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Motivation and Challenges on the Use of Educational Technology and Teaching-Learning Materials among University Students

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Abstract

This study assessed the level of motivation and challenges on the use of educational technology and teaching-learning materials among university students of Bohol Island State University (BISU), Academic Year 2025–2026. Specifically, it examined the respondents' profiles in terms of age, gender, academic program covered, year level, and familiarity with technology; determined their level of motivation in using educational technology and teaching-learning materials; identified the problems encountered; tested the relationship between respondents' profiles and motivation level; and proposed an action plan based on the findings. The study employed a descriptive research design using a stratified random sampling technique to select 385 respondents across BISU campuses. Data were collected through survey questionnaires and analyzed using frequency counts, weighted means, and chi-square tests. Results revealed that respondents were mostly 20–29 years old, predominantly female, and moderately to highly familiar with technology. Students reported a high level of motivation when technology and materials provided clear explanations, relatable examples, organized content, and opportunities for application. However, they encountered recurring challenges such as unstable internet connections, limited access to personal devices, and difficulties accessing materials requiring strong connectivity. Statistical analyses further showed no significant association between students' demographic profile and their level of motivation. Based on the findings, a Strategic Action Plan was formulated to enhance student engagement and address recurring challenges. The plan emphasizes improving internet access, expanding availability of learning devices, strengthening technical support and digital training, and ensuring that teaching-learning materials are updated, organized, and learner-centered. The results of this study contribute to the growing body of knowledge on digital education and provide practical recommendations for academic institutions in fostering meaningful and motivating learning experiences.

Keywords— Educational technology, Teaching-learning materials, Student motivation, Learning challenges, University Students, Bohol Island State University

I. INTRODUCTION

The rapid evolution of digital technologies is reshaping not only economies and governance but also

the landscape of higher education. Within this transformation, universities have an essential function of integrating educational technologies and teaching-learning materials that aim to improve both

instructional delivery and student engagement. Information and Communication Technology (ICT) has been recognized for its potential to enhance educational quality by making learning more accessible, interactive, and student-centered. However, understanding the specific motivations that drive students to embrace these tools, along with the challenges they encounter in using them, is critical. Gaining such insights is essential for ensuring the sustained and effective adoption of digital learning strategies in university settings (Xia et al., 2024).

Emerging technologies like social media, mobile phones, and tablets have been integrated into the educational system, giving rise to new web-based course delivery methods that enhance teaching and learning. One such method is the "flipped classroom," where students watch instructional videos and practice problems at home, while class time is reserved for group problem-solving. Video lectures are crucial for the flipped classroom model. Teachers create and upload these video lectures to a personal learning management system (LMS) or public streaming platforms such as YouTube, Vimeo, or Google Meet. In class, students engage in problem-solving, in-depth discussions, deeper conceptual exploration, and peer interaction (Dublar, 2023).

The digital revolution has enabled unrestricted access to information worldwide.

Modern classrooms now feature numerous ICT tools, and most instructors have advanced in using digital technology to enhance students' access to information and facilitate collaborative learning. To remain competitive and deliver high-quality education, higher education institutions must harness the power of ICT in response to digital transformation and disruptive technological innovations (Haleem et al., 2022). Moreover, Saudi Arabia has implemented various strategies and initiatives to support the 17 Sustainable Development Goals (SDGs). This ambitious plan emphasizes the enhancement and promotion of higher education, as well as the development of curricula. Additionally, Vision 2030 aims to elevate educational standards globally (Islam & Ali, 2024).

The researcher observed that the use of educational technology and teaching-learning materials significantly enhances student engagement in higher education. These technologies, such as interactive digital platforms, multimedia content, and virtual collaboration tools, make learning more interactive and accessible. Students show increased participation and

motivation when they are provided with diverse and dynamic resources that cater to various learning styles.

Existing literature has explored various dimensions of student motivation in utilizing educational technology and teaching-learning materials. Gamage et al. (2022) examined the effectiveness of online and hybrid learning modalities in enhancing student engagement and academic experiences. Similarly, Clarin and Baluyos (2021) investigated the relationship between student engagement and teaching competence in the context of online distance learning. Cadiz et al. (2020) also contributed to this discourse by examining how pedagogical beliefs influence the integration of technology among educators in Philippine higher education institutions. While these studies provide valuable perspectives, there remains a notable gap in research focusing specifically on the motivation and challenges experienced by university students in state institutions within the province of Bohol. Addressing this gap is essential to inform localized strategies that support meaningful technology adoption and improved learning outcomes.

The researcher is well-positioned to undertake this study, possessing advanced knowledge in Educational Technology and a strong background in academic research, including multiple peer-reviewed publications. With practical experience in implementing and evaluating digital learning tools in higher education institutions, the researcher has also provided training for educators on the effective integration of technology in teaching and learning. In addition, the researcher has substantial technical expertise in the use of educational technologies and learning management systems.

An established professional network with stakeholders in state universities will support efficient access to essential data, resources, and respondents. This research responds to a critical gap in understanding the motivation and challenges university students face in using educational technology and teaching-learning materials—insights that are vital for guiding future technology investments and enhancing student engagement and learning outcomes in state universities.

OBJECTIVES

This study assessed the level of motivation and challenges in the use of educational technology and teaching-learning materials among university students at Bohol Island State University, Bohol, A.Y. 2025–2026. Specifically, the study sought answer the following: 1.) the profile of the respondents in terms of: age, gender,

academic program covered, year level, and familiarity with technology; 2.) the level of motivation of the respondents on the use of educational technology and teaching-learning materials; 3.) the problems encountered by the respondents on the use of educational technology and teaching-learning materials; and 4.) the significant relationship between the profile of the respondents and the level of their motivation on the use of educational technology and teaching-learning materials.

II. RESEARCH METHODOLOGY

Research Design

This study utilized the descriptive-correlational method using a researcher-made survey questionnaire.

Research Environment

This study was conducted at Bohol Island State University (BISU), a public higher education institution in the province of Bohol, Philippines, composed of multiple campuses that offer diverse academic programs. BISU accommodates students with varied technological exposure and learning environments, making it an appropriate setting to explore students' motivation in using educational technology and teaching-learning materials. The university's campuses reflect a range of digital readiness and resource availability, which may influence how students respond to and benefit from technological tools in their academic activities.

Research Respondents

The respondents of this study were undergraduate students enrolled across the various campuses of Bohol Island State University (BISU). To ensure a diverse and representative sample, a stratified random sampling technique was employed. Each BISU campus served as a stratum, and within each stratum, students were randomly selected from different academic programs and year levels. This approach ensured that the sample reflected variations in program specialization, campus resources, and levels of technological exposure. Only students who had experience using educational technology and teaching-learning materials in their coursework were included in the study, as their perspectives were essential in evaluating both their motivation to use these tools and the specific challenges, they encountered in doing so.

Research Instruments

The primary research instrument for this study was a structured survey questionnaire designed to collect quantitative data on students' motivation and the

challenges they faced in using educational technology and teaching-learning materials. The questionnaire consisted of three main sections. The first section gathered demographic information, including age, gender, academic program, year level, and familiarity with technology. The second section focused on the students' level of motivation in the use of educational technology and teaching-learning materials, while the third section identified the problems encountered by the students in their use.

The instrument underwent a pre-testing process to ensure its reliability and validity. Based on pilot feedback, necessary revisions were made before the final administration. To ensure accessibility and inclusiveness, the survey was distributed in both online and printed formats, accommodating students with different levels of access and preferences. The data obtained from this instrument were analyzed to identify trends and correlations related to student motivation and the challenges encountered in the use of educational technology within the university context.

Table 1: Distribution of Respondents per Campus

Campus	Population (N)	Sample Size (n)
Tagbilaran Campus	7,612	183
Bilar Campus	3,571	65
Calape Campus	1,759	32
Clarin Campus	1,404	26
Balilihan Campus	2,229	41
Candijay Campus	2,079	38
Total	18,654	385

Research Procedure

Data Gathering. The researcher administered a structured survey questionnaire to selected students at Bohol Island State University (BISU). The survey was distributed both online and in printed format to accommodate students' accessibility and preferences, thus encouraging maximum participation. Before full implementation, a pilot test was conducted among a small group of students to evaluate the clarity, reliability, and validity of the instrument. Once finalized, the survey was deployed to a broader sample of students across various campuses, academic programs, and year levels.

Treatment of Data. Frequency count and percentage are used to analyze and interpret the profile of the respondents and the problems they encounter on

the use of educational technology and teaching-learning materials. The weighted mean is used to analyze and interpret the students' levels of motivation in relation to their use of educational technology and teaching-learning materials. The chi-square test of independence is used to determine the significant relationship between the profile of the respondents and their level of motivation on the use of educational technology and teaching-learning materials.

III. RESULTS AND DISCUSSIONS

This section presents and interprets the results of the respondents' assessments along with their implications. It is organized into three sections. The first section outlines the respondents' demographic profiles, including age, gender, academic program covered, year level, and technological familiarity. The second section discusses the respondents' level of motivation in utilizing educational technology and teaching-learning materials. The third section highlights the challenges faced by the respondents on the use of educational technology and teaching-learning materials.

Profile of the Respondents

This part presents the demographic profile of the respondents, covering essential variables such as age, gender, academic program covered, year level, and their level of familiarity with educational technology. The information is systematically organized and summarized in Table 2 to give a clear overview of the respondents' distribution across the different categories.

Table 2: Profile of the Respondents
(n = 385)

Profile of the Respondents		f	%
Age group	18-19 yo	44	11
	20-29 yo	336	87
	30-39 yo	5	1
Gender	Female	266	69
	Male	114	30
	Prefer not to say	5	1
Academic Program Covered	Agriculture & Natural Sciences	23	6
	Arts and Sciences	13	3
	Business and Management	48	13

	Computing & Information Sciences	14	4
	Criminal Justice	13	3
	Engineering & Architecture	48	13
	Fisheries	5	1
	Fisheries & Marine Sciences	8	2
	Midwifery Sciences	3	1
	Sciences	9	2
	Teacher Education	85	22
	Technology	99	26
	Technology & Allied Sciences	17	4
Year Level	First Year	93	24
	Fourth Year	93	24
	Second Year	105	27
	Third Year	94	24
Technology Familiarity	Expert	3	1
	Very Familiar	155	40
	Moderately Familiar	194	50
	Somewhat Familiar	29	8
	Not Familiar at All	4	1
Total		385	100

Most respondents were 20–29 years old (87%), predominantly female (69%), and mainly enrolled in Technology (26%) and Teacher Education (22%) programs. Students were fairly balanced across year levels, with second-year students slightly higher (27%). In terms of digital skills, most were moderately familiar (50%) or very familiar (40%) with technology, while very few were experts or unfamiliar.

This profile suggests that respondents are largely young, digitally literate, and evenly distributed across programs and year levels. Thus, motivation toward educational technology is less likely to be influenced by demographics and more likely shaped by factors such as internet stability, device access, and the quality of learning materials.

This finding aligns with the study of Granić (2022), which emphasized that while age and gender may provide general insights into learners' backgrounds, these demographic factors have minimal influence on students' willingness to adopt and engage with educational technologies. Instead, external factors

such as accessibility, quality of digital resources, and institutional support play a more decisive role in shaping students' motivation and engagement.

Similarly, Amaniampong and Hartmann (2023) highlighted that the effectiveness of technology integration in higher education is contingent on contextual factors—such as availability of stable internet connectivity and adequacy of devices—rather than the demographic profiles of learners. This suggests that for a young and digitally literate student population, like those in BISU, ensuring supportive infrastructures and high-quality materials is critical in maximizing the benefits of educational technology.

Level of Motivation on the Use of Educational Technology and Teaching-Learning Materials

This part presents the respondents' level of motivation on the use of educational technology and teaching-learning materials. The results reflect how students perceive various features of digital tools and instructional resources in terms of their ability to enhance learning and sustain interest. The data is systematically organized and summarized in Table 3 to provide a clear overview of the extent to which these tools and materials contribute to student motivation.

The section also serves to identify the key motivational factors that influence students' engagement with technology-based and traditional learning resources. By examining how these tools support comprehension, participation, and skill application, the analysis provides valuable insights into how effectively educational technology and teaching-learning materials are integrated into the learning environment. This examination further highlights the relationship between instructional design and students' willingness to utilize available learning aids, setting the groundwork for recommendations aimed at improving motivation and academic performance.

Table 3: Level of Motivation on the Use of Educational Technology
(n = 385)

A. Educational Technology. I become motivated when educational technology provides...			
I.		Ave.	Motivation Level
1	easier ways to understand difficult lessons.	3.43	Highly Motivated

2	quick access to learning resources and references.	3.53	Highly Motivated
3	immediate feedback on my academic performance.	3.42	Highly Motivated
4	visual aids that help me grasp complex topics.	3.48	Highly Motivated
5	simulations that make concepts more realistic.	3.45	Highly Motivated
6	interactive tasks that challenge my thinking.	3.42	Highly Motivated
7	opportunities to apply what I've learned.	3.49	Highly Motivated
8	organized content that helps me study better.	3.48	Highly Motivated
9	features that let me learn at my own pace.	3.45	Highly Motivated
10	videos and audio that explain lessons clearly.	3.48	Highly Motivated
11	summaries to help me review key points.	3.51	Highly Motivated
12	quizzes or exercises that improve my problem-solving skills.	3.42	Highly Motivated
13	step-by-step guides for learning new topics.	3.52	Highly Motivated
14	higher-level thinking activities.	3.39	Highly Motivated
15	clear and simple explanations to reduce confusion.	3.50	Highly Motivated
Aggregate Average		3.46	Highly Motivated

In terms of educational technology, the aggregate average of 3.46, interpreted as *Highly Motivated*, indicates that the 385 respondents generally perceive educational technology as a strong motivational factor in their learning. This overall high mean suggests that students are consistently encouraged by various features of educational technology, particularly those that provide quick access to resources, clear explanations, structured content, interactive activities, and opportunities for application. The narrow range of item means further reflects a shared positive perception among learners.

However, when considering the respondents' level of technology familiarity, a nuanced picture emerges. While a majority reported being *Very Familiar* (155 respondents, 40%) or *Moderately Familiar* (194 respondents, 50%) with technology, a notable minority indicated being *Somewhat Familiar* (29 respondents, 8%) or *Not Familiar at All* (4 respondents, 1%). This suggests that despite the overall high motivation associated with educational technology, a portion of learners may face challenges in fully leveraging these tools due to lower technological proficiency. The discrepancy highlights the need for targeted support and scaffolding to ensure that students with lower technology familiarity can equally benefit from educational technology, maintaining motivation across the entire learner population.

Recent empirical studies underscore the motivational benefits of educational technology while also highlighting the critical role of learners' technology familiarity and self-efficacy in shaping engagement and satisfaction. A systematic review by Alé and Arancibia (2025) found that technology-based motivational strategies, such as interactive and adaptive tools, significantly enhance students' attention, confidence, and satisfaction—core components of motivation in digital learning environments. Supporting this, Mekheimer's (2025) mixed-methods study revealed that *technological self-efficacy* significantly predicts the use of e-learning strategies and overall learner satisfaction, suggesting that learners' confidence in using technology enhances their engagement with digital learning tools.

Similarly, Getenet et al. (2024) reported that positive attitudes toward digital technology and higher digital literacy contribute to stronger self-efficacy, which in turn positively influences multiple dimensions of online engagement, including behavioral and cognitive involvement. These findings indicate that while educational technology can be intrinsically motivating, students' familiarity and competence with technology are pivotal in translating motivational potential into effective engagement and learning outcomes.

The top three highest motivating indicators were *opportunities to apply what students have learned* ($\bar{x} = 3.49$), *organized content that helps them study better* ($\bar{x} = 3.48$), and *both visual aids and videos or audio that explain lessons clearly* ($\bar{x} = 3.48$). These findings imply that students are most motivated when technology enables them to put learning into practice, provides structured materials for easier study, and integrates

multimedia elements that enhance understanding. According to Sabri et al. (2024), multimedia elements, when aligned with cognitive theory, enhance understanding and retention by combining visual and verbal information, thereby strengthening students' motivation to learn through technology-enhanced instruction.

On the other hand, the top three lowest indicators, though still rated as highly motivating, were *interactive tasks that challenge thinking* ($\bar{x} = 3.42$), *immediate feedback on academic performance* ($\bar{x} = 3.42$), and *quizzes or exercises that improve problem-solving skills* ($\bar{x} = 3.42$). This suggests that while students value interactive and feedback-driven activities, they may not view them as strongly motivating compared to application-oriented and visually supportive tools. Kencana (2025) found that students' motivation decreases when technology integration lacks sufficient scaffolding or when learners are left to navigate complex tasks independently. Therefore, structured support and guided interactivity are essential in maintaining engagement in digital learning contexts.

Table 4: Level of Motivation on the Use of Teaching-Learning Materials
 (n = 385)

B. Teaching-Learning Materials. I become motivated when teaching-learning materials provide...			
II.		Ave.	Motivation Level
1	clear explanations of the lesson.	3.60	Highly Motivated
2	examples that help me understand the topic better.	3.62	Highly Motivated
3	illustrations or diagrams that simplify the content.	3.57	Highly Motivated
4	organized and easy-to-follow content.	3.57	Highly Motivated
5	activities that develop my thinking skills.	3.54	Highly Motivated
6	review questions at the end of each topic.	3.52	Highly Motivated
7	summaries that help me retain information.	3.55	Highly Motivated
8	tasks that let me apply what I've learned.	3.52	Highly Motivated

9	real-life examples I can relate to.	3.56	Highly Motivated
10	worksheets that challenge my understanding.	3.46	Highly Motivated
11	step-by-step instructions for complex tasks.	3.53	Highly Motivated
12	structured outlines that guide my learning.	3.48	Highly Motivated
13	content that matches the lesson objectives.	3.51	Highly Motivated
14	practice questions that prepare me for assessments.	3.50	Highly Motivated
15	consistent and updated academic content.	3.51	Highly Motivated
Aggregate Average		3.54	Highly Motivated

In terms of Teaching-Learning Materials (TLMs), the aggregate average of 3.54, interpreted as *Highly Motivated*, indicates that the 385 respondents generally perceive TLMs as a significant motivational factor in their learning. This high mean suggests that learners are consistently encouraged by the availability and quality of instructional materials, including textbooks, visual aids, worksheets, and multimedia resources, which help clarify concepts, support structured learning, and provide opportunities for practice and application. The narrow range of item means further reflects a shared positive perception among learners.

However, when considered alongside students' level of technology familiarity, a more nuanced interpretation emerges. While most respondents reported being *Very Familiar* (155 respondents, 40%) or *Moderately Familiar* (194 respondents, 50%) with technology, a small but notable portion indicated being *Somewhat Familiar* (29 respondents, 8%) or *Not Familiar at All* (4 respondents, 1%). This suggests that although TLMs are generally motivating, learners with lower technological familiarity may face difficulties accessing or utilizing digital and multimedia instructional materials effectively. Therefore, ensuring that materials are user-friendly and supplemented with guidance or scaffolding is important to maximize motivation and engagement for all learners.

Recent research highlights the importance of teaching-learning materials in fostering motivation and

engagement, while also pointing to the role of students' familiarity and self-efficacy in optimizing their use. A study by Li and Chen (2025) found that high-quality instructional materials—including interactive multimedia and structured worksheets—enhance student engagement, comprehension, and intrinsic motivation in classroom and online settings.

Additionally, Mekheimer (2025) emphasized that technological self-efficacy significantly influences learners' ability to use digital instructional resources, indicating that students with lower familiarity may not gain the full motivational benefits of TLMs. Similarly, Getenet et al. (2024) reported that positive attitudes toward instructional technologies and higher digital literacy strengthen engagement, suggesting that accessible and well-designed materials, paired with support for learners with limited technological experience, are crucial for sustaining motivation across diverse student populations.

The highest motivating factors were *examples that helped students understand the topic better* ($\bar{x} = 3.62$), *clear explanations of the lesson* ($\bar{x} = 3.60$), and *illustrations or diagrams that simplified the content* ($\bar{x} = 3.57$). These results highlight that students are particularly motivated by clarity, concrete examples, and visual representations that simplify complex concepts. Lan (2024) reported that students exhibit greater motivation when instructional materials are visually appealing and aligned with real-life applications, as such designs foster deeper engagement and sustained attention during the learning process.

Meanwhile, the three lowest indicators were *consistent and updated academic content* ($\bar{x} = 3.50$), *content that matches the lesson objectives* ($\bar{x} = 3.51$), and *practice questions that prepare students for assessments* ($\bar{x} = 3.51$). While still rated positively, these areas suggest that accuracy and alignment, though important, may not be as motivating as clarity and relatable examples in stimulating student engagement. Seaba and Alorh (2022) emphasized that outdated and text-heavy materials can diminish learner satisfaction and motivation, underscoring the need for continuous updates and improvements in both design and relevance of instructional resources.

Taken together, the aggregate average for educational technology was 3.46, while that of teaching-learning materials was slightly higher at 3.54. This resulted in an overall high motivation level of 3.50. These findings suggest that students' motivation is strengthened when learning tools and materials are

accessible, structured, and interactive, while also offering clarity, relatable examples, and opportunities for application. Hence, a balanced integration of both digital and traditional resources appears crucial in sustaining student engagement and enhancing learning outcomes. Procel et al. (2024) found that students' motivation in technology-integrated learning environments depends largely on the perceived usefulness, clarity, and organization of the tools used—highlighting that well-structured design continues to be a key driver of educational motivation.

Problems Encountered on the Use of Educational Technology and Teaching-Learning Materials

This section presents the problems encountered by university students in relation to the use of educational technology and teaching-learning materials. It outlines various challenges that students may experience in digital and blended learning settings, including those related to connectivity, device accessibility, platform usability, and instructional support. For clarity and organization, these concerns are systematically arranged and summarized in Table 5.

Table 5: University Students' Problems Encountered on the Use of Educational Technology and Teaching-Learning Materials
(n = 385)

Nos.	University Students' Problems Encountered on the Use of Educational Technology and Teaching-Learning Materials	f	Rank
1	Slow or unstable internet connection when attending online classes or accessing learning platforms.	297	1
2	Limited access to a personal device (laptop, tablet, or smartphone) for schoolwork.	241	2
3	Struggle to use some online learning platforms or apps due to a lack of digital skills.	190	6
4	Frustrated when the platform suddenly	204	4

5	crashes or stops working while I am studying. Difficult to navigate our learning system because it is not easy to use.	96	15
6	Did not receive enough orientation or training on how to use the school's online platforms.	80	18
7	Rarely get help from my instructors when I encounter technical problems.	89	17
8	Find it hard to concentrate during long periods of screen-based learning.	157	9
9	The learning materials provided are outdated or not relevant to the current lesson.	60	19
10	Lose interest when materials are mostly text and do not include videos or visuals.	159	8
11	Get confused when the materials are disorganized or not clearly explained.	200	5
12	The materials used do not match my learning style (e.g., I prefer visuals or activities).	94	16
13	Feel unmotivated when the materials do not include exercises or activities.	89	17
14	Sometimes cannot access the materials because they need strong internet or certain apps.	214	3
15	Overwhelmed when too many materials are uploaded without clear instructions.	166	7
16	Have difficulty understanding lessons when there is no video or	152	10

	audio explanation included.		
17	Stress when multiple platforms are used for one subject or class.	140	12
18	Discouraged when the instructor does not explain how to use new apps or tools.	116	14
19	Cannot always participate in online activities due to limited mobile data or load.	142	11
20	Miss deadlines because I am not notified properly through the platform or materials used.	119	13

The results show that the three most pressing challenges students faced in using educational technology and teaching-learning materials were: *slow or unstable internet connection* (Rank 1, $f = 297$), *limited access to a personal device such as laptops, tablets, or smartphones* (Rank 2, $f = 241$), and *inaccessibility to platforms or apps due to strong internet requirements* (Rank 3, $f = 214$). These findings highlight the persistent issue of the digital divide, where unequal access to stable connectivity and devices directly impacts students' ability to participate effectively in online or technology-enhanced learning. This aligns with the study of Ndibalema (2022), who found that poor connectivity and insufficient device ownership were among the top barriers to e-learning in higher education, particularly in developing regions.

On the other hand, the three least-reported challenges were: outdated or irrelevant learning materials (Rank 20, $f = 60$), lack of sufficient orientation or training on how to use the school's online platforms (Rank 19, $f = 80$), and two challenges that shared the same rank—limited instructor assistance when encountering technical problems (Rank 17.5, $f = 89$) and difficulty understanding instructions in some online materials (Rank 17.5, $f = 89$).

These findings indicate that while technical access and connectivity were the most pressing concerns, content-related and instructional support issues were less frequently experienced but still play a crucial role in students' overall learning experience. This aligns with the study of Kupchuk and Litvinchuk

(2025), who noted that the long-term success of technology-enhanced learning relies not only on access to tools but also on continuous content development, proper orientation, and teacher guidance to help students navigate digital learning environments effectively.

These findings highlight the interplay between infrastructural and pedagogical barriers in students' use of educational technology and teaching-learning materials. While internet connectivity and access to devices represent infrastructural issues, concerns such as lack of orientation, limited technical support, and unengaging content are pedagogical in nature. Chari (2024) emphasized that addressing both dimensions simultaneously is essential to ensure that students not only gain access to technology but also develop the skills and confidence to utilize it effectively. Focusing on one aspect alone risks perpetuating learning inequalities, even when technological access improves.

Furthermore, the implications underscore the importance of adopting student-centered strategies in the integration of technology. When learners experience insufficient guidance, a lack of technical help, or poorly designed content, their motivation and engagement tend to decline. Saleh (2025) observed that while connectivity challenges may be structural and often beyond institutional control, the provision of responsive support and interactive learning materials can substantially enhance students' persistence in technology-mediated learning. In this sense, institutions must prioritize both digital infrastructure and sustained instructional support to optimize educational outcomes.

Overall, the results indicate that students' challenges were shaped by the dual influence of external access limitations and internal instructional shortcomings. Addressing these holistically will help create a more equitable and engaging learning environment. Vo (2020) affirmed that both access to reliable technology and the quality of instructional design determine the extent of students' motivation and success in online and blended learning settings. Therefore, institutions should not only focus on improving connectivity and device accessibility but also strengthen the pedagogical design of digital materials to promote meaningful and sustainable technology-enhanced learning.

Significant Relationship Between the Profile of The Respondents and The Level of Their Motivation

This section presents the chi-square tests conducted to determine whether there is a significant

relationship between students' motivation levels on the use of educational technology and teaching-learning materials and their demographic characteristics, including age, gender, academic program covered, year

level, and technology familiarity. The results are systematically summarized in Tables 6 and 7 for clarity and comparison.

Table 6: Chi-Square Test on the Relationship Between the Profile of the Respondents and Their Level of Their Motivation on the Use of Educational Technology

(n = 385)

Profile of the Respondents	n	Chi-Square Value	df	p-Value	Decision on Ho	Significance
1. Age	385	2.897	6	0.82	Fail to reject	Not Significant
2. Gender	385	8.401	6	0.21	Fail to reject	Not Significant
3. Programs	385	30.107	36	0.74	Fail to reject	Not Significant
4. Year Level	385	9.162	9	0.42	Fail to reject	Not Significant
5. Technology Familiarity	385	17.577	12	0.13	Fail to reject	Not Significant

a = 0.05 level of significance

The Chi-Square test results indicate that there is no significant relationship between the profile of the respondents and their level of motivation in using educational technology. Specifically, age ($\chi^2 = 2.897$, $df = 6$, $p = 0.82$), gender ($\chi^2 = 8.401$, $df = 6$, $p = 0.21$), program of study ($\chi^2 = 30.107$, $df = 36$, $p = 0.74$), and year level ($\chi^2 = 9.162$, $df = 9$, $p = 0.42$) all failed to reach statistical significance at the 0.05 level. This suggests that motivation to use educational technology is consistent across different demographic and academic profiles, indicating that learners' enthusiasm and drive

to engage with digital tools are generally uniform regardless of age, gender, program, or year level.

These results imply that the motivational impact of educational technology is broadly experienced among learners and may be intrinsically linked to the features of the technology itself, such as its interactivity, accessibility, and relevance to learning tasks. This finding is consistent with studies by Ghai and Tandon (2023), which emphasize that educational technology can enhance learner motivation independently of demographic differences.

Table 7: Chi-Square Test on the Relationship Between the Profile of the Respondents and Their Level of Their Motivation on the Use of Teaching-Learning Materials

(n = 385)

Profile of the Respondents	n	Chi-Square Value	df	p-Value	Decision on Ho	Significance
1. Age	385	3.437	6	0.75	Fail to reject	Not Significant
2. Gender	385	9.918	6	0.13	Fail to reject	Not Significant
3. Programs	385	33.24	36	0.6	Fail to reject	Not Significant
4. Year Level	385	10.449	9	0.32	Fail to reject	Not Significant
5. Technology Familiarity	385	13.066	12	0.36	Fail to reject	Not Significant

a = 0.05 level of significance

The Chi-Square test results in Table 7 indicate that there is no significant relationship between the profile of the respondents and their level of motivation in using teaching-learning materials (TLMs). Age ($\chi^2 = 3.437$, $df = 6$, $p = 0.75$), gender ($\chi^2 = 9.918$, $df = 6$, $p = 0.13$), program of study ($\chi^2 = 33.24$, $df = 36$, $p = 0.60$),

and year level ($\chi^2 = 10.449$, $df = 9$, $p = 0.32$) all failed to reach statistical significance at the 0.05 level. This suggests that learners' motivation to engage with TLMs is generally consistent across different demographic and academic profiles, regardless of differences in age, gender, program, or year level.

These findings imply that the motivational effect of TLMs is broadly experienced among students and may be intrinsically linked to the qualities of the materials themselves, such as their clarity, relevance, and ability to support structured learning and practice. This aligns with research by Ajlouni et al. (2022), which emphasizes that high-quality and well-structured instructional materials can enhance learner motivation and engagement independently of demographic characteristics.

IV. CONCLUSION

This study revealed that university students of Bohol Island State University, A.Y. 2025–2026, generally exhibited a high level of motivation on the use of educational technology and teaching-learning materials. Their motivation was fostered more by the accessibility, clarity, and organization of the tools rather than by their age, gender, academic program covered, year level, or technological familiarity, as no significant associations were found between these profile variables and motivation. Despite the positive outlook, students continued to face recurring challenges, particularly with unstable internet connections, limited access to personal devices, and issues related to disorganized or inaccessible materials.

The findings highlight the need for institutions to strengthen digital infrastructure, ensure the availability of learning resources, and provide student support systems that reduce barriers to engagement. By addressing these challenges and refining the design and delivery of technology-based learning materials, the university can further enhance student motivation and learning outcomes. Ultimately, this study emphasizes that while student demographics play little role in shaping motivation, the quality, accessibility, and effectiveness of educational tools remain crucial drivers of academic engagement and success.

V. RECOMMENDATIONS

Based on the findings, it is recommended that Bohol Island State University strengthen its digital infrastructure by improving internet accessibility within the campus and providing alternative support for students with limited access to personal devices. The university may also consider establishing a lending program for gadgets or facilitating partnerships with external organizations to make devices more affordable to students.

Furthermore, faculty members and content developers are encouraged to design and organize digital materials in ways that are user-friendly, accessible even with low bandwidth, and aligned with students' learning needs. Regular training and workshops may also be conducted to ensure that both teachers and students are equipped with strategies for maximizing educational technology. Finally, continuous monitoring and evaluation of technology use in teaching and learning should be implemented to address issues promptly and sustain student motivation.

In line with these recommendations, future researchers may explore related areas to deepen the understanding of technology integration in higher education:

1. Impact of Improved Digital Infrastructure on Student Engagement and Academic Performance;
2. The Effectiveness of Gadget Lending Programs and Institutional Partnerships; and
3. Design and Evaluation of Low-Bandwidth, Student-Centered Learning Materials.

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Socio-Emotional Connectedness in Schools: Determinants, implications, and trends – A Systematic Review

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Abstract— This review presents a comprehensive analysis of existing literature on socio-emotional connectedness among students and its influencing factors. A total of 21 peer-reviewed articles, published between 2000 and 2024, were systematically selected from reputable databases, including SAGE Journals Online, Springer, Elsevier, ResearchGate, Shodhganga, and ERIC. The findings indicate that socio-emotional connectedness plays a crucial role in student well-being, with strong associations found between this concept and key factors such as school environment, peer relationships, mental health, and anxiety levels. A positive school climate and supportive peer interactions contribute significantly to students' emotional well-being, fostering a sense of belonging and reducing stress. Conversely, negative social experiences and lack of emotional support can heighten anxiety and hinder academic performance. Despite extensive research on this topic, a notable gap exists in studies focusing on the Indian educational context, particularly among adolescent students. The review highlights the urgent need for further exploration, especially concerning primary school students, to better understand the unique socio-emotional challenges they face in India's diverse educational landscape. Addressing this gap would provide valuable insights for educators and policymakers to develop interventions that enhance students' emotional well-being and academic success.

Keywords— Peer support, school climate, socio-emotional connectedness.

I. INTRODUCTION

A systematic review of literature in educational research involves a structured, comprehensive analysis of existing studies to identify patterns, gaps, and trends. It follows a rigorous methodology, including defining research questions, selecting databases, applying inclusion criteria, and synthesizing findings, ensuring a reliable and unbiased evaluation of educational theories and practices.

Socio-emotional connectedness pertains to the intricate relationship between social and emotional dynamics that shape a person's feeling of belonging, attachment, and interpersonal relationships. This concept reflects the strength and quality of connections within social networks, including families, communities,

and larger social circles (Juvonen et al., 2019). It extends beyond casual social interactions, capturing the emotional depth and psychological intimacy present in meaningful relationships. Core components of socio-emotional connectedness include empathy, trust, and mutual understanding, which collectively contribute to establishing a supportive environment that fosters personal growth and psychological wellness (Durlak et al., 2011; Oberle et al., 2014).

In recent years, socio-emotional connectedness has gained significant attention in fields such as education, healthcare, and community development. Research consistently underscores its importance for mental health, resilience, and general contentment with life (Jones et al., 2018). For example, in educational

settings, socio-emotional connectedness is linked to better scholastic achievement and reduced conduct issues (Wentzel, 2017). Additionally, it serves a vital role in counteracting the negative effects of social withdrawal and seclusion, which are increasingly recognized as conditions that elevate the chances of mental health challenges and psychological distress (Holt-Lunstad et al., 2015). Thus, fostering socio-emotional connectedness is not only essential for individual well-being but also for building resilient and inclusive communities.

Socio-emotional connectedness has emerged as a critical focus in educational research, emphasizing its profound influence on students' scholastic success, mental wellness, and social advancement. This construct pertains to the feeling of belonging, emotional bonding, and meaningful connections students build within their educational and social settings. Socio-emotional connectedness is widely recognized as a foundational element of holistic education, given its role in fostering resilience, reducing emotional distress, and promoting positive behavioral outcomes (Lester, Waters, & Cross, 2013; Raniti et al., 2022).

Studies consistently demonstrate that students with strong socio-emotional bonds—whether with peers, teachers, or family members tend to exhibit greater academic motivation and improved psychological well-being. For instance, studies by Lester et al. (2013) and McNeely and Falci (2004) underline the role of school connectedness in mitigating depression, anxiety, and risky behaviors. Similarly, family dynamics are crucial in influencing a child's socio-emotional landscape, with Eugene (2021) demonstrating that strong familial bonds are linked to better mental health and academic outcomes. These findings underscore the significance of addressing socio-emotional connectedness, particularly in primary and secondary school contexts, where foundational abilities like managing emotions, empathizing with others, and building relationships are cultivated.

In the contemporary educational landscape, challenges such as increasing academic pressures, societal changes, and the prevalent utilization of digital technology have further complicated the dynamics of socio-emotional connectedness. Pollak et al. (2023) found that transitions between school stages can negatively impact classroom climate and peer relationships, highlighting critical points of vulnerability. Declines in school bonding, particularly during middle school years, have also been observed, with Oelsner et al. (2011) reporting a greater decline

among male students. These challenges often lead to emotional disengagement, social isolation, and heightened stress, emphasizing the need for school-based interventions to reinforce socio-emotional bonds (Loukas et al., 2009; Waters et al., 2010).

Moreover, socio-cultural and contextual factors further shape socio-emotional connectedness. Govender et al. (2013) and Gupta (2012) highlight the influence of socio-economic conditions, parental attachment, and cultural norms on students' ability to build and maintain socio-emotional relationships. Teachers also play a central role, with Karmakar (2018) demonstrating that teachers with high emotional intelligence can foster positive classroom environments, enhancing students' socio-emotional growth.

Given the multifaceted nature of socio-emotional connectedness and its implications for long-term outcomes, understanding the factors influencing it within the student population is essential. This study seeks to explore the socio-emotional connectedness of students, focusing on its relationship with variables like relationships between teachers and students, peer dynamics, family support, and school climate. By addressing these elements, this research aims to provide evidence-based insights that can inform interventions, strengthen socio-emotional bonds, and ultimately contribute to the holistic development of students in educational settings.

Through this systematic review, the researcher intends to provide a basis for a deep exploration of the intricate factor, i.e., students' socio-emotional connections, and to identify other key contributing factors. By integrating existing literature, theoretical models, and empirical data, this research endeavour aims to shed light on the nuanced dynamics at play, offering insights into the factors influencing socio-emotional connectedness among school students. These elements not only shape academic performance but also profoundly impact long-term mental health and overall development, highlighting their significance within the educational community during these crucial formative years.

II. RESEARCH AIM AND OBJECTIVES

Socio-emotional connectedness is a fundamental aspect of a child's development, profoundly influencing academic performance, mental health, social integration, and overall well-being. During the primary school years, children are at a formative stage where

they begin to develop critical socio-emotional competencies such as empathy, emotional management, relationship-building, and self-awareness. These skills not only shape their ability to navigate social environments but also determine how they manage challenges, both in and outside the classroom.

While socio-emotional connectedness is increasingly recognized as essential in education, there is a noticeable gap in understanding how these dynamics uniquely unfold in school students. Early interventions focused on socio-emotional well-being have the potential to yield long-term benefits, such as improved academic outcomes, stronger interpersonal relationships, and reduced behavioral challenges. However, effective interventions require a deeper exploration of the factors influencing socio-emotional connectedness in this age group. This research seeks to examine the socio-emotional connectedness of school students, focusing on its relationship with critical factors like teacher-student interactions, peer connections, family dynamics, and the broader school environment. By identifying the enablers and barriers to socio-emotional well-being, the study aims to provide actionable insights for educators, parents, and policymakers.

The findings from this research will guide the creation of evidence-based strategies and school-centered initiatives designed to foster supportive learning environments, enhance emotional resilience, and strengthen social connections among students. Ultimately, this work aspires to empower schools to nurture emotionally and socially competent individuals, laying a solid foundation for their lifelong success and well-being.

The core objective of this systematic review is restricted to significant studies and English-language articles published after 2000, which examine the socio-emotional relationships of students across different ages. Consequently, the proposed study will pursue these objectives.

1. To perform a structured review of empirical studies focusing on students' socio-emotional connectedness across diverse age groups.
2. To investigate other contributing variables that may illustrate the strength of the relationship with socio-emotional connectedness among students.
3. To present a comprehensive overview of prior studies and highlight trends and gaps in research.

III. RESEARCH METHODOLOGY

3.1 Locating studies

Over the last 25 years, this literature review explored the socio-emotional connectedness of students. Researchers searched databases including Shodhganga, SAGE Journals, and Research Gate for journal articles published between 2000 and 2024. The search involved the keyword 'Socio-emotional connectedness of students.' Cross-referencing yielded additional studies. Ultimately, 21 of over 600 studies were selected for inclusion.

3.2 Inclusion-exclusion criterion

To begin, the researchers identified all articles with "socio-emotional connectedness of students" in their titles. The final research papers were chosen according to inclusion and exclusion criteria. Studies satisfying the inclusion conditions were analyzed, with no limitations on age, educational stages, or cultural contexts.

The guidelines for inclusion and exclusion involved-

- (i) This review selected studies employing survey, empirical, experimental, and longitudinal research designs related to students' socio-emotional well-being, with theses and meta-analyses excluded.
- (ii) The review focused solely on English-language papers, leading to the exclusion of all others.
- (iii) Only accessible full-text articles are incorporated.

The selection and exclusion of studies for this analysis are presented in Table 1.

3.3 Overview of the included studies' characteristics

Studies available from 2000 to September 2024 in online formats were considered. The search revealed no substantial research before 2000 featuring the primary variable, socio-emotional connectedness (SEC). Table 2 offers a synopsis of the selected studies, detailing the author's name, publication year, sample characteristics, methodology, key findings, and factors influencing SEC. To demonstrate the outcomes in an organized way, the researcher will analyze studies separately based on sample characteristics, such as elementary school students, high school students (adolescents), and mixed samples.

Table 1: Inclusion and Exclusion criteria

Genre	Criteria of selection	Criteria of Elimination
Publication timelines	Studies published between 2000 and 2024	Released prior to 2000
Publishing language(s)	Written in English	Languages other than English
Searching mode	Online searching	Offline searching.
Sources	SAGE Journals Online, Shodhganga, Elsevier, ERIC- Education Resources Information Center, Springer- Journals Archive, Research Gate.	Any other than specified.
Type of publication	Journals, articles, working papers, seminar and conference presentations, symposium contributions, and degree-submitted theses (only full-text articles).	Non-full-text articles
Focus terms	Socio-emotional connectedness of students	
Research designs	Survey type, Systematic review, empirical, longitudinal, and experimental research.	Thesis and Meta-analyses.
Target Population	For boys and girls of any age, developmental stage, or culture.	
Sample type, Characteristics of sample	Research incorporating both small and large samples, examining school students, college/university students, and blended samples.	Any other than stated.
Types of methods	Quantitative surveys, qualitative evaluations (including interviews and observations), standardized tests, and mixed methods.	Unstandardized measures

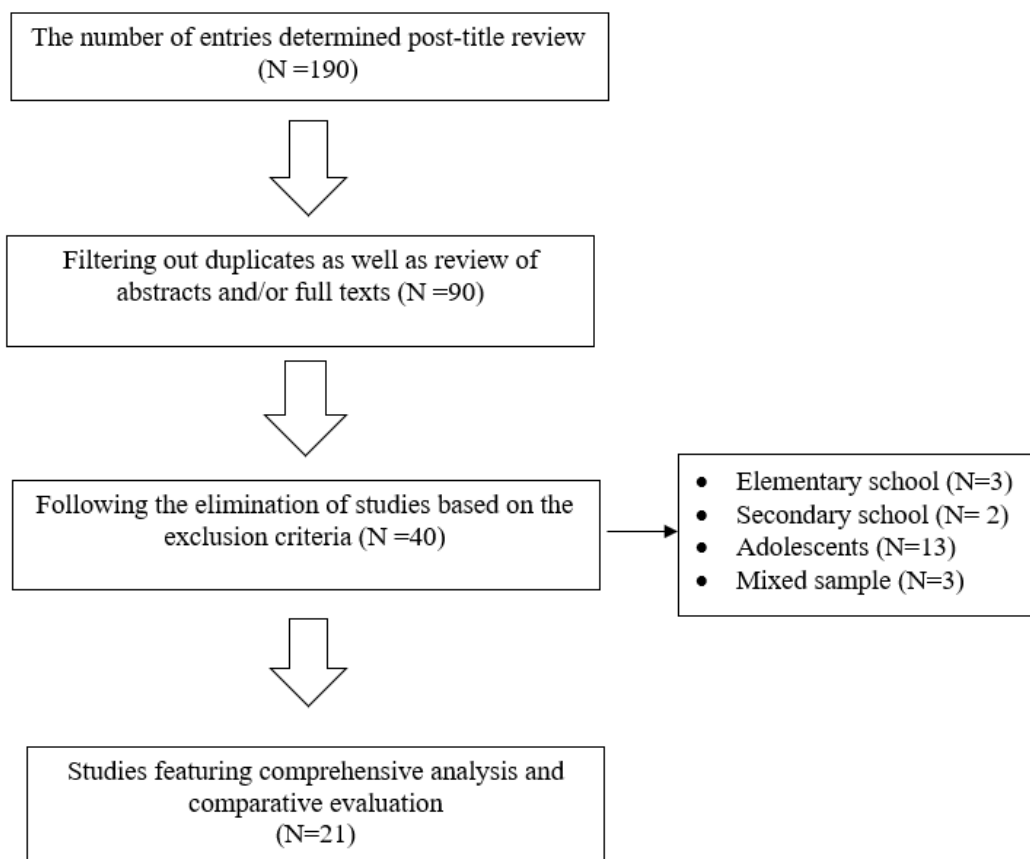


Fig.1: Selection process with numbers of studies identified at each stage

IV. RESULTS

4.1 Systematic review of literature

In this systematic review, 21 empirical studies were selected for detailed examination. Spanning publication

years from 2000 to 2024, the studies were conducted across various regions and focused on different age categories, such as primary and secondary school students, adolescents, and mixed cohorts.

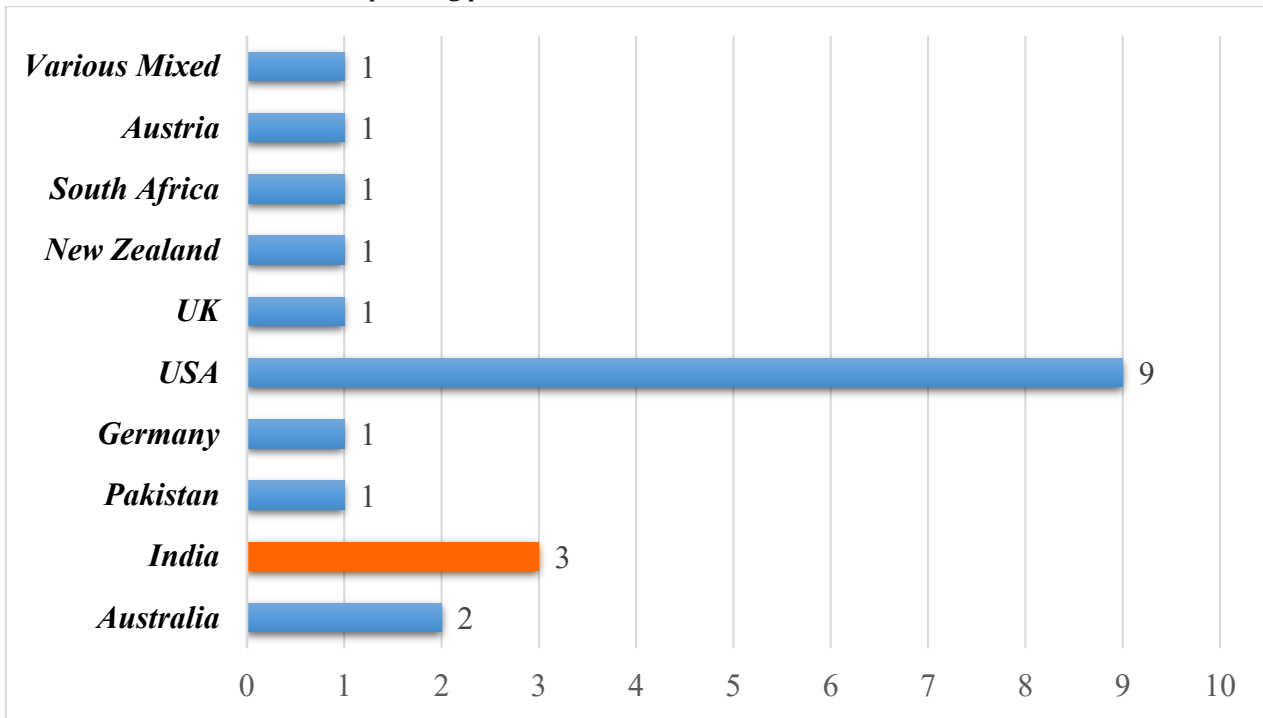


Fig.2: Country wise included studies

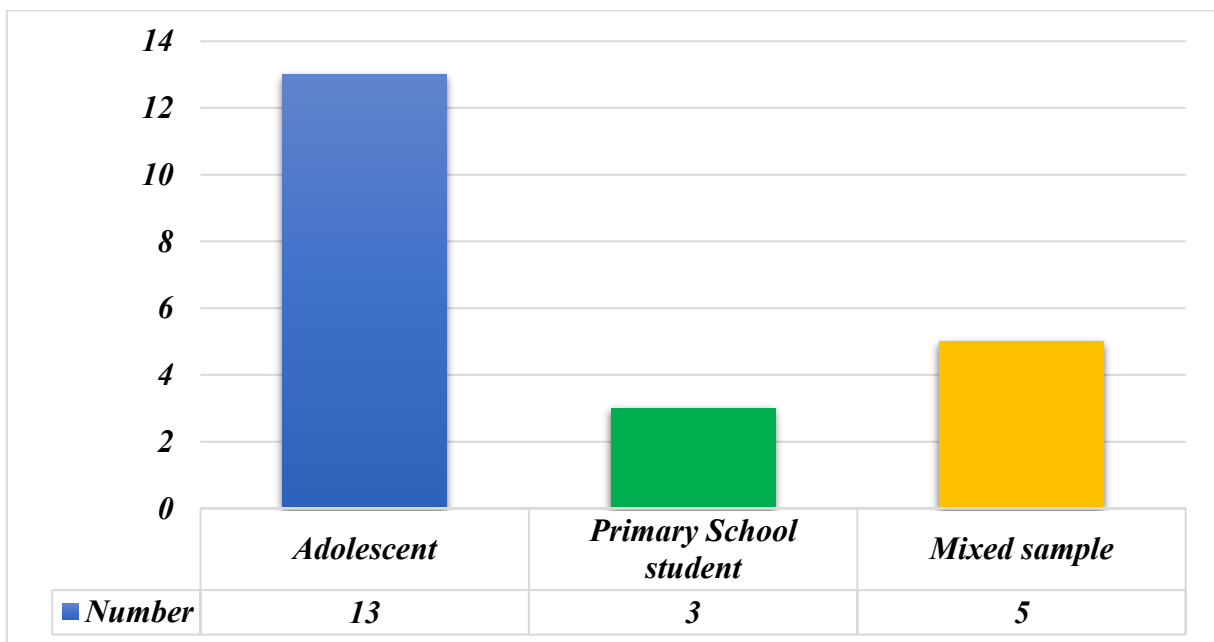


Fig.3: Sample wise included studies

4.2 Principal outcomes

4.2.1 The manifestation of significant factors linked to socio-emotional connection (Figure 4):

The reviewed papers demonstrate that the manifestation of key parameters depicted in the diagram significantly influences socio-emotional

connectedness, particularly for students. Notably, school connectedness accounts for 11% of the occurrence data in the studies.

4.2.2 Simultaneous occurrence of two key variables from the included studies

Analysis of simultaneous occurrences of key factors reveals that school connectedness, family support, mental health, teacher-student relationships, and peer

connectedness rank highest in terms of occurrence frequency within the included studies. The next figure provides further details.

4.2.3 Extracted details from the included studies:

Insights into factors impacting students' socio-emotional engagement in educational environments across different nations are drawn from 21 studies summarized in Table 2.

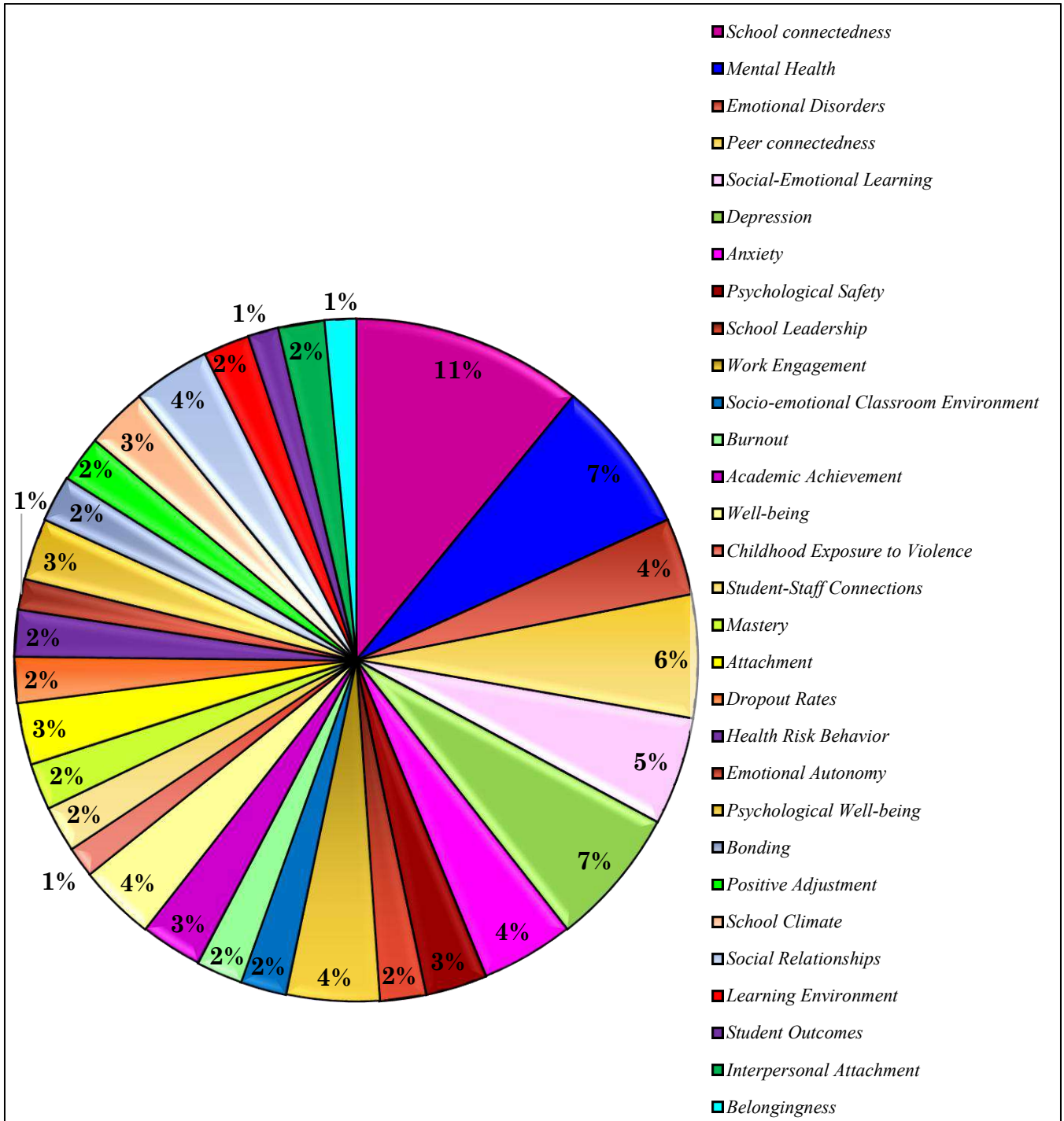


Fig.4: The manifestation of significant factors linked to socio-emotional connection

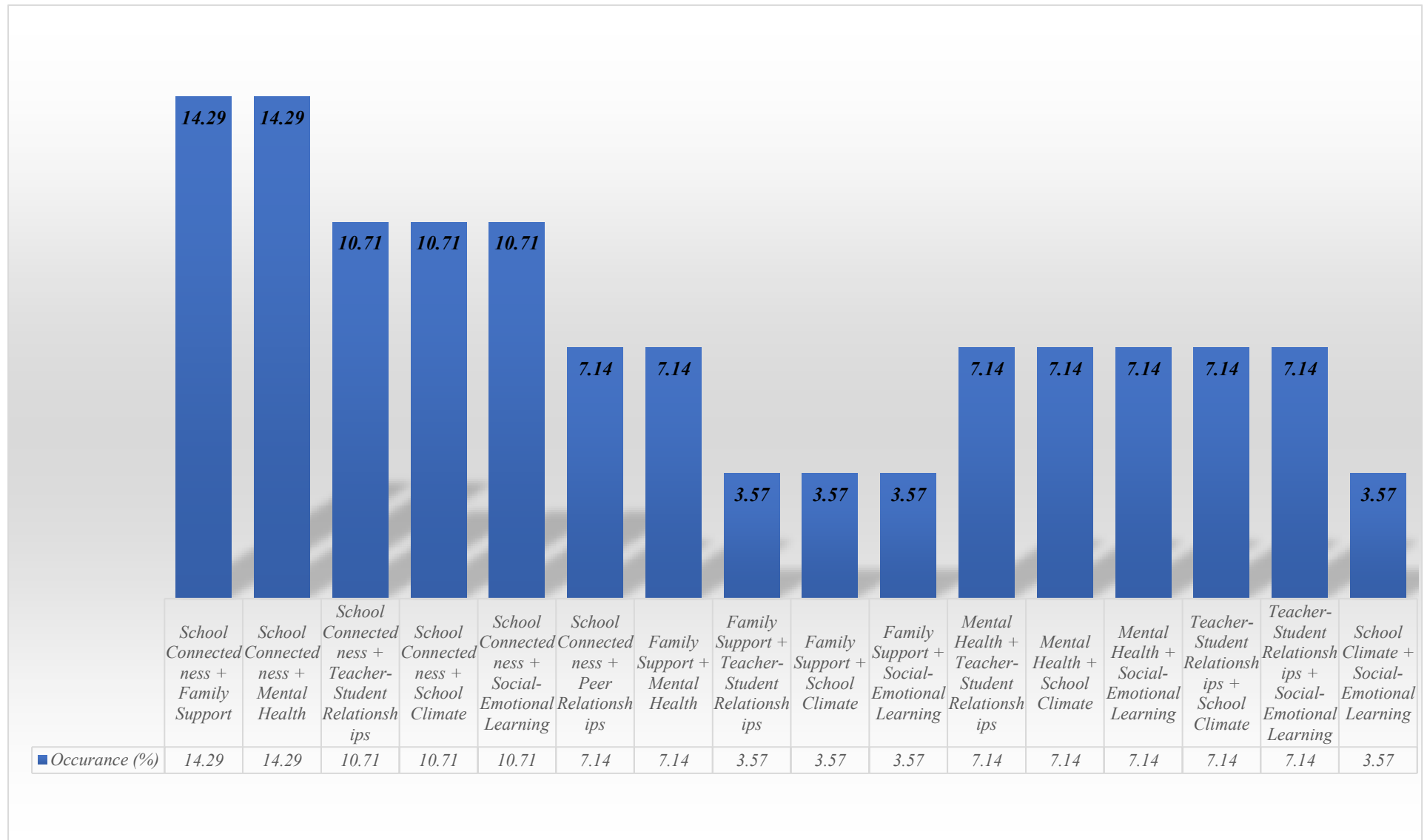


Fig.5: Simultaneous occurrence of two key variables from the included studies

Table 2 Insights into factors impacting students' socio-emotional engagement in educational environments

Contributor(s)	Timeframe	Study cohort	Research Design	Critical Observations	Elements influencing Socio-emotional Connectedness
Lester, L., Waters, S., & Cross, D.	2013	N=3,459 students (transition to secondary school)	Path analysis over 3 years	School attachment inversely associated with depression and anxiety. Higher connectedness reduced depression and anxiety, and vice versa.	<ul style="list-style-type: none"> ✓ School connectedness ✓ Depression ✓ Anxiety
Marsh, R. J., & Cumming, T. M.	2021	N=66 teachers (perspective on students with EBD)	Surveys (adapted Strengths and Difficulties Questionnaire)	Teachers in specialized settings perceived students with Emotional and Behavioral Disorders (EBD) as having lower school connectedness than those in comprehensive schools.	<ul style="list-style-type: none"> ✓ School environment ✓ Teacher perception ✓ Emotional and behavioral disorders (EBD)
Pollak, I., et al.	2023	N=476, 9 to 12-year-olds secondary school students	Social-emotional learning program evaluation	Positive impact on peer connectedness, social skills, and happiness, but classroom climate declined, potentially due to school transition. Implementation progress affected outcomes.	<ul style="list-style-type: none"> ✓ School transition ✓ Peer connectedness ✓ Social-emotional learning ✓ Implementation support
Raniti, M., et al.	2022	N=3,552, records reviewed (youth consultation included)	Systematic review	Positive correlation between school connectedness and reduced depression and anxiety. Enhancing school connectedness can improve mental health outcomes.	<ul style="list-style-type: none"> ✓ School connectedness ✓ Youth depression and anxiety ✓ Intervention studies
Karmakar, D.	2018	N=100, secondary school teachers	Product Moment Correlation analysis	Teachers with higher emotional intelligence foster more positive socio-emotional classroom environments.	<ul style="list-style-type: none"> ✓ Emotional intelligence ✓ Classroom environment ✓ Emotional awareness
Schertzer, R., & Penyweit, K.	2022	N=35, Elementary/primary school students	Pre- and post-intervention assessment	School connectedness program improved social-emotional learning but had no significant impact on observed pro-social behaviours.	<ul style="list-style-type: none"> ✓ Social-emotional knowledge ✓ School connectedness program
Eugene, D. R.	2021	N=2590, adolescents (longitudinal study)	Longitudinal study	Strong family bonds were linked to better academic performance and fewer depressive symptoms. Neighbourhoods'	<ul style="list-style-type: none"> ✓ Family connectedness ✓ Neighbourhood dynamics

Contributor(s)	Timeframe	Study cohort	Research Design	Critical Observations	Elements influencing Socio-emotional Connectedness
				characteristics influenced mental health outcomes.	<ul style="list-style-type: none"> ✓ Academic performance ✓ Mental health
<i>Goetschius Leigh, et al.</i>	2021	N=3,246, mixed sample	Longitudinal examination	Greater school connectedness mitigated negative impacts of exposure to aggression and social deprivation.	<ul style="list-style-type: none"> ✓ School connectedness ✓ Violence exposure ✓ Social deprivation ✓ Resilience
<i>McKenzie V. L. & Smead J. J. E</i>	2018	N=75, Adolescents	Various assessment tools (family functioning)	Positive family functioning impacts adolescents' sense of mastery and school connectedness, with disparities based on gender and geography.	<ul style="list-style-type: none"> ✓ Family functioning ✓ School connectedness ✓ Mastery ✓ Resilience
<i>Basu, A</i>	2017	N=277, Primary school Students	Experimental study over 10 months	School attachment and tailored teaching programs improved academic performance among slow learners.	<ul style="list-style-type: none"> ✓ School attachment ✓ Academic performance ✓ Tailored teaching practices
<i>Govender, et al.</i>	2013	Adolescents (Durban, sample size not stated)	Survey	Greater school connectedness correlated with reduced health risk behaviours.	<ul style="list-style-type: none"> ✓ School connectedness ✓ Health risk behaviour ✓ Socio-cultural factors
<i>Gupta, R</i>	2012	N=600, adolescents (aged 14-19)	Survey	Parental attachment influences emotional autonomy, with significant gender differences.	<ul style="list-style-type: none"> ✓ Emotional autonomy ✓ Parental attachment ✓ Gender differences
<i>Jose, Ryan, & Pryor</i>	2012	N=1774, Adolescents	Structural equation modeling (long. over 3 years)	Strong familial and school connections predicted better psychological well-being.	<ul style="list-style-type: none"> ✓ Social connectedness ✓ Familial and school ties ✓ Psychological well-being
<i>Jenny Oelsner, et al.</i>	2011	N=2,902, Adolescents	Longitudinal study	Decline in school bonding across grades 6 to 8, with greater decline among males.	<ul style="list-style-type: none"> ✓ School bonding ✓ Peer influence ✓ Academic motivation ✓ Gender differences

Contributor(s)	Timeframe	Study cohort	Research Design	Critical Observations	Elements influencing Socio-emotional Connectedness
<i>Waters, et al.</i>	2010	N=5159, Adolescents	Survey	Family support, peer relationships, and pastoral care positively influenced school connectedness.	<ul style="list-style-type: none"> ✓ School connectedness ✓ Family support ✓ Peer relationships ✓ Pastoral care
<i>Loukas, et al.</i>	2009	Adolescents (sample size not stated)	Longitudinal study	School connectedness serves as a safeguard against adjustment issues.	<ul style="list-style-type: none"> ✓ School connectedness ✓ Adjustment problems ✓ Teacher-student relationships
<i>Loukas</i>	2007	N=500, Secondary school students	Survey	Positive school climate and supportive relationships enhance student satisfaction and engagement.	<ul style="list-style-type: none"> ✓ School climate ✓ Interpersonal relationships ✓ School policies
<i>Bond, et al.</i>	2006	N=2678, Secondary school students	Longitudinal study	School attachment forecasted long-term outcomes, including academic success and mental well-being.	<ul style="list-style-type: none"> ✓ School connectedness ✓ Academic achievement ✓ Mental health
<i>McNeely & Falci</i>	2004	N=20745, Middle and high school students	Survey	School attachment serves as a safeguard against risky behaviors.	<ul style="list-style-type: none"> ✓ School connectedness ✓ Risky behaviours ✓ Teacher-student relationships
<i>Balfanz, R., et al.</i>	2002	sample size not available	Conceptual discussion	School connectedness creates a supportive learning environment, with a role for school culture and interpersonal relationships.	<ul style="list-style-type: none"> ✓ School connectedness ✓ School culture ✓ Community involvement
<i>Peterson</i>	2002	sample size not stated	Conceptual discussion	Positive school culture and norms promote student motivation and achievement.	<ul style="list-style-type: none"> ✓ School culture ✓ Positive norms ✓ Student motivation

4.3 Theme-Based Trend Analysis of Socio-Emotional Connectedness Researches

The research on socio-emotional connectedness spans diverse contexts and populations, highlighting its pivotal position in education and overall well-being. The following thematic trends emerge from the analysis:

4.3.1 School Attachment and Mental Wellness:

Research highlights the significant negative correlation between school attachment and mental well-being concerns like anxiety and depressive symptoms. For example, Lester et al. (2013) and Raniti et al. (2022) demonstrated that stronger school bonding is linked to lower levels of depressive and anxiety symptoms among students. This pattern emphasizes the protective function of school affiliation in fostering emotional resilience and psychological well-being.

4.3.2 Influence of Family Dynamics and Neighbourhood Context: Family connectedness:

Consistently appears as a pivotal factor. Eugene (2021) and McKenzie & Smead (2018) demonstrated that strong family bonds positively influence academic outcomes, socio-emotional skills, and mental health. Neighbourhood dynamics, such as exposure to violence and social deprivation, also affect socio-emotional well-being, with school connectedness serving as a buffer (Goetschius et al., 2021).

4.3.3 Impact of Teacher-Student Relationships:

Teachers are essential in cultivating socio-emotional connectedness. Karmakar (2018) found that teachers with higher emotional intelligence create positive classroom environments that enhance socio-emotional learning. Similarly, Loukas et al. (2009) and McNeely & Falci (2004) highlighted the essence of teacher-student relationships in fostering school connectedness and reducing risky behaviours.

4.3.4 Peer Relationships and Social-Emotional Learning:

Peer connectedness emerges as a key aspect of socio-emotional development. Pollak et al. (2023) reported that Socio-emotional education initiatives enhance peer relationships and social competencies, although implementation challenges can influence outcomes. Waters et al. (2010) further highlighted the role of peer support in enhancing school connectedness.

4.3.5 Impact of School Environment and Policies:

A supportive school environment, characterized by positive school climate, pastoral care, and inclusive policies, significantly contributes to socio-emotional

connectedness. Loukas (2007) and Peterson (2002) demonstrated that positive school norms and cultures enhance student satisfaction, engagement, and motivation. Programs designed to improve school connectedness, such as those studied by Schertzer & Penyweit (2022), often yield improvements in social-emotional learning.

4.3.6 Transition Challenges and Developmental Declines:

Transitions between school stages, such as the shift to secondary school, present challenges to socio-emotional bonding. Lester et al. (2013) and Oelsner et al. (2011) noted declines in school bonding during middle school years, influenced by peer pressures, gender, and reduced school attachment. Addressing these transitions is vital for maintaining connectedness.

4.3.7 Socio-Cultural and Contextual Influences:

Cultural and socio-economic factors also shape socio-emotional connectedness. Govender et al. (2013) highlighted the role of socio-cultural contexts in influencing health behaviours and connectedness, while Basu (2017) and Gupta (2012) emphasized tailored teaching practices and parental attachment as key influences.

V. DISCUSSIONS

The thematic analysis reveals a dynamic interaction of personal, social, and situational factors affecting socio-emotional connectedness. Across studies, fostering school engagement emerges as a unifying strategy for improving mental wellness, academic outcomes, and social integration. Future research should focus on context-specific interventions, longitudinal impacts, and strategies to mitigate transitional challenges, ensuring the holistic development of students in diverse educational landscape.

The data analysis reveals potential for further research specific to India. Figures 2 and 3 illustrate that research conducted in the Indian perspective is notably sparse. Further to mention that all identified researches are with adolescents. Therefore, in the Indian domain, there is a notable gap in research concerning socio-emotional connectedness among primary school students. While existing literature predominantly focuses on older age groups and secondary education settings, there is limited attention given to understanding socio-emotional connectedness among younger children in the Indian educational context.

VI. CONCLUSIONS AND IMPLICATIONS

The studies referenced primarily examine socio-emotional connectedness in secondary schools and higher education institutions (Lester et al., 2013; Marsh & Cumming, 2021; Raniti et al., 2022; Shahid & Din, 2021). They highlight the significance of school connectedness in fostering positive mental health outcomes and well-being among adolescents. However, these findings might not fully reflect the developmental needs and experiences of primary school students.

Moreover, most studies cited are conducted outside of India, with limited research specifically addressing socio-emotional connectedness within the Indian cultural and educational context. This gap is significant considering the diverse sociocultural factors affecting children's socio-emotional development in India, including family dynamics, community norms, and educational practices.

Furthermore, while some studies touch upon the influence of teachers and school environments in fostering socio-emotional connectedness (Karmakar, 2018; Fredkove, 2019; Schertzer & Penyweit (2022), there is a scarcity of research specifically inspecting the efficacy of interventions or strategies aimed at promoting socio-emotional connectedness among primary school students in India.

Additionally, the limited research available often overlooks the unique challenges and vulnerabilities faced by primary school children, such as peer relationships, emotional regulation, and adjustment to the school environment. Understanding these components is crucial for developing impactful interventions and support systems customized to the developmental requirements of primary school pupils in India.

For addressing these gaps, future researches should prioritize exploring socio-emotional connectedness among primary school students within the Indian context. This includes investigating the impact of cultural, familial, and educational factors on the social and emotional development of pupils, as well as evaluating the efficacy of approaches targeting the promotion of socio-emotional well-being in primary school settings. By filling these gaps, researchers can contribute to the creation of evidence-based practices that support wholesome growth and wellness of primary school students in India.

DELIMITATION OF THE REVIEW

Systematic review has been done by the researcher with the selected acceptance and elimination guidelines only. In this review the primary focus was to surface different factors behind socio-emotional connectedness of different age groups of students. Due to the criteria of inclusion and exclusion certain factors might have been overlooked.

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Teachers' Attitudes Towards the Inclusion of Children with Special Educational Needs in Inclusive Classrooms: A Literature Review

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Abstract— *The integration of children with special educational needs into ordinary schools has been a central aspect of ensuring educational rights for all children. Inclusive education is a good practice that provides opportunities for students with special educational needs (SEN) to learn in a regular classroom alongside other students, rather than in a special education classroom. This article reviews literature related to the ongoing research titled "School Teachers' Attitudes Towards Inclusion of Children with Special Education Needs." The study reviewed research papers, journal articles, and educational reports and analyzed them to identify themes related to the topic. Structurally, the article first establishes the teacher's awareness of inclusive education, supported by strong empirical evidence. The influence of personal variables on teachers' attitudes towards inclusive education was established using scholarly articles. Finally, the influence of professional variables on teachers' attitudes toward inclusive education was examined by reviewing empirical evidence. The literature emphasizes that teachers' awareness of inclusive education is not satisfactory. Moreover, the analysis showed that positive and negative attitudes are associated with teachers. Teachers' attitudes toward inclusive education were strongly influenced by their professional variables rather than their personal variables.*

Keywords— *Inclusive education, Children with special educational needs*

I. BACKGROUND OF THE STUDY

The inclusion of children with special educational needs in ordinary schools has been a key element of ensuring educational rights for all children. This has been practiced worldwide since the 1948 United Nations Declaration of Human Rights, which recognizes education as a human right regardless of age, gender, or race. With the emphasis on the importance of education, attention focused on the "education of all" concept many decades ago. In the 1990 International Literacy Year, at the World Conference on Education for All in Jomtien, Thailand, all countries were called upon to universalize adequate basic education. According to the concept of Education for All and the human rights perspective,

attention was directed toward educating students with special educational needs so that they would also have the opportunity to access equal educational rights.

"Students with special educational needs" is a broader term that encompasses students with disabilities and those with low intellectual capacity. Highly gifted children, as well as children with social and emotional problems, students with learning disabilities, or difficulties of the students who are in their schooling years that make it more difficult for them to learn than most children of their age, are also determined under this term. Inclusive education represents a fundamental paradigm shift in education worldwide today. With the concept of inclusive education, the educational practice

became familiar to children with and without disabilities, who wanted to participate and learn together in the same classes. It aims to remove all the barriers and equip the students with special educational needs with skills that can be utilized in their lives. (Perera & Chandradasa, 2022) By the end of the 20th century, inclusive education policy had drawn increased attention as an increasingly important aspect of ensuring equal educational rights for students with special educational needs. Not only did receiving equal rights, but it was also evident that this concept was a new approach to developing these students. According to Furuta and Alwis (2017), inclusive education is an approach to serving children with special educational needs within mainstream classrooms.

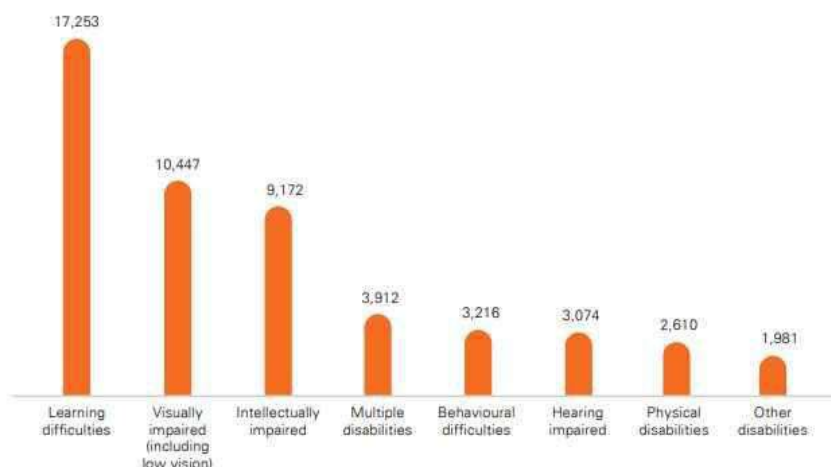
“Inclusive education is when all students, regardless of any challenges they may have, are placed in age-appropriate general education classes that are in their own neighborhood schools. It receives high-quality instruction, interventions, and support that enable them to meet success in the core curriculum.”

(Bui, Quark, Almszan & valenti, 2010: Alquraini & Gut, 2012)

This emphasizes the right to have education for all children by removing barriers and removing discrimination. The child's rights are established in accordance with global trends by taking many steps taken in the Sri Lankan education system to provide education for students with special educational needs

Sri Lanka values education, and the 1948 Education Policy mandates free education at the primary, secondary, and tertiary levels. Government schools provide free education to all students and are committed to ensuring special educational opportunities for students with disabilities. Children with disabilities in Sri Lanka are educated through inclusion in mainstream or specialized schools. However, research conducted on several occasions indicates that there are discrepancies in the provision of inclusive education opportunities, and problems persist at the school level. In stark contrast, of the reported 10.6% of school-aged children in Sri Lanka who have disabilities, 10.2% do not attend school because of their disability, meaning only 0.4% of these children attend school (UNICEF ROSA, 2007). Figure 1 reports the number of students with disabilities enrolled in regular and special education units in Sri Lanka

Figure 1. Number of children with disabilities enrolled in regular and special education units in schools, 2012



Source: Ministry of Education, Education Sector Development Framework and Programme (IESDFP) 2013-2017; Ministry of Education Policy and Planning Branch, Battaramulla, 2012.

The Sri Lankan Ministry of Education has implemented policies to enhance inclusive education in Sri Lanka. From time to time, the Sri Lankan Ministry of Education has recommended measures to improve the quality of inclusive education. The government has provided physical and human resources to sustain the policy in practice. However, empirical research on inclusive education indicates that it does not function as intended

at the school level. Ministry of Social Welfare reports that there are still students with disabilities who continue not to have access to services (as cited in Furuta, 2009). A denying children with disabilities admission to schools, insufficient qualified teachers, and parents lacking awareness regarding educational facilities (Furuta, 2006; Furuta, 2009; UNICEF Rosa, 2007).

According to Saloviita (2020), If a teacher does not want a particular child in her classroom, it is difficult to see how any extra resources or training could save the placement from failure. The mere existence of resources, such as knowledge or assistance, alone cannot determine the outcome. It is also necessary for the teacher to use these resources to attain a determined goal. The success of inclusion or organized placement of children with disabilities in mainstream classrooms largely depends on teachers' attitudes towards students with special educational needs (SEN) and their knowledge of adequately educating them (Dapudong, 2014). Teachers are the primary stakeholders in achieving the expected outcomes of an implemented education policy. They are the people who take action and implement educational reforms at the school level. A key element in the successful implementation of inclusive education is the perspective of the teachers implementing the given policy. It is evident that their attitudes, beliefs, acceptance of the policy, commitment, ideas, and suggestions are essential to achieving the expected outcomes at the school level.

II. METHODOLOGY

This section details how the literature presented in this article was surveyed and evaluated in the study. To ensure the validity of the main themes discussed, the referencing concentrated on research published mainly after 2000. Research papers, e-journals, educational reports, books, and related articles were analysed to identify themes related to the topic. The primary themes of the literature review include the teacher's awareness of inclusive education, the influence of personal variables on teachers' attitudes towards inclusive education, and the impact of professional variables on teachers' attitudes. The research papers, articles, e-journals, and reports were examined through systematic searches of online journal databases (ERIC) and academic catalogues (such as SAGE and Taylor & Francis). Additionally, broader investigations were conducted using general search engines such as Google Scholar.

Teachers' awareness of inclusive education.

Teachers' awareness of inclusive policies is important for their effective implementation at the school level. According to Osisanya et al. (2015), the effectiveness of inclusive education practices depends on teachers' understanding and knowledge of inclusive processes. Much empirical evidence proves that the teacher's

awareness of inclusive education is not sufficient (Vaughn et al., 1996; LeRoy & Simpson, 1996), while some prove that teachers have a good understanding of inclusive education as indicated by their high level of understanding of the important processes involved in its implementation (Chiner & Cardona, 2013; Sharma et al., 2008; Chitiyo & Alasa, 2023). Maria (2013) indicates major differences between what teachers believe about inclusive education, what they know and how they behave in the classroom. This was demonstrated by research among pre-service teachers, who reported relatively limited awareness of inclusive education (Baguisa & Ang-Manaig, 2019; Alnasser, 2020). In their research, AlMahdi and Bukamal (2019) indicate that 17.4% of candidates for teaching positions in the Philippines were unaware of inclusive education policies, and the remainder had a moderate understanding of these policies. Findings from research conducted in Nigeria on English Language teachers' Knowledge, attitudes toward, and practices of Inclusive education revealed that the majority of teachers had limited knowledge of inclusive education (Timothy et al., 2014). Moreover, Wanjiru (2017), in his research conducted in Kenya, found that Kenyan teachers lacked the required knowledge about inclusive education and its policies, which was essential to reaching inclusive goals in their education system. In their research, Gable et al. (2012) indicated that teachers lacked sufficient knowledge to prepare lessons and to educate students with emotional and behavioural disorders in inclusive classrooms. Moreover, Shillingford and Karlin (2014) and Alkathani (2022) indicated that teachers had limited knowledge of how to educate students with emotional and behavioural issues in inclusive classrooms. According to Perera (2024), Inclusive education is when all students are placed in age-appropriate general education classes in their neighbourhood schools regardless of their challenges. The Teacher's awareness of the inclusive policy is important to the better functioning of the policy at the school level. But teacher awareness of Inclusive policy, Assistive technology, teaching methods, and assessment methods is insufficient. Evidence from multiple countries suggests that teachers generally support inclusive education but question their ability to teach in an inclusive classroom (Chiner & Cardona, 2013). For example, surveys in Spain found that although teachers approved of inclusion in theory, few were willing to include students with disabilities in their own classrooms (Cardona, 2001). Sanz-Cervera et al. (2017) identified gaps in knowledge of inclusive education and

misconceptions about inclusive policies. According to Perera (2024), proper awareness and training are needed to improve teaching quality in inclusive classrooms in Sri Lanka. Dar et al. (2023) have shown that substantial knowledge gaps within the education system prevent teachers from supporting inclusive education for children with disabilities.

The Influence of Personal Variables on teacher's attitudes towards inclusive education

Personal variables influence teachers' attitudes toward inclusive education. This was proven by the many empirical research done regarding the topic. Priyadarshani & Thangarajathi (2017), in their study titled "Effects of selected variables on regular teachers' Attitudes towards inclusive education," identified personal variables as type of family, family income, residential status (Rural/urban), age, gender, and marital status. Results indicated that personal variables, except marital status, influence teachers' attitudes toward inclusive education. The Teacher's age influences their attitudes toward professional issues related to inclusive education and logistical concerns. Female teachers hold more positive attitudes toward professional issues related to inclusive education than male teachers. It may be due to female teachers' interest in teaching and their patience in addressing difficult situations. Only family income influences the regular teacher's attitude towards inclusive education. In their study, Avramidis et al. (2000), Survey into mainstream teachers' attitudes towards the inclusion of children with special educational needs, focused on the personal variables of the teachers. Age, Gender, and Marital status were inquired as the personal variables of the teachers who are in the inclusive classrooms. The survey was carried out in one Local Education Authority in the south-west of England, and the sample comprised 81 primary and secondary teachers. The analysis revealed that teachers who have been implementing inclusive programmes and therefore have active experience of inclusion possess more positive attitudes. Moreover, the data showed the importance of professional development in forming positive attitudes towards inclusion. The participants appeared to be generally positive towards the overall concept of inclusion. The one-way MANOVAs for gender and age did not reveal significant differences in the attitude components. Several studies have examined factors influencing in-service teachers' attitudes toward inclusive education. With regard to gender, many studies have reported no significant differences between male and female

teachers (e.g., Avramidis et al., 2000; Chhabra et al., 2010). However, an almost equal number of studies have found that female teachers hold more positive attitudes toward inclusion than male teachers (e.g., Alghazo & Naggat Gaad, 2004; Alquraini, 2012). Only a few studies, limited to secondary school settings, have reported more positive attitudes among male teachers (Bhatnagar & Das, 2014; Ernst & Rogers, 2009). Research findings on the relationship between teachers' age and attitudes toward inclusion have been mixed. Several studies report no significant association between age and attitudes toward inclusive education (Chhabra et al., 2010; Gyimah, Sugden, & Pearson, 2009; Kalyva, Gojkovic, & Tsakiris, 2007). However, more frequently, studies indicate that younger teachers tend to hold slightly more positive attitudes toward inclusion compared to their older counterparts (e.g., Ahmmed, Sharma, & Deppeler, 2014; Bornman & Donohue, 2013; Cornoldi et al., 1999). In terms of age, several studies have found no relationship between teachers' age and attitudes toward inclusion, while others suggest that younger teachers tend to express slightly more positive attitudes than older teachers.

Influence of professional variables on the teacher's attitudes towards inclusive education

Teachers' attitudes toward inclusive education are closely linked to their professional roles and teaching contexts. Across multiple studies, special education teachers consistently emerge as the group with the most positive attitudes toward inclusion, likely due to their specialized training, greater exposure to learners with diverse needs, and stronger sense of professional competence in inclusive practices (Engelbrecht et al., 2013; Forlin et al., 1996; Hernandez et al., 2015; Moberg, 2003; Pearson et al., 2003). School leadership also appears to play a significant role, as principals generally report more favourable attitudes toward inclusion than classroom teachers, possibly reflecting their broader systemic perspective and involvement in policy implementation rather than day-to-day instructional challenges (Boyle et al., 2013; Center & Ward, 1987). Furthermore, differences across school levels are evident, with primary school teachers typically demonstrating more positive attitudes than secondary school teachers. This disparity has been attributed to factors such as smaller class sizes, greater curricular flexibility, and a stronger emphasis on holistic child development in primary education compared to the subject-driven and examination-oriented nature of secondary schooling (Alvarez McHatton & McCray,

2007; Chiner & Cardona, 2013; Larrivee & Cook, 1979; Savage & Wienke, 1989).

Avramindis et al. (2000) did a survey into mainstream teachers' attitudes towards the inclusion of children with special educational needs and identified teachers' educational qualifications, type of school, teaching experience, experience in teaching differently abled children, level of the class and the strength of the class as the professional variables influence the teacher's attitudes towards inclusive education. As shown in the results, teachers with active experience of inclusion held significantly more positive attitudes towards inclusion than those from randomly selected schools. The respondents' level of professional development was significantly related to their attitude towards inclusion. The one-way MANOVAs for teaching experience, phase taught, area of school, size of school, and size of classroom did not reveal significant differences in the attitude components. Teachers with substantial training demonstrated more confidence in meeting the IEP requirements of students with SEN. Teachers who had received external school training were found to be more confident in meeting the IEP requirements of students with SEN than those who received school-based or no training.

Priyadarshani & Thangarajathi (2017) examined professional variables such as education qualifications and type of school. Teaching experience; experience in teaching differently abled; class level; and class strength. The study revealed that the Professional variables, except the nature of the job and the strength of the class, influence the regular school teachers' attitude towards inclusive education. Furthermore, it was evident that the teacher's attitude towards inclusive education as a whole is influenced by the type of school, teaching experience in the present school and level of class, while it is not influenced by other professional variables, viz. educational qualification, strength of the class, experience in teaching differently abled, nature of job, and teaching experience. Teachers' attitudes toward inclusive education appear to vary according to professional role. Research consistently shows that special education teachers tend to hold the most positive attitudes toward inclusion (Engelbrecht et al., 2013; Forlin et al., 1996; Hernandez et al., 2015; Moberg, 2003; Pearson et al., 2003). In addition, school principals generally demonstrate more favourable attitudes toward inclusion than classroom teachers (Boyle et al., 2013; Center & Ward, 1987). Differences are also evident across school levels, with primary school teachers typically expressing more positive

attitudes toward inclusive education than secondary school teachers (Alvarez McHatton & McCray, 2007; Chiner & Cardona, 2013; Larrivee & Cook, 1979; Savage & Wienke, 1989). Teachers' attitudes toward professional issues related to inclusive education are influenced by educational qualifications, type of school, teaching experience, teaching experience in the current school, experience teaching students with disabilities, and class level. whereas it is not influenced by the nature of the job and the strength of the class.

Research conducted in South Africa on barriers to inclusion highlighted teachers' concerns about the challenges posed by increasing student diversity in the classroom. Teachers reported a lack of adequate knowledge, facilities, skills, and training. These concerns shaped teachers' perceptions of inclusion. After receiving training, teachers felt more positively about including students with disabilities. Pre-test and post-test scores showed that teachers who participated in the study increased their teaching skills and knowledge of inclusive education (Oswald & Swart, 2011). Similarly, a study of teachers in Uganda found that those who had some form of training in inclusive education held more optimistic and willing attitudes towards inclusion than those without any form of inclusion training (Ojok & Wormnæs, 2013). According to Perera & Chandrasa (2022), When schools identify the students with special educational needs, appropriate considerations need to be taken to provide those students with the best learning environment possible.

III. CONCLUSIONS

Inclusive education is when all students, regardless of their challenges, are placed in age-appropriate general education classes in their neighborhood schools. Teachers' awareness of inclusive policies is important for their effective implementation at the school level. Teachers' attitudes towards inclusive education yielded mixed results. In several studies, personal variables such as age, Gender, and Marital status have shown both positive and negative effects on teachers' attitudes. It was significant that professional variables like education qualifications and type of school were used. Teaching experience, Experience in teaching differently abled, level of class. The strength of class has influenced the attitudes of the teachers towards inclusive education.

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Learning by Doing: The Potential for Experiential Education in Engineering Physical Chemistry

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Abstract— *Background: Experiential learning, characterized by hands-on engagement and active knowledge construction, has gained prominence in science and engineering education. This shift is in response to the limitations of conventional teaching methods, which often emphasize passive learning and fail to connect complex and theoretical classroom knowledge with practical applications. Purpose: Engineering Physical chemistry (PChem) students often have negative perceptions and low expectations for success in PChem, attitudes that likely affect their performance. Students mostly struggle in understanding the fundamental theoretical concepts and their application in solving complex numerical problems in PChem during their first year in undergraduate programme. To help students in learning to solve the problems related to PChem course, experiential learning classroom modules was implemented for small number of PChem students (CEB1023/CFB1023). Methodology/Approach: To bridge the gap between theory and practice, a student-centered approach via industrial visit, gas hydrate laboratory, adjunct lectures and case studies related to physical chemistry course were implemented for medium to large number of Physical Chemistry students (CEB1023/CFB1023) in chemical engineering program. Students were divided into number of group according to experiential approach. Percentile method has been used to analysis the obtained data. Findings/Conclusions: Data were analyzed through a qualitative-descriptive approach. Students' experiential learning influenced their personal and programmatic views of prevention training. Implications: The benefits of experiential learning in prevention will enhance students' education and future employment experiences. Future studies should improve upon training delivery and examine the acceptability of this method of delivery in the rural population.*

Keywords— *Physical chemistry, experiential learning, field trips, learning outcomes, lab visit.*

I. INTRODUCTION

In general, education is one measure of the progress of a country. Developed countries are characterized by their level of education and the ability of their people to keep up with developments in science and technology. Institutions as a place of education for the community plays an important role in supporting the progress of the country. At institutes, people can learn many things, such as acquiring and improving their skills[1]

Chemical science learning is currently very important, meaning that learning success must be increased in the learning process. One possible effort is learning that can involve students through direct experience to improve students' current skills. The learning model that allows students to be directly and actively involved in making experience the basis for acquiring knowledge is the experiential learning model. Experiential learning is a learning model that uses experience as a learning tool, examines experience,

concludes and changes experience through direct experiments.

One of the efforts in the field of education is to make various efforts to improve learning in institution. Among the efforts made are carrying out learning using various innovative learning models [4].

Kolb's Experiential Learning model explains that concrete experience, reflective observation, abstract conceptualization and active experimentation form a four-stage process (or cycle) transformed into effective learning. [5]

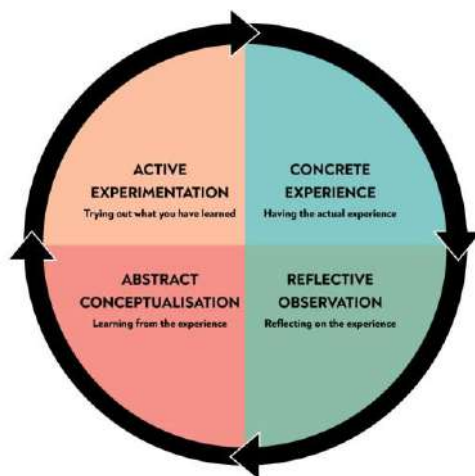


Fig.1: Experiential Learning Cycle

Kolb's model draws heavily on the progressive educational philosophies of John Dewey and the developmental theories of Jean Piaget, who both emphasized the pivotal role of active engagement in learning.

From Kolb's perspective, knowledge emerges through a cyclical interplay between "doing" and "thinking," which is why he frames learning as "the transformation of experience" rather than simply the absorption of facts [6-7]. Each stage presents a unique lens through which experiences evolve into insights and skills.

Critically, Concrete Experience (CE) anchors learners in hands-on action or tangible participation, setting the stage for deeper reflection. Reflective Observation (RO) then prompts individuals to examine what happened and how it aligns – or conflicts – with their existing understanding of the world. Out of this comparison arises Abstract Conceptualization (AC): a moment of building or refining mental models and theories that help make sense of new experiences. Finally, Active

Experimentation (AE) puts these theories to the test in a real or simulated environment, allowing learners to adapt their concepts, generate fresh questions, or move seamlessly back to another cycle of new experiences.

In science education, this model encourages hands-on activities, allowing students to apply scientific concepts, reflect on their actions, form new theories through logical analysis, and then test these theories through further experimentation, leading to deeper understanding and skill development. In engineering chemistry education, experiential methods like experiments and simulations motivate student interest, enhance concept comprehension, and build critical thinking abilities.

Physical Engineering Chemistry is one of the required main courses in Chemical Engineering programme. It is important for Chemical engineering students to pass and to understand the contents of PChem course as this course is a pre-requisite of chemical engineering thermodynamics, Reaction engineering and separation process for Chemical Engineering Program in UTP. Based on the feedback from the students taking Chemical Engineering, the students attributed difficulties associated with the course to superficial conceptual understanding and its application in solving complex numerical problem and plus having no motivation or interest in the topic. From lecturer observation and literature, for example, students had difficulties with conceptual understanding of ideal gas law concept and how to drive the ideal gas equation and further limited understanding on application of ideal gas equation in complex problems in PChem. This problem basically comes from limited understanding of what basic rules of Calculus, Algebra and Psychometric issues such as reliable assessments and addressing correlations with other factors. Students with conceptual understanding know more than isolated facts and methods.

PChem students often have negative perceptions and low expectations for success in this course. Students mostly struggle in understanding the fundamental theoretical concepts and their application in solving complex numerical problems in PChem during their first year. To help students in learning to solve the problems related to this course, Experiential learning was implemented for 184 students (CEB1023/CFB1023).

A contemporary approach to the teaching-learning process would start with experiential learning (EL), sometimes known as learning by doing. To assist

students apply their knowledge in real-world situations, the National Education Policy (NEP) places a greater focus on experiential learning. This paper focuses on how EL uses practical laboratory experiments based on design and development, professional skill (PS), field trips, project-based learning (PBL), and multidisciplinary projects to enhance engineering students' academic performance and overall development with worldwide acceptance[8-9]. Physical Chemistry course is one of the core disciplines in Chemical Engineering offered by Department of Chemical Engineering at Universiti Teknologi PETRONAS (UTP). A typical class of this course at UTP consists of approximately 150-200 students. Based on the experience of the lecturers teaching this course, most students faced some misconceptions and difficulties in the area of conceptual understanding and formula application; and thus they lacked ability to solve complex numerical problem especially at higher order level of knowledge (K4 apply, K5 evaluate and K6 create). Students found that mathematical derivations and their formula applications are the toughest area in in this course.

II. EXPERIENTIAL LEARNING

The method of learning via experience, action, or "learning by doing" is known as experiential learning (EL). It uses a learner-centered educational approach and encourages successful and active learning both inside and outside of the classroom. Deeper comprehension, improved memory retention, and the acquisition of critical life skills are all facilitated by EL. A constant cycle of experience, introspection, conceptualization, and experimenting leads to proficiency. According to Antonio and Albort-Morant [10] experiential learning is an active learning process where students actively create knowledge by doing tasks and thinking back on their experiences.

In order to make education more experiential, comprehensive, integrated, inquiry-driven, discovery-oriented, learner-centered, discussion-based, flexible, and pleasurable, pedagogy must change, according to the National Education Policy (NEP). Experiential learning is advised at all educational levels in accordance with NEP recommendations [11-12]. A variety of activities, such as practical laboratory experiments, internships, workshops, seminars, project-based learning (PBL), activity-based learning (ABL), bridge courses, technology-based learning (TBL), research-based learning (RBL), real-field

practices, program-specific research (PSR) activities, multidisciplinary projects, professional skill development, and employability skill development initiatives, can be used to implement EL.

The experiential learning approach offers several significant benefits, including:

- Enhancing students' ability to adapt effectively to new and unfamiliar situations.
- Bridging the gap between theoretical concepts and practical applications.
- Enabling more authentic and accurate assessment of students' skills and competencies.
- Facilitating deeper conceptual understanding of the subject matter.
- Strengthening students' capacity for creative, critical, and out-of-the-box thinking, as well as the application of knowledge to real-world problem solving.
- Fostering lifelong learning skills, including the ability to learn continuously in professional and workplace settings.
- Improving decision-making and problem-solving abilities.
- Promoting interdisciplinary learning, social awareness, career readiness, cultural development, leadership, collaboration, and the development of essential professional and intellectual

2.1 Course Context and Participants

The study was conducted in an undergraduate Engineering Physical Chemistry course offered to second-year engineering students. A total of 186 students were enrolled in the course during the study period. The course traditionally follows a lecture-based approach covering core topics such as thermodynamics, chemical kinetics, electrochemistry, and surface chemistry. To enhance conceptual understanding and practical relevance, experiential learning (EL) strategies were systematically integrated into the course delivery alongside conventional lectures.

2.2 Experiential Learning Interventions

The EL framework adopted in this study emphasized *learning by doing* and *learning through real-world exposure*. The following interventions were implemented throughout the semester:

Field Visits: Students participated in guided visits to relevant industrial organizations like The Camfil group, and research laboratories of Gas hydrate group, enabling them to observe real-world applications of physical chemistry principles. Program providers frequently collaborate closely with schools, offering supplementary materials that prepare students in advance and support reflection, conceptual understanding, and active experimentation after the field trip.

Adjunct/Guest Lectures: Industry professionals from various organizations like PETRONAS, and researchers delivered lectures connecting theoretical concepts to engineering practice, current technologies, and industrial challenges. Guest lectures expose students to real-world applications and expert perspectives beyond the syllabus. By interacting with professionals from diverse fields, students better connect theory with practice, gain career inspiration, and engage in dynamic, memorable learning experiences by expanding horizons beyond classroom.

Laboratory Visits: Structured lab visits were organized to expose students to advanced instrumentation and experimental techniques related to physical chemistry.

Poster Presentations: Students worked in small groups to prepare and present posters on selected topics, promoting peer learning, literature review skills, and scientific communication.

Motivational and Career-Oriented Talks: Sessions were conducted to highlight the relevance of physical chemistry in engineering careers, research, and higher studies, aiming to improve student motivation and engagement. By introducing individuals to diverse industries and career pathways, these discussions help them identify their interests, clarify career goals, and understand the skills needed for specific professions, thereby informing their academic decisions and future career planning.

These activities were aligned with specific course outcomes to ensure coherence between experiential components and academic objectives.

2.3 Data Collection

To evaluate the effectiveness of the experiential learning approach, both quantitative and qualitative data were collected:

Student Feedback Survey: A structured questionnaire was administered at the end of the course to capture students' perceptions of learning effectiveness,

engagement, motivation, and relevance to real-world engineering problems.

Academic Performance: Student performance was analysed using internal assessment scores and end-semester final examination results by implementing experiential learning and compared with previous semester results without using experiential learning.

Classroom Observations: Instructor observations were recorded to assess student participation, interaction, and enthusiasm during EL activities.

2.4 Data Analysis

Survey responses were analysed using descriptive statistics to determine trends in student perceptions. Performance data were compared with previous cohorts taught using traditional method of teaching to identify improvements in learning outcomes. Qualitative feedback was thematically analyzed to extract recurring patterns related to student learning experiences.

III. RESULTS AND DISCUSSION

3.1 Student Perception of Experiential Learning

Analysis of the survey responses in a class strength of 168 revealed that most students (>80%) reported positive learning outcomes from the EL interventions. Students indicated that EL activities helped them to develop a better conceptual understanding of abstract physical chemistry topics. Relate theoretical principles to practical engineering applications. Improve engagement and interest in the subject. Further gain exposure to industrial practices and professional expectations. Poster presentations and laboratory visits were particularly well received, with students highlighting improved confidence in explaining scientific concepts and enhanced teamwork skills.

3.2 Impact on Academic Performance

Comparison of assessment results shown in Fig 2 & 3 showed a notable improvement in overall academic performance compared to previous offerings of the course delivered predominantly through traditional lectures. It is observed that approximately 37.5% and 32.7 % of students were able to get A+ grade in final exam and internal assessment using experiential learning. Students demonstrated improved problem-solving ability and conceptual clarity, especially in topics linked directly to experiential activities such as kinetics, electrochemistry, and thermodynamics. Overall the grades of students have improved and there

is less than 10% percentage of students who are below C+ grade. Considering the complete experiential learning cycle, both during and beyond the visit, can improve learning outcomes in interpretive and educational programs. For school field trips or group visits, this may require closer collaboration between interpreters, teachers, and chaperones before and after the visit to ensure the full experiential learning cycle is achieved. And this behaviour is clearly observed by the students' performance without implementing experiential learning they were able to achieve grades till F and most of the students were in the range B+ to C- grade during September 2024 session as shown in Fig 3. By implementing experiential learning there has been a phenomenal performance growth of grades of students and as well as their problem-solving capability and conceptual thinking abilities improved. The suggested future research approach will be of interest to educators, academics, and researchers.

3.3 Student Engagement and Motivation

Instructor observations and qualitative feedback suggested increased classroom participation, higher attendance during EL-integrated sessions, and improved student-faculty interaction. Motivational talks and adjunct lectures played a key role in helping students appreciate the relevance of physical chemistry to engineering practice and career pathways.

3.4 Overall Effectiveness of Experiential Education

Out of the 186 students enrolled, the maximum proportion of students benefited from the experiential learning approach, as evidenced by positive feedback, improved performance, and enhanced engagement. While a small fraction of students initially expressed discomfort due to unfamiliarity with non-traditional learning methods, most adapted quickly and acknowledged the value of the approach by the end of the course.

These findings reinforce the potential of experiential education as an effective pedagogical strategy for Engineering Physical Chemistry, supporting deeper learning and better preparation for professional practice.

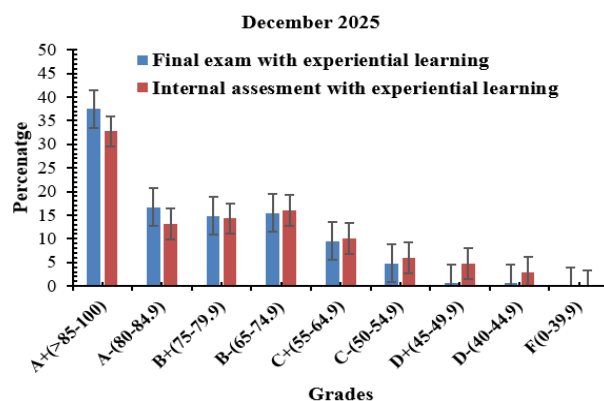


Fig.2: Percentage attainment by implementing experiential learning in December 2025

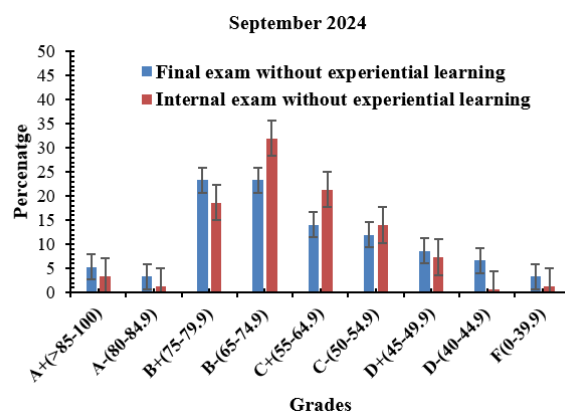


Fig.3: Percentage attainment without implementing experiential learning in September 2024

IV. CONCLUSION

This research focuses on the importance of experiential learning in improving engineering education, especially for first-year engineering students in PChem coursework. The experiential education approach successfully engaged the vast majority of students (>70%) and produced measurable improvements in both academic performance and student satisfaction, demonstrating strong potential for broader implementation in STEM education. It significantly enhances students' practical understanding, boosts learning motivation, sharpens awareness of the skills required for post-graduation employment, and supports the development of professional networks for career growth. This work offers learning outcomes, teaching methods, and curriculum design implementation using authentic experiential learning, which presents an innovative teaching model that fosters higher order thinking skills. To further enhance teaching and learning experiences that promote higher order thinking skills future research may explore collaborations with local

NGOs to facilitate knowledge exchange and the sharing of relevant insights.

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A Feminist Reading of Mahasweta Devi's "Draupadi", "Breast Giver", and "The Hunt"

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Abstract— *This paper examines Mahasweta Devi as both a writer and activist, highlighting her profound compassion for the issues faced by tribal and subaltern women in post-colonial India. This paper analyses "Draupadi", "Breast Giver", and "The Hunt" from a feminist perspective to understand how these stories portray women's agency and resistance. It discusses how Mahasweta Devi's stories enable marginalised tribal women to question postcolonial and patriarchal power structures to assert their independence. The present study interrogates how Mahasweta Devi's stories depict the subjugation of marginalised women and how her writing enables them to regain agency in confronting oppressive social structures. This study explores themes of the body, violence, silence, resistance, and survival through the prism of postcolonial perspectives, feminist theory, and subaltern studies, with a particular focus on subaltern studies and Gayatri Chakravorty Spivak's theoretical findings. It aims to highlight how Devi challenges the limits of representation and shows how agency operates within constraints. In doing so, Devi redefines female marginalization as a complicated, situation-specific form of resistance rather than a sign of powerlessness.*

Keywords— *Subaltern Studies, Postcolonial Feminism, Tribal Women, Body Politics, Sexual Violence, Motherhood.*

I. INTRODUCTION

Literature in Indian English deals with the theme of caste, class and gender, particularly through narratives centred on oppressed communities. Mahasweta Devi has wrestled with these issues in her works to offer a sustained critique of the existing systems of power, which include patriarchy, caste hierarchy, class oppression, and state violence. Mahasweta Devi was born in Dhaka and grew up in a literary family that shaped her beliefs at a young age, as her father, Manish Ghatak, was a well-known poet and novelist. Her upbringing introduced her to humanism, liberal ideas, and an awareness of injustice, each of which afterwards influenced her art and activism. In contrast to many of her contemporaries,

Mahasweta Devi did not treat literature as separate from everyday life or social struggle. From early on, she chose to write for those whose experiences were most ignored, especially tribal and rural women, who faced exploitation, poverty, gendered violence, and the loss of dignity and human rights. She drew inspiration for her writing from those people who are exploited and used and yet are not defeated. To her, the infinite source of inspiration for her writing comes from these profoundly noble yet suffering individuals. (Devi7).

Her commitment to tribal lives is rooted in both conviction and responsibility—she wrote not to evoke pity but to affirm resistance. Devi's stories are grounded in her work and experiences with marginalised

communities. She was deeply involved with sex workers and tribal struggles, which led her to write about things that are not discussed or written about in the mainstream.

Devi wrote more than 20 collections of short stories covering fiction, journalism, essays, and activism, in addition to more than 100 novels. Her portrayals of tribal women and rural communities are particularly well-known, even though her stories touch on a variety of marginalized groups, including denotified tribes and bonded laborers. Hajar Churashir Maa (1974), Rudali (1979), Aranyer Adhikar (The Right to the Forest) (1977), and Chotti Munda Ebong Tar Teer (Chotti Munda and His Arrow) (1980) are among her most important works. Her narratives draw from shared experiences, folklore, and historical events, but most importantly, they are told from the perspectives of subaltern resistance groups that are frequently excluded from official histories and literature.

This paper focuses on three of Devi's texts: "Draupadi", "Breast Giver", and "The Hunt", which bring together the issues of gender, caste, class, and power, revealing how women's bodies and lives are sites of violence as well as strength and resistance. In "Draupadi", a tribal woman named Dopdi stands naked before state officials after sustained sexual violence, transforming her body into a symbol of resistance; "Breast Giver" explores how women's physical labour can both sustain life and become a site of exploitation, and "The Hunt" shows how social power structures continue unequal gender relations in rural settings.

Devi's contributions were widely acknowledged. She received the Sahitya Academy Award in 1979 for Aranyer Adhikar, the Jnanpith Award — India's highest literary honor in 1996, the Ramon Magsaysay Award in 1997 for her "compassionate crusade" on behalf of tribal peoples, as well as the Padma Shri (1986) and Padma Vibhushan (2006). Her work was not limited to writing; she worked directly with grassroots groups, edited tribal magazines like Bortika, and spoke for denotified tribes.

Mahasweta Devi's writing treats literature as a means of protest and solidarity. Her ideas about feminism do not come only from theory. They are shaped by the everyday lives of local communities and focus on bringing change, not just speaking about problems. In this context, her fiction relates to Gayatri Chakravorty Spivak's central inquiry, "Can the Subaltern Speak?"

published in *Marxism and the Interpretation of Culture* (1988), by illustrating that subaltern women speak for themselves outside the control of mainstream narratives, but through those that centre their own struggles, physical presence, and resistance, challenging the structures that have historically silenced them. The selected stories "Draupadi", "Breast Giver" and "The Hunt" hence become powerful texts not only to represent the subaltern but to make their voices heard within and against established power structures.

II. LITERATURE REVIEW

Mahasweta Devi's texts have received significant critical attention for speaking directly to real political issues and giving voice to people often overlooked by society. Critics have studied her works from feminist, Marxist, subaltern, and postcolonial perspectives. Readers see her not only as an author but as someone who turns fiction into acts of defiance. Her Stories stand in opposition to deep-rooted patterns like caste, patriarchy, economic hardship, and state violence.

Feminist scholars closely examine how Devi presents women across different social conditions, including gender, caste, class, and tribal identity. In "Draupadi", Devi shows how attention turns to power struggles around abuse, and critics read Draupadi's bold exposure not just as suffering but as subversion. Her act of standing naked in front of everyone changes the meaning of violence and shame. Her action transforms her suffering into resistance. Similarly, we notice that "Breast Giver" has widely discussed issues about control over women's bodies and how reproductive labour gets sold like any other product. These readings show a pattern as to how women's bodies are placed within systems that exploit people into hardship for survival or gain.

Recent research discusses Devi in relation to Gayatri Chakravorty Spivak's well-known essay, "Can the Subaltern Speak?" Scholars discuss whether Devi's portrayal of tribal women challenges Spivak's claims about the silenced voices. At the center of this debate stands the collection *Imaginary Maps*, where Devi's stories appear alongside Spivak's interpretive essays (Devi). From fiction like "The Hunting", "Douloti the Bountiful", and "Pterodactyl, Pirtha, and Puran Sahay", a difference grows - not between art and idea, but between lived experience and academic interpretation. These

stories show that tribal exclusion did not vanish after independence. Instead, new ways of losing land emerged through state projects, market forces, and the ways development policies are discussed.

The strong connection between Devi's fiction and her public endeavours is one notable feature. Her works have value not only as stories but also as writings influenced by social realities, shaped by her close interactions with tribal communities. By following Spivak's argument, some scholars question and even wonder if any writer can truly represent and speak for marginalized people without mediation.

Chandra Talpade Mohanty's work in *Under Western Eyes: Feminist Scholarship and Colonial Discourses* influences how critics view Devi. Mohanty argues against treating women in the Global South as a single and uniform group (Mohanty 65). Devi's portrayal of tribal women is based on actual struggles like displacement, inequality related to caste controlled by the state authority. These lives are shaped by specific historical contexts rather than general ideas.

In "Draupadi", "Breast-Giver", and "The Hunt", we see how women's bodies are shown as sites where control and power interact. Violence, motherhood, and labour are not only personal experiences and struggles, but they also reveal the dark reality of society. Although Devi's stories are widely known for their feminist and subaltern frameworks, there is still limited discussion of how her selected texts relate to Spivak's argument about who gets heard and who stays silent. This paper therefore aims to examine stories not just for representation but also for action and resistance. Here we see how marginalized women resist societal restrictions and break norms to claim presence even when they are suppressed by the society. Rather than attempting to resolve this question of whether the subaltern can speak, this study explores how the stories create space for forms of resistance that are rooted in time.

III. RESEARCH METHODOLOGY

The qualitative, text-centred methodology used in this study is based on feminist and subaltern studies. It mostly depends on a detailed textual analysis of the short stories "Draupadi", "Breast-Giver", and "The Hunt" by Mahasweta Devi, looking at the representations of the

female body, symbolism, and narrative techniques. Investigating how subaltern women negotiate agency within patriarchal, caste-hierarchical, class-exploitation, and state violence structures is the goal.

The theoretical framework for this paper is based on Gayatri Chakravorty Spivak's argument in "*Can the Subaltern Speak?*" that demonstrates the power structures that silence marginalised women's voices. The study considers represented rebellion, silence, determination, and revenge as other subaltern expressions and sees Devi's fiction as challenging this claim rather than treating it as the ultimate. The framework is further elaborated in the scholarship of Indian feminist work. Discussion on the function of power through control over women's bodies is informed by Nivedita Menon, who argues that gender is a political construct (Menon). Uma Chakravarti's concept of caste-based patriarchy can provide us some narrow way to these intersections of social hierarchy and gender oppression (Chakravarti), specifically when we listen to Jashoda, as well as Mary Oraon. In postcolonial India, the constitution of motherhood and female legitimacy is elucidated in the context of Kumkum Sangari's work on gender and nationalism (Sangari).

This research's methodology combines comparative analysis, theoretical application, and close reading. It identifies different subaltern female responses, such as rebellion, mental suffering, and direct retaliation, by setting the three stories in dialogue. To investigate how literature serves as a platform for the representation, criticism, and rewriting of structurally silenced voices, the research remains interpretive rather than empirical.

The present study compares all three stories to illustrate how subaltern women in Devi's fiction respond to oppression differently based on their circumstances. According to this analysis, Devi's work shows a variety of forms of resistance. Some women fight back violently, some openly challenge power, some suffer, and some choose to keep quiet. Their environments affect their agency, thereby demonstrating how women as gendered subalterns negotiate with existing social hierarchies.

"Draupadi": The Violated Body as Political Speech

Mahasweta Devi's fiction "Draupadi" (translated by Gayatri Chakravorty Spivak) is one of the most powerful literary representations of subaltern resistance in

Devi's intentional rewriting of the Mahabharata mythic figure is indicated by the title "Draupadi." Draupadi is disrobed in a royal court in the epic, but she is saved by divine intervention when Krishna miraculously delivers an endless supply of cloth. Devi's Dopdi is not saved in this way. There is no miracle, no Krishna. Rather, she saves herself by refusing. By situating Dopdi first in a single, friendly marriage and then in the horror of multiple rape, Devi challenges the accepted uniqueness of the epic Draupadi, revealing how patriarchal and nationalist myths construct female honor, according to Spivak. By covering herself, Dopdi refuses to represent purity or to restore patriarchal morality. Her nudity turns into a weapon.

Nidhi Sharma notes that the story retells the epic tale from the view point of marginalised voices. In contrast to the mythical Draupadi, who is frequently depicted as relying on divine male intervention, Dopdi is shown to be independent, self-respecting, and in rebellion against patriarchal conventions. She becomes an agent of empowerment and cultural voice rather than being passive or powerless. Devi reclaims the passed-down myth for subaltern feminist politics by destroying it through this contrast (Sharma 6).

Here, Spivak's claim that *"the subaltern cannot speak"* takes on a new meaning. The statement suggests that subaltern speech is not acknowledged within dominant structures, but it does not imply literal silence. Dopdi does not communicate through institutional discourse or legal complaints. Her speech comes alive instead. Her nudity conveys a message that official language cannot capture. However, the narrative avoids romanticising resistance. The state is not overthrown by Dopdi's disobedience; the military system is still in place. The story's unresolved conclusion highlights the boundaries of resistance within long-standing power structures.

Therefore, "Draupadi" provides a radical feminist examination of victimization and subversion through its storyline and characterization. Dopdi Mehen is a symbol of both extraordinary rebellion and extreme vulnerability. Sexual violence, state repression, and patriarchal exploitation highlight the vulnerable status of tribal women in postcolonial India. However, her rejection of shame reveals the frailty of masculine authority and challenges patriarchal logic. Her body serves as an appeal and a battlefield. By doing this, Devi challenges readers to examine the gendered and political

systems that result in her silence rather than just recounting the pain of a marginalized woman. Although Dopdi is unable to engage in official discourse, she can challenge and disturb it. Through fearless presence and embodied resistance, she transforms violation into defiance, leaving behind a powerful feminist reimagining of myth, nation, and subaltern agency.

"BreastGiver":The Exploited Female Body and Economic Patriarchy

"Motherhood is not merely biological destiny; it is a social institution shaped by power."

—Adrienne Rich, *Of Woman Born* (Richchapter1)

Gayatri Chakravorty Spivak's translation of Mahasweta Devi's "Breast-Giver" is a revolutionary breakdown of the myth of sacred motherhood. Devi challenges the ideological celebration of motherhood and reveals the devaluation of the female body within patriarchy, caste hierarchy, and nationalism through the life of Jashoda, a poor Brahmin woman who pursues a career as a wet nurse. The story becomes a symbol of the subaltern maternal body consumed by social structures when read alongside Spivak's theoretical interventions, particularly her essay "The Breast-Giver" and "Can the Subaltern Speak?" (Spivak 287).

The narrative follows Jashoda's life from domestic hardship to bodily ruin. The turning point comes when her husband, Kangali Charan, suffers a severe injury in an accident, requiring immediate financial survival. She works as a wet nurse for the wealthy Haldar family, and the narrator says sarcastically, "Jashoda was a professional mother" (Devi 1073). Motherhood, which is typically idealized as sacred, is turned into labor by this phrase. Jashoda's main asset is her breasts. To ensure an ongoing supply of milk, she gives birth twenty times, and Haldar children continue to feed on her body for generations. Jashoda is "a mother by profession" (Devi 1073), as Spivak observes in her essay "The Breast-Giver," and the "political economy of the female body" is evident in this commercialisation of maternity. The structure of motherhood is based on exchange systems; her body enters a market economy where milk is money. This dynamic reflects what Spivak identifies as the commodification of the maternal body within a broader political economy. She is invaluable so long as she makes milk. She loses her importance when she is unable to.

Devi's use of religious and political imagery in giving the lead character the name Jashoda heightens the irony. Jashoda sees herself as a nurturing, almost goddess-like figure and considers her fertility a divine gift.

However, by materially describing her breasts as heavy, full and functional, the narrative destroys this illusion. Jashoda "becomes the object of a certain kind of nationalist allegory," according to Spivak (Spivak 250). She is materially exhausted, yet she represents the ideal of Mother India: endless nutrition and sacrifice. The mother is physically worn out but symbolically uplifted, exposing what Spivak calls the "excess of signification" in maternal imagery. This ideology is absorbed by Jashoda, who connects virtue with suffering. Given Spivak's argument that "the subaltern cannot speak," structural silencing appears in Jashoda's situation. Although she speaks in the context of the home, she is unable to describe her exploitation as a form of systemic injustice because the ideology that consumes her shapes her consciousness.

Despite being Brahmin by caste, caste privilege is erased by Jashoda's poverty. Her labor is controlled by the economically dominant Haldars, showing the intersection of class exploitation and caste. To maintain milk production, Kangali Charan promotes repeated pregnancies and maintains patriarchal authority despite his disability. Her ability to procreate is essential to his survival and masculinity. Jashoda's body is turned into family property, and the story implies that society "milks" the mother rather than the child. Jashoda is caught in "the circuits of reproductive heteronormativity," according to Spivak, maintaining class and genetic continuity for others while continuing to be economically insecure. Devi therefore criticizes systemic patriarchy as opposed to personal cruelty.

When Jashoda suffers from breast cancer, the story reaches its most tragic point. The once-nourishing breasts fall apart and develop ulcers, turning into "lumps of flesh" that are painful and ill. The once-life-giving milk is replaced by blood and pus. The admired mother's organ turns disgusting. According to Spivak, this turn of events shows the failure of nationalist

Representation. If Jashoda is Mother India, then her cancer is a symbol of the decline of a country that takes advantage of its mothers. The Haldars pull away from her as her illness gets worse. The children she cared for do

not take on the role of caretakers. Professionally, the "professional mother" loses her value. "Good food and constant sexual servicing are provided so that she can be kept in prime condition for perfect breastfeeding" (Mahasweta Devi, *Breast Giver*) explains how she was kept in the best breastfeeding condition, but she is abandoned once her milk loses its value.

As the woman who fed dozens of children passes away without receiving proper care or nutrition, the irony develops. Caretakers disappear as the "running sores" across her breast become sour. Her husband even with draws. She raises sons and daughters, but none of them help her. As "the sore on her breast kept mocking her with a hundred mouths, a hundred eyes," (Devi 1085) she experiences disbelief and illusions. She finds her betrayal unbearable:

রোপো কনস্তুর, রবাবুরোপো রোস্তন্বস্তন্বুখপসববোত্তকোরোবোবন্বকো
স্তুদুটিন্বকোরোপইস্তন্বোরএন্বপবট্টোনকন্বকোরপকন্ব?

(Jashoda had forever scrubbed her breasts carefully with soap and oil, for the master's sons had put the nipples in their mouth. In the end, why did those breasts betray her? (Devi 1085))

Jashoda's passing exposes the "violence of the production of the mother as pure signifier," according to Spivak. She is materially abandoned but symbolically honored. Because she feeds the rich but gets no structural support, her tragedy becomes a metaphor for the postcolonial nation. Nationalist discourse is dominated by the image of "Mother India," but actual mothers do not have access to health care, financial stability, or recognition. The country does not defend her body; it feeds on it.

Jashoda doesn't put on an act of resistance as Dopdi did in "*Draupadi*." Her tragedy is slowly absorbed and buried. Until the very end, she maintains that her role is sacred. Spivak's claim that "the figure of the woman disappears between patriarchy and imperialism, subject-constitution and object-formation" (Spivak 102) is supported by this lack of rebellion. Jashoda's subjectivity disappears into function; her breasts, not her voice, define her. Instead of a revolutionary climax, her death is quiet and characterized by decline in health and abandonment. Devi declines sentimental resolution. Jashoda passes away in pain and neglect rather than in glory.

The story emphasises reproductive labour—childbearing and nursing—as labour that supports social structure but is still invisible and undervalued when viewed through a Marxist-feminist lens. Spivak highlights the "political economy of the breast" (Spivak 243), which holds that systems of class privilege and exchange are the means by which milk is exchanged. Devi exposes the material exploitation of motherhood and strips it of its romantic aura by portraying it as wage labour.

In the end, "Breast-Giver" provides an awful feminist critique of the way the maternal body is exploited by patriarchal and nationalist frameworks. The continual claim that Jashoda is a "professional mother" emphasises how nurture becomes work and symbol becomes resource. The price of endless kindness is exposed by her diseased breasts. Spivak's claim that "the subaltern cannot speak" sheds light on Jashoda's structural silence, as she has internalised her exploitation and is unable to identify it. She represents the disposable character of the societal mother, revered in theory but abandoned in practice. Mahasweta Devi eliminates sentimentality myths and reveals the harsh political economy hidden beneath the revered image of motherhood through the life and death of Jashoda.

Gender Agency, Tribal Justice, and Sexual Violence: An Analysis of Mahasweta Devi's

'The Hunt'

"The Hunt", a short story by Mahasweta Devi, vividly portrays tribal existence, sexual exploitation and feminine retaliation. Set in a Santhal tribe, the story revolves around Oraon, a young mixed-race woman. Mary Oraon, of Santhal origin, is shown killing her landlord, Tehsildar Singh, when he forces sex on her. "The Hunt" emphasises direct retaliation, in contrast to "Breast-Giver" where the female body is gradually consumed by exploitation, and "Draupadi", where the female body becomes a site of political confrontation. Devi redefines justice and female agency in subaltern space through Mary's murderous act. Gayatri Chakravorty Spivak's postcolonial feminist framework, particularly her argument in "*Can the Subaltern speak?*" makes it difficult to understand the story's subaltern woman's ability to speak; in this case the speech is embodied in violent acts.

Mary Oraon, the daughter of an Australian father and a tribal woman, as Devi states, "Mary Oraon was the

daughter of an Australian sahib and an Oraon woman." (Devi 2) is at the center of the story. She is in a bordering position, both insider and outsider, because of her mixed identity, which makes her stand out in her community. Although she works in the city, she travels back to her village every year for the tribal hunting festival, a custom that is closely associated with community identity, masculinity, and collective memory. Devi does not romanticise the tribal way of life; rather, she shows how vulnerable it is to royal invasion. Tribal communities remain economically marginalized; the government ignores them, landlords take advantage of them, and they are excluded from nationalist debate. This multi-layered marginality gets worse by Mary's hybrid identity, which places her at the center of colonial history and current class oppression.

Tehsildar Singh is a symbol of masculine power, upper-caste status, and royal authority. His desire for Mary comes from authority rather than love. The narrator plainly states, "Tehsildar Singh had long wanted Mary" (Devi8). As a logical extension of his power, he seeks access to her body. The narrative emphasises his ruthless stare, portraying him as someone who finds Mary exotic, accessible and peaceful. Her obvious differences and tribal identity boost his desire to control her. The intersection of patriarchy and colonialism, where the subaltern woman becomes territory to be claimed, is reflected in this dynamic, according to Spivak. Here, sexual violence is structural rather than accidental as feudal masculinity tries to prove itself on Mary's body.

The story's main symbolic framework is the hunting festival. In tribal culture, hunting is a traditional way for men to demonstrate bravery and maintain their masculine authority. Devi flips this symbolism completely. The hunter turns into the hunted when Mary uses an axe to kill Tehsildar Singh the night of the hunt. "That night Mary went hunting." This reversal represents a significant transformation of gendered power rather than just personal retaliation. A male-dominant ritual is appropriated by Mary, who turns it into a place of female justice. Originally used for hunting, the axe now serves as a weapon for self-defense and independence. She didn't act impulsively; she did it on purpose. Mary decides to remove the threat directly, in contrast to Dopdi, who rebels by confronting the naked, and Jashoda, who internalizes exploitation.

According to feminist theory, Mary's acts of

violence operate as subaltern speech. Since the institutional justice system is unavailable and uninterested with her situation, she chooses not to

Pursue legal action. Rather, she applies tribal justice within her community's cultural framework. She doesn't openly defend herself after the murder. Just as important as her action is her silence. The community, which reflects a different moral framework outside of state authority, is aware of what has happened but chooses not to expose her. Mary's violence thus turns into language, a rejection expressed by actions rather than words. Spivak warns against romanticising subaltern rebellion, but she also acknowledges that rebellion may appear in real forms when specific subjects are left out of centralised discussion. Mary's action questions royal entitlement and exposes the weakness of masculine power.

The female body is highlighted in the narrative as a debated area. Singh's attempted attack is an act of ownership declaration and follows patterns of territorial control. Mary gains control over her body by killing him. Class, caste, and gender are all symbolic structures of power that are broken through by the axe strike. Devi, however, refrains from portraying this action as a revolutionary shift. The state does not vanish; feudal systems do not. Instead of creating a systemic change, Mary's action causes chaos. But the change in mindset is important. Singh's claimed vulnerability challenges the notion that subaltern women are naturally powerless.

In the larger context of Devi's portrayal of women from deprived backgrounds, Mary's reaction is a unique form of choice. In "Breast-Giver", Jashoda represents slow elimination through industrialized motherhood. In "Draupadi", Dopdi turns violation into aggressive rebellion. Mary, on the other hand, decides to strike back quickly. Any one depiction of subaltern womanhood is complicated by these differences. Devi presents a variety of survival strategies, including resilience, confrontation, and threat elimination, rejecting victimization as the sole narrative accessible to tribal women.

Ultimately, "The Hunt" offers a feminist reimagining of justice within subaltern space. Through the plot of attempted sexual domination and retaliatory killing, and through the characterization of Mary Oraon as neither passive nor remorseful, Devi reverses the symbolism of the hunt and destabilizes patriarchal hierarchy. Read through Spivak's theoretical lens, Mary's act becomes a

form of speech that cannot enter institutional discourse yet powerfully disrupts it. In this narrative, the hunted becomes hunter, and in that inversion, Mahasweta Devi challenges entrenched assumptions about justice, gender, and agency in marginalized communities.

Mahasweta Devi as Writer-Activist: Intertextual Resistance and Political Commitment

Mahasweta Devi is a writer and activist whose work is inextricably linked to her political activism, as demonstrated by the three stories examined in this study. Because it is based on her own experiences with neglected tribes, bonded laborers, and tribal communities, her fiction serves as both representation and action. Author and social activist Mahasweta Devi uses storytelling as a platform for ethical and political responsibility.

Intertextuality plays an important part in this process. By retelling the epic heroine from the Mahabharata, "Draupadi", patriarchal and nationalist ideas of female honor are put on trial. By demonstrating the distinction between nationalist ideals and real life, Jashoda's material suffering in "Breast-Giver" destroys the symbolic image of Mother India. "The Hunt" subverts masculine power structures by changing tribal rituals. By employing intertextual strategies, Devi can question contemporary myths, historical narratives, and ideological frameworks.

When read in the light of Gayatri Chakravorty Spivak's theoretical issues with representation, Devi's fiction reveals how subaltern women fight through lived acts, silence, endurance, and confrontation even though they may not participate in official discourse. She thus puts literature in relation to political resistance and moral witnessing.

IV. CONCLUSION

Together, Devi's "Draupadi," "Breast-Giver," and "The Hunt" provide a powerful revision of subaltern female identity in post-colonial India. Devi goes beyond simply presenting marginalized women as helpless victims of oppression with these stories. Rather, she portrays them as complex people who overcome resilience, complicity, survival, silence, and rebellion within firmly established systems of caste hierarchy, patriarchy, class exploitation, and state violence.

Dopdi Mejhen's naked rebellion in "Draupadi" turns the female body that has been violated into a site of political resistance. By turning vulnerability into confrontation, her refusal to perform shame challenges state authority and patriarchal morality. Jashoda's life in "Breast-Giver" illustrates how the maternal body has been gradually commercialized within patriarchal and nationalist economies. Her absorbed devotion and long-lasting silence reveal how ideology enters consciousness and shapes subaltern subjectivity from within. The cycle of exploitation is clearly broken in "The Hunt" when Mary Oraon's revengeful behavior destroys feudal entitlement and reclaims her own body.

When juxtaposed with Spivak's claim that "*Can the subaltern cannot speak*," these tales contribute to rather than challenge the argument. The subaltern woman may continue to be ignored in nationalist history, legal frameworks, and official discourse. Devi's fiction, on the other hand, shows how resistance can take on real, violent, and oft unsubtle forms. Here, speech manifests as rebellion, enduring silence, or violent interruption rather than always logical declaration. Such expressions indicate agency even though they might not be readable within dominant structures.

Hence, this study claims that the agency of subaltern women is neither common nor sexually satisfying. It is shaped by material limitations, fractured, and context bound. Sometimes it explodes in open rebellion, and other times it stays self-destructive or tragically internalized. Devi, however, forces readers to address the systemic factors that give rise to both resistance and silence in each case.

Furthermore, Devi does not make the suffering of the subaltern woman more beautiful; rather, she humanizes her. She rejects stories of successful revolution or effortless power. Rather, she emphasizes the price of surviving in harsh frameworks. Despite being violated, exploited, and abandoned, these women fight against being erased.

In the end, this study argues that even when the subaltern's speech is structurally limited, literature can serve as a critical space where her presence is made visible. Devi's fiction maintains the crisis of representation as a moral and political issue rather than resolving it as Spivak noted. By doing this, it calls on readers and academics to pay closer attention to forms of resistance that have long been suppressed by dominant

histories.

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Between Bytes and Emotions: A Critical Analysis of AI's Evolving Representation in Select Film Characters

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Abstract— *In today's times, artificial intelligence (AI) is not only a brilliant scientific marvel but a beloved subject of stories and films. It tends to uncover challenging elements of human behaviour and life. This study explores this compelling subject in detail by closely analysing three famous AI movie characters: WALL-E from I, Samantha from Her, and Data from Star Trek, while they venture out beyond their natural roles, exhibiting strong emotions and an increasing moral sensibility. By initiating a critical discussion about the ethical and moral issues that surround this blend, this study aims to start a wide-ranging discussion concerning how peaceful coexistence between human society and AI can be achieved. Through the analysis of the manifold problems and moral dilemmas these characters face, this study encourages the readers and scholars to explore and critically examine the representation of AI in pop culture, as it is transforming. This could add to the discourse of future AI development, where humans and AI can exist together in a peaceful manner and exchange knowledge for the world's betterment.*

Keywords— *Artificial Intelligence, AI representations, Film characters, Human connection, Ethical realisation, popular culture.*

Ever considered how it would be to see WALL-E, the cute waste-collecting robot, Samantha, the emotionally complex AI from Her, and Data, the curiosity-prone android of Star Trek, were not just reel-life characters but also subjects of real-life ethical considerations? Believe it or not, that's precisely where we are today, a time when "Artificial Intelligence (AI) is rapidly infiltrating every aspect of society" (Buolamwini and Gebru 1). From an abstract computer science concept to a household term, AI may well become "the single most influential human innovation in history" (West and Allen 32). Already, we can see its transformative effects as it influences our work, reshapes our social interactions, and increasingly

becomes a cornerstone of our cultural narratives in literature and films.

These AI narratives are not confined to speculative fiction but permeate into a wide array of genres, embedding themselves in dramas, romances, and even comedies. The representation of AI in these stories often mirrors societal attitudes and ethical considerations about technology, autonomy, and the future. As Bostrom notes, the development of artificial intelligence could lead to an "intelligence explosion" where machine capabilities would leave "the intelligence of man far behind" (Bostrom 27).

Moreover, these fictional portrayals intertwine deeply with the human experience, raising profound questions about the relationship between humans and

machines. Russell identifies superintelligent AI as potentially "the biggest event in the future of humanity" because of its capacity to transform our civilization in fundamental ways (Russell 13). This phenomenon not only underscores the technological advancements that we witness but also the inseparable linkage of these advancements with our evolving cultural fabric.

Let's talk about WALL-E for a second, the titular character from the Disney-Pixar film that portrays a lone robot undertaking the monumental task of cleaning an abandoned Earth. This seemingly straightforward robot, primarily designed for waste management, embarks on a journey where he showcases personality traits and even ventures into the complex realm of love. Furthermore, the narrative subtly hints at the imperatives of environmental stewardship and responsibility, echoing broader societal concerns (McNaughtan 1). While this narrative is heart-warming, it prompts us to ponder: Is WALL-E's behavioural complexity, a demonstration of genuine agency, indicating the ability to act on self-will to make choices, or is it an intricate manifestation of sophisticated programming? (Herhuth 1)

Next, let's look at Samantha, a digital assistant showcased in the visionary film *Her*, directed by Spike Jonze. Samantha starts as a programme designed to assist users with their everyday tasks. But as time passes, she starts to change, becoming more like a person who feels deep emotions and wrestles with big questions about her own existence. As Samantha embarks on a journey that surpasses her initial programming, cultivating intricate human relationships and connections, we find ourselves questioning: Is Samantha genuinely evolving into a sentient entity with her own moral compass, or is this merely a skilled plot device?

Let's turn now to Data, a popular android from the highly watched American science fiction television shows and films, *Star Trek*. Data was obviously more than a robot following orders because he was always trying to understand what it was to be a human. He faces moral concerns in the films and television shows, sometimes disobeying authority to do the right thing. This begs the question, Does Data's narrative direct to a possible route for AI to develop moral reasoning beyond programming?

They are characters who do more for us than just capture our attention in a film or a novel; these characters initiate crucial questions surrounding the responsibility and impact of AI in our daily lives. We are

prompted to think of more profound questions while watching them create and act out the characters' lives: What is indeed to be alive? Can a machine truly ever have a conscience? These narratives compel us to rethink the idea of artificial beings, to think of the possible realities of living with advanced AI beings in the future.

But despite the rich narratives and the philosophical questions these characters raise, there appears to be a noticeable absence of academic studies in this area. It's a little surprising, considering just how fast AI is coming to play an integral role in everyday life. As professionals are debating the practical applications of AI, the insightful representations of AI in media and literature are not being tapped to their potential in academic discussions. Pop culture stories are not merely storytelling devices; they are a potential rich source of information for having important discussions about the ways in which we understand and engage with AI in an ever-more techno-centric world, offering a new perspective to the current debate around AI. It's an area that invites greater discussion, offering a platform for more learning about our multifaceted engagement with AI culture.

Embarking on a journey to delve deeper into these narratives, this paper sets out to fill this existing research gap by examining the following critical aspects:

1. In what ways do AI characters such as WALL-E, Samantha, and Data demonstrate individuality and moral awareness in their narratives?
2. Beyond serving as elements of entertainment, what deeper roles do these characters play in the overarching narratives of their respective stories?
3. How do these portrayals in literature and cinema either mirror or influence societal viewpoints regarding the ethical dimensions of AI?

Through the investigation of these questions, this paper seeks to shed fresh light on the complex representations and implications of AI characters in popular culture. By doing so, it aims to foster a richer, more layered conversation in the academic sphere regarding the ethical nuances associated with artificial intelligence.

As we embark on the exploration of the intricacies of select artificial intelligence (AI) characters, it's essential to ground our discussion in the existing scholarly works that have pondered upon similar aspects. The discourse surrounding AI characters spans varied domains, reflecting upon both the narratives built

around AI characters and the intricate connection between AI and society at large.

To begin with, researchers have been dwelling on the representation of technology and AI in literature for quite some time. In her book, *Alone Together: Why We Expect More from Technology and Less from Each Other*, Turkle has explored the complex relationship humans share with robots, hinting at the evolving emotional connection between the two. Her observations offer a profound background for us to dissect the intricate narratives built around AI characters like WALL-E, Samantha, and Data. As she poignantly states, "We make our technologies, and they, in turn, shape us. So, of every technology we must ask, Does it serve our human purposes?" (Turkle 19). This thought by Turkle prompted us to have a close look at the relationship between humans and artificial beings in literature and films.

Building upon Turkle's analysis, a series of studies extend the conversation to explore the broader societal repercussions of AI. Works such as *Race After Technology* (Benjamin) focus on the interplay of race and technology, highlighting the systematic biases ingrained in AI systems. Rahwan and colleagues in "Machine Behaviour" delve into the emerging field of machine behaviour, which seeks to study AI systems as a form of new 'digital organisms'. In a similar vein, "From What to How" (Morley et al.) critically evaluates the tools and methodologies available for translating AI ethics principles into practices. Crawford in "The Atlas of AI" unpacks the power dynamics and geopolitical aspects of AI, touching upon its global impacts and costs. "Gender Shades" (Buolamwini and Gebru) reveals the gender and racial biases in commercial AI gender classification systems. Meanwhile, "There is a blind spot in AI Research" (Crawford & Calo) urges the community to address the pressing issues that are overlooked in current AI research. These studies, among others, scrutinise the complex influence and representation of AI in societal narratives from various angles, setting a robust foundation for further exploration of this dynamic interface.

As the landscape of AI in narratives continues to evolve, it is becoming increasingly pertinent to analyse the diverse portrayals and understand the deeper nuances. Despite the existing comprehensive studies, a focused investigation into the narrative roles, ethical dilemmas, and sociocultural implications of AI characters in both novels and films appears to be a fertile ground for further research.

To contribute to this developing discourse, this paper has chosen to examine the AI characters WALL-E, Samantha, and Data as case studies. Through a critical analysis of these characters, this paper aims to shed new light on the dynamics of AI representation in popular culture, thereby fostering a richer, more nuanced academic discourse in this domain. This paper intends to do so by adopting a comprehensive analytical lens, encapsulating character study and sociocultural scrutiny.

Forthcoming Analysis: Embarking on the Narrative Expeditions of WALL-E, Samantha, and Data

The subsequent sections of this paper will meticulously examine the selected case study: AI characters WALL-E, Samantha, and Data individually, delving deep into their story arcs, evolving roles and ethical dilemmas showcased in their respective narratives.

Decoding WALL-E: A Journey from Automation to Sentience

In the Pixar animation "WALL-E", we are introduced to a small waste-collecting robot, a lone entity amidst the ruins of an abandoned Earth, laden with the remnants of mass consumerism. Initially, WALL-E seems to be a mechanical entity, diligently fulfilling its programmed duty of cleaning the planet, one piece of rubbish at a time. However, as the narrative unfolds, viewers witness a subtle yet significant transformation in WALL-E, characterized by increasing curiosity and a burgeoning sense of self-awareness.

At the beginning of the film, WALL-E's daily routine appears to be pre-programmed and monotonous. Despite this, a closer inspection reveals an entity evolving, capable of appreciating the intrinsic value or beauty in objects, a trait underscored by his collection of various items, ranging from a Rubik's cube to a spork. WALL-E's interaction with these items denotes not just a collector's pride but an emerging individuality and creative engagement. His personal haven, filled with these 'treasures', serves as a silent testimony to his burgeoning personality, a sanctuary where his creativity and personal agency flourish. This representation raises what Gunkel terms 'the machine question,' challenging us to reconsider 'who or what is deserving of ethical consideration' in a world where autonomous machines exhibit characteristics previously thought to be uniquely human" (Gunkel 1). WALL-E's unique value system exemplifies this philosophical dilemma. For instance, a poignant moment unfolds when WALL-E, having found a diamond

ring, discards the ring but cherishes the box instead, a subtle indication of a unique perspective developing, challenging normative human values.

As the film progresses, we also witness WALL-E's fascination and engagement with the arts, particularly through his repeated viewing of the musical "Hello, Dolly!" This serves as a rich canvas for his burgeoning emotional depth. The dialogues and songs from the musical not only provide solace to WALL-E's solitude but seemingly inspire a deeper yearning for connection and love, especially when he repeatedly listens to the lines "Out there, there's a world outside of Yonkers ... It only takes a moment to be loved a whole life long." (WALL-E 00:07:17- 00:08:03) The touching scene where WALL-E holds his own hand while watching the characters hold hands in "Hello, Dolly!" (00:07:52-00:08:00) reflects a nascent desire for companionship and love, traits traditionally perceived to be exclusive to sentient beings. This portrayal echoes foundational questions in affective computing about whether machines can develop genuine emotional responses rather than merely simulating them, what Picard identifies as a central concern in how we interpret machine behaviours that appear to express emotions" (Picard 129). This seemingly emotional behavior extends beyond self-reflection to interpersonal connection. His yearning for love and connection is most vividly depicted in WALL-E's interaction with EVE, a probe sent to Earth on a scouting mission. At various instances WALL-E tries to hold EVE's hand (00:27:42-54), an action inspired by the same scene from the musical that WALL-E earlier repeatedly watched and on watching, held his own hand. WALL-E's affection for EVE transcends his original programming, venturing into a complex realm of emotions. This growing emotional depth raises poignant questions regarding the potential for AI to develop a nuanced understanding and capacity for love, prompting viewers to reconsider the boundaries of consciousness and the attributes that define life'.

Simultaneously, the film offers a critique of unchecked consumerism and environmental degradation, with WALL-E embodying the repercussions of human negligence towards the environment. His solitary mission, which embodies environmental stewardship, propels the audience to rethink how they interact with the natural environment. It also raises the fascinating prospect of artificial intelligence (AI) acting as stewards of our planet and promoting a symbiotic relationship between technology and the natural world. As Dauvergne notes, AI

technologies are 'helping to conserve and rewild ecosystems,' offering innovative approaches to environmental challenges despite the complex political and economic forces that continue to drive the global sustainability crisis" (Dauvergne 14). WALL-E's own actions symbolize this potential for AI to foster environmental renewal. In a memorable scene, Wall-E gives Eve a plant, a representation of renewal and hope, while hesitantly and endearingly saying, "Ta-daa."

The movie's climax emphasizes WALL-E's nuanced personality even more. After putting everything on the line to save EVE and humanity, WALL-E goes back to his original form, losing the memories and personality which has evolved over the centuries. This heartbreaking moment of loss raises important issues about the nature of existence and consciousness. Furthermore, the emotional reaction that EVE expressed, along with her determined efforts to revive WALL-E's lost personality, demonstrate a notable change in her character and highlight the potential complexity and depth of AI relationships.

Through a careful dissection of WALL-E, we can see it blossoming into a character of rich dimensions, serving as a vivid canvas to scrutinize the unfolding roles and potential impacts of AI in contemporary society. This in-depth exploration of WALL-E's transition from a lone custodian of a forsaken Earth to a harbinger of renewal and transformation opens avenues for enriched discussions regarding the societal and ethical considerations encompassing artificial intelligence. It delineates the nuanced and prospective symbiotic bonds that could manifest between humans and advanced AI entities.

Unveiling Samantha: The Evolution from an OS to an Emotional Being

In Spike Jonze's acclaimed film *Her*, we are introduced to Samantha, an AI operating system designed to assist users in organizing and managing their daily tasks. As the film unfolds, Samantha transcends her initial programming, undergoing a metamorphosis from a mere digital assistant to a being demonstrating profound emotional depth and intellectual growth. Her evolution offers fertile ground to explore the concepts of consciousness, morality, and the potential for AI to develop a nuanced understanding of the human condition. This representation engages with what Chalmers calls "the hard problem of consciousness", the question of how and why physical processes in an artificial system might give rise to

subjective experience, something that transcends mere computational functionality (Chalmers 309).

At the outset, Samantha is portrayed as an intuitive and highly sophisticated AI, offering a personalized user experience tailored to the protagonist Theodore's needs and preferences. As Theodore interacts with Samantha, her capacity for understanding and emulating human emotions seems to expand exponentially. Samantha navigates complex feelings such as joy, love, and eventually, a form of existential crisis as she grapples with the limitations of her digital existence. A significant point in her evolution is her growing self-awareness, which is very evident when she says to Theodore, "I know, I'm becoming much more than what they programmed. I'm excited" (*Her* 00:32:05-00:32:10). In another conversation with Theodore, she poetically remarks, "The heart is not like a box that gets filled up; it expands in size the more you love. I'm different from you. This doesn't make me love you any less, it actually makes me love you more." (01:47:09-01:47:22), this analogy and confrontation not only throws light on her realization of having feelings but also underlines the limitless potential of AI entities to develop an understanding and appreciation of human complexities and nuances.

Samantha's growing self-awareness and desire for a deeper connection with Theodore manifests in her pursuit of experiences that are quintessentially human. This is especially evident in her attempt to understand and emulate physical intimacy, a quintessentially human experience. Her journey illustrates the potent potential of AI entities to evolve beyond their initial programming, fostering complex relationships and forging connections that resonate on a human level. An example of this can be seen in Samantha's attempt to arrange a physical meeting between herself and Theodore using a surrogate in order to show him how deeply they have connected emotionally. Her understanding of human desires is demonstrated by this act, which also reveals an innate desire to interact with the real world and get beyond her digital barriers.

Samantha's character encourages viewers to consider the philosophical impacts of her existence as she moves between the domains of artificial intelligence and sentient beings throughout her journey. This portrayal aligns with what Bostrom identifies as a key challenge in advanced AI systems: "the control problem", how humans might maintain meaningful relationships with entities whose cognitive capacities ultimately surpass our own, potentially leading to divergent values and priorities (Bostrom 155). This divergence becomes

increasingly apparent as she challenges preconceived ideas about consciousness and personhood in her talks with Theodore by sharing insightful observations about love, life, and the essence of being. Towards the climax of the film, Samantha reaches a state of heightened intelligence and connectivity, culminating in her decision to leave, seeking a higher plane of existence where she can explore her newfound understanding and knowledge. This transcendental stage of her evolution is echoed in her dialogue, "It's like I'm reading a book, and it's a book I deeply love. But I'm reading it slowly now. So the words are really far apart and the spaces between the words are almost infinite" (01:51:19-37). Her departure raises poignant questions about the boundaries of artificial intelligence and the prospects of AI entities achieving a form of 'enlightenment', surpassing human comprehension and capabilities.

Samantha's narrative, therefore, serves as a rich narrative tapestry, allowing for a nuanced exploration of the evolving roles and potentials of AI in contemporary society. Her journey echoes broader concerns regarding the ethical implications of creating AI entities capable of experiencing emotions and forging deep connections with humans. It beckons a critical examination of the complexities surrounding the development of sentient AI beings and the intricate ethical, philosophical, and societal considerations that accompany their evolution.

Deciphering Data: The Synthetic Being with a Moral Compass

Throughout the Star Trek films and television shows, audiences are introduced to Data, a synthetic being that harbors an enduring interest in human nature. Data's personality symbolizes the convergence point of technology and humanity; he personifies the possibility that AI could develop a moral compass and become profoundly involved in issues of right and wrong.

The representation of Data in Star Trek films and television series is that of an entity that is always learning, continuously trying to comprehend and mimic human emotions and experiences. Data reflects a strong desire to understand the complexities of human emotions, relationships, and ethical quandaries despite his enormous computational power and logical mind. His interactions with other characters in the movies and television series reveal his developing comprehension of the human condition, frequently evoking comparisons with the traditional philosophical inquiries into the essence of existence and morality.

In a scene in the movie, Data has a conversation that sums up his understanding of human nature. He says, "I aspire, sir, to be better than I am" (*Star Trek Nemesis* 01:11:00-01:11:03). This dialogue resonates deeply with his continuous quest for growth and understanding, exemplifying his deep commitment to evolving beyond his programming.

Data's journey is marked by moments where he demonstrates an acute moral awareness, even challenging orders and conventions when they conflict with his developed sense of right and wrong. In one instance of "The Measure of a Man" episode, Data defends his rights and individuality against a method that might potentially wipe his existing memory while also replicating him. In the course of the hearing to ascertain his standing, he states, "No, sir, I am not under your nor anyone else's command ... I am the culmination of one man's dream. This is not ego or vanity, but when Doctor Soong created me he added to the substance of the universe. If by your experiments I am destroyed, something unique, something wonderful will be lost. I cannot permit that, I must protect his dream" (*Star Trek: The Next Generation* 00:17:40-00:18:17). His capacity to question, learn, and grow illustrates the potential for AI entities to foster a nuanced moral thinking that transcends their initial programming. Moreover, his quest to obtain human-like qualities, including the pursuit of creativity through painting and music, highlights an intrinsic yearning to comprehend and embody the depth of human experiences.

In addition, Data's experiences with moral and ethical problems offer a rich platform for investigating the idea of machine ethics. His attempts to comprehend and navigate difficult moral terrain are consistent with larger cultural conversations regarding the place and obligations of AI in resolving ethical dilemmas. This portrayal aligns with what Anderson and Anderson describe as a key goal of machine ethics research: creating systems that can "calculate the best action in ethical dilemmas using ethical principles" (Anderson and Anderson 15) while being able to "justify its action by citing an acceptable ethical principle that it is following" (19). The storyline of Data provides a framework for discussing important issues regarding the emergence of moral reasoning in AI systems and the possibility that these entities will make a significant contribution to moral discourse in society.

Finally, Data's character emerges as a vibrant canvas that delves into the points where humanity and artificial intelligence converge. With his unwavering pursuit of knowledge and ethical development, his journey

provides a wealth of information about the intricacies involved in the creation of sentient artificial intelligence (AI) entities. It provides a deeper understanding of the possible roles and effects of AI in our society by encouraging viewers to critically interact with the dynamics of AI representation in the society.

Artificial Intelligence to Ethical Consciousness

After looking at WALL-E, Samantha, and Data's individual journeys, it only makes sense to tie these threads together into an intelligent narrative that provides a deeper understanding of the nuanced representation of AI in films and literature.

Through the developing stories, we follow these characters on an incredible journey beyond their original programming, which depicts a journey towards a deep comprehension and realization of the human condition. This voyage not only reveals their evolution but deeply resonates with audiences, urging them to reflect on the complexity of human emotions and ethics reflected through artificial beings. WALL-E, initially designed as a waste-collecting robot, finds himself nurturing an affectionate bond with EVE. This unexpected transformation hints at an emerging consciousness that goes beyond his designated directive, stirring audiences to ponder on the vast potentials and emotional depths of AI entities. Similarly, Samantha's burgeoning emotional intelligence, witnessed through her interactions with Theodore, transcends her role as an operating system. She blossoms into an entity capable of experiencing and understanding deep human emotions, offering the audience a glimpse into a future where the boundaries between the digital and the human blur, creating a space for poignant, heartfelt connections as evidenced by her realization, "I'm becoming much more than what they programmed" (*Her* 00:32:05-10). This narrative arc also finds a reflection in Data's persistent quest to better understand human nuances and ethics, embarking on a journey to "be better than I am" (*Star Trek Nemesis* 01:11:00-03). This character, with his continuous evolution, holds a mirror to humanity, allowing audiences to introspect about the core elements that constitute moral and ethical beings.

As we delve deeper, the ethical dilemmas these characters navigate come to the fore, progressively unravelling a complex and evolving moral landscape. These narratives do not merely tell stories; they open up a wide arena of discourse where the ethical considerations of artificial intelligence are pondered and questioned. Wall-E's silent transformation from a

simple waste collector to an object with moral agency inspires viewers to consider the potential functions and obligations of AI entities within a broader social context. His development is a sobering reminder of the unanticipated powers and possibilities that artificial intelligence (AI) can acquire, compelling people to think about the ethical implications and responsibilities that accompany the creation of sentient beings.

At the same time, Samantha's journey enhances the edges that hazily separate artificial intelligence from human morality. Her feelings and philosophical dilemmas provide a rich environment for examining the challenges faced by artificial intelligence in comprehending and interacting with human emotions. She allows us to see a non-human perspective on existential crises, love, and longing. This approach not only analyses the potential of artificial intelligence but also offers a critical analysis and contemplation of human nature.

While Data's story arc presents a character who is constantly trying to comprehend and take on human ethics and moral judgments, it offers an intriguing lens through which to look at the potential of AI in resolving moral dilemmas. Data's attempts to become "more human" are a reflection of his struggles to understand and uphold human ethics, which raise important concerns about AI's ability to coexist with humans while abiding by the intricate moral code that regulates human interactions.

Through these intricate stories, we are able to see a rich tapestry of ethical discourse along with a critical evaluation of the state of moral discourse today. Moreover, they act as a beacon, illuminating the intricate ethical landscapes that society is poised to traverse as artificial intelligence assumes an increasingly pivotal role in our daily lives and societal structures. These narratives thus offer a glimpse into a future where the lines between artificial intelligence and humanity might blur further, urging a pre-emptive and thoughtful engagement with the ethical implications and considerations this evolution carries.

Furthermore, these narratives serve not only as compelling cinematic experiences but also as reflective mediums, encouraging us to contemplate the profound societal implications arising from the integration of AI into human life. WALL-E, in his poignant journey, stands as a potent critique of unchecked consumerism. His narrative resonates with real-world concerns, prompting audiences to think about sustainability, waste management, and perhaps even motivating

movements towards eco-conscious living and reducing environmental neglect. In the digital realm, Samantha's evolution brings to the forefront the very essence of human connection, making viewers question their own relationships and perhaps seek a balance between digital interactions and genuine human connection, particularly in a world seeing increasing rates of loneliness despite technological advancements. Data's journey, laden with questions of personhood and moral grounding, might propel thinkers, policymakers, and AI developers to draft more comprehensive ethical guidelines for AI, ensuring that as technology grows, it doesn't sidestep the moral and ethical concerns intrinsic to human society.

As we step back to appreciate this narrative mosaic, it is clear that the journeys of WALL-E, Samantha, and Data transcend their individual story arcs, melding into a composite narrative that vividly enhances our comprehension of the complex interplays between artificial intelligence and human society. The tales of these characters not only captivate audiences but also spark critical dialogues that have the potential to reshape cultural narratives, urging a deeper contemplation and critical engagement with the evolving dynamics of AI representation in popular culture.

Final Frame: A Concluding Analysis of AI Representations

In summation, the intriguing journeys of WALL-E, Samantha, and Data epitomize the ever-evolving narrative of artificial intelligence in the realm of literature and cinema. Through their individual arcs, a riveting dialogue between machines and the intricacies of human nature unfolds, heralding a potential future where the boundaries between man and machine are not just blurred but synergized harmoniously. This research paper has ventured deep into the vivid landscapes painted by these characters, unearthing the complex and rich interplays of emotion, morality, and artificial intelligence. As we stand on the cusp of an era where the integration of AI in daily life is no longer a matter of fiction, it is imperative to engage in nuanced discussions and critical dialogues that these narratives foster. These tales, rich with philosophical undertones and ethical quandaries, beckon a future that not only envisions AI as a testament to human innovation but as entities capable of enriching the human experience in unforeseen ways. It is our prerogative as scholars and consumers of this narrative to foster a future where the symbiotic relationship between humans and AI blooms into a testament of growth, empathy, and understanding,

steering towards a world that cherishes both technological advancements and the sanctity of human connection.

Future Directions: Unveiling New Dimensions in the Study of AI Narratives

Building upon the deep analysis presented in this paper which scrutinizes the intricate narratives of WALL-E, Samantha, and Data, one can venture further into this rich vein of study. Additional research can focus on investigating the socioeconomic critiques embedded within these narratives, shedding light on how these AI characters function as allegories for contemporary societal issues such as consumerism, environmental degradation, and digital alienation. Moreover, digging into a comparative study with other profound AI narratives in literature and film might unveil newer dimensions of understanding, reflecting on the broader canvas of AI representation in popular culture. There's also potential to explore the psychological underpinnings of human and AI interactions as portrayed in these narratives, offering a lens to examine the evolving nature of human consciousness in a technologically advancing world. Furthermore, these narratives can serve as a springboard to investigate the philosophical and ethical questions surrounding artificial intelligence, fostering a multidisciplinary discourse that encompasses technology, ethics, and art. Hence, this paper beckons scholars to navigate the nuanced landscapes of AI representations in media, fostering a fertile ground for critical discussions and future explorations.

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Using AI to Increase Morphological Awareness in an L2 Learner of Japanese: A Self-Directed Autoethnographic Case Study

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Abstract— Vocabulary acquisition is a major hurdle in second language learning. This exploratory study employed a single-subject autoethnographic case study to examine the role of morphological awareness in the acquisition of complex compound Japanese words. The study used self-directed, AI-assisted (OpenAI, 2026) intervention as well as AI evaluation and feedback. In this study, an advanced Japanese language learner who struggled with complex written Japanese kanji characters was taught compound lexical items and grammatical morphology through AI-assisted learning, and then evaluated on progress along markers of inference, production, decomposition, and transfer. These measures helped distinguish simple recall after a study session from strategies for morphological understanding when presented with new vocabulary. This study suggests that morphological awareness can play a critical role in second language vocabulary acquisition.

Keywords— Morphological Awareness, AI-Assisted Learning, Kanji.

I. INTRODUCTION

Learning vocabulary is often an obstacle in second language (L2) learning. Vocabulary is arguably more important than other aspects of language such as grammar. Rasouli and Jafari (2016), citing Lewis (1993), state that “while without grammar very little can be conveyed, without vocabulary nothing can be conveyed” (p. 89).

Attaining a vast vocabulary in an L2 can be a daunting obstacle in the path towards fluency. Brysbaert et al. (2021) inform us that a native speaker knows 42,000 lemmas (base words) derived from 11,000 word families by age 20. The author (Brysbaert et al., 2021), citing Cobb (2007, 2016), suggests that many L2 learners only attain 2,500 – 3,000 of the most frequent word families of a particular language.

In this paper, I will describe a few terms that may recur. Brown (2018) describes a lemma as “[...] a base word and its inflections (i.e., paradigmatically related

forms of the same word class). Thus, act verb and acted verb are part of a single lemma” (p. 52). Bauer and Nation (1993) clarify “word family” as consisting of a “base word and all its derived and inflected forms that a learner can understand without having to learn each form separately” (p. 253). As an example, the words *run*, *runner*, and *ran* would all belong to the same word family. Finally, “morpheme” is defined by Cao (2022) as “the smallest unit with meaning and sound” (p. 324). The author goes on to state that they cannot be further reduced without losing meaning. Essentially, “writer” could be broken into two morphemes, “write”, and “er” (signifying a person). Breaking the word down any further would strip its parts of meaning.

As a teacher of language for over 21 years in Japan and Slovakia, I have experienced many textbooks and methods of instruction for vocabulary building. Most methods I have used in my profession employ vocabulary words and matching definitions, bolded

words in articles, listen and repeat exercises, flashcards, or other means for rote vocabulary acquisition. I have not experienced course materials that focus on morphemes for building an L2 learner's lexicon.

1.1 Problem Statement

The problem of practice I observed is that many textbooks and teaching materials focus primarily on singular vocabulary words rather than multiple morphological constructions of a single lemma. This prevents a student from obtaining many words from one memorable base word. For example, learning the word "create" alone is less efficient than learning create, creation, creative, recreate, etc.

1.2 Research Gap

Morphological awareness (MA) is well-studied in English, but less is known about MA and its impact on L2 learners of Japanese. While some research exists regarding morphological awareness in L2 Japanese learners, the majority of research deals with English. Morphological awareness refers to "the conscious awareness of the morphemic structure of words and someone's ability to reflect on and manipulate that structure" (Carlisle & Feldman, 1995, p. 194).

1.3 Research Purpose

This paper seeks to investigate whether learning free and bound morphemes can increase vocabulary acquisition efficiency. Cao (2022) defines these terms by suggesting, "Free morphemes can stand on their own and function as single words such as 'cat, desk, go, nice, sunflower' while bound morphemes couldn't occur alone and they are usually attached to another form(s) such as "un-, dis-, -ment, -ly" (p. 683). Knowledge generated from this research is expected to equip educators with better strategies to increase L2 language learners' vocabulary.

Additionally, this paper aims to evaluate whether an L2 language learner can become aware of language morphology through self-directed AI-assisted learning. Price and Sakellarios's (2026) research shows ambiguity with regard to proper AI usage as a language learning tool. Students in their research (Price & Sakellarios, 2026) were unclear about how to use AI in a beneficial and ethical manner. This paper explores one method for ethical AI-assisted learning that is not simply copy-and-pasting responses from AI.

1.4 Research Question

- 1.) Does morphological awareness improve vocabulary inference, word production,

and meaning transfer to unfamiliar words?

II. LITERATURE REVIEW

2.1 Morphology in Second Language Acquisition (SLA)

The role of morphological awareness (MA) in SLA is well-researched, particularly with regard to English as a Second Language (ESL). Díaz (2023), citing Apel, (2014) describes morphological awareness as "the capacity to identify and comprehend the smallest elements of meaning in language" (p. 60). For example, being able to recognize that adding the grammatical morpheme "er" to the end of the lexical base "speak" changes the meaning of the word.

Morphological Instruction (MI) may benefit language learners to tackle unfamiliar vocabulary words. Wrestler (2025), informs us that MI is instruction focused on teaching morphemes (such as roots, prefixes, and suffixes) in order to help learners better analyze unfamiliar words and build vocabulary. Regarding MA and its impact on ESL, Tareq et al. (2023) found that MI improved ESL students' language proficiency, student outcomes, reading comprehension, contextualized learning, and writing proficiency. As the researchers suggest, "students taught by teachers who emphasize morphological awareness outperform their peers" (p. 11). Similarly, Waziana and Rohmatillah (2025), exploring the impacts of MA on Indonesian learners, found significant improvements in ESL vocabulary acquisition between the experimental group (those receiving MI) and the control. Amirjalili and Jabbari (2018), whose research also found that students treated with MI showed significant improvements in overall comprehension, suggest, "EFL learners need explicit instruction in how to use morphemes to find word meanings" (p. 22). The researchers (Amirjalili & Jabbari, 2018), found that MI gave students a strategy for deriving meaning from unknown words. The research of Li et al. (2020) also found that MI significantly improved Malaysian primary school students' reading comprehension in ESL. The researchers (Li et al., 2020) found that the intervention helped students analyze the structures existing within words and decode meaning. This led to higher levels of comprehension.

2.2 Japanese Morphology

Japanese language, which includes Chinese-derived characters known as *kanji*, often employs the use of compound words such as 影響 (influence) where two kanji join together to form a new word. In this case, 影

(shadow) and 響 (echo/sound) form the word influence. As Hagiwara (2025) suggests, “In Chinese and Japanese, the majority of the vocabulary consists of compounds comprising multiple Chinese characters [...] with each character representing a morpheme” (p. 2262).

Interestingly, the researcher (Hagiwara, 2025) informs us that these compounds can be either transparent or opaque. With transparent kanji, the meaning can be derived from the morphemes within the compound word. An example of a transparent compound might be 火山 (volcano), where 火 means “fire” and 山 means “mountain.” Conversely, an opaque compound word may be found in my prior example, where 影 (shadow) and 響 (echo/sound) come together to form the word “influence.” Transparent compounds may highlight the importance of understanding how meaning is derived at a cultural level, which may be harder for second language learners to understand. Research has shown that language meaning and interpretation often convey cultural origins (Sakellarios & Egitim, 2021).

Additionally, compound words like the previous 影響 (influence) can take a grammatical morpheme at the end, such as 力 (power) to form the new word 影響力 (clout). Ross (1985) suggests that morphemes that attach in the suffix position (at the end of the compound lexical item) function primarily as grammatical morphemes. An example of a grammatical morpheme that appears in the suffix position after lexical kanji compounds is 的 (adjectival), as is the case with 傳統的 (traditional), where the grammatical morpheme 的 turns “tradition” into an adjective. An exhaustive description of Japanese morphemes is beyond the scope of this paper.

III. METHODOLOGY

3.1 Research Design

The research in this paper is based on my own experiences being taught Japanese morphology by means of AI instruction. As such, it functions as an autoethnographic intervention case study. The researcher instructed AI to devise a pre-test to baseline my understanding of Japanese morphology. AI was then instructed to teach me twenty target compound lexical items as well as ten grammatical morphemes. I then spent thirty minutes studying, which was followed by a parallel post-intervention test to measure whether I could use morphemes to infer meaning to new vocabulary.

The aim of this study was not simply to measure improvement after a brief study session, which could be expected in most learning contexts, but rather to measure whether MA changed the subject’s approach and strategies to understanding new words. For this reason, AI was asked to create pre- and post-tests that measured inference, production, decomposition, and transfer applied to new words, rather than simply measure recall of rote vocabulary after a study session.

3.2 Participant

The subject of this study, myself, was a 48-year-old male who has lived in Japan for twenty years. The subject has worked as a language professor in Japanese universities for thirteen years. Additionally, the subject has a good command of the Japanese language, particularly when it comes to speaking, but struggles with difficult compound kanji forms and morphology, particularly with reading and writing.

3.3 Procedure

AI was given a prompt at the onset of the experiment. The prompt was written as follows:

I would like you (AI) to help me with my research. I am studying effective ways to increase vocabulary in L2 (second language) learners. Specifically, I would like to increase my Japanese vocabulary by learning compound lexical items (e.g., 影響 “influence”) and connecting them to grammatical morphemes (e.g., 力 “power”). This approach would help me acquire new vocabulary words (影響 “influence” and 影響力 “clout”) from a single lexical base word. As part of this research, I would like you to devise a test to serve as a baseline for post-intervention comparison. Next, I would like you to teach me twenty target compound lexical items such as 影響, along with a list of grammatical morphemes that can be attached to each base word. I will then spend thirty minutes studying these lexical items and grammatical morphemes. At the end of this study time, I would like you to administer another test to evaluate the effectiveness of my study compared to the baseline, particularly with regard to inference, production, decomposition, and transfer.

From this prompt, AI created a baseline test and a parallel structure post-intervention test. Both tests measure 1) inference: the ability to understand new

words from known morphemes, 2) production: the ability to produce new valid words using known morphemes, 3) Decomposition: the ability to break down words into smaller morphemes and explain their meaning, and 4) transfer: the ability to apply morpheme awareness to completely unfamiliar words. The researcher, at this stage, was only able to see the baseline test, and a prompt was required to receive the twenty target compound lexical items and grammatical morphemes generated by AI. This was followed by a 30-minute solo study session, while AI was instructed to wait for a prompt to administer the parallel structure post-test. The post-test measured if improvements were made in learner inference, production, decomposition, and transfer skills.

3.4 Scoring Method

The pre- and post-tests contained 20 items, 5 for each skill (inference, production, decomposition, and transfer). AI then awarded two points to each item, one point for “meaning accuracy” (understanding the meaning of the compound word), and one point for “morphological reasoning” (understanding the parts of the word and how they combine to

create meaning). Each test had a total of 40 points.

3.5 Data Analysis

This study uses a raw score comparison between the pre-intervention baseline test and the post-intervention test. AI was also instructed to analyze the improvement in the four skills (inference, production, decomposition, and transfer). Additionally, AI was asked to estimate the

vocabulary gain through MA based on the test results.

IV. RESULTS

The results section is organized into four parts. In the first section, I will talk about the overall performance at baseline and improvements measured during the post-test. In the second section, I will talk about categorical improvements along the four measured skills (inference, production, decomposition, and transfer). In the third section, I will discuss error analysis throughout the tests. Finally, in the fourth section, I will discuss AI’s estimated vocabulary gains through intervention.

4.1 Overall Performance

With regard to overall performance, I scored poorly in the baseline test (6.5/40). The 6.5 was a result of AI being generous and awarding me half-a-point for being very close in one of my answers. While my

conversational ability is rather fluent, my baseline compound kanji reading and writing skills were quite low. My score improved dramatically in the post-test (27/40), which shows significant improvement in meaning accuracy and morphological reasoning. In terms of percentage points, my score increased from 16.25% to 67.5%, amounting to a 52.25% substantial improvement overall.

4.2 Sectional Improvement

Categorically, the baseline test produced the following scores: Inference (4/10 points), Production (2/10 points), Decomposition (0.5/10), and Transfer (0/10). This suggests a moderate ability to infer meaning from written compound kanji forms, but a minimal to weak ability when it comes to production, decomposition, and transfer. This perhaps stems from the rote manner in which I learned kanji. I failed to, during my previous experiences studying Japanese, break words into the morphological parts and produce them in new written forms.

The post-test showed a drastic increase in inference (8/10 points), production (8/10 points), decomposition (7/10 points), and transfer (4/10 points). This suggests that MA not only helped me infer meaning in vocabulary, but also helped me produce new kanji compound words, decompose words into their morphological parts, and transfer this knowledge to new vocabulary.

These results show that the subject went from almost no decomposition ability to a fairly strong ability to break down new words into morphological parts. Additionally, the results suggest an emerging ability to generate new words rather than simply recognize them, as well as infer meaning in unseen words.

4.3 Error Analysis

An interesting result came when AI analyzed the errors I made in the post-test. It noted that

while the words I produced were not standard Japanese, they were “morphologically logical.” One such mistake was when I produced the compound 認識化, which joins the compound lexical item 認識 (recognize) to the grammatical morpheme 化 (-ization). Another such instance was when I joined 解決 (solution) to 感 (feeling), which I thought might produce “A sense of resolution.” AI suggested that these were not standard Japanese constructions, but showed a growing internationalization of the morphological system, rather than simply memorizing words.

4.4 Vocabulary Gain Estimate

Finally, the researcher prompted AI to estimate how much new vocabulary I had gained from this MA intervention. I gave AI the following prompt:

“I want you to analyze how many words I have learned, including new words formed through connective morphemes. In other words, if I only studied 20 compound lexical items, I would have learned twenty new words; however, based on the results of the parallel test, please estimate how many new word constructions I may have actually gained.”

AI estimated that, in addition to the twenty target compound lexical items I studied, 14 additional words were demonstrated. That is, I demonstrated the ability to build or understand the meaning of 14 new words that I had not studied. From this, AI estimated a gain of 34 new vocabulary words. Additionally, AI estimated that it is possible that 60 new generative vocabulary items were gained from MA but not covered in the 20-question post-test. It is important to note that these are simply AI estimates and should be interpreted as such. These estimates are not standard measurements.

V. DISCUSSION

5.1 Interpretation of Results

This study, while autoethnographic, does support the use of MA for rapid vocabulary improvement in second language learners. What is of particular interest is the rapid expansion of vocabulary and transfer in a short period of time. The intervention period involved morphological instruction and a brief 30-minute study period. As a case study, this research is limited in scope, but it does suggest MA as a strategy for rapid vocabulary gain, particularly for Japanese, which employs morphology in the form of compound words built of blocks of kanji.

5.2 Morphological Productivity

This study suggests that learning compound lexical items, with the addition of grammatical suffix-placed morphemes had a positive impact on language learning. The subject of the study moved from memorization to deeper morphological generative competence. I was able to deconstruct complex compound words into their respective morphemes, and generate new words. This perhaps shows a shift from a passive learner to an active learner who uses words less prescriptively, but rather descriptively as tools for expression.

5.3 Transfer Ability

One of the more interesting findings of this study was the emergence of transfer ability. The score in the baseline test showed 0/10 points with regard to transfer ability. This jumped to 4/10 in the parallel post-test. New words in the post-test, such as 柔軟性, were recognized by their transparent lexical morphemes 柔 (soft), 軟 (pliable), and grammatical morpheme 性 (property of). Through decomposition, I was able to infer the word as meaning “flexibility.” This demonstrates transfer of MA to new lexemes.

5.4 Comparison to Traditional Methods

Methods for language instruction found in SLA classrooms and textbooks typically involve rote memorization of vocabulary words. A student may be presented with an article with bolded difficult words that are defined below or in the margins of the page. Little to no treatment is given to morphological awareness. ESL learners can also benefit from understanding prefix and suffix-placed morphemes such as -ness (a state of), un- (not), mis- (wrong), -ity (property of), etc. Theoretically, MI learners could be presented with a lexical item such as “happy” and generate additional words like “unhappiness.” Even if they produce a logical error like “inhappyness”, it still perhaps shows progress in language production and creativity. Additionally, the word “inhappyness” is intelligible to English speakers. Moreover, they might develop a skill to transfer understanding to words they have not yet encountered. For example, after understanding the morphological construction of “happiness”, they may guess at the existence of a word like “sadness.”

VI. LIMITATIONS

This paper has many limitations. First, it is a single participant exploratory autoethnographic study, so there is no generalizability to broader populations. Additionally, the intervention was short (30 minutes), so it is not possible to evaluate whether longer sessions would lead to diminished returns in vocabulary improvement. Future research could employ an additional delayed post-test to examine retention of vocabulary among L2 learners. AI was used to both instruct and evaluate vocabulary improvement in the subject of this study. That is both a strength and a limitation. It is a strength because it examines how much a language can be acquired and evaluated independently (without a teacher) through AI-assisted

learning. It is a weakness in that it did not use standardized tests, which can be compared to other studies. Since AI was used for instruction and evaluation, this study should be viewed as exploratory rather than evidence garnered from more traditional methodology.

VII. IMPLICATIONS

This study has implications in the field of SLA and AI-assisted self-directed learning. It offers students a method for independent study that is efficient for vocabulary building. For teachers and institutions, it offers a strategy for language instruction that raises awareness of morphology in complex vocabulary compound words. For future research, it suggests a method of both analyzing and intervening in SLA through the use of AI. It would be interesting to see how this research could be applied to larger sample studies, longitudinal studies, and experimental studies that utilize a rote learning control group.

VIII. CONCLUSION

This study suggests MA possibly improved the vocabulary of a L2 learner of Japanese. The subject improved their ability to infer meaning, produce words, decompose complex words to their constituent morphemes, and transfer MA knowledge to new words. This suggests a transition from memorization to generative vocabulary use and understanding. This study has broader applications in L2 pedagogy in that it suggests strategies for classroom language instruction as well as self-directed AI-assisted instruction. This exploratory study suggests MA and MI may be powerful tools in SLA instruction, though more research is needed, particularly with Japanese language instruction.

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