

## DIGITAL TECHNOLOGIES FOR EQUITABLE QUALITY EDUCATION<sup>1</sup>

TECNOLOGIAS DIGITAIS PARA UMA EDUCAÇÃO DE QUALIDADE EQUITATIVA

TECNOLOGÍAS DIGITALES PARA UNA EDUCACIÓN DE CALIDAD EQUITATIVA

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### ABSTRACT:

The use of digital technologies in education ('EdTech') has created problems of centralization of control over educational processes as well as privatization of education. The use of proprietary EdTech creates a dangerous vendor lock-in, in which teacher agency and institutional autonomy are compromised. This endangers the social transformation goals of education. The use of 'Artificial Intelligence' now, threatens to aggravate the danger, as it accentuates the existing social biases and increases corporate control over education. In order to enable equitable quality of education for all children, digital technologies must firstly, be designed to enable inclusive and participatory teaching-learning processes, effective teacher education for developing 'professional and humane' teachers, and decentralized education administration. For achieving this, it is essential that we use only free and open digital technologies, that are licensed to allow all (including teachers), to freely share and customize for their own use. Secondly the primary use of EdTech should be to empower teachers to develop a critical understanding of tech, and design its appropriation in school education. Education systems should keep technology vendors out of EdTech policy and privilege the role of informed educators in EdTech policy, design, and implementation in the education system.

**Keywords:** edtech; teacher education; free and open digital technologies; public edtech; equity.

### RESUMO:

O uso de tecnologias digitais na educação ('EdTech') criou problemas de centralização do controle sobre os processos educacionais, bem como de privatização da educação. O uso de EdTech proprietária cria um perigoso vendor lock-in (bloqueio de fornecedor), no qual a agência docente e a autonomia institucional são comprometidas. Isso coloca em risco os objetivos de transformação social da educação. O uso de 'Inteligência Artificial' agora ameaça agravar esse perigo, pois acentua os preconceitos sociais existentes e aumenta o controle corporativo sobre a educação. Para possibilitar uma educação de qualidade equitativa para todas as crianças, as tecnologias digitais devem, em primeiro lugar, ser projetadas para permitir

<sup>1</sup> This article is part of the focus section *Artificial Intelligence and Education* as part of the initial discussions of the AI Research Center, titled *AI Worldwide: Education, Language and Society*, headquartered at the Federal University of Sergipe, Brazil. The center brings together more than 25 researchers from 12 countries across all continents, aiming to foster interdisciplinary and global debates on the impact of AI on education, language, and society.

processos de ensino-aprendizagem inclusivos e participativos, uma educação docente eficaz para o desenvolvimento de professores 'profissionais e humanos', e uma administração educacional descentralizada. Para alcançar isso, é essencial que usemos apenas tecnologias digitais livres e abertas, licenciadas para permitir que todos (incluindo professores) compartilhem e personalizem livremente para seu próprio uso. Em segundo lugar, o uso primário da EdTech deve ser o de capacitar os professores a desenvolver uma compreensão crítica da tecnologia e projetar sua apropriação na educação escolar. Os sistemas educacionais devem manter os fornecedores de tecnologia fora da política de EdTech e privilegiar o papel de educadores informados na política, design e implementação de EdTech no sistema educacional. **Palavras-chave:** edtech; formação docente; tecnologias digitais livres e abertas; edtech pública; equidade.

#### RESUMEN:

El uso de tecnologías digitales en la educación ('EdTech') ha generado problemas de centralización del control sobre los procesos educativos, así como la privatización de la educación. El uso de EdTech propietaria crea un peligroso **vendor lock-in** (bloqueo de proveedor), en el cual la agencia docente y la autonomía institucional se ven comprometidas. Esto pone en riesgo los objetivos de transformación social de la educación. El uso de 'Inteligencia Artificial' ahora amenaza con agravar este peligro, ya que acentúa los sesgos sociales existentes y aumenta el control corporativo sobre la educación. Para posibilitar una educación equitativa y de calidad para todos los niños, las tecnologías digitales deben, en primer lugar, estar diseñadas para permitir procesos de enseñanza-aprendizaje inclusivos y participativos, una formación docente eficaz para el desarrollo de profesores 'profesionales y humanos', y una administración educativa descentralizada. Para lograr esto, es esencial que usemos únicamente tecnologías digitales libres y abiertas, que estén licenciadas para permitir que todos (incluyendo docentes) compartan y personalicen libremente para su propio uso. En segundo lugar, el uso principal de EdTech debe ser empoderar a los docentes para que desarrollen una comprensión crítica de la tecnología y diseñen su apropiación en la educación escolar. Los sistemas educativos deben mantener a los proveedores de tecnología fuera de la política de EdTech y privilegiar el rol de educadores informados en la política, diseño e implementación de EdTech en el sistema educativo.

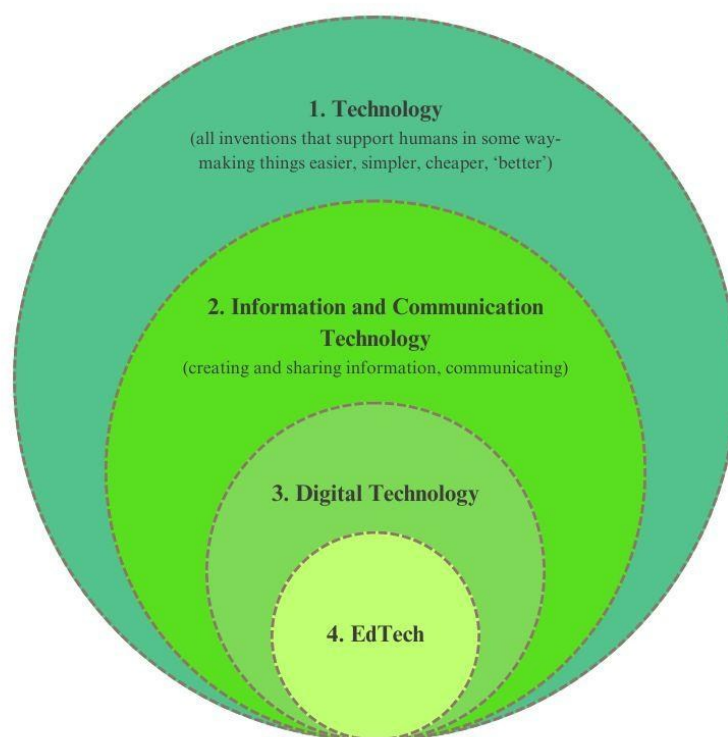
**Palabras clave:** edtech; formación docente; tecnologías digitales libres y abiertas; edtech pública; equidad.

## Introduction

Communication and information processing are core to humans. Information and Communication Technologies (ICTs), an important subset of technology, impact society widely and deeply. Language, script, print, radio, television are all ICTs; the introduction/ invention of each, radically changed human existence and society. Digital technologies are the latest application of ICTs. Information access, creation, storage, and dissemination has become cheaper and easier because of digital formats. Digital networks have made communication and networking quicker and more inexpensive. These features make digital technologies very powerful and their impact widespread and far reaching. ICT is core to educational processes, hence there are high expectations that education will be transformed by digital technologies

(EdTech). Yet many educators are apprehensive about EdTech's varied ill-effects on education. It has been seen that EdTech distorts teaching-learning processes and impoverishes learning environments when it is used to promote passive consumption of e-content, deskilling of teachers, and the diluting of teacher and learner agency (West, 2023).

**Figure 1** - Technology and subsets - ICTs, Digital Technologies and EdTechA



Source: IT for Change (n.d.)

## Challenges from EdTech

Technology is not new to education, in fact, every teaching aid is a technological artefact. However, the danger from EdTech lies in it being 'given' to teachers and students for passive consumption/use. EdTech can only be meaningfully appropriated or used if it is available to the teacher to use in a manner they deem fit. Hence, the starting point for EdTech is teacher capacity building, to enable its meaningful use. Such capacity building cannot merely be the ability to use a tool, it must include a critical understanding of if and when to use the technology, and what dangers/costs its use can entail.

Firstly, while a pen or a book are inert, digital technologies can be made interactive. Because of this feature, many EdTech programs focus on directly providing applications and

content to students, for ‘self-learning’, bypassing teachers. There is a popular (and promoted) belief that teachers lack motivation and ability (that the public school system ‘is broken’), and constitute the main problem in school education, and that digital technologies can help provide education without teachers. While self-learning indeed does have a role, it is dangerous to think that it can replace learning that is facilitated and mediated by a caring and capable adult. Toyoma (2011) says, “No technology today or in the foreseeable future can provide the tailored attention, encouragement, inspiration, or even the occasional scolding for students that dedicated adults can, and thus, attempts to use technology as a stand-in for capable instruction are bound to fail.”

Toyoma points out that EdTech models that displace teachers would never be allowed in well-resourced schools, but are considered seriously only for poorly resourced schools. These tendencies support a view of education where teachers are for the rich, **technology is for the poor**. This is regressive and increases social stratification. Toyoma (2011) is on point when he rightly observes, “Computers can help good schools do some things better, but they do nothing positive for under-performing schools. This means, very specifically, that efforts to fix broken schools with technology or to substitute for missing teachers with technology invariably fail”. Thus, EdTech cannot be used to compensate for poor investment in school education, but it can be designed to support well-resourced schools to work better.

Secondly, unlike technologies of the past, digital tools and platforms enter our lives as ‘free’ (gratis or no cost) products, while they actually deprive us of the ‘free’-doms which we usually exercise while using other technologies. These freedoms include freely sharing them with others, customizing them to our needs, etc. As ‘users’ of digital tools and not ‘participants’ in them, teachers are locked into and stuck with technologies over which they have no control, severely affecting their agency. We need to see this as the biggest danger from EdTech, and this risk can only be addressed by consciously selecting and even mandating free and open-source technologies over proprietary and for-profit technologies.

### **Solutionism and learnification: tech-driven program design**

Often, in policy circles, technologists (and technology companies) are seen as experts on digital technologies in education, while teachers and educators are not considered knowledgeable enough to contribute to programmatic design. Unfortunately, policy-makers tend to rely on technologists for policy formulation and program design.

However, good program design needs a deep and historical understanding of educational philosophies and aims, school contexts and needs, cognition and pedagogy. Expertise in digital technologies is a trivial requirement, relatively, for addressing challenges in the complex processes of lesson-planning, teaching-learning, assessment, and teacher education. The belief ('Solutionism') that technologies can offer easy solutions to complex problems actually harms education by promoting centralization of education processes diluting teacher agency, learnification, and privatization, in its search for 'definite, computable solutions'. Hence decisions around the use of EdTech must only be made by expert committees in which the voices of those having a deep understanding of different aspects of education are dominant, and not by technologies experts alone.

Reducing learning to an ever-narrowing set of concepts, and tracking student achievement based on digitizing responses to assessment questions dilutes education to 'learnification'. Van Dijck and Poell criticize this process by explaining that:

[...] many data-driven, personalized education initiatives focus on learning rather than education, and on processes rather than on teachers and students....The 'learnification' model is predicated on the real-time, short-term process of learning rather than its long-term outcome, which is, in most schools, to provide an education. Education, as critics argue, involves simultaneous nourishing of intellectual, social, technical, and cognitive skills. (Van Dijck and Poell, 2015)

The obsession with quantifying individual 'learning outcomes' reduces scope for classroom collaboration, open-ended exploration, and development of skills.

### **Artificial intelligence to support natural intelligence, not replace it**

Artificial intelligence (AI) is the new 'disruptive' digital technology, where the combining of machine learning with Big Data is used to emphasize 'personalized learning', where learners will directly engage with the computer, and teacher will be told what content and pedagogy they should adopt for each learner. However, AI-based assessments will tend to be narrow and will atomize teaching-learning. Since AI is based on a projection of the past based on probabilities, it tends to exacerbate biases. In Indian education history, social bias (gender, caste, creed, region) has been a fatal impediment to quality universal education. Using AI for personalised assessment and learning will aggravate these biases and create an even more inequitable education system (Kasinathan, 2020)<sup>2</sup>. AI is usually implemented through black

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<sup>2</sup> For a discussion on the dangers of the current directions of AI, see: [Acemoglu \(2021\)](#).

box algorithms that don't explain how decisions and outputs are reached because of which neither the teacher nor the learner is able to navigate, let alone design, its implementation. AI in education can worsen existing social inequities, directly contradicting education's primary aim of social transformation.

We need to follow a golden rule in integrating EdTech into education: **no technology should be allowed to come between the teacher and learner**. Hence, the best use of AI could perhaps be suggesting diverse content and pedagogic strategies to a teacher, having the ability to mediate its use in teaching. A second rule would be to treat "AI product testing" akin to 'drug testing' and prescribe stringent rules for assessing the pedagogical value of any algorithm, and not allow commercial entities to play with the education of vulnerable children with their black box products. Education has been defined as a "high risk" sector in the EU AI Act (European Union, 2024). The use of AI in other sectors has sufficiently evidenced its dangers<sup>3</sup>, hence its role in education must be comprehensively and strictly regulated to prevent harm.

### **Centralization of educational processes causing teacher dis-empowerment**

Krishna Kumar, an eminent Indian educator has criticized the 'textbook culture' (Kumar, 1988) in Indian schools that limits teachers' curricular choices. Digital technologies can take such prescription of work processes to an extreme. Teachers can be given clear instructions on how the content should be used for subject teaching; with the aim to ensure quality through "uniform" content and pedagogy across teachers, classes, and schools. It is easier to use digital tech to control teachers and students by prescribing (what has to be taught), surveilling (what is taught), and recording (what has been taught). Such control limits teachers' ability to be sensitive to local contexts, thereby damaging the authenticity and, hence the value, of the teaching-learning processes (Kasinathan, forthcoming).

Digital technologies also are used by bureaucracies and school managements to gather information into centralised hubs, process, and transmit decisions to the peripheries. For instance, the government of India spends huge energies in collecting school-level information, which is collated for centralized planning and to disseminate state and district summary reports. However, the same data is seldom used at a district, block, or cluster level to facilitate local and

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<sup>3</sup> For instance, facial recognition technologies are increasingly been seen as harmful and many governments are banning its use, see: [Flynn \(2020\)](#).

participatory decision-making, such as in addressing school dropout and supporting micro-planning.

### **Recommendations: making EdTech useful in education**

We need to view EdTech as a resource to address accepted educational aims and priorities, and avoid the ‘We have technology, how can we use it?’ perspective that has often dominated the EdTech discourse (akin to a ‘hammer chasing nails’). The focus necessarily has to be in improving teaching-learning and assessment processes, support teacher professional development, enhance educational access, as well as streamline educational planning and administration towards equitable quality education. Towards this, we need to consider four design parameters as essential for success:

1. Integrating digital technologies into school curricula in meaningful ways, focusing on subject teaching rather than mere technology literacy
2. Focusing on decentralization rather than strengthening centralized control over the education system
3. Teacher Professional Development (TPD) to enable teachers to take ownership and responsibility for the design and implementation; letting the teacher decide the what, when and how of integrating EdTech in the teaching-learning processes.
4. Teacher agency and institutional/systemic autonomy necessitates using Free and Open digital technologies, including free and open-source software (FOSS) and Open Educational Resources (OER).

This means the focus of the education system should be to make the teacher capable of appropriating EdTech and then responding to the teachers’ demands for providing digital infrastructure to the school, using a bottom-up approach. Teachers will need to use FOSS and collaboratively develop OER for contextually rich learning environments. The Indian state of Kerala has demonstrated such a model at a systemic level (see Recommendations section below).



## **Digital resources (OER) for teaching and teacher education**

A rich, contextual, and diverse curricular environment that is both appropriate and adequate, is essential for good quality education. Large-scale availability of print, audio, and video resources in multiple languages (which are spoken in the country/state) in schools and in libraries, will inculcate listening and reading habits within educational institutions and in communities.

Such large-scale requirement for teaching-learning materials can be planned through digital technologies-aided creation and trans-creation (digital technologies-aided creation as a holistic process) processes, as a part of a TPD program. Such material making should consider contextual/ local needs. It should provide multilingual and multilevel textbooks, and teaching-learning materials to enable students to think and speak about these subjects. The digital can actually facilitate this - resources on a large scale can be developed through programs that support school and college teachers, and teacher educators to collaborate on (digital) networks and use (digital) tools to develop (digital) learning resources in text, animation, image, audio and video formats, that can be easily re-used, adapted/ contextualized, curated, shared, and published (Kasinathan, 2021).

There are numerous examples of such use of digital technologies. Karnataka, the province in which, my organization, IT for Change is based, has a history of supporting teachers to design and develop contextual learning resources (for instance more than 30,000 resources have been uploaded on an OER portal established by the Ministry of Education, Government of India, called ‘Diksha’)<sup>4</sup>. IT for Change itself maintains OER repositories on MediaWiki platforms in multiple languages and for different grades and subjects.

To further mature this process, an institutional framework and a process for the continuous design and development of resources collaboratively by teachers, with the inputs and guidance of experts, is needed under the facilitation of the education department of the province. The creation process should be a part of the resource cycle, consisting of assessing requirements, designing the OER, developing the OER, reviewing the OER, and finalizing and publishing these resources. Creators, reviewers, and publishers can themselves collaborate over virtual networks in this cycle. Such a OER cycle can itself be a powerful method for Continuous Professional Development (CPD).

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<sup>4</sup> IT for Change collaborated with the education department of the state of Karnataka, on such a program – ‘Subject Teacher Forum’, in which 20,000 government high school teachers learnt to develop OER in Mathematics, Science, Social Science and languages, using various FOSS editors and platforms.



## **TPD – the crucial enabler for EdTech to succeed**

As mentioned, material making, apart from being an end in itself, can also be instrumental for strengthening teacher development and agency. As teachers and teacher educators engage with materials/content and the complexities of marrying educational aims, contexts, and diverse learner communities, they will need to think of creative approaches to develop rich and contextual materials. Teachers should be encouraged to use multilingual teaching methodologies, using multi-level and multi-modal teaching-learning materials. EdTech should be extensively used for teaching-learning of languages and to popularize language learning in teachers, to provide nurturing multilingual classroom environments.

Apart from using digital technologies to support teachers' in 'creating and learning', these technologies can also support teacher development through 'connecting and learning'<sup>5</sup>. Teachers should be given continuous opportunities for development, including learning recent advances in their profession. Such development should be offered in blended mode, combining in-person workshops and online courses. Digital platforms would also enable teachers to share ideas and experiences.

## **Public ownership of EdTech is necessary**

Just as public education is seen as an imperative for equitable and quality education, public ownership and control of digital technologies is an imperative for teachers and educators to exercise their agency and autonomy for a meaningful pedagogic design of EdTech. Enabling such public ownership is what the free and open software and open educational resources movements have been independently working for, and such public ownership needs to be an indispensable part of EdTech appropriation. While hardware/basic infrastructure needs to be purchased, the more important digital resources— software and content— can easily be accessed, produced and distributed through public ownership models. Such a 'public EdTech' model is necessary for achieving the goal of equitable quality education. We see a good exemplar for such a model in the province of Kerala, India.

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<sup>5</sup> Creating and learning, connecting and learning are identified as themes of ICT integration in education, by the NCERT National ICT Curriculum (NCERT, 2013). NCERT is the apex institution in India for curriculum design, material development, and Education Research.

The “IT@schools” program of the Kerala education department initiated a school-owned and teacher-driven ‘public EdTech’ model from 2002 onwards that was fully based on Public EdTech, using FOSS and TPD (Kasinathan, 2009). Kerala has continued with this tradition of public sector production of EdTech over the last two decades, through the ‘Kerala Infrastructure and Technology for Education’ (KITE) entity<sup>6</sup>, with increasing maturity that reflects in comprehensive functional coverage of EdTech in educational processes as well as maximizing school-teacher-student coverage to ensure inclusion and equity. This model is relevant to all public education systems across the world.

## Conclusion

Hence, the question is not ‘do we need technology?’ or ‘can we do without it?’ but ‘how can we offer teachers agency in designing and deploying digital technologies in ways they see fit to meet the educational needs of their students?’. While the actual production of technology might still happen predominantly in industry, or in free software communities, the role and scope of technology in our life needs to be shaped by informed public discourse. Such debates must also be part of the mandate of an autonomous body (part of the public education system), which should be created as a platform that can support the free exchange of ideas in school and higher education, on the use of digital technologies to strengthen learning, assessment, planning, and administration. No EdTech program should be initiated without a prior discussion and debate in this forum on its pedagogical, as well as political, social, and economic aspects. The forum should necessarily be helmed by educators with a background in various disciplines that contribute to education.

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<sup>6</sup> <https://kite.kerala.gov.in/>

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