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The Paradox of Technology-Enhanced Learning: A Critical Review of Psychological Need Satisfaction in Global Elementary Contexts

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Abstract: This critical discourse attempts to evaluate, how technology-integrated instruction influences psychological needs. Specifically, it emphasizes the satisfaction quotients of elementary learners' sense of belonging. Global research carried on till date, illustrates the purposeful use of digital tools in educational settings. Grounded in a qualitative analytical framework, this study investigates the dual nature of technology-enhanced instruction in shaping young learners' sense of belonging. It highlights both the potential benefits and inherent paradoxes that emerge in contemporary educational contexts. Indeed, above-mentioned methodology can enhance engagement, inclusivity and relational connectedness. These benefits are mostly dependent on socio-emotional and contextual factors. However, the accessibility and affordability of digital tools have become major barriers to their implementation in low-resource countries. Integrating collaborative perspectives, this study contends a balanced approach for learners' needs and satisfaction through user friendly-technology and instruction applied by trained educators. Hence, it can be concluded that only a responsive and emotionally safe learning environment can support learners' development through technological innovations. The contextual dynamics of this study are significant from a global viewpoint.

Keywords: *Psychological Need Satisfaction, Global Elementary Education, Sense of Belonging, Technology-Integrated Instruction, Self Determination Theory.*

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I. INTRODUCTION

Technology-enhanced instruction helps transform traditional classrooms, including instructional methods or strategies, personalized learning, expanded accessibility. Although, these digital tools primarily develop cognitive abilities for learners' emotional needs, love and belonging remain secondary. Specifically, it emphasizes the satisfaction quotient of elementary learners' sense of belonging. UNESCO (2024) reports that 251 million children and youth remain out of school worldwide. In low-income countries, 33% of school-aged children do not attend school. The statistics show that low-income countries invest less than 4% of their GDP on education and spent $55 per learner in 2022, compared with high-income countries spent $8,543 per learner. Considering these issues and learners' involvement in school, it is important to obtain emotional support from teachers and affordable integration of Ed-Tech tools to create a more engaging learning environment. Although, Technology-integrated instruction has transformed the field of education. Its growth has been particularly evident in India since the COVID-19 pandemic began in 2020. In addition to considering the growing importance of technology, it is expected that EdTech tools or technological innovations, can boost children's engagement and potential, not only cognitively, but also in the affective domain. Learners' development depends on early experiences. While both developed and developing countries consider learners holistic growth through education and prioritize the importance of technology, they should also include providing tools for learners' empathy, peer bonding, and emotional development. When a child is accepted by family, friends, and society, they gain confidence and motivation to grow in their lives and perform at their best in their field. Every human being has fundamental needs, including physiological, safety and security, love and belonging, and self-esteem. When these needs are fulfilled chronologically, an individual can reach a higher level of their life, that is self-actualization (Maslow, 1943). The need for love and belonging is essential for child development. According to Ryan et al. (1997), "Self-determiation is an approach to human motivation and personality...that highlights the importance of humans' evolved inner resources for personality development and behavioural self -regulation" (p.702). This paper indicates that although existing research

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shows students' inclusion, engagement, and collaboration in schools through digital tools or instructional media. A supportive teacher-student bond, advanced pedagogy, and efficient resources play a significant role in integrating technological tools into curriculum and instruction to meet learners' psychological needs satisfaction.

➢ *Objectives of the Study*

- To explore global perspectives on elementary students' sense of belonging in educational settings.
- To analyse how technology-enhanced learning contributes to the fulfilment of learners' psychological needs.
- To identify the factors affecting pedagogical practices in diverse global contexts.

➢ *Research Questions*

- How do different nations promote elementary learners' sense of belonging in the education sector?
- How do the elementary education systems differ between developed and developing countries?
- In what ways does technology positively contribute to fulfilling learners' psychological needs?
- What constraints do learners face in technology-mediated educational settings?
- What context-sensitive pedagogical factors influence educational practices in global settings?
- To what extent do contextual dynamics contribute to variations in elementary learners' psychological need satisfaction in digital education?

➢ *Conceptual Framework*

Technology-integrated instruction plays a supportive role in fostering students' mathematical learning and geometrical thinking (Wu et al., 2024). Storytelling and digital tools influence on numeracy and arithmetic related problem solving. It plays a major impact on academic achievement. However, In the present educational context, child-centered education and enhance student engagement is a major concern. It is important to fulfill students' psychological needs through ed-tech innovations.

In the context of research concerning the fulfillment of students' psychological needs, this study draws upon the three core components of Deci and Ryan's Self-Determination Theory.

- Autonomy: This component emphasizes students' choice and freedom, a concept central to child-centered education. Tech tools facilitate the development of personalized or self-paced learning experiences for students.
- Competence: This refers to the intrinsic motivation that inspires students to engage in specific tasks. Through the use of interactive EdTech tools, a genuine interest in learning activities can be cultivated among students. In addition, this method encouraging them to actively participate in resolving academic challenges.
- Relatedness: This component plays a particularly significant role in students' overall development and academic achievement. When a student perceives that they are valued and accepted within their educational environment, by teachers, peers, and staff members, they begin to identify themselves as an integral member of institutions. Technology integration enables the collaborative and contributing to their socio-emotional development. This concept aligns closely with Maslow's theory regarding the "Sense of belonging".

Technology integration proves highly beneficial within traditional educational framework. However, the extent to its effectiveness to fulfilling psychological needs across different contexts remains a subject of ongoing discussion.

II. METHODOLOGY

This study employs a qualitative critical review approach. Through the analysis and synthesis of several literature, a contextual analysis has been presented regarding the extent to which it is justifiable to address students' psychological needs through technology-integrated instruction in Global Elementary Context.

➢ *Research Design*

This study design as a qualitative critical thematic review of the literature. Employing affordances, constraints and contextual dynamics. it presents a comprehensive overview of the fulfillment of psychological needs in the context of technology integration.

➢ *Data Sources*

The research paper analyzed based on peer-reviewed journals, articles, scholarly reports, and UNESCO reports. Keywords used in the search process:

- Maslow's Hierarchy of Needs in Educational Context
- Self Determination Theory in Classroom setting
- Elementary or Primary Education and Technology
- Technology Enhanced or Integrated Learning
- Psychological Need Satisfaction, Student Motivation,
- Young learners' Sense of Belonging

The search focused primarily on recent studies to ensure up-to-date relevance, while selectively integrating seminal theoretical works to provide conceptual grounding.

➢ *Selection Criteria*

- Psychological need in classroom: Elementary School students'
- Technology- integrated Instructional context
- Enhance the concept of Inclusive Education in Primary Classroom
- Promote Belongingness in Educational Environment
- UNESCO report on Primary Education

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➢ *Method of Analysis*

- This study was conducted using a thematic synthesis approach and familiarization to ensure a comprehensive understanding.
- Subsequently, an open coding approach was adopted, grounded in the concepts and core ideas of psychological needs and technology-integrated instruction. Themes were then developed based on affordances, constraints, risks, and contextual dynamics. In the final stage, contradictions were mapped and synthesized to construct a coherent analytical narrative.

III. AFFORDANCES OF TECHNOLOGY-ENHANCED LEARNING FOR PSYCHOLOGICAL NEED SATISFACTION

Research findings obtained from qualitative library research and structured observation methods, employed across various primary schools by Idhan et al. (2025), indicate that, in the context of elementary learning, technology integration facilitates a better grasp of concepts, supports personalized or adaptive learning, and enables rapid access to information. In addition, various collaborative platforms and digital media have a significant influence on development of social skills, such as empathy, cooperation, and communication. Another study by David and Weinstein (2023), grounded in Self-Determination Theory, sheds light on how the strategic use of classroom technology can enhance intrinsic motivation and engagement. Additionally, technology-supported learning should be made a more enjoyable experience. That study was conducted by contrasting traditional, non-technology-aided learning with learning that utilizes Student Response Systems (SRS). Conversely, SRS usage with and without the incorporation of specific motivational strategies was compared. These motivational strategies included teamwork, friendly competition, and providing students with a choice regarding participation. The research findings indicate that, the use of SRS contributes positively to academic well-being. Specifically in terms of fostering interest, effort, and engagement. Furthermore, when SRS activities are structured around specific motivational strategies, students experience greater autonomy need satisfaction. Concurrently, during SRS activities, students demonstrate heightened motivational framing, which eventually makes the learning process more effective. This approach fosters a sense of connection among classmates and transforms the overall learning climate into a positive and engaging educational environment.

IV. CONSTRAINTS AND PSYCHOLOGICAL RISKS IN TECHNOLOGY-INTEGRATED LEARNING

Although technology-integrated instruction offers valuable possibilities, Research cautions that it cannot radically impact learners' emotional safety and sense of belonging. To present this view, Cha et al. (2025) conducted a quantitative correlational study involving fourth and fifth-grade students in U.S. public elementary schools. This study investigated the impact of technology self-efficacy and networking on students' online and face-to-face engagement. Through a cross-sectional survey, students from both grade levels were examined regarding their use of online or face-to-face Learning Management Systems (LMS) to assess the efficacy of technology-mediated instruction. Hierarchical regression and Moderation analyses of the research findings revealed that for students lacking confidence in utilizing LMS tools, fulfilling their psychological needs through this medium poses a risk. Moreover, those who do not feel comfortable collaborating and communicating via online platforms tend to disengage from technology-integrated instructions. As a result, this leads to a diminishing sense of belonging among them. S and Jadoun (2024), conducted a study examining the role of technology in primary education, drawing on secondary data from both global and Indian perspectives. This paper evaluates various sources, including government reports, peer-reviewed literature, and initiatives undertaken in Kerala, such as LITE and the Hi-Tech School Project. The authors interpret material using global theoretical frameworks: SAMR, TPACK, and Diffusion of Innovation, to judge how "meaningful" (beyond superficial) integration is. This research finding indicates that technology has been utilized merely at a basic substitution level rather than for interactive learning. Consequently, it has proven ineffective in actively engaging students in their study. However, the study revealed that policy implementation has not been feasible in rural and under-resourced government schools due to poor infrastructure. The lack of context-sensitive teacher training and locally relevant digital content creates significant hurdles at every stage, particularly regarding students' cultural and linguistic backgrounds.

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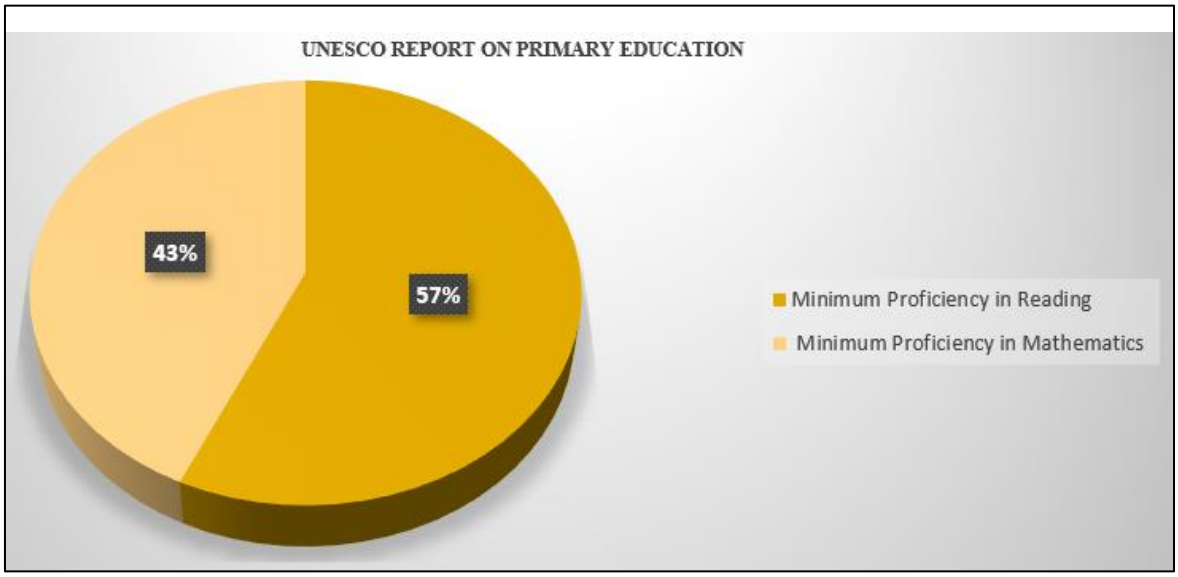

Fig 1 (UNESCO, 2025) Report on Primary Education

V. CONTEXTUAL DYNAMICS OF TECHNOLOGY AND NEED SATISFACTION

Based on a systematic literature review, technological features such as collaborative tools and feedback mechanisms can either support or thwart autonomy, competence, and relatedness within a classroom context. The study was conducted on elementary and middle school students aged 6 – 14 years, adhering to the PRISMA guidelines and PICO framework. The research findings indicate that well-designed technology is instrumental in enhancing students' intrinsic motivation and engagement. In addition, it exerts a significant positive influence on students' academic achievements and overall well-being (Conesa et al., 2022). However, no evidence has been found regarding the efficacy of purely digital or blended learning approaches for children aged 6 – 14 years. A single hypermedia intervention in isolation, is never capable of fully satisfying these needs. Another study on the sense of belonging and well-being of South African students highlights that technology has the potential to foster self-directed and inclusive learning environments. However, the surrounding atmosphere deepens the divide and stress. A study by Folabit et al.,2024, was designed based on a published, peer-reviewed systematic literature review of the relationship between technology and the sense of belonging. The research findings were interpreted through the lenses of the Technology Acceptance Model (TAM), specifically perceived usefulness and ease of use and Self-Determination Theory (SDT). The results indicate that inclusive, user-friendly platforms enhance students' sense of connectedness and competence. When students possess both access and requisite skills, technology facilitates self-directed learning and flexibility, thereby supporting psychological needs such as autonomy and competence. Moreover, socioeconomic disparities and unreliable connectivity can be sources of isolation-related stress and digital strain for students. Zarifsanaiey et al. (2022) revealed how digital storytelling combined with group discussion influences the social-emotional functioning of young learners. This quasi-experimental study was conducted on third grade female elementary school students. A total of 60 students were selected for this research using simple random sampling. Thirty students were assigned to an intervention group involved digital storytelling paired with group discussion. On the other side, another thirty were placed in a control group receiving regular instruction without digital storying. The Tromso Social Intelligence Scale and Bar-On Educational Intelligence Inventory Scale were administered before and after the intervention. The research findings indicate that technology incorporates impactful storytelling, fostering emotional engagement and relevance. Furthermore, coupling technology with face-to-face group discussions enhances social competence and a sense of relatedness. Several limitations of the aforementioned study are worth noting. For instance, need satisfaction cannot be directly measured. Therefore, this remains a matter of theoretical interpretation. Additionally, the quasi-experimental design, focused on a single class within a single school. However, the long- term effects and actual classroom behaviors (beyond mere test scores) remain unknown. There still research gaps remain regarding its appropriate implementation in the teaching-learning process. For Instance, for low resource schools and underrepresented communities, the application of digital tools can be a barrier. To mitigate this issue, low-cost and user-friendly tools can will be able to increase access for learners in low-resource contexts and promote inclusivity (Isik et al., 2024). Technology-delivered literacy instruction is beneficial for improving the literacy skills of elementary students. The meta-analysis was conducted on fifth grade students. The research findings indicate that, overall, technology-delivered instruction has a small but statistically significant positive effect on literacy. Although various moderators were tested, such as study design, types of literacy skills, and student characteristics none proved to be statistically significant. Overall, the study suggests that this form of instruction supports students' competence, specifically by enhancing their reading and writing capabilities. However, because the study's primary focus was on test outcomes, need satisfaction was only indirectly rather than directly measured.

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VI. INTEGRATIVE SYNTHESIS AND THEORETICAL REFRAMING

While teaching and learning through technology is a highly relevant topic in the contemporary era, the question of, how this method addresses the psychological needs of students remains a substantial discourse. This study specifically explores several aspects of how young learners, particularly within the realm of elementary education, engage with this technological approach. It is important to examine whether these technologies effectively meet the needs of the elderly or, conversely, create new challenges. Based on the evidence of several recent studies conducted from a global perspective, which prioritize technology-enhanced educational systems. The findings reveal profound perspectives. For Instance, Researchers across India, the U.S.A, South Africa and several other nations have consistently obtained largely similar results on this subject in their post-COVID studies. Technology-integrated instruction has demonstrated a supportive and positive influence on several critical areas. This includes fostering rapid access to information, enhancing social skills (such as empathy and cooperation), significantly boosting intrinsic motivation, improving literacy skills, increasing student engagement through methods such as storytelling, and prioritizing socio-emotional development. In terms of fulfilling psychological needs, specifically the fundamental requirements for a sense of belonging, technology serves as an effective tool. On the other hand, UNESCO's reports from 2023 and review of 2025, which address the mental health and broader circumstances of school-going students, have commanded considerable focus. These reports highlight a vast disparity between various nations' GDPs and their respective education sectors. It Pointed out that 251 million young people remain outside the reach of formal education systems. While developed nations invest over $8,000 per student in their education sectors, developing nations spend approximately $55 per student. Due to this significant gap, the implementation of technology and the subsequent transformation of educational systems through its aid have become particular challenging endeavors for low-income nations. In the contemporary era, while several nations, such as India have increased budgetary allocations for the education sector, the practical implementation and efficacy of these measures remain subjects of ongoing discussion (Tiwai, 2023)**.** However, in the context of high-income countries, notable challenges arise from the technology dilemma. Highlights encompass issues such as distractions caused by social and digital media (Bidala et al.,2025), a shortage of teachers trained in technology-integrated pedagogy, declining health due to excessive screen time, and risks associated with cyberbullying and online safety (Evangelio et al.,2022)**.** Conversely, low-income nations face a distinct set of challenges, particularly in remote rural areas. Such challenges include a lack of technology implementation, inadequate infrastructure, limited access to devices, language barriers that obstruct student comprehension, and a scarcity of educational literature within the home environment (Kukulsaka-Hulme et al.,2023). Although, the specific nature of these problems varies across different nations, they collectively hinder the ability to fully and effectively address the psychological needs of students. Consequently, while a theoretical framework based on Self-Determination Theory (SDT) can be constructed to analyze these issues, its practical measurement and empirical validation remain to be seen. Therefore, to ensure that the impact of technology in elementary education is truly beneficial, in the context of both low-resource and high-resource nations. Indeed, several key factors are crucial, such as, increased budgetary allocations for education, the development of well-structured pedagogy and curricula, adequate teacher training, expanded infrastructure and access, and, most importantly, the evolution of child-centric educational approaches. According to the UNESCO Global Monitoring Report (2025), 79 million students still lack access to basic education services (primary stage). In addition, the report reveals 88% global completion rate, 60% completion rate in low-income countries, and 71% adjusted completion rate (late enrollment or repetition).

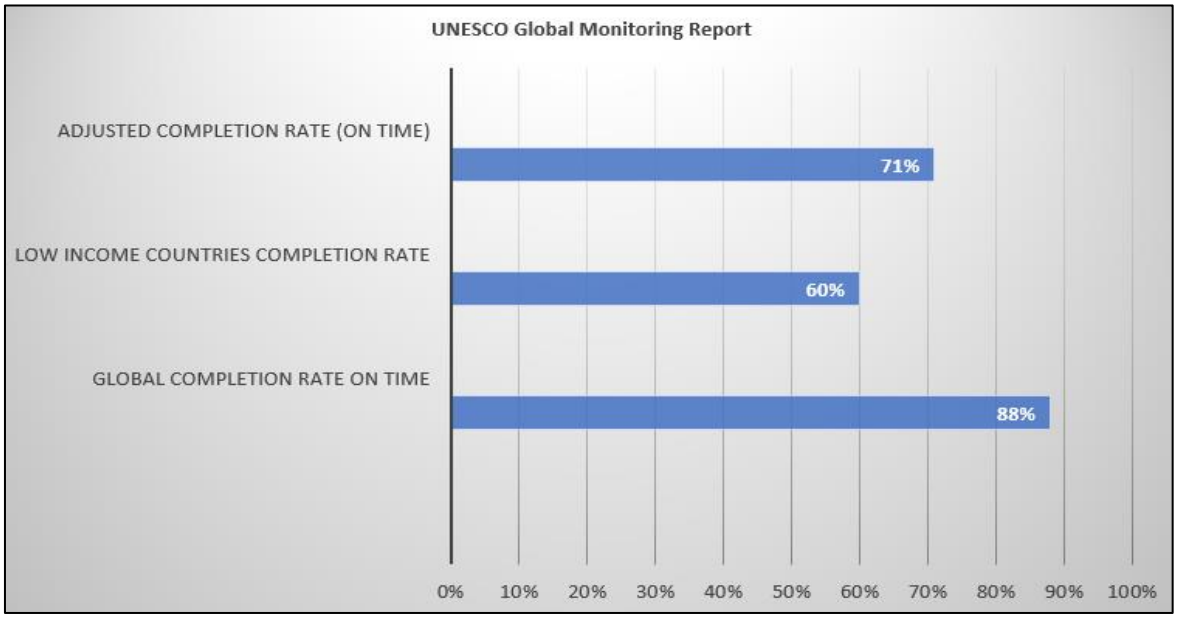

Fig 2 UNESCO Global Monitoring Report, 2025

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VII. CONTEXT SENSITIVE PEDAGOGY

From a pedagogical perspective; this research clearly demonstrates that technology cannot be applied universally to follow the same approach. Technology-enhanced teaching and learning become truly effective only when instruction is conducted by appropriately trained educators. Because they integrating specialized pedagogies and modern curricula to prioritize child-centric principles, such as, student needs and autonomy. Moreover, it is crucial to implement technology-enhanced educational strategies that are specifically tailored to local conditions. Since, considerable the distinct educational systems and environments of both rural and urban areas within each country. Eventually, addressing students' psychological needs requires a strategic and refinement approach, one that ensures students feel a sense of belonging within the educational landscape and prevents technology from fostering feelings of isolation. Additionally, In-service teacher training is essential for developing skills and wider knowledge about trauma sensitive approach, awareness of silent suffering and digital literacy (Bilbrey et al. 2022). With mentioned approaches, educators can develop themselves professionally and in compassionate way. Finally, for a successful learners' holistic development, teachers' well-being plays a significant role. When educators feel valued and emotionally secure, they can create a nurturing environment and enhances human relationship which cannot be replaced by technology. The UNESCO data reveal proportion of school with access to basic services in Indian Primary Schools. (UNESCO Institutes for statistics, 2025)

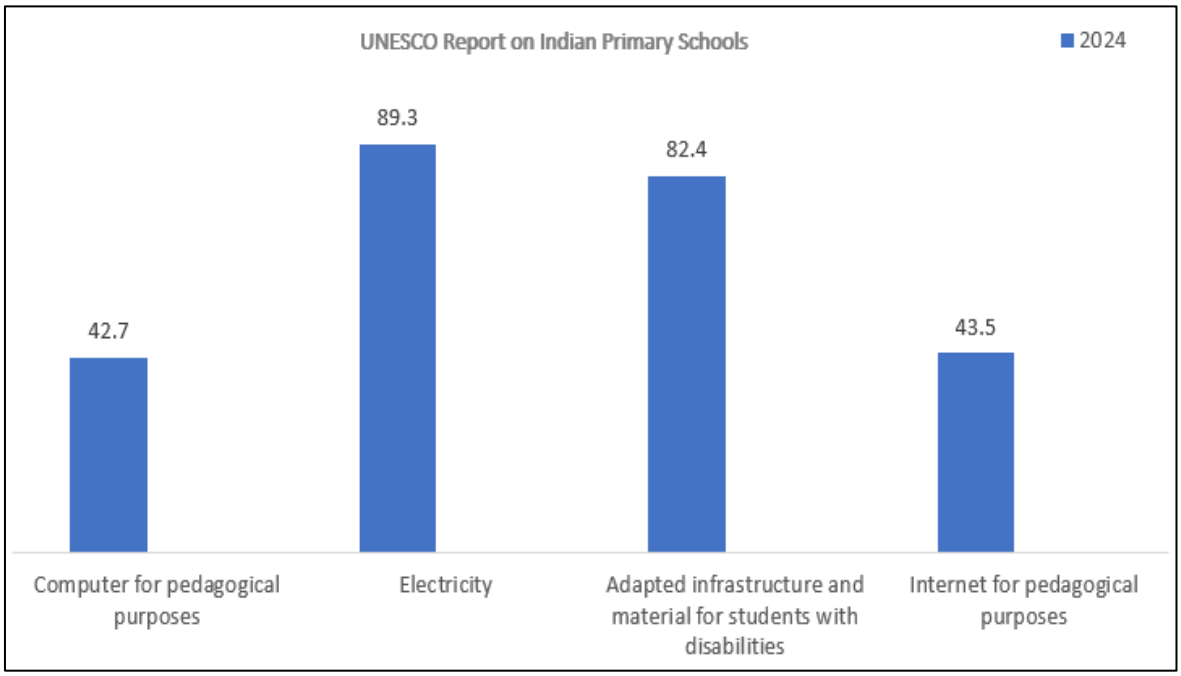

Fig 3 UNESCO (2025) Report on Indian Primary Schools

VIII. LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

This research paper presents a critical review, grounded in contemporary research and viewed through a global lens. The study examining how technology-enhanced learning enable the fulfillment of elementary students' psychological needs. In addition, highlighting the associated risks and constraints of this mentioned method. This research has several limitations, that indicate further investigation or recommendation for new research. For instance, mentioned study based on qualitative review. However, a mixed-method approach is essential to fully understand the depth and complexity of this subject. Future research could employ context-sensitive comparative studies to investigate variations across socio-economic, cultural, and geographical dimensions. Moreover, a longitudinal research design would be highly relevant for exploring how technology can effectively address psychological needs over time. While an intervention-based studies would prove instrumental in assessing the true scope and impact of this subject matter.

IX. CONCLUSION

A well balanced and context sensitive integration of technology in instructional procedure can genuinely support learners' academic growth, as well as emotional well-being. Based on the critical review of this paper, it is considerable that, technology integrated instruction can authentically support learners' psychological needs satisfaction. For Instance, Regular monitoring system is essential for measuring learners belonging and silent emotional distress. The reason of this fact is early identification helps teachers to timely support the learners. Despite the fact that, the implementation of the tech tools challenging in low resource schools. It is expected that to consider learners' holistic development is linked to a well-balanced GDP investment for Education. Along with this, teachers' well-being indirectly affects learners' motivation, love and belonging. These multiple factors play the role of foundation for a technological enhanced learning environment, where every child can feel safe emotionally and supportively can grow with their full potential.

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