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Research Paper

Digital Footprint on Education: Sustainable or Not?

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ABSTRACT

The rapid digitalization of education has undeniably transformed learning systems worldwide. With institutions integrating digital tools into their curricula, the concept of a digital footprint emerges as a crucial factor in assessing the sustainability. Digital footprint represents the trail of data generated through interactions with digital platforms. In education, this includes online learning resources, e-learning platforms, cloud storage, and AI-driven assessments. Digitalization has significantly improved access to education, empowering students in remote areas to engage with quality content while enabling educators to enhance teaching with global resources. However, this shift raises sustainability concerns. Maintaining large data centres and powering energy-intensive devices contribute to a significant carbon footprint. The global ICT sector accounts for approximately 2-3% of greenhouse gas emissions, comparable to the aviation industry. With the growing adoption of digital ecosystems, this footprint is poised to expand. Despite these challenges, digitalization offers sustainable solutions. Paperless classrooms reduce deforestation, online learning minimizes commuting emissions. Implementing practices such as powering data centres with renewable energy and optimizing software for efficiency can further mitigate environmental impacts. Equally important is addressing digital inequality. Many students lack access to reliable internet and devices, threatening the inclusivity digital education aims to promote. Bridging this divide requires initiatives like affordable internet access and device distribution for underserved communities. Partnerships between educational institutions and tech companies can drive innovative solutions. Professional development programs for educators can also promote sustainable technology use. Training teachers to leverage digital tools effectively fosters a culture of responsible digitalization. Insights can shape policies enhancing inclusivity and sustainability. In conclusion, the sustainability of the digital footprint in education depends on careful management. By aligning digital transformation with green practices and equitable access, we can harness its potential while minimizing environmental and social drawbacks. Through collaboration among policymakers, educators, and tech innovators, digitalization can become a transformative and sustainable force in education.

Keywords: *digitalization of education, sustainability, digital ecosystems, digital inequality, inclusivity, culture of responsible digitalization, green practices*

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TRANSFORMATION IN THE AGE OF MODERNIZATION:

The 21st century, very rightfully called the age of globalization and technical innovation, has shown incredible results as digitalization has been observed to take the realm of education over in a storm. At the same time, it is to be expected that when something revolutionary occurs in the world, a debate sparks; and in this context the debate revolves around the topic: Is it sustainable, or is it not? The rapid digitalization of education has undeniably transformed learning systems worldwide. As schools, colleges, and universities integrate digital tools into their curricula, the concept of a digital footprint emerges as a crucial factor in assessing the sustainability of this change.

A digital footprint stands for the trail of data generated through interactions with digital platforms. In education, this includes online learning resources, e-learning platforms, cloud storage, and AI-driven assessments. Digitalization has significantly improved access to education, empowering students in remote areas to engage with quality content while enabling educators to enhance teaching with global resources.

Digitalization refers to a generic term in which we see transformation of society and its patterns in economy. It is an age of transformation from a traditional idea to an age of knowledge by technologies.

In modern times a man leaves his footprint on social media while being almost followed by the various social media platforms and apps we use in our day-to-day mundane lives, consciously or unconsciously. It is time we realize the truth behind the articulated digital world, i.e., what we are watching is watching over us. In this influx of technologies coming in it has become even more important to make education more sustainable, where knowledge is acquired in a holistic manner as we have already witnessed the shift in the mediums used in teaching-learning ever since Covid 19 has hit us all.

UNESCO highlights 5 pillars of education as the foundational base for the system which are–

- Learning to know
- Learning to do
- Learning to live together.
- Learning to be
- Learning to transform oneself and society.

COPING UP IN THE TIME OF PANDEMIC:

It was only after the hiatus of Covid that education as a whole saw an influx of digitalization where various AI tools made more cases for change in education's What and How. The need of the hour then to continue education while the world was at halt made technology the to-go device to continue with the teaching-learning process.

Innovation is an ongoing process, with every new transformation there is the beginning of an age of renaissance. In education too we have seen the change from conventionalism of classroom to Zoom/G Meet classes, from blackboards to smart boards, from books and notebooks to Chat-GPT and AI.

The task of researchers and for students to complete their project has become quite a cake walk for Siri knows it all, but is that what the idea of projects or papers were meant to be? However, global connectivity has surely increased over time as people are engaging and

interacting over the virtual world. Though digital education is a wonderful boon to the people, it may bring us some good to at the very least be aware of the negatives of the concept. Digital education provides underage users unrestricted access to the internet realm, which is brought about by lack of digital awareness, which is still very profound in our dear country. The exposure to harmful or not age-appropriate content can be avoided by the enforcement of parental controls and monitoring methods to keep the logins and overall activity over the internet in check.

There is a chance of spread of misinformation due to unverified sources present on the internet that may cause conflicts in research and may prove to be a barrier between knowledge and accuracy. Prevention of this would include the extraction of information from verified sites ending with ".edu" which are specifically meant for educational purposes.

There also exists a persistent fear of technologically advanced tools replacing the traditional idea of jobs where the mantra of 'AI knows everything' became quite popular. Having said that, I would also like to state that AI is certainly NOT replacing most jobs any time soon. AI is a tool mechanised by human minds where humans are the minds behind most developments. AI does not know everything, it only knows as much as it is fed by human minds.

It is by all means correct to believe that education needs psychosocial and economic needs. They are both interconnected to each other for the fulfilment of education in a holistic manner. Needless to say, that the psychosocial side of education is rarely explicit when it states its aim as wisdom and wisdom is achieved in a practical way. Wisdom is not an ethereal concept which can be attained by only thinking or believing, it is quite actionable, where it relies on more than one factor certainly. In this growing age of technology wisdom is about understanding, reasoning, having the Knowledge of the subject matter, Skills, Character, and Meta-Learning considering the time span and the need of the hour.

DIGITALIZATION IN EDUCATION AND IT'S CONCERNS:

However, this shift raises sustainability concerns. Maintaining large data centres and powering energy-intensive devices contribute to a significant carbon footprint. The global ICT sector accounts for approximately 2-3% of greenhouse gas emissions, comparable to the aviation industry. With the growing adoption of digital ecosystems, this footprint is poised to expand.

Despite these challenges, digitalization offers sustainable solutions. Paperless classrooms reduce deforestation, online learning minimizes commuting emissions. Implementing practices such as powering data centres with renewable energy and optimizing software for efficiency can further mitigate environmental impacts. Energy-efficient technologies not only lower carbon emissions but also reduce operational costs.

Dependency and addiction, both are major drawbacks to digital education for there is a constant use of electronic gadgets that have been argued to reduce the creativity levels of students, but even that can be combated with the introduction of online proctoring during important exams which are now, at this point of time, made available online for people who may have difficulty showing up offline.

Equally important is addressing digital inequality. Many may argue that there is a digital inequality raging through the country, and a great portion of the population still fits in the idea of poverty. The Digital inequality or the gap and split, is a social, economic and cultural issue referring to the gap that exists between individuals who have access to modern information and communication technology and those who lack the access to resources. It represents the disparities between demographics and regions at different social, economic levels or other categories over the use of Internet and communication technologies. Many students lack access to reliable internet and devices, threatening the inclusivity digital education aims to promote. This disparity leading to inequalities in society came to the forefront especially during the pandemic period caused by covid 19 where the greater question was not restricted to whether the students are being blessed with technology for research or write ups as guiding forces but rather the point was drawn to whether they can join the classes which happened on various modern devices, where we see accessibility is the answer we are looking forward , and this has predominantly increased the number of school drop outs leading to missing out of opportunities. As per the report by NSO, most of the internet enabled homes are in cities, where 42% have internet access. In rural India, however, only 15% are connected to the internet. Across India, only one in ten households have a computer — whether a desktop, laptop or tablet. Almost 25% of all homes have Internet facilities, accessed via a fixed or mobile device.

Digitalization has also benefited to students by the "no facing crowd" theory in real as they had the liberty to hide behind the cameras and keep them muted where the compulsion to answer and interact became an optional idea.

While I address the issue of economic inequality, I would also like to highlight the growing linguistic marginalization caused in the blooming era of digitalization in education and otherwise. More than 80% of the content on the Internet is in English, so states, where people are more competent in English, are more digitally competent which is another reason for students not knowing English more fluently to be less confident than the other side of the society which inherently is bringing along a language divide within class division, so a marginalized section within another marginalized section. Bridging this divide requires initiatives like affordable internet access and device distribution for underserved communities.

MEASURES FOR CREATING SUSTAINABLE EDUCATION:

In the realm of the importance of digital literacy**,** the Supreme Court of India has declared the right to access to the Internet as a fundamental right, making it a part of the right to privacy and the right to education that comes under Article 2. The government in India even before the global pandemic emphasised on digital literacy for making India walk towards development through various schemes that it launched over a period of time. To begin with The PM Gramin Digital Saksharta Abhiyan launched in 2017 emphasised to bring about a new horizon in digital literacy in rural India by covering 60 million households for a greater impact in having a nation with most citizens provided with the idea of fundamental right to education for a better life.

Secondly, National Education Policy, 2020 aims at making "India a global knowledge superpower" by introducing several changes from the school to college level in the Indian education system with special emphasis on digital education.

Thirdly, the Internet Saathi Program was launched in 2015 by Google India and Tata Trusts aimed to facilitate digital literacy among rural Indian women.

Moving on we also havr DIKSHA, national platform for school education available for all states and the central government for grades 1 to 12. It was launched in September 2017. DIKSHA is the 'one nation; one digital platform' for school education in India which is a part of Our Prime Minister's Atmanirbhar Bharat Abhiyan.

Professional development programs for educators can also promote sustainable technology use. Training teachers to leverage digital tools effectively fosters a culture of responsible digitalization. The facilitators are upgrading their knowledge as they participate in various workshops, programmes etc. Insights can shape policies enhancing inclusivity and sustainability. Ongoing research is essential to evaluate digital education's long-term impact, particularly on marginalized groups.

I for one, recognizing all sides of the story around this paradigm, hold the opinion that yes, it is sustainable but if used in the most judicious manner. Curious as humans are, we are bound to question; How and why? Barring the entire world, if we take in account our very own steadily developing nation of India, we must agree that digitization of education has made a significant impact on the students; most of it being arguably positive in nature. Everyone expected an eventual change to digital education, however the quarantine period faced by the world due to the global pandemic Covid-19 catalysed the introduction of the concept. All strata of society were pushed to walk the path of digitalization, as even children in remote areas such as villages turned to online classes, or apps that would aid their education. For years in building, websites such as Unacademy, Khan Academy etc were introducing the general mass to the concept of online education, and how beneficial it could really be. And the onset of quarantine pushed us just a tad bit faster towards the process. The immediate reason for the popularity of digital education is the accessibility of the methods at any place with even bare minimum internet access. This helps students, educators, users in general to overcome the criterions of distance and disability of any sort that might cause them commuting problems to the institution. Websites and apps are designed to be user centric, especially the ones made for educational purposes which create tests and assignments as per student requirements which further help to enhance knowledge. Searches made over the internet are fast, and reliable enough to base immediate research off. Items that were once considered luxury such as smartphones, laptops, tablets etc are now in the hands of nearly 52.4% of the population statistically speaking. Bare minimum internet access has been made available by ever so generous capitalists of India that are observed to have done some good at the least with the introduction of internet data services at reasonable price. Sustainability is a rather subjective topic, which I firmly believe is in positive stature in this paradigm as with upcoming years, and years that have passed we've seen growth in digital education and no less. Introduction of smartboards, online assignments, applications related to school activities that help both educators and guardians keep track of their children's progress, make digital education even more commendable and attractive to follow.

Collaborative efforts such as joint studying sessions of students from across and beyond the borders of our own nation, brings the youth closer to connectivity and networking. This international interaction offers students an opportunity to take a leap out of their usual crowd.

Discussing positives of a concept as the only view of it is rather ignorant, and that brings me to acknowledge the statement that nothing is ever perfect and all beneficial. With the pros, come the cons, with the light comes the dark. Every coin has two sides, it is absolutely imperative for us to understand the necessity of modernization and sustainability at the same time especially in the changing dynamic of the society and in the field of education. Partnerships between educational institutions and tech companies can drive innovative solutions. It is not only the policies that can bring in the desired changes but also consistent efforts of each individual in this teaching-learning sector and otherwise too which can help us create a sustainable system of education with the help of digitalization and there we neither lose out on our creativity nor the originality.

School doors have been shut in the time of pandemic and hence the right effort had to be initiated in order to continue education on the right track and the crisis has given us the opportunity to indulge more in technological based tools in education. It was not only for students, but online technology refers to technological advancements of the teachers and their role in academics. Teachers had the opportunity to be more than teachers or for that fact be the facilitators or coaches, mentors and evaluators. Teachers' role alongside students too are becoming more dynamic.

There has been a plethora of scientific frameworks which have been used to evaluate the understanding of the notion 'integration of technology in education'. Among the various frameworks provided, TAM (Technology Acceptance Model) has been the most accepted models to cope up with changing times. The TAM denotes to the attitude of the ones using it and here the consideration is also to be given to the intention of the user whether it is used positively will help us take the best out of it and if used as a means to plagiarize content or use it any way negative and thereby the performance towards adopting a system is predicted by their perceived usefulness and perceived ease of use. Adding to it is also the extent to which it is used which counts and brings in new ideas offered to hypothetically predict perceived ease of use and perceived usefulness.

The footprint thus left behind by digitalization of education, is rather sustainable as I've discussed all major discourses along the topic. This brings me to conclude on a positive note that in the era of all things digital and addictive, education over the internet is proving to be a huge success which with building parameters to protect privacy and exposure in the coming years can prove to be a greater revolution than it already is. In conclusion, the sustainability of the digital footprint in education depends on careful management. By aligning digital transformation with green practices and equitable access, we can harness its potential while minimizing environmental and social drawbacks. Through collaboration among policymakers, educators, and tech innovators, digitalization can become a transformative and sustainable force in education. So, the decision here is for us to ponder and execute, are we ready to bring in and accept the change for a sustainable idea in education with the boons of digitalization?

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Conflict of Interest

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