given to curriculum integration, campus operations, governance

mechanisms, and stakeholder participation. The discussion is further situated within policy frameworks such as India's National Education Policy (NEP) 2020, which advocates holistic, socially responsible, and environmentally conscious educational practices.

2. Need and Significance

Sustainability in higher education extends beyond environmental conservation and encompasses the interconnected dimensions of environmental stewardship, social responsibility, and economic viability. The triple-bottom-line framework emphasizes that sustainable institutions must balance ecological integrity, social well-being, and economic efficiency through integrated approaches to teaching, research, governance, campus operations, and community engagement (Sustainable Practices in Academic Institutions, 2025). Consequently, higher education institutions (HEIs) are increasingly recognized as key contributors to sustainable development through their capacity to generate knowledge, influence societal values, and promote sustainable practices.

The significance of sustainability in higher education has grown considerably in response to global environmental challenges, including climate change, biodiversity loss, resource depletion, and increasing social inequalities. Universities are uniquely positioned to address these challenges by preparing graduates with the knowledge, skills, attitudes, and competencies necessary for sustainable development (Sahin, 2025). As centers of innovation and critical inquiry, HEIs can influence not only student learning outcomes but also broader societal transitions toward sustainability.

The concept of Education for Sustainable Development (ESD) provides a comprehensive framework for integrating sustainability into educational systems. ESD encourages the development of critical thinking, ethical decision-making, systems thinking, and active participation in addressing real-world sustainability challenges (Suklun & Bengü, 2024). Through interdisciplinary curricula, experiential learning opportunities, and community-based projects,

HEIs can cultivate sustainability competencies that empower learners to become responsible

global citizens.

Furthermore, institutions that successfully embed sustainability across their academic, operational, and governance structures often demonstrate stronger institutional resilience, enhanced stakeholder engagement, and greater contributions to Sustainable Development Goals (SDGs) achievement (Towards More Sustainable Universities, 2025). Therefore, understanding sustainable practices in higher education is essential for developing transformative institutional models capable of addressing contemporary global challenges while promoting long-term environmental, social, and economic sustainability.

3. Sustainable Practices in Higher Education

3.1 Curriculum and Pedagogy

The integration of sustainability into higher education curricula is widely recognized as a fundamental strategy for promoting sustainable development and preparing students to address complex global challenges. Sustainability-oriented curricula encourage interdisciplinary learning, critical thinking, problem-solving, and systems thinking, enabling learners to understand the interrelationships among environmental, social, and economic issues (Sahin, 2025). Many universities have incorporated Sustainable Development Goal (SDG) themes into core and elective courses, while experiential learning approaches such as project-based learning, field studies, and community engagement activities provide opportunities for students to apply sustainability concepts in real-world contexts (Suklun & Bengü, 2024). Such pedagogical approaches foster sustainability competencies and contribute to the development of responsible global citizens capable of promoting sustainable societal transformation.

3.2 Campus Operations and Infrastructure

Sustainable campus operations constitute an essential dimension of institutional sustainability. Universities increasingly implement environmentally responsible practices, including energy-efficient technologies, renewable energy systems, water conservation measures,

waste management programs, and green building initiatives. These practices not only reduce

institutional environmental footprints but also create learning opportunities for students by transforming campuses into living laboratories for sustainability education (Sustainable Practices in Academic Institutions, 2025). International sustainability assessment frameworks, such as the UI Green Metric World University Rankings, have further encouraged institutions to improve environmental performance and adopt comprehensive sustainability strategies aligned with global sustainability objectives (Times Higher Education, 2024).

3.3 Governance and Leadership

Effective governance and visionary leadership play a critical role in institutionalizing sustainability within higher education. Sustainable transformation requires the integration of sustainability principles into institutional missions, strategic plans, policies, and decision-making processes. Universities increasingly establish sustainability committees, SDG cells, and dedicated sustainability offices to coordinate sustainability initiatives across academic and administrative units (The Times of India, 2024a). Such governance mechanisms facilitate collaboration among stakeholders, ensure accountability, and promote long-term sustainability planning. Research suggests that institutions with strong leadership commitment are more successful in achieving meaningful sustainability outcomes and embedding sustainability across organizational structures (Towards More Sustainable Universities, 2025).

3.4 Student Engagement and Institutional Culture

Student engagement is a vital component of sustainability initiatives in higher education. Active student participation in sustainability-related activities, including eco-clubs, environmental campaigns, volunteer programs, and community outreach projects, enhances sustainability awareness and encourages environmentally responsible behavior (Suklun & Bengü, 2024). These initiatives contribute to the development of a sustainability-oriented institutional culture where students become active agents of change rather than passive recipients of knowledge. Furthermore, collaborations among universities, non-governmental organizations, local communities, and industry partners provide students with authentic opportunities to address sustainability challenges

while strengthening university-community relationships and promoting societal impact.

3.5 Assessment Indicators for Institutional Sustainability

Institutional sustainability should be evaluated using measurable indicators that assess environmental, academic, operational, and governance performance. International assessment frameworks such as the **UI GreenMetric World University Rankings**, **Times Higher Education (THE) Impact Rankings**, and the **Sustainability Tracking, Assessment and Rating System (STARS)** provide comprehensive benchmarks for evaluating sustainability initiatives in Higher Education Institutions. Common indicators include energy efficiency, renewable energy utilisation, carbon footprint reduction, water conservation, waste management, green infrastructure, curriculum integration, sustainability research, stakeholder participation, and community engagement. These indicators enable institutions to monitor progress, identify areas for improvement, and strengthen accountability toward achieving the Sustainable Development Goals (SDGs).

4. Sustainable Practices in the Indian Context

4.1 Institutional Models and Initiatives

In recent years, Indian higher education institutions (HEIs) have increasingly embraced sustainability as a strategic priority, aligning their institutional practices with the Sustainable Development Goals (SDGs) and national policy frameworks. Rather than limiting sustainability to isolated environmental activities, many institutions are adopting comprehensive approaches that integrate sustainability into campus operations, academic programs, research initiatives, governance structures, and community engagement. These emerging models demonstrate how HEIs can contribute to sustainable development while fostering environmentally responsible and socially conscious institutional cultures.

4.2 Net-Zero and Green Campus Initiatives

The Indian Institute of Technology (IIT) Dharwad represents a notable example of campus sustainability through its commitment to achieving net-zero targets in water, energy, and waste

management. The institution has implemented an eco-responsive master plan that incorporates large-scale solar energy generation, rainwater harvesting systems, and integrated waste management practices. Such initiatives contribute significantly to resource conservation, reduction of carbon emissions, and enhancement of environmental sustainability while supporting SDG 7 (Affordable and Clean Energy), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action) (The Times of India, 2024a).

4.3 Solar Energy and Green Infrastructure Development

The Indian Institute of Management (IIM) Nagpur has demonstrated a strong commitment to sustainable campus development through the establishment of a 2 MW solar power park, extensive afforestation programs, rainwater harvesting systems, wastewater recycling mechanisms, and biodiversity conservation initiatives. These efforts not only reduce environmental impacts and operational costs but also provide experiential learning opportunities for students by transforming the campus into a living laboratory for sustainability education (The Times of India, 2024b).

4.4 Integrated SDG Cells and Climate Action Strategies

Integral University, Lucknow, presents a holistic model of sustainability integration through the establishment of SDG-oriented initiatives encompassing renewable energy adoption, climate action planning, sustainable transportation infrastructure, and comprehensive waste management systems. The university has installed grid-connected solar photovoltaic systems, promoted low-carbon mobility solutions, and integrated climate literacy into academic programs. Such initiatives demonstrate how institutional governance, academic innovation, and community engagement can collectively advance SDG 12 and SDG 13 objectives (Integral University, 2024a).

4.5 Biodiversity Conservation and Resource Management

In addition to climate-focused interventions, Integral University has implemented biodiversity audits, rainwater harvesting systems, wastewater treatment and reuse programs, and policies aimed at reducing single-use plastics. These initiatives reflect a comprehensive approach

to environmental stewardship and illustrate the importance of integrating resource conservation strategies into institutional planning and operations. Such practices contribute to the creation of environmentally responsible campus ecosystems while strengthening sustainability awareness among students and staff (Integral University, 2024b).

4.6 Living Laboratory Approaches to Sustainability

Adichunchanagiri University exemplifies the concept of the university as a “living laboratory” for sustainable development. The institution integrates SDGs into teaching, research, campus management, and community outreach activities. Its sustainability initiatives include renewable energy systems, large-scale plantation programs, wastewater management facilities, plastic-free campus policies, and zero-waste practices. Student participation through National Service Scheme (NSS) units, eco-clubs, and collaborative partnerships further enhances sustainability learning and community engagement. Such initiatives demonstrate how experiential and participatory approaches can strengthen institutional contributions to SDG 12 and SDG 13 while fostering a culture of sustainability (Adichunchanagiri University, 2024).

Collectively, these examples illustrate that Indian HEIs are progressively moving beyond fragmented sustainability activities toward integrated institutional models that combine sustainable infrastructure, participatory governance, academic innovation, and stakeholder engagement. These practices provide valuable pathways for institutional transformation and offer replicable models for advancing sustainability across the higher education sector in India.

5. Practical Applications of Green Classroom and Sustainable Education in Higher Education

Higher education institutions (HEIs) play a crucial role in promoting sustainability by integrating environmental, social, and economic considerations into teaching, learning, research, and campus operations. Green classrooms and sustainable education extend beyond environmental awareness to foster behavioral transformation, institutional responsibility, and interdisciplinary competence. Through innovative pedagogical practices and sustainability-oriented learning

environments, HEIs can contribute significantly to the achievement of Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action) (Sahin, 2025; Suklun & Bengü, 2024).

5.1 Pedagogical Applications

Green classrooms promote experiential, inquiry-based, and problem-centered learning approaches that enable students to engage actively with real-world sustainability challenges. Sustainability themes can be integrated into disciplinary courses without compromising academic rigor. For example, engineering and science programs may incorporate energy audits, waste management studies, and renewable energy projects, while social science and education programs may utilize case studies addressing sustainable governance and environmental policy. Such approaches foster critical thinking, systems thinking, and problem-solving skills that are essential for sustainable development (Suklun & Bengü, 2024).

6. Behavioral and Habitual Transformation

An important outcome of green classroom practices is the development of environmentally responsible behaviors among learners. Through consistent engagement in activities such as waste segregation, paper conservation, energy-efficient practices, and responsible consumption, students gradually internalize sustainability values and behaviors. Education for Sustainable Development (ESD) emphasizes that sustainability learning should facilitate long-term behavioral change by connecting knowledge with everyday actions and decision-making processes (Sahin, 2025).

6.1 Campus as a Living Laboratory

Contemporary HEIs increasingly adopt the concept of the campus as a living laboratory where sustainability concepts are tested and applied in real-world settings. Students participate in monitoring energy consumption, evaluating water conservation measures, assessing biodiversity, and designing sustainability solutions for campus operations. These experiences bridge the gap between theory and practice while supporting institutional sustainability objectives (Towards More Sustainable Universities, 2025).

6.2 Curriculum and Assessment Innovations

Sustainable education encourages curriculum reform through the incorporation of sustainability competencies, interdisciplinary learning outcomes, and authentic assessment practices. Assessment methods may include project-based learning, sustainability audits, reflective journals, community engagement projects, and portfolio evaluations. Such approaches enable institutions to assess not only content knowledge but also sustainability-related attitudes, skills, and competencies required for addressing complex societal challenges (Suklun & Bengü, 2024).

6.3 Leadership and Citizenship Development

Green classrooms contribute significantly to the development of leadership qualities and responsible citizenship among students. Participation in sustainability initiatives encourages ethical reasoning, collaborative decision-making, social responsibility, and environmental stewardship. These experiences align with the broader objectives of global citizenship education by preparing graduates to contribute positively to sustainable communities and workplaces (Sahin, 2025).

6.4 Digital and Resource-Efficient Learning

The integration of digital technologies supports sustainability by reducing paper consumption and promoting resource-efficient educational practices. The use of Learning Management Systems (LMS), Open Educational Resources (OER), digital assessments, and virtual collaboration platforms minimizes material waste while enhancing accessibility and flexibility in learning. These practices support responsible consumption and contribute to sustainable institutional operations (Sustainable Practices in Academic Institutions, 2025).

6.5 Community Engagement and Policy Linkages

Green classroom initiatives frequently extend beyond campus boundaries through community-based sustainability projects, environmental awareness campaigns, service-learning activities, and partnerships with governmental and non-governmental organizations. Such collaborations strengthen university–community relationships and enable students to address local

sustainability challenges while developing a broader understanding of global environmental issues. These initiatives reinforce the role of HEIs as catalysts for sustainable social transformation and community development (Suklun & Bengü, 2024).

To maximize the impact of sustainable education, HEIs should integrate sustainability into institutional missions, provide professional development opportunities for faculty members, invest in sustainable infrastructure, and establish partnerships with government agencies, industry, and civil society organizations. Such comprehensive approaches can strengthen institutional contributions toward achieving the SDGs and advancing sustainable development.

6.6 Future Research Directions

Future research may focus on developing institution-specific sustainability assessment frameworks, evaluating the long-term effectiveness of Green Classroom initiatives, examining sustainability leadership in Higher Education Institutions, and investigating the influence of student participation on institutional transformation. Comparative studies involving universities across different regions and countries may further strengthen evidence for sustainable higher education practices.

7. Conclusion

Sustainable practices in higher education have become essential for fostering institutional transformation and supporting global sustainable development. As centers of knowledge creation, innovation, and societal influence, higher education institutions are uniquely positioned to promote sustainability through curriculum integration, research, campus operations, governance structures, and community engagement. The examples discussed in this paper demonstrate that sustainability is most effective when embedded across all dimensions of institutional functioning rather than implemented as isolated initiatives.

The findings highlight that green classrooms, sustainable campus operations, participatory governance, and stakeholder engagement collectively contribute to the development of sustainability competencies, environmentally responsible behaviors, and institutional resilience.

Furthermore, Indian higher education institutions are increasingly adopting innovative sustainability models that align with national priorities and the Sustainable Development Goals (SDGs).

Despite significant progress, challenges such as fragmented implementation, limited resources, inadequate faculty preparation, and insufficient assessment mechanisms continue to hinder comprehensive sustainability integration. Therefore, a whole-institution approach supported by strong leadership, collaborative partnerships, and continuous evaluation is necessary to achieve meaningful and lasting change. By embracing sustainability as a core institutional value, higher education institutions can serve as powerful catalysts for ecological responsibility, social equity, economic resilience, and societal transformation.

Ultimately, sustainable institutional transformation requires a whole-institution approach in which sustainability becomes an integral component of teaching, research, governance, campus operations, and community engagement, enabling Higher Education Institutions to serve as catalysts for achieving the Sustainable Development Goals and creating a more sustainable future.

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