ENHANCING LITERATURE IN ENGLISH EDUCATION: INTEGRATING INTERNET OF THINGS (IoT) FOR INNOVATIVE TEACHING AND LEARNING

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Abstract
The integration of the Internet of Things (IoT) technologies into educational contexts offers transformative possibilities for literature instruction. This paper examines the role of IoT in enhancing the teaching and learning of literature education, highlighting its ability to support personalized learning, accommodate diverse learning styles, and enhance student engagement. Additionally, the paper argues that IoT-enabled systems can support differentiated instruction, improve student engagement and comprehension, expand access to diverse literary resources, and help create a safer learning environment. It also highlights key challenges, including financial constraints, privacy and security concerns, and inadequate infrastructure for data storage and processing. The paper concludes by emphasizing the need for appropriate integration of IoT technologies into literature in English education.
Keywords: Internet of Things (IoT), Literature in English Education, Teaching and Learning, student-centered learning, smart technologies, Digital tools

Introduction
A wave of change has seeped into the method and practice of teaching and learning, with digital tools serving as a key catalyst. Digital tools have introduced new possibilities and prospects into the classroom, remodeling and replacing traditional teaching and learning approaches. Integrati ng technology into teaching and learning has profoundly impacted perspectives on pedagogy an d revolutionized the methodologies used by teachers. As a result, the role of the teacher, the nat ure and context of learning, and the function and significance of course content have all been ch allenged and redefined. In this evolving landscape, tech-wary, tech-resistant, or digitally skepti cal teachers find themselves increasingly out of place. The pedagogy of Literature in English education has evolved beyond traditional lecture-based instruction. Lecture-based instruction is often a passive method where students listen without active engagement or meaningful participation. In this approach, the educational message is typically delivered in a one-way format (Elgadir, Lahodin, and Nadzir, 2023). As a result, there is an increasing need to shift away from teacher-centered methods and toward more interactive, student-centered approaches. This shift has led to the adoption of strategies that promote student engagement, interaction, and active participation during lessons, like the Close Reading method and the Socratic Method or Discussion-Based Learning (Aarons et al., 2023). Today, the integration of digital tools has become essential in modern pedagogy, not only to support teachers with a variety of instructional resources but also to enhance student engagement, foster

critical thinking, and personalize the learning experience. Ultimately, incorporating technology into literature education is transforming traditional teaching practices, making literary studies more accessible, dynamic, and engaging for today's learners. With advancements in digital technology, artificial intelligence (AI), and online learning platforms, both teachers and students now have access to diverse tools that enhance the teaching and interpretation of literature. Virtual learning environments facilitate learner-centered education by promoting collaboration, personalization, and accessibility, which are essential for modern literature in English pedagogy (Anderson & Dron, 2011). This is a welcome intervention, as it will mitigate the situation where the teacher is the sole speaker in the classroom, with their personality dominating the lesson delivery and the students acting as passive listeners. Incorporating technology into literature education pedagogy elevates the quality of education. It allows teachers to remain up-to-date and incorporate modern innovations that improve student engagement and learning outcomes. It is against this backdrop that Elnadeef (2022) argues that one of the most significant advancements in technology is the Internet of Things (IoT), which integrates Internet connectivity into physical devices and everyday objects. This entire system is equipped with effective hardware, electronics, and internet connectivity.

The Internet of Things (IoT) The Internet of Things (IoT) is a network of interconnected digital and mechanical devices that communicate and exchange data without requiring direct human-to-human or human-to-computer interaction (Elnadeef, 2022). This interconnected network allows devices to collect and exchange data, facilitating smart recognition, positioning, tracing, monitoring, and administration. The devices, equipped with computing capabilities, seamlessly transfer data over the network, enabling automation and smart functionality across various applications. Ashton (2009) categorized IoT into three: firstly, things that collect and send information; secondly, things that receive information and act on it; and lastly, things that do the first and second. The Internet of Things plays a crucial role in advancing education in general and is a key objective of the Sustainable Development Goals (SDGs), contributing to quality assurance for students' future and the sustainability of education (Martinez et al., 2021). Again, the Internet of Things can be defined as a paradigm that enables everyday physical objects to be connected to the Internet, allowing them to send and receive data, interact with each other, and support decision-making processes in various domains such as education, healthcare, and industry (Atzori, Iera, & Morabito, 2010). IoT in literature in English is a model or system that changes how literature in English teachers use technology in teaching literature, ie, moving from isolated devices to interconnected systems. It enables communication between electronic devices and sensors through the Internet. The Internet of Things aims to seamlessly connect devices, people, and objects anytime, anywhere, using any network, pathway, or service (Patel and Patel, 2016). It enables real-time monitoring, automation, and data-driven decision-making across various sectors, including healthcare, manufacturing, smart cities, and transportation. It is pertinent to note that the Internet of Things is not a teaching method or theory but a tool that aids teachers, educators, and learners by improving access to different types of media already in use. Patel and Patel (2016) further argue that the IoT recognizes the pervasive presence of diverse objects in the environment, which, through wired and wireless connections and unique addressing schemes, can interact and cooperate to create new applications and achieve common goals. Furthermore, IoT goes beyond machine-to-machine communication, wireless sensor networks, sensor networks, 2G/3G/4G, GSM, GPRS, RFID, Wi-Fi, GPS, microcontrollers, microprocessors, etc. All these are rather the enabling technologies that enhance the effectiveness of its application. Rather, it extends internet connectivity beyond conventional computing devices such as desktops, laptops, smartphones, and tablets to encompass a wide array of traditionally non-networked or non-internet-enabled physical devices and everyday objects (Gills, 2015). The Internet of Things is not a single tec

hnology but an integration of different hardware and software technologies. This integration is essential for carrying out tasks such as storing, retrieving, and processing data.

Transforming Literature in English Education Through the Internet of Things The Internet of Things is a transformative force that has revolutionized literature education by incor porating smart technologies to enhance learner engagement, accessibility, and interactivity. The IoT tools make the teaching and learning of literature and literary appreciation more dynamic, i nteractive, and tailored to suit different learning styles. It enables learners to engage in online le arning activities at their convenience, allowing them to study at flexible times and engage in refl ective thinking (Hrastinski, 2008). This form of learning conquers the barriers of time and locati on since learners can engage with instructional content, discussions, and assignments at differe nt times without real-time interaction with instructors or peers. Patel and Patel (2016) posit that one of the objectives of the Internet of Things is to enable things to be connected anytime, anypl ace, with anything and anyone, ideally using any path/network and any service. This objective d rives IoT's flexibility, enabling students and teachers to interact with content at different times a nd promoting adaptable participation and self-paced learning. IoT has impacted literature educa tion by facilitating learning through smart classrooms, access to digital libraries, and interactive discussion forums. **(**Kumar and Sharma, 2021**)**. These platforms allow students and teachers to access resources, analyze literary works, and engage in discussions without the constraints of ti me and location. In other words, IoT technologies make resources more accessible, classrooms more interactive, and discussions more collaborative.

The IoT-powered smart classrooms are made up of inte ractive whiteboards, AI-driven lecture recording tools, and cloud-based learning management systems (LMS), which are geared towards enhancing distant learning in literature. By expanding learning opportunities outside of traditional classrooms and libraries, the Internet of Things chal lenges the established educational system. Teachers can upload lessons, thereby enabling stude nts to access prerecorded materials on literary themes, critical theories, and literary styles throu gh platforms like Google Classroom, Coursera, and Edmodo. Furthermore, the capacity to retri eve information from any location allows students to progress at their own pace and to cultivate a learning environment at home that mirrors the supportive atmosphere of the classroom. Stude nts can watch and listen to the lectures at their convenience, pausing or revisiting complex secti ons. Oliynyk, (2025) notes that using IoT devices for education (literature) is highly effective at providing real-time access to resources. The IoT-enabled tools such as Google Jamboard and M icrosoft Surface Hub automatically store literary analysis, thematic discussions, and notes that c an be retrieved at any time. Teachers also benefit from IoT by remotely designing their lessons, evaluating program effectiveness, and tracking students' progress.

The Internet of Things tools function as a digital k nowledge bank and permanent knowledge repository for learners' future reference (Anderson, 2008). Sometimes, approved literary texts can be challenging for students and even teachers, es pecially when they have a foreign setting. IoT-powered classrooms use LCD projectors, Google Image Search, and web portals like YouTube.com and Video.Google.com to enhance lesson de livery, support learning, and improve students' comprehension and performance. These tools ca n visually represent various scenes from the novel or drama text being studied to make compreh ension easier. All these reinforce learning and aid revision.

Learners can access literature texts and participate in discussions at their conv enience, thereby overcoming time zone and scheduling constraints, since it has facilities that all ow the teacher to record an interactive lecture/lesson on any literary text (Hrastinski, 2008). A dditionally, IoT-integrated e-books and audiobooks store data in the cloud, allowing students th e opportunity to watch videos, review the teacher's annotations, and submit their interpretati ons on a discussion forum. Learners are no longer burdened with carrying bulky hard copies of

books and notes, as digital platforms allow them to access materials and engage in academic activities from virtually any location. This shift not only enhances convenience but also supports continuous learning in diverse settings. IoT-based platforms, such as smart classrooms, digital libraries, and discussion forums, allow literature students and teachers to share resources and discuss literary works asynchronously (Zhao and Okamoto, 2019). IoT enhances online literary forums, e-groups (e.g., Google Groups, Edmodo), and Learning Management Systems (LMS) (e.g., Moodle, Blackboard), thereby enabling asynchronous discussions on literary themes, analyses, and interpretations of literary styles and elements. Learners post their interpretations of a literary work, and teachers provide feedback asynchronously. For instance, smart reading devices like Amazon Kindle with IoT connectivity allow students to highlight texts, share notes, and access additional commentary asynchronously.

The Internet of Thought moves beyond a one-size-fits-all approach, championing personalized learning that considers students with disabilities and learning challenges. Offering self-paced learning tailored to students' cognitive needs helps remove barriers to engagement and fosters critical thinking. IoT sensors in literature in English classes help teachers plan lessons based on the needs of every student, while robotic solutions enable the personalization of curriculum content and pace based on how students respond to questions or solve test tasks (Oliynyk, 2025). This implies that the Internet of Things supports reinforcement learning, allowing for dynamic adaptation to each student's individual needs and personalizing the learning process accordingly (Kamalov, Calonge & Gurrib, 2023). Also, the integration of the Internet of Things enables the development of intelligent tutoring systems that interact dynamically with students and provide substantive feedback, thereby advancing the goals of personalized learning. Beyond merely allowing learners to engage with literature lessons at their own pace, IoT technologies also deepen comprehension, thereby promoting more meaningful and active participation in scholarly discussions. Therefore, IoT guarantees that learners, regardless of their challenges, comprehend and experience the richness of literature in a way that is accessible, interactive, and meaningful by removing cognitive and physical barriers.

The traditional classroom moves at a fixed pace, which can be challenging for students with learning disabilities like dyslexia, ADHD, and autism (Shaywitz & Shaywitz, 2005). However, the Internet of Things overcomes this by enabling AI-powered adaptive learning platforms that adjust text complexity based on real-time cognitive feedback, provide automated summarization for students struggling with comprehension, and detect cognitive fatigue or track cognitive load and suggest breaks or adjust content presentation (Yaseen, Mohammad, Ashal, Abusaimeh, Ali, & Sharabati, 2025). In literature classes, such systems make complex texts more understandable and learner-friendly.

Another significant contribution of the Internet of Things (IoT) to the teaching and learning of literature lies in its capacity to enhance safety and security within the educational environment for both students and teachers. This is particularly relevant in Nigeria, where the country is currently grappling with various forms of insecurity. Incidents involving the attack, abduction, or even killing of school children have raised serious concerns. As perpetrators of insecurity become more sophisticated, traditional security measures and manual protection methods are proving less effective. IoT-based security systems offer a more advanced solution, incorporating smart cameras, smart ID cards, smart doors and access control, motion detectors, and RFID. These tools help detect unauthorized access, track student movement, and monitor attendance and punctuality. Such systems are especially beneficial in managing large student populations, offering both real-time surveillance and improved administrative efficiency. Ensuring the safety of both students and teachers is fundamental, and the integration of IoT technologies provides a secure environment that is essential for the effective teaching and learning of literature.

Challenges of Integrating IoT in Teaching Literature in English and Solutions Historically, new technology has often been prone to misuse; for instance, the discovery of nuclear fission led to the creation of the devastating nuclear bomb, while the advent of the internet gave rise to the dark web, a space where illicit and illegal activities can be concealed from authorities (Kamalov, 2023). Therefore, it is not surprising that IoT has challenges. Notable among them are:

1. financial constraints 2. Privacy and security concerns
3. Inadequate infrastructure for data storage and processing.

1. Financial Constraints

Financial constraints significantly impact the integration of IoT devices and software in the education sector. The costs associated with purchasing hardware, acquiring software licenses, and maintaining IoT tools can be prohibitively high and require substantial capital investment. Additionally, a consistent power supply is essential for the efficient operation of IoT devices, which remains a challenge in Nigeria. To address this, schools may need to invest in alternative power sources, further increasing costs. Also, for the effective integration of IoT in the teaching of English literature, teachers must regularly engage in professional development in order to remain abreast of technological advancements, and this is an additional financial burden.

Additionally, it is expensive to access the internet, including enough bandwidth and Wi-Fi connectivity. Given the scale of implementation, these expenses demand significant financial resources. As a result, education budgets and school expenditures will rise, and institutions unable to adapt to these advancements risk falling behind (Nwaedozie, 2024). If students are required to provide their own devices and internet access, not all will be able to afford the recurring subscription fees. This financial disparity creates unequal access to educational resources, widening the digital divide among learners.

2. Privacy and Security Concerns

One drawback of IoT in literature in English and education generally is its vulnerability to cyber attacks. The growing number of connected devices and sensors in IoT increases the risk of cyber threats, leading to valid concerns among consumers about potential data breaches. Oliynyk (2025) identifies cyber threats, like data theft, phishing attacks, man-in-the-middle attacks, and ransomware, as risks to the security of IoT educational systems. Sometimes, criminally minded people can impersonate teachers or school authorities to deceive students into revealing sensitive information, such as passwords, credit card details, or personal data. These malicious activities are perpetrated through deceptive emails, websites, or messages that imitate legitimate communications from teachers, thereby manipulating students into revealing personal information. Beyond individual harm, such security breaches pose systemic risks, including reputational damage to educational institutions, erosion of trust in digital learning platforms, significant loss of personal data, disruption of academic continuity, and a broader compromise of student safety and institutional integrity.

2. Inadequate Infrastructure for Data Storage and Processing.

The integration of Internet of Things technologies into literature in English instruction has been severely hampered by the absence of suitable infrastructure for data processing and storage, especially in environments with limited resources like Nigeria. The integration of Internet of Things devices generates vast amounts of data, starting from students' engagement metrics to attendance records and learning analytics, which require robust servers, cloud computing capabilities, and secure data centers for efficient handling (Gubbi, Buyya, Marusic, &

Palaniswami, 2013). However, many educational institutions lack the technological backbone to support such infrastructure, thereby leading to challenges in implementing real-time feedback systems, personalized learning platforms, and digital content management essential for modern literature in English instruction. Aderibigbe and Chigona (2021) observe that public schools in Nigeria, suffer from a severe deficiency in ICT infrastructure, thereby significantly limiting their capacity to adopt and integrate data-driven educational innovations.

Again, some schools struggle with outdated and unstable devices. Persistent reliance on outdated and unstable technological infrastructure continues to undermine the effectiveness of educational delivery in many schools, often resulting in system malfunctions, data loss, and heightened vulnerabilities to breaches of sensitive information. Consequently, the transformative potential of Internet of Things technologies to personalize literature instruction through the analysis of learners' reading habits, comprehension patterns, and performance metrics remains substantially underutilized, leading to malfunctions, data loss, or an increased risk of sensitive information leakage. There is no gainsaying that poor internet connectivity, inadequate technical support systems, and outdated and unstable devices worsen the issue and thus lead to the underutilization of digital tools and fragmented implementation (UNESCO, 2020). Therefore, without the foundational infrastructure to store and process educational data, the full benefits of the Internet of Things in literature education cannot be realized.

Conclusion:

The integration of Internet of Things technologies into literature in English pedagogy represent s a transformative opportunity to enhance teaching and learning experiences. By enabling real-t ime tracking of students' reading habits, comprehension levels, and engagement patterns, the In ternet of Things offers unprecedented possibilities for personalized and adaptive instruction. Th is technology fosters more responsive, inclusive, and collaborative literary learning environme nts, helping teachers meet the diverse needs of their students more effectively. Nevertheless, rea lizing its full potential requires strategic investments in infrastructure, teacher training, and data privacy measures. As educational institutions continue to embrace digital innovation, using the Internet of Things can serve not merely as a supplementary tool but as a catalyst for reimagining how literature is taught, learned, and experienced. Thus, it is crucial to develop frameworks that guarantee equitable access, promote ethical data usage, and make it easier to integrate Internet o f Things technologies into literature education in a way that is both pedagogically sound and eff ective. educationally effective

Recommendations

1. To fully leverage the potential of the Internet of Things in literature in English education schools and educational institutions must prioritize significant investments in ICT infra structure. This includes ensuring reliable internet connectivity, access to modern device s, and the development of smart classrooms that are equipped to support IoT-based learn ing.
2. Teachers should receive targeted professional development programs to enhance their d igital literacy and pedagogical skills for integrating IoT tools into literature instruction. Training should focus on effectively using the Internet of Things to personalize learning assess student progress, and create interactive, collaborative learning experiences.
3. Given the data-driven nature of Internet of Things technologies, it is crucial to establish strong data governance policies that protect students' privacy and ensure ethical use of d ata. Schools should adhere to established guidelines for data security and transparency, ensuring that both students and parents are aware of how data is collected and used.

4. Educators should explore how the Internet of Things tools can be meaningfully integrated into existing literature in English curricula. This includes aligning IoT-based activities with learning objectives, fostering interactive learning through connected devices, and utilizing Internet of Things insights to adapt instruction to individual student needs.
5. Ongoing research is essential to evaluate the long-term effects of the Internet of Things on literature teaching and learning. Future studies should focus on examining the impact of Internet of Things on student learning outcomes, engagement, and critical thinking skills, while also exploring the challenges and barriers to its implementation in diverse educational contexts.

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