国际数字教育案例汇编

International Best Practices of Digital Education

Editor's note

As a new round of scientific and technological revolution and industrial revolution accelerates, digital technology has increasingly become a driving force that fundamentally changes and reshapes the thinking patterns, organizational structures, and operational modes of human society in all fronts. It presents us with both new challenges and major opportunities to innovate pathways, redesign forms and promote development. The application and development of digital technology have integrated into all areas of society and will exert a profound influence on the future development of education.

The United Nations, along with countries worldwide and numerous international organizations, are taking active measures to prioritize digital education as a crucial pathway and initiative in responding to challenges and forging a bright future. Digital transformation has become a vital vehicle and direction for global educational transformation. The United Nations Transforming Education Summit has identified digital transformation in education as one of the five priority areas for action, emphasizing that the digital revolution should ensure benefits for all learners. Many countries have implemented strategies for digital development with education being a significant component of these efforts. China will further implement the national education digitalization strategy, enrich the supply of digital education resources, build a broad and open learning environment, accelerate the sharing of resources between different types and levels of learning platforms, promote the integration of new technologies and education and learning, and accelerate the digital transformation of education.

Developing digital education fundamentally relies on application, finds potential in sharing, thrives on innovation, and open collaboration is the essential path for the advancement of digital education. Hosting the *2024 World Digital Education Conference* aims to center around the United Nations 2030 Sustainable Development Goals, with a focus on the theme of "Digital Education: Application, Sharing, and Innovation." The objective is to further harness collective intelligence, deepen collaborative efforts, and achieve new breakthroughs in promoting equitable, high-quality, and sustainable development in education.

In the face of opportunities and challenges resulting from digitalization, we publish this "International Best Practices of Digital Education" report, at the *World Digital Education Conference*, to serve as a comprehensive guide for educators, policymakers, and stakeholders in navigating the dynamic landscape of digital education. This report aims to bridge the gap between the rapid

advancements in technology and their effective integration into educational practices worldwide. By showcasing exemplary practices from various corners of the globe, we strive to provide valuable insights into innovative methodologies, pedagogical approaches, and technological implementations that best represent the forefront of digital education.

The report is structured into six parts, each addressing a critical aspect of digital education: Part I focuses on build interconnected public platform for creating smart learning environment. Part II emphasizes the promotion of open sharing of high-quality resources to narrow the digital divide. Part III explores the deep integration of digital technology and education for building a new educational ecology. Part IV discusses strategies to innovate educational and teaching methods for promoting digital literacy for teachers and students. Part V aims to build inclusive digital learning systems for strengthening crisis resilience. Finally, Part VI highlights the importance of safeguarding the right to education for the most marginalized groups for ensuring the inclusive access to digital education.

In the current landscape where traditional education models are being redefined by technology, sharing best practices is crucial for fostering collaboration, inspiring innovation, and ensuring equitable access to quality education for learners of all ages. We anticipate that by disseminating these exemplary cases, promoting the deep integration of digital technology and education, and collaboratively building a more inclusive, resilient, and digitally empowered global education system, we can ensure that the dividends of digital education are fairly accessible to everyone. Together, we aim to achieve the United Nations Sustainable Development Goals by 2030.

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Part I

Build Interconnected Public Platform for Creating Smart Learning Environment

The National Resource Hub

Country
Ireland

Organizer
National Forum for the Enhancement of Teaching and Learning in Higher Education

Date started
2019

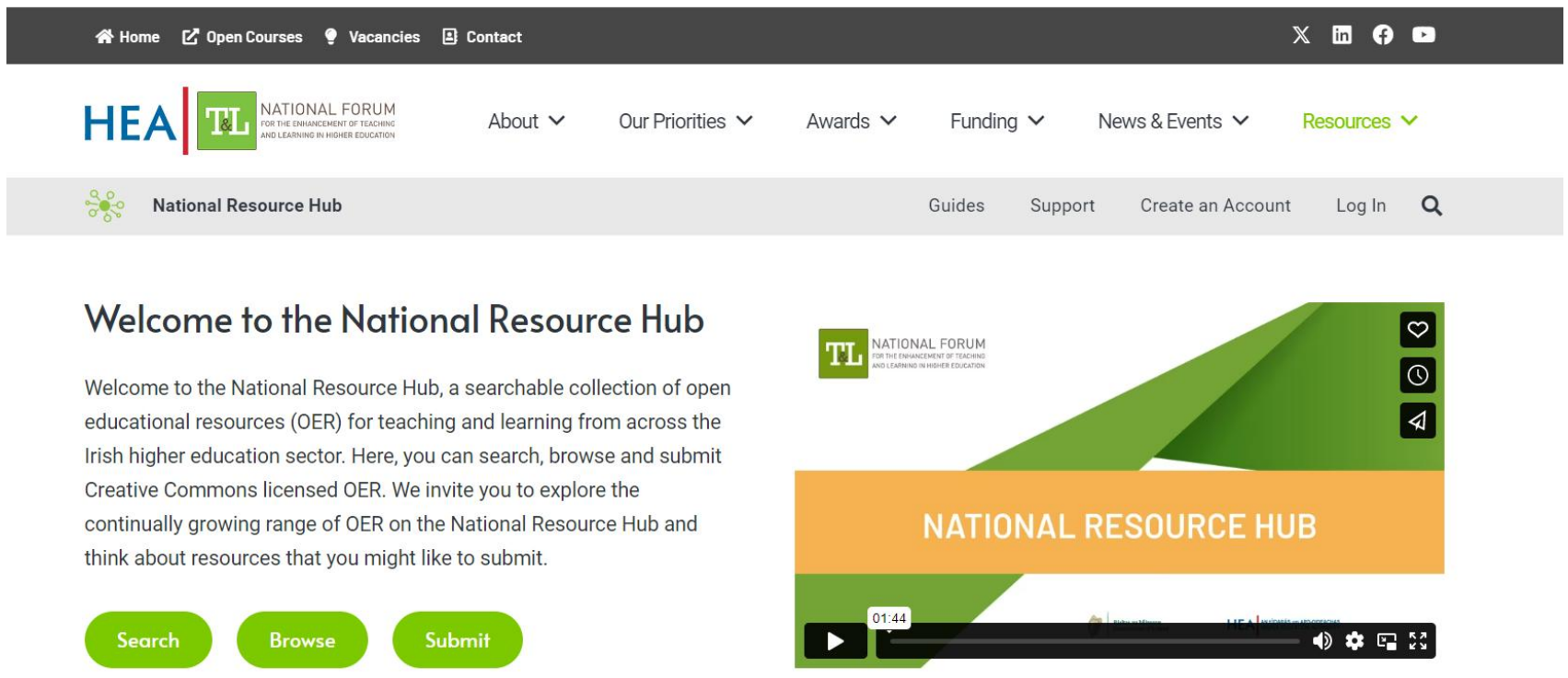
Summary

Established in 2019 by the National Forum for the Enhancement of Teaching and Learning in Higher Education, the National Resource Hub is a collaborative and inclusive platform that serves as a gateway to open educational resources (OERs) and practices in higher education.

As of early 2023, the Hub has compiled over 780 high-quality resources, reaching a global user base of 650,000 individuals from 173 countries. The Hub also features open courses for professional development, completed by over 5,000 staff from higher education institutions and a network of 628 trained facilitators in Ireland. The resources, easily searched and explored through the platform, include diverse subject areas and formats, such as online courses, toolkits, policy guidelines, research papers, case studies, assessments and more. Based on extensive consultations with students and teachers, the Hub was created to ensure user-friendliness and functionality.

The Hub maintains a robust review process and incorporates user feedback to ensure the relevance and quality of its content. It embraces diversity and inclusion by encouraging gender inclusive content, providing features for learners with additional needs and offering resources for low-connectivity contexts. The Hub's commitment to openness is transforming the landscape of higher education in Ireland and empowering educators and learners alike.

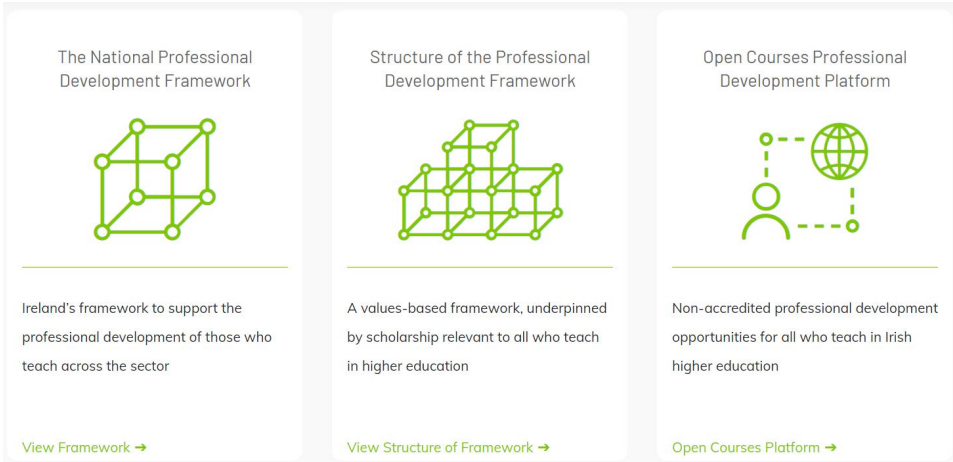
More information at:
https://hub.teachingandlearning.ie



Strategic Priorities

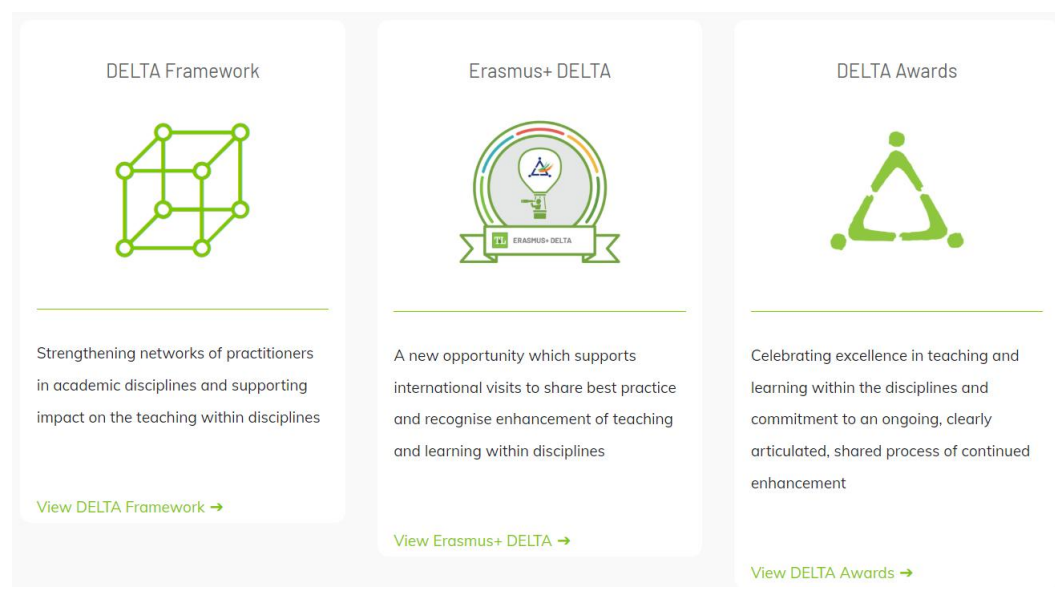
The National Forum Strategy 2019-21 aims to channel the substantial progress of the past six years, strengthen collaborative relationships within and beyond the Irish higher education sector, and provide leadership and guidance for the continued enhancement of teaching and learning in Irish higher education, for the benefit of all. The National Forum will consolidate progress to date and focus on four key strategic priorities.

1. The Professional Development of All Those Who Teach - Promoting evidence-based, flexible, inclusive professional development opportunities that reflect the contextual needs and drivers within and across higher education institutions

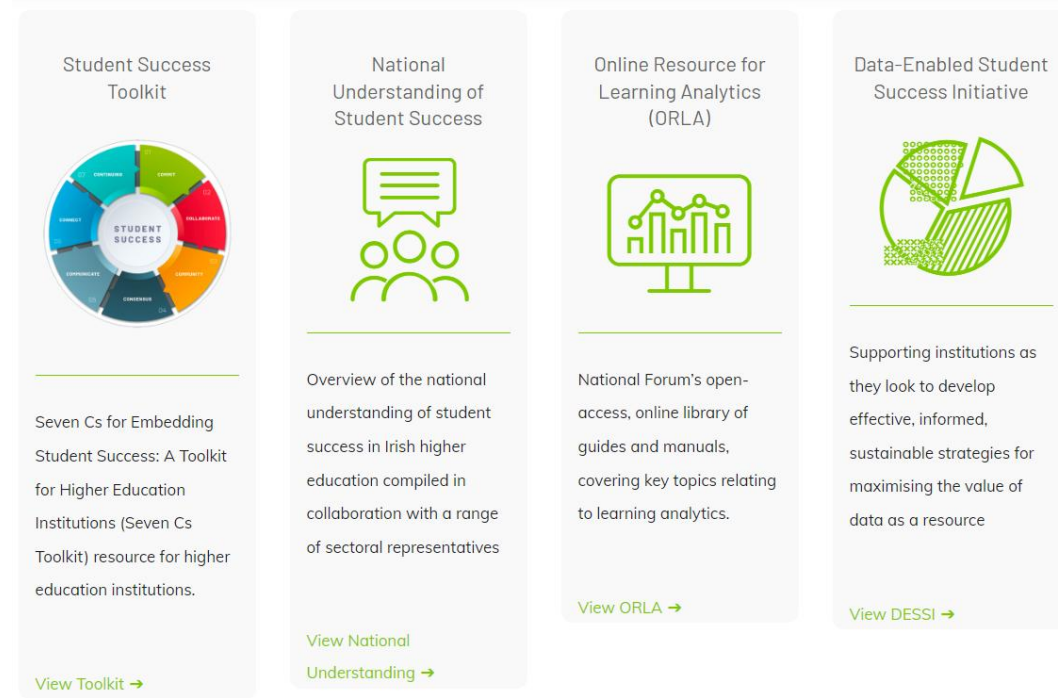


2. Teaching and Learning in a Digital World - Supporting those who learn, teach and lead in higher education to critically apply digital technologies with the goal of enhancing learning, teaching and overall digital capability

3. Teaching and Learning Enhancement Within and Across Disciplines - Recognising that disciplines are a key unit of change in higher education, with a focus on disciplinary excellence in learning, teaching and assessment



4. Student Success - Developing a vision of success, in partnership with students, with the aim of providing all students with the opportunity to fulfil their potential and become creators of new knowledge who are community engaged, ethically conscious, professionally competent and equipped to flourish in a global world.



Reimagining Teaching & Learning via DELIMa Platform

Country
Malaysia

Organizer
Educational Technology and Resources Malaysia, Ministry of Education Malaysia

Date started
2019

Abstract of the Implementing Organization or Individual

The Ministry of Education(MOE) Malaysia established a digital learning platform named DELIMa or Digital Educational Learning lnitiative Malaysia since July 2019. DELIMa focuses on digital teaching and learning (T&L) involving all 5.3 million teachers and students. DELIMa is the best example of how a learning platform can be a source to access quality education for students including those in rural areas. Being the one-stop digital resource centre, DELIMa provides a wide range of educational resources in various formats including interactive lessons, video tutorials and virtual classrooms. The geographical coverage of the DELIMa is national.

Problems and Objectives

Digital learning has become increasingly prevalent in Malaysia, particularly in the wake of the COVID-19 pandemic. While it offers several potential benefits, digital learning also presents several challenges that need to be addressed to ensure its effectiveness and accessibility for all students such as the following:

- Infrastructure and Connectivity
- Digital Literacy and Skills Gap
- Equity and Access
- Teacher Training and Support

Technological advancement has enhanced digital learning to a new frontier which drives digital learning through personalisation. Personalised learning via the DELIMa platform aims to customise the learning experience for each student's strengths, weaknesses, needs interests, and learning styles. lt involves tailoring instruction, content, and assessment to meet the individual needs of each learner. The primary objectives of DELIMa as a personalized learning platform are to:

- Enhance Student Engagement and Motivation
- Improve Student Outcomes and Achievement
- Promote Self-Directed Learning and Metacognition to Empower Students as Learners
- Nurture Individual Talents and Abilities
- Address Diverse Learning Styles and Needs
- Create a More Inclusive and Equitable Learning Environment
- Promote Continuous Improvement in Teaching and Learning

Personalised learning supports Malaysia's digital education policy in producing digitally fluent and resilient students in the digital era.

Awards and Honors

OPENGOV ASIA RECOGNITION OF EXCELLENCE AWARD, 2023

Key Data

Funding of the project	The funding is provided by the government including corporate social responsibility (CSR) by tech giants like Google, Microsoft, Apple and UNICEF and a host of other government agencies and private companies.
Target groups and percentage	Children at the age of basic education - 100% Young people - 100%
Total number of beneficiaries	5.3 million users including teachers, school leaders, administrators, students, postsecondary students, matriculations students as well as technical and vocational students.

Key Activities

DELIMa provides a wide range of educational resources in various formats including interactive lessons, videos, tutorials, and virtual classrooms. Through DELIMa, students can access educational video tutorials that are specially developed according to the syllabus and presented by the best teachers. Besides, DELIMa also provides personalised high-quality online modules that focus on future skill development such as coding, robotics, Al and global citizenship. All the contents are specially tailored for Malaysian students by MOE and our strategic partners such as Google, Microsoft, Apple, UNICEF, DigiCelcom, Inlmagine, Petronas and Intel.

All students are provided with DELIMa lDs so they can attend virtual classrooms and use telepresence technologies. These features enable students to connect with teachers and experts from around the world, providing access to specialized instruction and diverse perspectives. This technology breaks down geographical barriers and allows students to engage in real-time learning experiences with educators beyond their immediate community.

DELIMa can also act as a digital library and open educational resources, which provide free access to a vast collection of textbooks, articles, and multimedia content. These resources help bridge the gap in access to quality learning materials, allowing students in rural areas to access the same resources as their urban counterparts. Teachers also play their part in sharing educational materials for teaching and learning to be used by their counterparts in other schools and regions.

DELIMa provides educational technology tools, such as simulations, virtual labs, and augmented reality, which provide immersive learning experiences that bring abstract concepts to life. These tools allow students to visualize complex topics, go on virtual field trips, conduct virtual experiments, and explore interactive models, enhancing their understanding of science, mathematics, and other subjects.

In short, all the tools, services and contents in DELIMa are accessible for all students and teachers to explore and use in teaching and learning.

Measures to Ensure Equality and Effectiveness

MOE is firmly committed to implementing transformative changes in the country's education system, ensuring that teaching and learning practices are continually updated to align with the latest advancements and requirements in education to meet

the needs of the country. As such, the Digital Education Policy (DEP) was developed and received approval by the Cabinet Ministers on May 26, 2023. DEP envisions the creative and innovative use of digital technology in teaching-learning to produce digitally fluent and resilient generations in the digital era. The focus is on the digital education ecosystem including the DELIMa platform which covers the aspects of students' talent development, learning approaches, teacher competencies, leadership, access to the appropriate digital infostructure and infrastructure, quality content and the commitment of all strategic partners. DEP ensures that all students including those in the rural areas benefit from the digital transformative initiatives and strategies to overcome the above issues.

Measures to Ensure the Sustainability

To ensure the sustainability and long-term success of the DELIMa platform, comprehensive approach that addresses various aspects of its operation and maintenance is essential. Some of the key strategies are as follows:

- Continuous Content Development and Curation
- Technology infrastructure and Upgrades
- User-Centered Design and Accessibility
- Effective, Promotion and User Engagement
- Data-Driven Decision-Making and Analytics
- CommunityBuilding and Engagement
- Teacher Training and Support
- Partnerships and Collaborations
- Sustainable Funding Mechanisms
- Continuous Evaluation and lmprovement

Future Plan

DELIMa is undergoing continuous improvements to cater for its users. Scaling up the DELIMa platform and envisioning its future requires a comprehensive plan that addresses its growth, impact, and sustainability. Moving forward, the DELIMa platform envisions to achieve and enhance the following:

Phase 1: Expanded Reach and Enhanced User Experience

- Personalized Learning Experience
- Mobile App Development
- Accessibility Enhancements

Phase 2: Content Enrichment and Teacher Empowerment

- Content Curation and Development
- Interactive Learning Activities
- Teacher-Led Content Creation Tools
- Teacher Training and Support
- Teacher Collaboration Platform

Phase 3: Impact Measurement and Sustainable Growth

- Data-Driven Insights
- lmpact Evaluation Studies
- Sustainable Funding Models
- Future Technologies Integration

By implementing these strategies in phases, the DELIMa platform will continue to evolve as a valuable tool for enhancing education, empowering teachers, and improving learning outcomes for students across Malaysia.

Other Materials

Video: https://youtu.be/fdcnnwGK2Cg

ICT Transformation in New Zealand Schools

Country
New Zealand

Organizer
Government

Date started
1980s

ICT in School Education Phase 1: (1990–1999)

Concerning the development of ICT infrastructure and resources, the shift towards localized decision-making created a void where schools struggled for almost a decade. Despite pivotal reports from the Consultative Committee on Information Technology in the School Curriculum and Nightingale and Chamberlain's 'A Study of Computers in New Zealand Schools' (1991), urging the government to take a more active role in leading ICT implementation in schools, these recommendations were ignored. The reports called for increased government involvement in schools' ICT decision-making and direction-setting, conflicting with the prevailing neoliberal agenda at the time. The government was also hesitant due to the anticipated high costs of developing and implementing a national ICT policy in terms of infrastructure, resources, and equipment. This ideological stance, coupled with government reluctance, led to the emergence of an industry comprising hardware and software vendors, self-proclaimed experts, ICT gurus, and private ICT consulting companies. These entities aggressively marketed their products and services to unsuspecting school boards and principals, often presenting their solutions as the cutting edge or exploiting schools' fears of falling behind in the competitive student environment. Consequently, by the end of the decade, there was an uncoordinated, ad hoc, and unreliable school ICT infrastructure, with digital resources limited to those compatible with the technology provided by hardware vendors.

ICT in School Education Phase 2: (2000–2008)

During the 'Digital Horizons' (2002–2006) and 'Enabling the Twenty-first Century Learner' (2006–2008) periods, the government implemented a series of measures aimed at supporting the development of ICT infrastructure and equipping schools with the necessary resources and teacher professional learning and development (PLD) opportunities to effectively integrate technology into their classrooms. Key initiatives in infrastructure and resources during this phase included:

- Expansion of broadband connectivity to all New Zealand schools: Recognizing a growing 'rural vs urban' access gap, the government took steps to upgrade network infrastructure in remote schools and communities, utilizing wireless and satellite technologies in an effort to bridge the emerging access divide.
- Launch of Project SNUP (School Network Upgrade Project): This program focused on upgrading internal network infrastructure in all schools to a minimum of Category 5 cabling. This upgrade was essential to support efforts to provide faster broadband, following previous but technically inadequate community NetDay initiatives.
- Introduction of SchoolZone: This managed internet portal for schools served as a filtering and network management tool, ensuring safe and secure broadband internet access for schools.
- Expansion of Te Kete Ipurangi (TKI): TKI, an ongoing initiative launched in early 1999, stands for Internet Knowledge Basket when translated. TKI serves as a diverse online repository of teaching and learning resources and has evolved into the primary destination for teachers seeking guidance and ideas to enhance their classroom programs (visit: www.tki.org.nz).

- Introduction of subsidized laptops for teachers (TELA project) and free 'laptops for principals': A program providing all New Zealand principals with a laptop, while schools had the option to subsidize teachers' laptop purchases through lease-to-own programs. At the end of the lease period, schools could opt to buy the laptops at residual value, thereby expanding the pool of digital resources for classroom use.
- Creation of a digital learning resource repository with Australia's Learning Federation: Development of digital learning objects (DLOs) aligned with the objectives of New Zealand and Australian curricula, offered freely to teachers.
- Establishment of 'Leadspace': An online network for principals focusing on enhancing ICT leadership capability, providing a platform for principals to exchange ideas and strategies supporting ICT integration.
- Provision of free access to the Microsoft suite for students and teachers: The government secured a bulk license agreement with Microsoft, granting teachers and students unrestricted access to the suite of Microsoft applications, which could also be installed on personally-owned devices.
- Introduction of a free-call ICT Helpdesk: Offering advice to teachers and principals on equipment purchases and technical matters.
- Creation of the Virtual School Learning Network (VLN): Connecting remote and regional high schools through learning hubs that utilized videoconferencing to 'share' teachers and deliver subjects and courses not normally accessible to students.

ICT in School Education Phase 3: (2009–Present)

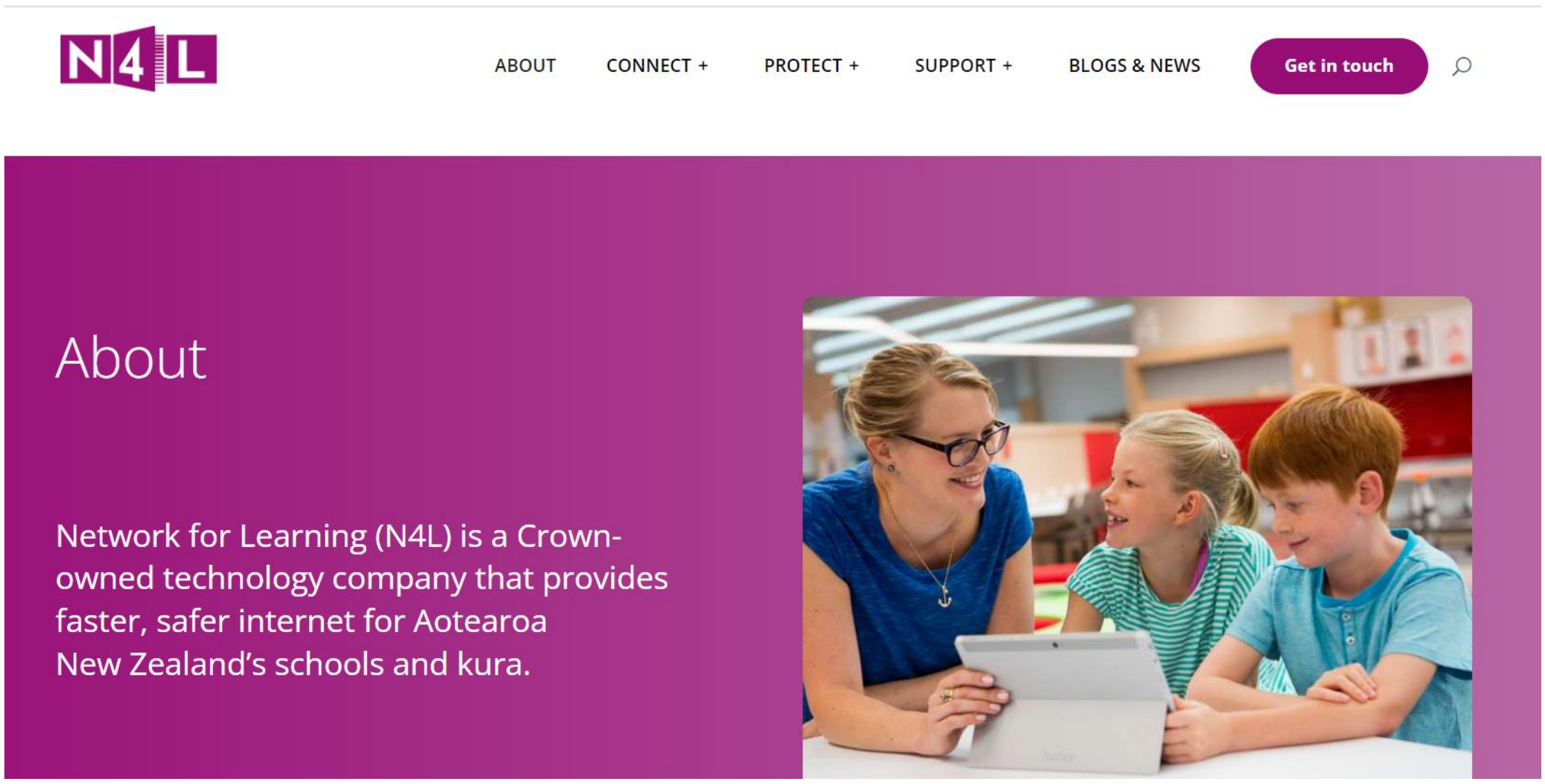
During this phase, the government focused on major infrastructure initiatives for schools, including the Ultrafast Broadband (UFB) project, the development of a national Network for Learning (N4L), and N4L's education-specific portal, POND.

The UFB project, initiated in 2009, aimed to provide fiber-based ultra-high-speed internet connectivity to 99% of New Zealanders by 2025, with all schools connected by 2020. Schools gained access to unlimited data at download speeds of up to 1Gbps, and as of mid-2018, 97% of schools have been connected to the network, with the remaining served by the Rural Broadband Initiative (RBI), a UFB partner project.

Parallel to UFB, the SNUP project (School Network Upgrade Project) was intensified, focusing on upgrading schools' internal network infrastructure. SNUP upgrades, employing a hybrid combination of Category 6 ethernet and wireless network access, have been ongoing, with over three-quarters of eligible schools completing upgrades by the end of 2017.

In 2013, the government established Network for Learning (N4L), a company tasked with connecting over 2400 schools in New Zealand to fast, reliable, safe, uncapped internet via the Managed Network. The service, fully funded and managed for schools, ensures seamless internet access for every student and teacher, regardless of their school's location.

Apart from delivering managed network services, N4L introduced the POND portal (https://www.n4l.co.nz/pond/), positioned as "a complimentary online community fostering connections and empowering educators." Described as the go-to platform for New Zealand educators to "uncover and exchange resources, knowledge, and experiences within a supportive and altruistic environment exclusively centered on teaching and learning," POND serves as both a searchable resource repository and a platform for teachers to collaborate and expand their professional networks. Its establishment aimed to facilitate collaborative engagement among teachers for sharing resources online via the UFB network. However, its adoption by teachers has been limited thus far, with a 2017 Research New Zealand (RNZ) survey revealing that less than one-third of New Zealand teachers, as reported by principals, regularly use POND. While the reasons for this low uptake remain unclear, a study by the New Zealand Council for Educational Research (NZCER, 2016) indicated that only 11% of teachers found POND/N4L useful, in contrast to 75% for the well-established TKI (refer to



Phase 2 above). Although a recent addition to teachers' digital resource options, indications suggest that POND may be competing within the same resource landscape as TKI, which has already established itself as a valuable resource portal.

Regarding access to school-provided digital equipment and resources, the RNZ report suggests that New Zealand schools have made minimal progress in improving the student-device ratio since 2011. Nevertheless, the rise of mobile, personally-owned devices and their increased availability for classroom learning through initiatives like Bring Your Own Device (BYOD) signals a broader trend in New Zealand schools moving away from fixed hardware in favor of mobile and portable technologies. The 2017 RNZ survey underscores the extent of this shift, with principals indicating that nearly 80% of students in their schools can access personal or school-owned mobile devices for learning purposes when needed. Notably, especially in secondary schools, the number of school-owned devices per student is lower in schools located in high socio-economic areas. This pattern may suggest that schools are transferring the burden of technology provision costs to parents, whom they may perceive as financially capable.

The Student Learning Space

Country
Singapore

Organizer
Ministry of Education (Singapore) , Educational Technology Division

Date started
2017

Abstract of the Implementing Organization or Individual

The Ministry of Education (MOE), Singapore plans and implements the Singapore Student Learning Space (SLS). The geographical coverage of the SLS is national.

Problems and Objectives

The SLS is Singapore's national online learning portal that provides all students with equal access to quality curriculum-aligned resources in major subjects from primary to pre-university level. In line with the development of 21st Century Competencies (21CC), the SLS encourages learners to be self-directed in their learning and pursue their interests.

The SLS also provides teachers with a range of tools to customise and create meaningful learning experiences that cater to diverse learning needs. For example, teachers have access to tools that help to make students' thinking processes visible. This enables teachers to make informed decisions and provide targeted intervention to address any gaps in understanding.

The SLS also serves as a common online platform for teachers to apply, adapt and share new pedagogies and technology-enhanced learning experiences by facilitating collaborations across classrooms and schools.

The SLS is continually being developed using agile methodology in response to the needs of students and teachers and by leveraging new technology. Curriculum-aligned resources and system tools such as AI-enabled features and learning analytics are continually being improved and developed in line with suggestions and feedback from users to cater to students' diverse and evolving learning needs.

Key Data

Funding of the project	Fully funded by the Ministry of Education (Singapore)
Target groups and percentage	All teachers and students in the national school system, from Primary to Pre-University/Junior College, have access to the SLS. This includes teachers and students in Special Education schools offering mainstream curriculum.

Age range or Grade level and percentage	Primary school level - 100% Secondary school level - 100% Pre-University level (Junior College) - 100%
Total number of beneficiaries	Approximately 500,000 users

Key Activities

As the Ministry of Education's core platform for teaching and learning and one of its key initiatives to transform the learning experiences of Singaporean students through the purposeful use of technology, the SLS is envisioned to fulfil these aims:

- **Learn Deeper:** A one-stop hub providing teachers and students with MOE-aligned resources in formal curriculum and the development of 21CC skills, as well as avenues for collaborative and self-directed learning.
- **Teach Better:** Versatile EdTech assistant with tools that support Teaching and Learning from design to enactment across various modes, tasks and durations aligned to MOE e-pedagogy principles and practices.
- **Built Learner:** Open and Modular Architecture that supports external apps and content which is constantly improved through stakeholder feedback and agile development processes.

1. Learn Deeper

The SLS is designed to enable students to engage in different learning modes and support Teaching and Learning (T&L) that is collaborative, self-directed, personalised and flexible for its 500,000 users. It aims to be a one-stop hub to meet all of MOE's T&L needs, eliminating the need for users to access content and tools from multiple platforms and reducing inconvenience.

The SLS has helped schools leverage technology to provide students with more equitable access to quality resources in the formal curriculum as well as engaging learning experiences, contributing to the development of students' digital literacies and 21st century competencies. The 12,000 resources that currently resides in the MOE Library - one of the two resource depositories in the SLS - have significantly contributed to enhancing students' learning experiences by engendering higher levels of cognitive engagement and student-directed learning, leading to stronger learning outcomes. Cognisant of the benefits of these digital resources to support more customised and independent learning, MOE will continue to develop new resources and improve existing ones.

Since its full roll-out in 2018, the SLS average unique monthly login has more than doubled, signaling active usage amongst both students and teachers. It is now used by 86% of students monthly (excluding major school holiday periods).

2. Teach Better

The SLS provides teachers with a range of educational technology (EdTech) tools to facilitate active learning that are better customised to various learning needs, and a set of unique Learning Experience templates informed by Learning Sciences research that guide teachers in designing effective technology-based lessons. The tools are continually being improved and developed. For example, lesson and course design by teachers were enhanced with the introduction of gamification features in 2022 to allow the inclusion of game-based elements. Features such as Experience Points and Levels, Game Stories and Achievements help raise student engagement levels further.

The SLS also serves as a common online platform for

sharing lessons and resources across schools. The Community Gallery (CG) is the other resource repository in the SLS that complements the MOE Library, and contains lessons and courses designed by teachers for teachers. It facilitates the co-creation and co-delivery of T&L resources on the SLS, thus benefitting a wider range of students beyond a teacher's individual classes. The sharing of lessons on CG has made lesson planning more efficient and led to significant time-savings in lesson preparation for teachers.

3. Built Learner

The SLS is MOE's first IT system developed using agile methodology, a design-driven and user-centric development approach that allows continuous development and improvement according to feedback from users. This feedback-driven enhancement approach gives the SLS the agility to cater to diverse and evolving needs of users. It also allows the SLS to anticipate and quickly adapt to new demands from users or policy changes. Future development plans include the application of AI and learning analytics in education, and use of interactive digital textbooks which will further personalise and enhance learning.

The SLS's Application Development Framework (ADF) capability allows its system capabilities to be extended via integration with external applications. This accelerates the adoption and integration of new external digital learning tools, resources, and emerging technologies that complement the SLS. To date, the SLS has whitelisted more than 200 free content/tools and built Application Programming Interface (APIs) to exchange content and tools, assessment items and learning data for more seamless lesson flows within the SLS. Examples of recent integration in the past year include Mother Tongue Language (MTL) Text-to-Speech and Speech Evaluation tools for students to practise reading at their own pace, and the integration with Google suite of tools.

4. Additional Role during COVID-19 Pandemic

The SLS was the core platform for MOE to ensure continuity of learning in Apr 2020 and in May 2021, when schools had to pivot to full Home-Based Learning due to COVID-19 pandemic.

The SLS was scaled up to support a much larger number of concurrent users and greater intensity of use. Provision of SLS' educational resources was also accelerated. The SLS 'Community Gallery' feature further allowed teachers to share their SLS lessons with other teachers across Singapore, who could then adopt or adapt them to meet the needs of their own students.

Capitalising on learnings from the Full HBL experience, MOE has since implemented Blended Learning. As part of Blended Learning, regular Home-Based Learning (HBL) Days have been integrated in the schooling experience in secondary schools and pre-university institutions, to develop self-directed, independent, and lifelong learners. Students learn curriculum content in a self-paced manner, and time is also set aside for students to pursue areas of interest beyond the curriculum. The implementation of regular HBL Days is supported by the SLS.

Awards and Honors

- International Data Corporation (IDC) Smart City Asia Pacific Award - Top Smart City Project for Education (2018)
- World Information Technology and Services Alliance (WITSA) Global ICT Excellence Awards - E-Education & Learning Runner-Up (2021)
- Ministry Of Education (Singapore) – Minister's Innovation Award (2023)
- Public Service Transformation Award (Singapore) – Service Delivery Excellence Award (2023)

Measures to Ensure Equality and Effectiveness

The SLS supports learning by providing every student with equal access to a library of quality curriculum-aligned digital resources covering major subjects from primary to pre-university level. With the SLS, students can learn any subject, at any level and at their own

pace, and track their progress.

Ensuring access to SLS

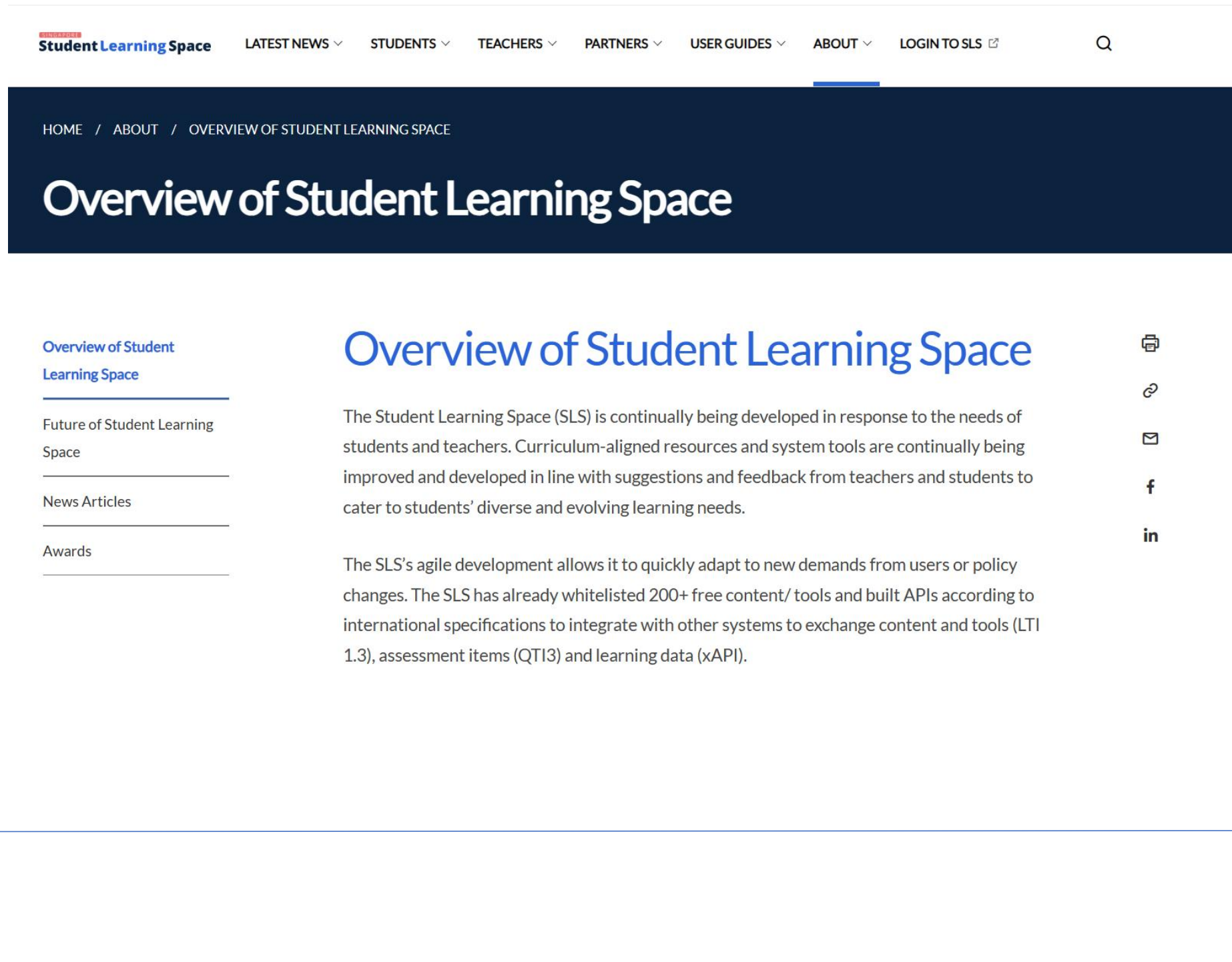
All secondary school students are equipped with a personal learning device (PLD) as part of the National Digital Literacy Programme (NDLP). The PLD enables secondary students to fully benefit from technology-enabled learning experiences and provides opportunities to develop digital literacies. MOE has also provided all primary schools with sufficient internet-enabled devices to support students' learning in school. In cases where primary students need to use devices after school hours but lack digital access, schools can loan computers and internet-enabling devices to students to use at home for schoolwork. Schools also encourage eligible students from lower-income households to leverage on other government's schemes to obtain subsidised digital devices and/or internet access. In addition, SLS is mobile-friendly and access is free.

SLS is also accessible by local students who need to take leave of absence from schools or are overseas for prolonged period of time. This ensures that learning for local students is able to continue with minimal disruption.

Ensuring effectiveness in using SLS

MOE is developing teachers' capacity in e-Pedagogy, which is the practice of teaching with technology for active learning. To build teachers' capacity in e-Pedagogy, they are provided with a range of professional development opportunities including online courses, workshops, demonstration lessons, and milestone programmes. MOE has also established Networked Learning Communities (NLCs) to support sharing and collaboration, including the Singapore Learning Designers Circle (SgLDC), an online network learning community of more than 20,000 teachers, where they share technology-enabled lessons, crowdsource for lesson ideas, help each other trouble-shoot technical challenges, and render support and encouragement as they learn to teach effectively with the SLS and other EdTech tools.

The SLS team actively leverages this SgLDC to reach out and share knowledge of the SLS features, update on its development and obtain unbiased feedback from teacher-users. Regular livestream sessions known as 'SLS Spotlight' are also conducted by the SLS team to demonstrate the SLS's ability to support T&L or showcase its new capabilities.



Measures to Ensure the Sustainability

MOE has set up a dedicated SLS project team to oversee the planning and implementation of the SLS. A strategic governance structure is in place to oversee and guide the SLS project team comprising senior management from MOE's divisions overseeing educational technology, curriculum, student development, information technology, and schools.

SLS's agile development approach ensures that resources and system tools are continually improved and developed in line with users' feedback, ensuring its ongoing relevance and alignment with MOE policy directions. Its ADF capability has accelerated and sustained the adoption and integration of new external digital learning tools, resources, and emerging technologies that are complementary to the SLS.

The SLS team is supported by other partners in MOE such as Academy of Singapore Teachers (AST), which spearheads the professional development of teachers, in facilitating comprehensive professional development programmes for users. To enhance access to SLS-related information and resources, an internet-based SLS Info-Site was also launched in 2022. Onboarding and user guides, walkthrough videos, key information and changelogs are now publicly accessible, enabling users to easily self-help and encourage user adoption. Since 2022, the SLS team has also co-opted several prominent teacher-users of SLS as 'Friends of SLS'. This initiative was aimed at involving other educators at SgLDC to expand the network of support and engagement for SLS beyond the efforts of the SLS team.

Teachers are encouraged to harness their creativity in content creation and share them through the Community Gallery (CG) resource repository in SLS, which helps to diversify and sustain the volume and relevance of SLS lesson resources for other teacher users. Lesson sharing in CG are recognised as contribution to the teaching community and included as one of the qualifying criteria for awards conferred by AST to teachers annually. These published CG lessons complement the curriculum-aligned resources curated and developed by MOE's curriculum experts, which are in the other SLS resource repository, the MOE Library.

Future Plan

As part of Singapore's National AI Strategy, MOE will enhance the capabilities of the SLS with AI learning tools to support greater customisation of learning for our students and to augment our teachers' professional practice.

- An AI-enabled adaptive learning system (ALS) will use machine learning to make customised learning recommendations for each student, based on how the student responds to questions and activities as they learn a topic. ALS for Mathematics was launched in June 2023, starting with three topics for the Primary 5 level, with more content and levels to be added progressively. MOE is also planning to pilot an ALS for a second subject by 2025.
- The Feedback Assistant - Mathematics (FA-Math) provides line-by-line immediate feedback to students' mathematical solutions, providing guidance and suggestions to scaffold their learning, enhance their understanding and improve their work, as they attempt the question. FA-Math has been made available to all primary, secondary and pre-university students since June 2023.
- The Language Feedback Assistant for English (LangFA-EL) provides feedback on students' writing in areas such as spelling and grammar. Teachers can then focus on guiding students in the more complex aspects of language construction, and to develop higher-level skills like creative expression, persuasiveness, and tone. LangFA-EL will be available from end 2023 onwards.
- The Learning Companion (LC) supports students' holistic development by keeping them engaged and motivated during challenging tasks, helping them reflect on their learning and recommending

further learning materials and activities. A Minimum Viable Product (MVP) of the LC has been implemented as a feature within the ALS for Mathematics to support student engagement, with plans to develop the LC further in 2024.

A new class of instructional materials, called Interactive Digital Textbooks (IDTs), will also be progressively developed over the next few years. IDTs play a similar role to print textbooks but have the benefit of more dynamic affordances and features as they are experienced through the SLS. They contain curriculum-aligned subject content and activities, including rich interactive media, that are customisable to meet diverse teaching and learning needs.

Other Materials

MOE corporate site
https://www.moe.gov.sg/education-in-sg/student-learning-space

SLS Info-Site
https://www.learning.moe.edu.sg/

Digital Learning Resource Platform

Country
Uzbekistan

Organizer
Institute of development of vocational education

Duration
Not Limited

Abstract of the Implementing Organization or Individual

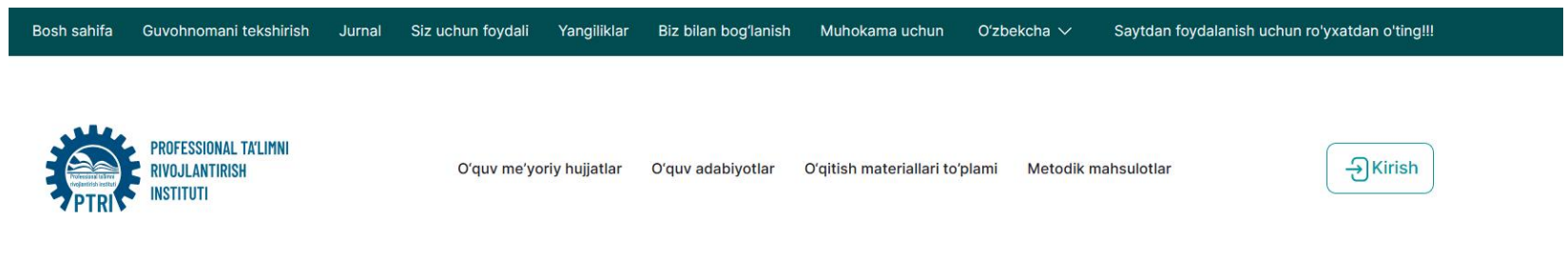
The Institute is an institution under the Ministry of Higher education, science and innovation of the Republic of Uzbekistan, and it is a state educational institution that carries out innovative development in the professional education system, improving the qualifications of directors and pedagogues and retraining them. The geographical coverage is national.

Problems and Objectives

Today, there are about 3,000 subjects and educational practices in the vocational education system. Selection of experienced specialists for the development of digital educational resources in all these disciplines and educational practices, training them in the development of digital educational resources, organization of development work and motivation of participants.

Key Activities

Digital learning content is a material presented in digital form intended for use in the educational process on a specific topic of science, its content is a lecture text, media materials (audio, video and animation materials), didactic it will consist of demonstration materials (posters), presentation materials, glossary (dictionary of terms), control programs (reinforcing questions, practical tasks andtest materials), a set of exercises and problems, materials supplementing the lesson content.
A Digital Learning Resource (DRT) is a collection of digital learning content covering all topics of a specific subject.



Metodik ta'minlash platformasi

Measures to Ensure Equality and Effectiveness

Selection of qualified programs for the production of digital educational resources The republican competition “Best digital learning resources” is being held in the professional education system.

Measures to Ensure the Sustainability

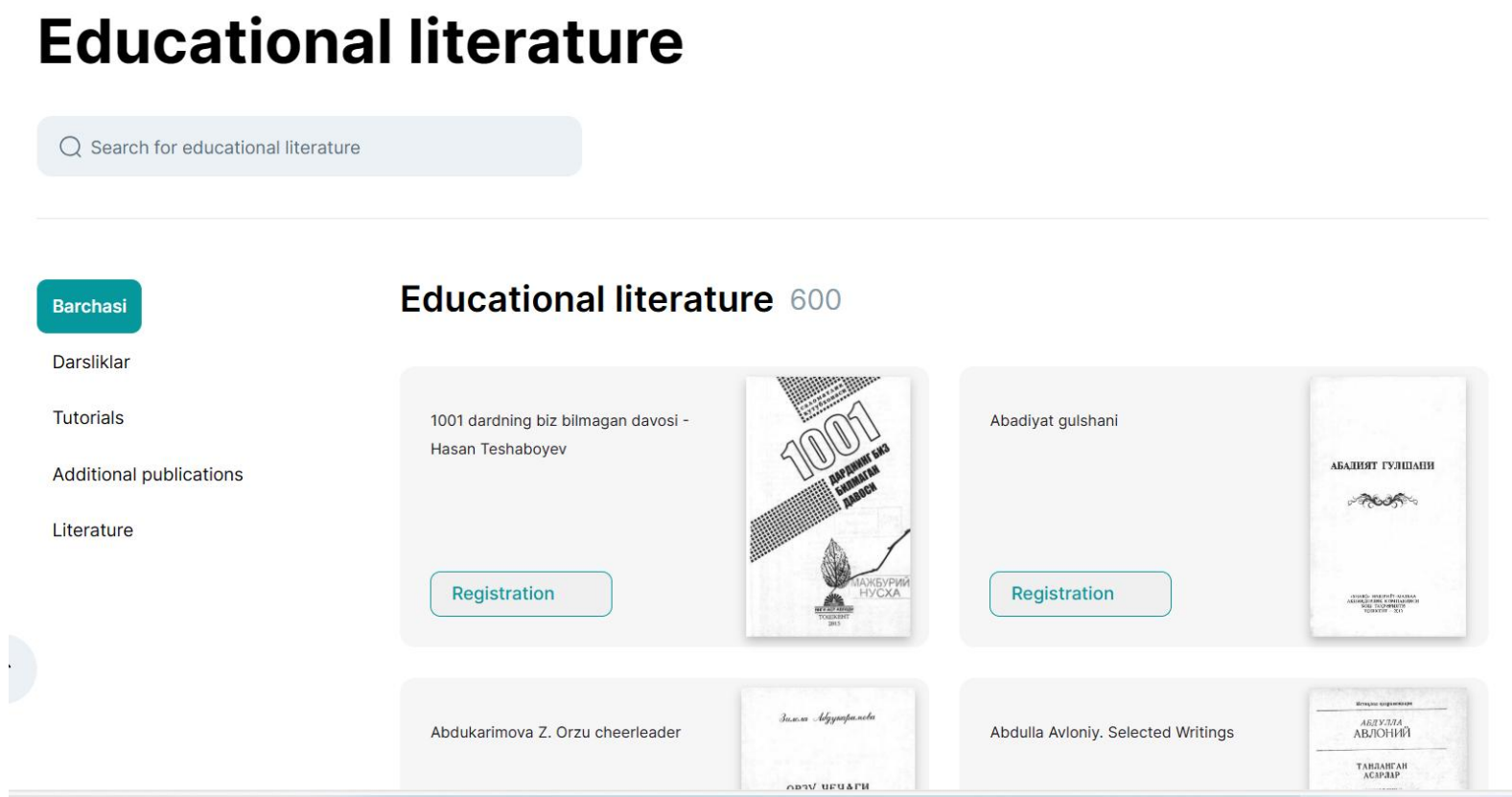
Coverage of all subjects in the professional education system until 2030.

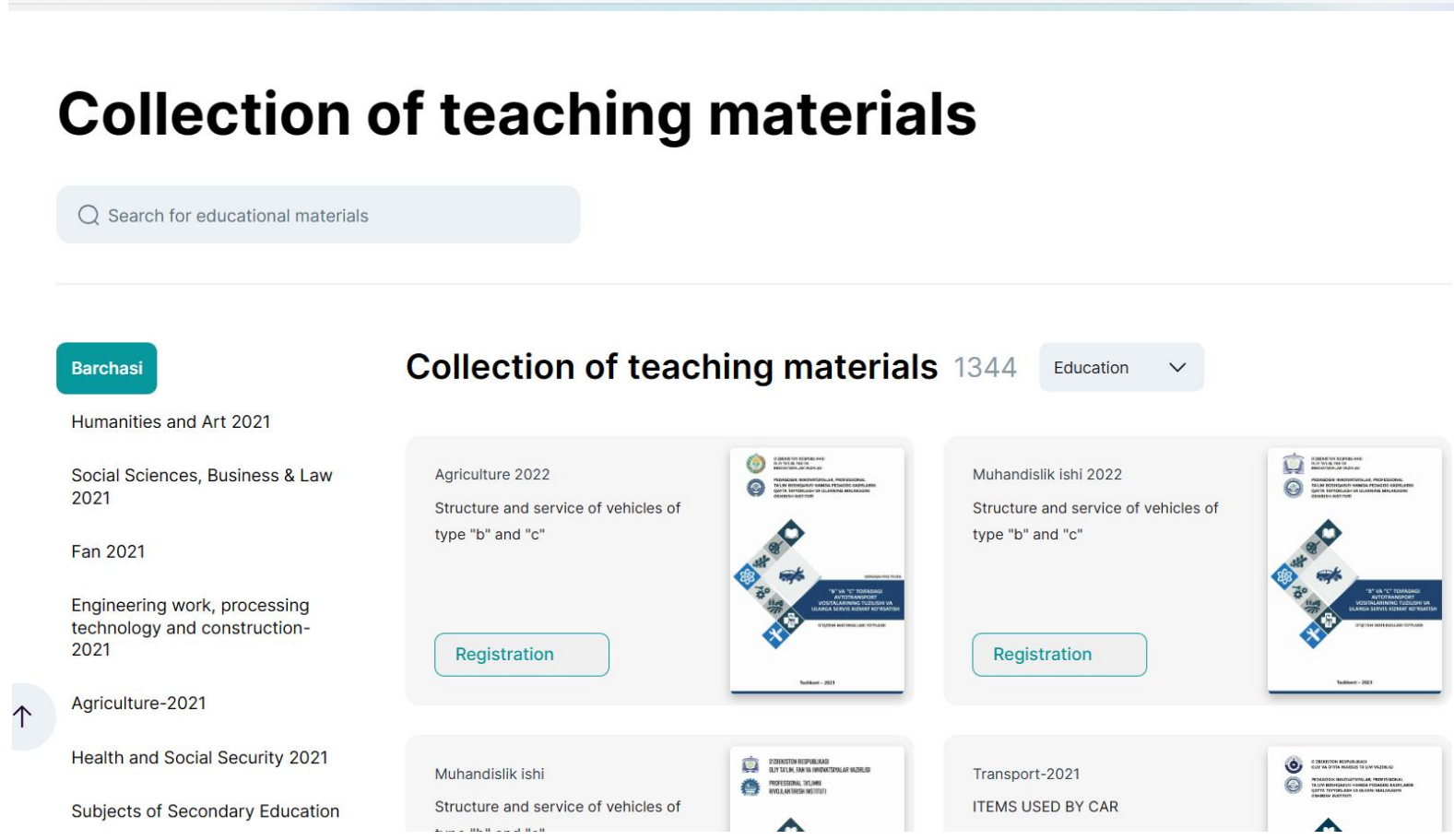
Future Plan

Development of digital learning resources for all subjects in the professional education system.

Other Materials

https://ipitvet.uz/
https://edu.profedu.uz/





Smart Education of China

Country
China

Organizer
Ministry of Education of People's Republic of China

Date started
2022

Summary

Rolled out in 2022, Smart Education of China is a comprehensive platform that hosts a wide range of learning resources aligned with curriculum. As of January 2024, the platform has aggregated 88,000 resources for primary and secondary schools, covering 65 versions with a total of 565 textbooks. It includes 1,559 vocational education teaching resource repositories, over 10,000 high-quality online courses, and more than 1,700 virtual simulation resources. In higher education, it offers 27,000 high-quality MOOCs covering 92 professional categories across 13 disciplines, establishing itself as the world's largest repository of educational resources. Up to the current date, the platform has accumulated over 37.2 billion views and has been visited by over 2.5 billion users.

Furthermore, the platform incorporates a rich collection of extracurricular materials on topics such as mental health, well-being, sports, and arts. By integrating educational resources at all levels and centrally providing educational services, the platform has created a "one-stop" space for learners, educators, and parents, boasting the world's largest learning resource library. During COVID-19, the platform played a crucial role in facilitating remote learning. Additionally, the initiative includes providing training to over 10 million teachers and reaching learners in remote and rural areas to enhance digital literacy, thereby promoting the quality and equity of education in China. The platform has become a cornerstone of China's digital transformation in education, with the potential to foster comprehensive education and contribute to the provision of education as a public good.

More information at: https://www.smartedu.cn/

Objectives

The objective is to promote the application and construction of the national smart education platform, aiming to achieve the following objectives:

- Promote Educational Equity: Establish an effective mechanism to expand the coverage of high-quality educational resources, thereby narrowing the "digital divide" among regions, urban and rural areas, and schools.
- Provide Convenient Services: Use the platform as a gateway for services such as employment assistance, exam services, academic degrees, and study abroad services. Utilize digital technology to facilitate online transactions for public services, minimizing the need for people to physically visit offices.
- Support Large-scale Online Teaching During the COVID-19 Pandemic: Ensure effective service for "learning without interruption" during the COVID-19 pandemic by facilitating extensive online teaching.
- Transform the Education System for the Digital Age: Utilize digital technology to revolutionize various aspects of the education system, including educational models and knowledge structures, to support the construction of a strong education nation.

Platform Features

Wide Accessibility and Inclusivity:

- Developing accessibility features such as subtitles and recitation to assist individuals with visual and hearing impairments.
- Adjustable font sizes for the elderly and visually impaired.
- Multilingual support, with priority given to the release of an English version for learners worldwide.
- Ensuring that students from national minority groups have barrier-free access to and use of the platform.

Network Security:

- Strict adherence to national cybersecurity laws and regulations, including the Network Security Law, Data Security Law, and Personal Information Protection Law.
- Implementation of robust security measures, with regular monitoring and timely resolution of security vulnerabilities.
- Over 12 million cyber attacks successfully defended since the platform's launch, with no security incidents throughout the year.

Fair and Inclusive Connection:

- Adherence to the non-profit nature of the platform, offering all resources for free.
- Focus on developing quality educational resources for underdeveloped and minority areas.
- Specialized column ("MOOCs for Western China") for western universities, providing 190,000 online courses and facilitating 4.46 million blended courses.

Gender Equality:

- Content undergoes rigorous review to eliminate gender discrimination and biases.
- Both males and females maintain equal status in receiving education under compulsory education for all eligible children in China.

Digital Literacy Cultivation:

Since 2022, the platform has been organizing annual summer training programs for teachers, focusing on holiday teacher development. It actively explores new modes of digital educational research, aiming to enhance teachers' digital literacy. As of August 31, 2023, a total of 16.095 million teachers nationwide have participated in this training, accumulating over 1.7 billion clicks on the training materials.

Effective Teaching Practices:

The Ministry of Education has established an operational monitoring platform to oversee the basic operations of various educational platforms. Currently, the platform has accumulated approximately 258.48 billion records of behavioral data, page data, and business table data, with a data capacity of 349.3 terabytes. The Ministry of Education conducts regular analyses of the platform's operation, compiles

monthly reports, and analyzes the supply and usage of platform resources.

Analytical functionalities have been integrated into the National Primary and Secondary School Platform, National Smart Vocational Education Platform, and National Smart Higher Education Platform. These features allow for the analysis of user behavior, enabling continuous improvements to enhance the user experience.

An all-encompassing platform with one of the largest collections of digital learning resources[1]

Smart Education of China is a platform that caters to all levels of education, consolidating a wide array of learning resources and providing “one-stop” education-related services for teachers, learners, and families. Arguably one of the most extensive repositories of digital learning resources in the world, SEC's resources are mostly in Chinese, and comprises four sub-platforms, each focused on Basic Education, Vocational Education, Higher Education, and book reading. It also features a Service Hall, and a portal that connects to regional platforms administered by local authorities, among others.

The learning resources available on the platform are closely aligned with the curriculum, encompassing 88,000 resources for primary and secondary education that span across various grades and subjects. It includes 1,559 repositories of vocational education teaching resources, over 10,000 high-quality online courses, and more than 1,700 virtual simulation resources. Additionally, there are 27,000 Massive Open Online Courses (MOOCs) for higher education. The platform also offers a diverse range of extracurricular materials covering topics such as mental health, well-being, sports, and arts. During the pandemic, the platform played a pivotal role in facilitating large-scale remote learning initiatives, contributing significantly to the advancement of distance education.

The platform not only provides opportunities for the development of digital literacy but has also trained over 10 million teachers. It has extended its reach to learners in remote and rural areas, effectively promoting the quality and equity of education in China. Notably, for underdeveloped regions, the platform has spearheaded the 'MOOCs for Western China' initiative. This initiative has cumulatively offered 190,000 MOOCs and online course services, facilitating 4.46 million instances of blended learning in the central and western regions. The program has been attended by 490 million students, and 1.83 million teachers from western universities have undergone MOOC training.

A platform to ensure quality digital learning for all[2]

While the platform became fully fledged during the pandemic to facilitate distance learning, its vision extends far beyond. Initially, it was created to foster educational equity and bridge the digital divide across regions, urban and rural areas, and schools, notably through rendering quality learning content accessible to all. As an added value, the platform serves as a convergence point where students and teachers can easily access services to enable online processing of public services, including employment, examinations, academic degree issuance, and studying abroad.

Recognizing the diverse local systems and specific needs within the country, measures have been implemented to encourage and support local schools,teachers, and students in utilizing the platform in an effective manner. These efforts include awareness-raising activities to introduce the platform to society at large, expert team workshops, and forums to guide teachers, students, and parents in

1 See https://www.unesco.org/en/articles/smart-education-platform-china-laureate-unesco-prize-ict-education

2 See https://www.unesco.org/en/articles/smart-education-platform-china-laureate-unesco-prize-ict-education

engaging with the platform. The use of the platform was also integrated into teacher training programmes across all levels in which teachers are trained on how to use the resources for teaching. Capacity-building efforts have also been made to enhance students' competency in searching for, identifying, selecting, and utilizing resources. Additionally, as part of the project, best practices have been gathered from schools, teachers, and students to promote effective engagement with the platform, creating a repository of exemplary cases that serve as inspiration for others.

To ensure the platform's effectiveness and assess how users engage with the resources, the platform conducts regular analyses of user engagement onlineto gain insights and track feedback. Each of the four sub-platforms allows for analyzing user behavior and delivering more precise and personalized resource recommendations. Questionnaires are regularly administered to collect input from schools and teachers, enabling ongoing optimization of platform functionalities, enhancement of user experience, and improved support for classroom teaching. Ultimately, these measures are aimed at continuously refining the platform's performance and adapting to the evolving needs of education.

Sustainability and Future Plan

To ensure the sustainable operation of the platform, the National Smart Education Platform has robust organizational and financial support. On one hand, the Ministry of Education consistently positions the advancement of the National Smart Education Platform as a crucial task in promoting digital education. The promotion of digital education is explicitly incorporated into annual work priorities and phased development plans. Additionally, there are plans to unveil a national education digitalization strategic action plan later this year to ensure continuous development. On the other hand, central finances prioritize the maintenance and operation of the platform, comprehensively supporting technical maintenance, content updates, and upgrade initiatives to ensure the development of the National Smart Education Platform.

The construction of the National Smart Education Platform aligns with the concept of sustainable environmental development. Leveraging digital technology, the platform aims to reduce the use of paper in teaching processes, enhance learning efficiency through educational model reforms, and allow students more time to connect with nature. The platform construction utilizes cloud computing technology, enabling dynamic resource adjustments, resource conservation, and subsequently reducing carbon emissions, contributing to the goal of environmentally sustainable development.

Moving forward, the Chinese Ministry of Education will drive the construction of the National Smart Education Platform in the following areas:

- Enriching Content Resources: Continuously enriching resources for basic education, vocational education, and higher education. Aggregating resources from libraries, museums, and other societal sources, incorporating technological innovations such as virtual reality and artificial intelligence in resource creation.
- Optimizing Platform Experience: Facilitating two-way identity authentication through the "Smart Education China Pass" and all connected platforms. Strengthening the help center, providing accessible features, and conducting regular user satisfaction surveys to understand platform usage.
- Diversifying Application Scenarios: Promoting the transformation of platform applications from online teaching to a combination of online and offline. Expanding services from serving schools, teachers, and students to serving a broader audience in society. Supporting the construction of a learning-oriented society and a learning-oriented nation, catering to both domestic and international users, and comprehensively promoting the development of a lifelong learning community.
- Developing multilingual access: Launching the Smart Education of China with multilingual language access, facilitating the sharing of open-access quality resources among the globe.

Part II

Open and Share High-quality Resources for Narrowing the Digital Divide

Educational Cloud Applications

Country
Albania

Organizer
Albanian Academic Network

Date started
2008 (started the implementation of cloud computing technologies)

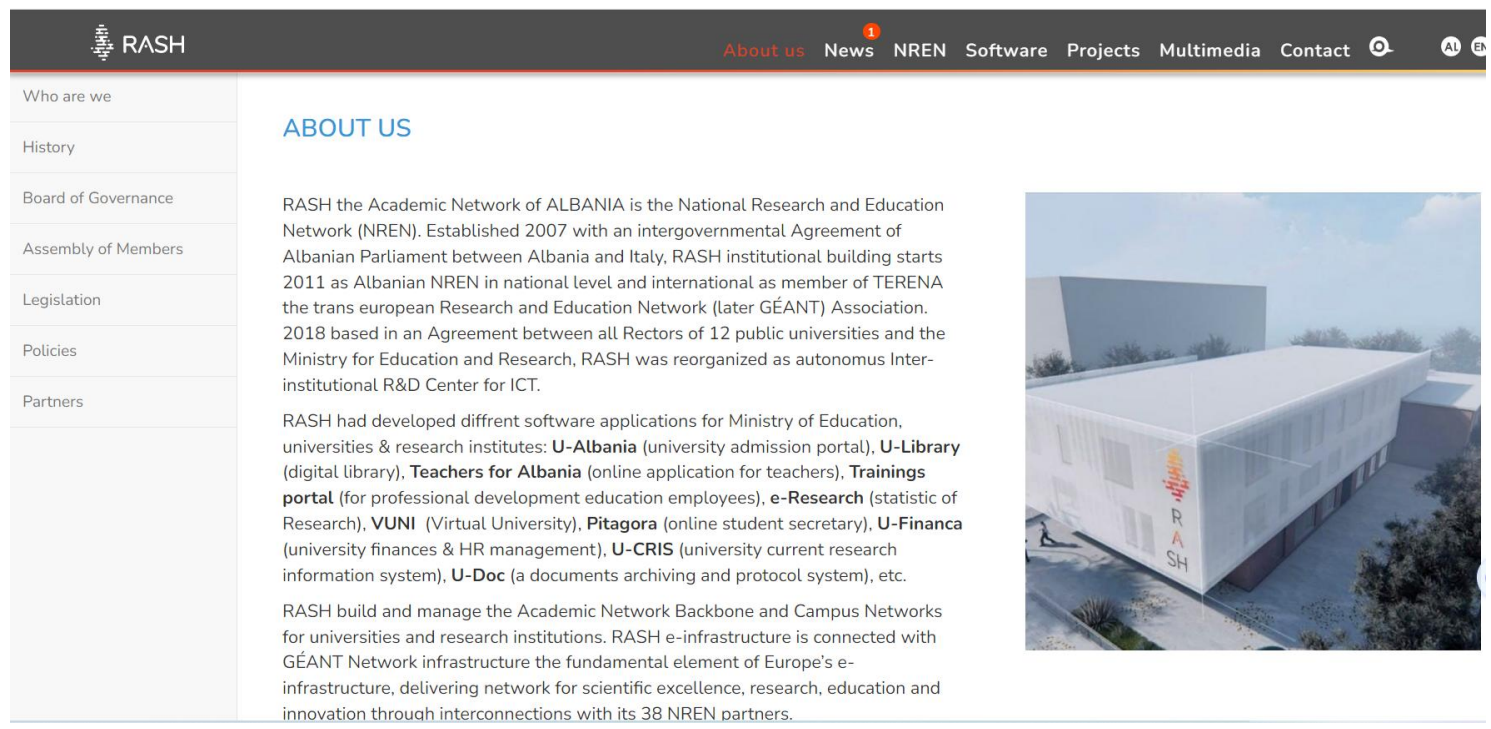
Cloud computing in the realm of education benefits students, educators, and administrators alike. It empowers students by providing access to assignments from any location with an internet connection. Educators can swiftly upload learning materials, while administrators find it easier to collaborate and save costs on data storage. Albanian Higher Education Institutions have embraced various cloud applications for online learning, including the Moodle Course Management System, Google Classroom, Google Meet, EduMEET, Microsoft Teams, and Zoom. The Albanian Academic Network (RASH) offers Infrastructure as a Service (IaaS) cloud computing resources to public universities, expanding its reach to K-12 education services and other state institutions. Notably, services like the PITAGORA software streamline university secretariat operations, allowing students to complete tasks online, such as exam registration, digital certificate printing, and real-time evaluation feedback from lecturers.

The U-CRIS platform serves as a comprehensive database for Albanian universities, linking to international research databases and facilitating the storage of scientific publications, doctorates, CVs, research projects, and more.

Albanian Academic Network (RASH) has also developed the following software applications for Ministry of Education, Sport and Youth, universities, and research institutes (RASH Portal):

- U-Albania platform showcasing information on 38 universities and 561 study programs
- Teacher Portal for Albania aiding in teacher employment
- Training Portal overseeing the professional development of educational staff

Other initiatives include the Census for the quality of scientific research, V-Uni (Virtual University) platform for online classes, U-library platform, Anti-Plagiarism control platform, E-Research providing statistical data for scientific research, and implementation of GÉANT services supporting scientific disciplines. In collaboration with Akademia.al, RASH piloted an Anti-Plagiarism control platform in 2020. Additionally, RASH has implemented various GÉANT services to support scientific disciplines in Albania.



ALECSO's Array of OER Endeavors

Country/Region
Arab region

Organizer
ALECSO

Date started
2013

The Arab League Educational, Cultural and Scientific Organization (ALECSO) is a Tunis-based specialized institution working under the umbrella of the League of Arab States. It is essentially concerned with the development and coordination of the activities related to education, culture and sciences in the Arab World. It includes 22 Member States.

Recognizing the potentials of OER to enhance education and to be involved in the international movement to support open and online education, ALECSO is endeavoring to promote the development and use of OER in education to make it more effective, accessible, and smarter through various projects.

Project 1 ALECSO-US Open Book initiative

Earlier in 2013, Secretary Clinton launched the Open Book Project, an initiative of the U.S. Department of State and ALECSO, leading education innovators to expand access to free and high-quality open educational resources in Arabic, with a focus on textbooks in science and technology. This movement could benefit the scientific learning in countries, which could further foster economic growth. Specifically, the aims of this initiative are:

- Developing an increased awareness of OER in the Arab countries and the U.S., including refining the concept and identifying connections with copyright and open licenses;
- Exploring the benefits of OER for governments, institutions, faculties, students, and the public, specifically examining how OER affects teaching and learning practices including the interrelationships and synergy of OER with open access, open data, open policy, open science;
- Evaluating the impact of OER on education business models and practices in the Arab countries and the U.S.

World Learning, which is an American educational and development organization, ensured the preparation and the implementation of the exchange program. The two phases of that program are as follows:

- Phase 1: A group of Arab fellows travel to the U.S. in order to pursue a rich and varied program encompassing several activities and visits. Two participants from each Arab country are selected and traveled to the U.S. in March 2014 for 3 weeks. During this visiting, Arabic fellows are expected to (1) learn about the day-to-day operations and projects that the American organization is engaged with; (2) share aspects of the foreign organizational practices and challenges (especially as pertains to OER) with U.S. counterparts; and (3) work with the host organization on the development of an action plan or methodology to create/develop and apply OER in the foreign fellow's originating academic institution.
- Phase 2: A group of practitioners and experts from the U.S. traveled to Arab countries (Tunisia and Jordan) at the end of 2014 in order to work with the fellows on implementation of the plans created in Phase 1, and to meet and identify key stakeholders in academia, government, and the NGO community that are already involved in the OER movement.

In that light, an Arab/American coordination meeting on the exchange experience and expertise in the field of Open Educational Resources was held in ALECSO in October 2014. The purpose of this meeting was to draw up a state of progress of the Open Book Project and to identify and discuss the areas of future potential collaboration with the American side, related to the promotion of OER in the Arab countries. At the end, the agreement was reached to continue collaboration in all aspects regarding the implementation of the Open Book Project and its potential amendment to cover OER promotion activities.

Project 2 Five OER Activities

Apart from the Open Book initiative, an entirely new OER project with a set of core activities for the promotion of Open Educational Resources in the Arab countries was also launched. These activities include launching OER policies, raising OER awareness and developing OER infrastructure in the Arab region. The project can be divided into three categories:

(1) Policies for OER: To support different stakeholders (decision and policy makers, institution staffs, unions/teachers' associations, administrators/school leaders, teachers, students and parents) in the Arab countries toward using and developing OER at both national and Pan-Arabic level, ALECSO should draw from international OER' best practices and from existing guidelines. These guidelines must be contextualized and localized according to each country's status and specificities. In addition, policies should cover best practices for sustainable development of OER, ensure quality while developing OER, make open licensing schemes during and after developing OER as well as developing national OER repositories.

(2) Raise Awareness and capacity building on OER: It is of the utmost importance to raise awareness, inform and train different stakeholders about the added value of OER and their expected benefits in accessing and enhancing education.

(3) Technical Infrastructure: Promoting OER at Pan-Arabic level means somehow offering a Pan-Arabian OER Infrastructure where teachers will be able to search and retrieve suitable OER. The proposed infrastructure could be deployed nationally at different Arab counties and then it could be integrated into a federated Pan-Arabian infrastructure promoting interoperability of these national OER portals.

In line with these objectives, the ALECSO OER project activities can be further divided, as shown below:

Activities	Sub-activities
Activity 1: Policies for OER	A1.1 Analyzing and selecting existing guidelines for ORE development
	A1.2 Preparing translating/localizing guidelines for ORE development
Activity 2: Raise awareness	A2.1 Raising awareness plan to conduct local, regional, and national activities (e.g., mission awareness campaigns and training workshops for key stakeholders in Arab schools)
	A2.2 Training workshops: (a) preparing training material (b) organizing training workshops
Activity 3: Technical infrastructure setup	A3.1 Architecture and Specifications of technical infrastructure
	A3.2 Set up national OER repositories progressively in selected Arab countries
	A3.3 Set up federated infrastructure integrating all national OER'repositories developed in A3.2 into a Pan-Arabian OER Infrastructure
Activity 4: Technical infrastructure take up/deployment	A4.1 Detailed implementation plan for the use of the technical infrastructure in selected Arab countries
	A4.2 Pilot deployment showing the technical infrastructure under exploitation for stakeholders from selected Arab countries
Activity 5: Evaluation	A5.1 Evaluation plan with appropriate evaluation instruments to be used for evaluating the use and development of OER at Pan-Arabic level
	A5.2 Evaluating the use of ORE based on analytical approach

Project 3 ALECSO MOOCs project

The Massive Open Online Courses MOOCs concept, which emerged from open educational resources and e-learning, represents currently one of the newest and latest trends in the realm of online learning. As its name implies, MOOCs have two key distinctive dimensions: “massiveness” and “openness”. MOOCs are intended to provide free open learning to online learners via the Internet. In this way, online learners could conveniently gain new and advanced knowledge and skills. Moreover, this new trend of learning is in accordance with the international movement which encourages open access to learning.

Despite that a learner can find various online content and courses available on MOOCs providers and open educational repositories, most of these high-level online courses are neither accessible nor adapted to specific needs of learners in the Arab region. Therefore, ALECSO called for a need to develop MOOCs, a promising field, in the Arab region in order to promote and empower the development and adoption of OER and MOOCs. To achieve this goal, ALECSO came up with a series of projects which aimed at promoting Arab MOOCs. Specifically, the general goals of these projects are summarized as follows:

- **Goal 1: Define MOOC capacity building steps in ALECSO member states' institutions**
  - Objectives: (1) Determine MOOC approach and technology needs of Arab states' institutions; (2) Develop workshop material to address those needs; (3) Run a number of these workshops in ALECSO member states

- **Goal 2: Propose a platform for Arabic language MOOCs development and hosting**
  - Objectives: (1) Review any available technologies supporting Arabic language MOOCs development, hosting, and referencing; (2) Determine gaps in currently available MOOC technologies to accommodate Arabic language MOOC development, hosting, and referencing; (3) Propose a plan to fill these gaps; (4) Deploy a platform for Arabic language MOOCs development, hosting, and referencing

- **Goal 3: Build teaching MOOC prototypes (with a focus on Arabic language MOOCs)**
  - Objective: Based on digital material supplied by teachers in Arab universities and ALECSO, produce MOOC courses on the developed platform.

- **Goal 4: Host and evaluate the developed prototype MOOCs and their delivery to target audiences**
  - Objectives: (1) Ensure the proper hosting of the platform and MOOC courses material; (2) Run (with ALECSO designated instructors) the MOOC courses developed on the targeted audiences; (3) Carry an evaluation of the delivered MOOC courses (technology, delivery to target audiences).

Project 4 Arab OER Hub

The Arab OER Hub is a unified platform for Arabic Open Educational Resources available online on the global OER platform (www.oercommons.org). The Hub provides unified access to all OER contents developed in the Arab countries. It does not only help to develop, use, share and promote open educational resources, but also provides opportunities for cooperation, sharing and exchange between Arab teachers and authors of educational contents with the aim of producing and sharing these resources and facilitating access to them by teachers and learners across the world. The Arab OER Hub also offers users with several tools that enable them to create, add and host digital contents and grant appropriate open licenses, thus make these contents available and accessible online as open educational resources. These tools include in particular:

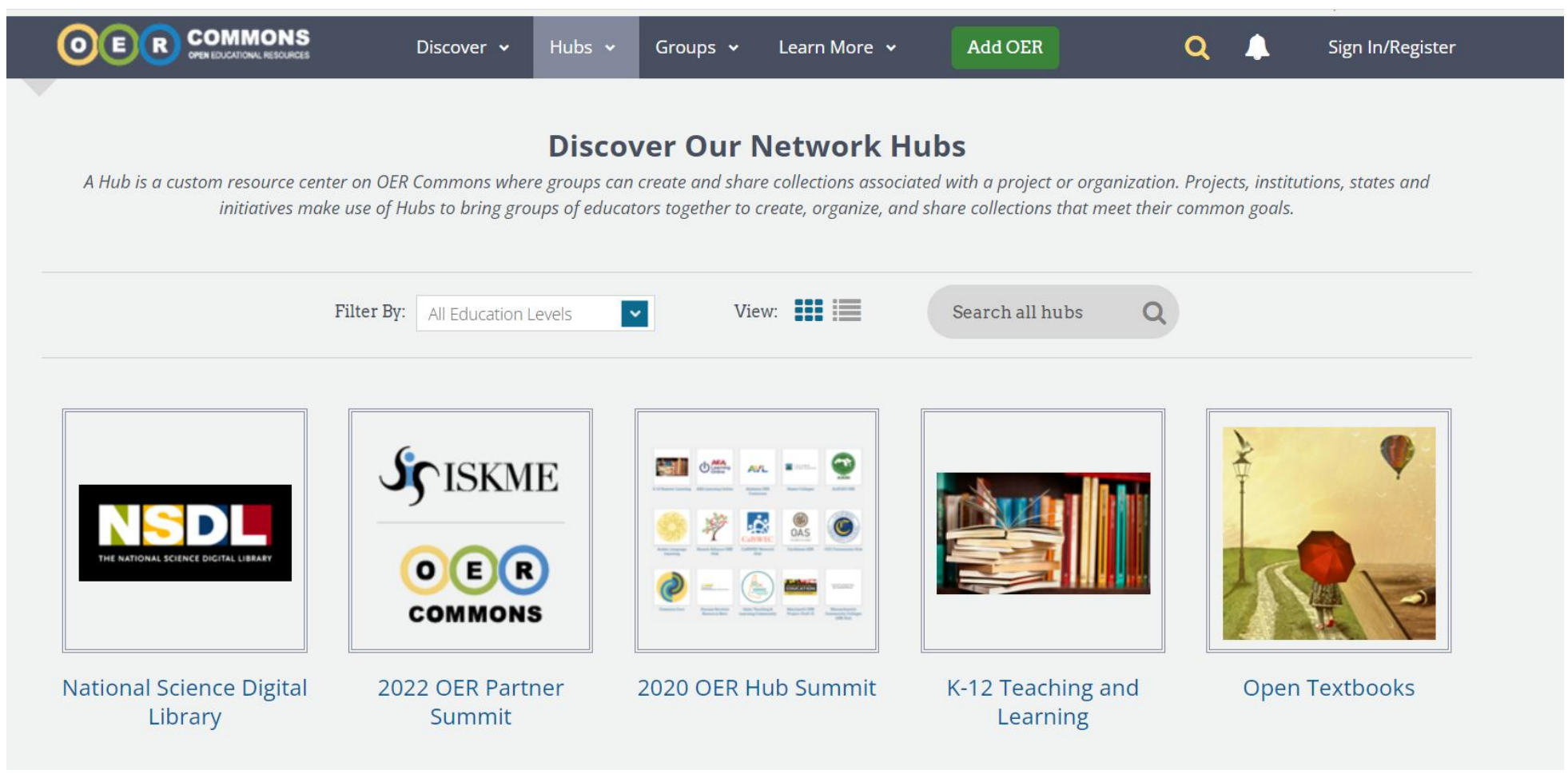
(1) Sharing existing educational resources, making them available via special online links and addresses (national platforms, specialized websites etc.), typesetting and indexing them by adding relevant standards and metadata, and allocating the appropriate open license.

(2) OER Author: The Hub includes a tool for creating and managing digital content, which enables OER authors to edit digital educational content, present it

in the form of learning units, and then add the needed metadata to facilitate automatic typesetting and ensure more effective search and access.

The OER Author tool makes it easy to combine digital contents in various formats (text, images, audio/video files, etc.) and to save them as open, licensed educational resources. These resources are then available and shared by teachers, learners and all those interested from all over the world. Resources and all multimedia files contained in these resources can be downloaded. The OER Authors tool are characterized as follows:

- Importing external resources from Google Docs: a new resource can be created by downloading a Google Doc and using it via the OER Author tool;
- Adjustment: the open content can be adjusted and adapted to meet the basic characteristics of the Commons, the State's requirements, and the special needs of learners and classrooms;
- Setting up and integrating open educational resources: it is possible to set up, integrate, adjust, adapt, allocate, and reorganize/reformulate existing resources in order to create new resources.



Meteorological APPs for Crop Management

Country
Colombia

Organizer
Hector Angel Arcila Educational Institution

Duration
10-month/year

Abstract of the Implementing Organization or Individual

What do we do?

The main objective of the classroom project is to teach students the proper use of technological tools, which offer multiple functions that can be used pedagogically. We specifically refer to mobile weather monitoring applications. These applications generate information that must be interpreted within the framework of a statistical process, which generates results in the adaptation and optimization of crops.

How do we do it?

The methodology will be oriented towards interactive practices in which the teacher plays the role of counsellor, promoting the active participation of the students. Taking this into account, a class has been planned in which prior knowledge is accompanied by some activities at home with the Parents contextualized in their crops and group and individual presentation work that they have already been working on in class, will allow students today to carry out identification exercises, collaborative work with concrete material and group activities that will strengthen prior knowledge, role assignment, responsible time management and socialization in the final class work. The evaluation of this pedagogical practice includes collaborative and interactive work, developing active participation, culminating in a co-evaluation of the activity. We also proceed to work on a group sheet that will be reviewed by the teacher and placed on a bulletin board, where I will analyze the progress and difficulties encountered in knowing if I continue with the work plan or should do reinforcement.

Problems

Students, finding themselves developing their social relationships in a rural environment, are permeated by agricultural activity, whether on a production scale or by subsistence cultivation, the general problem lies in that the connection of crops with climatological variables is not sufficient to guarantee optimum production levels; by understanding the behavior of climatic variables (atmospheric pressure, wind direction, rainfall and temperature) that affect crops; They can make decisions that will allow greater production per square meter of land to be achieved, which will result in greater income for peasant families, improving quality of life conditions.

Objectives

- Identify the needs and formulate the research question: (Planning phase) when identifying needs and formulating the research question, it is necessary to immediately determine the ideal tools to meet this objective.
- Collect information on climatological variables: (Implementation phase) fieldwork begins with the collection of information through mobile applications.
- Systematization and analysis of information: (Analysis phase) the information collected during the school year is tabulated, systematized, analyzed and socialized.

Key Data

Funding of the project	The financing of the project is achieved with resources from teachers, students and parents of the students. Alliances are being managed with the Colombian ministry of education and private companies to bring the project to all rural institutions in the city of Pereira.
Target Groups and Percentage	Children at the age of basic education - 20%
Age range or Grade Level and Percentage	Secondary school level - 80% Higher education level - 20%
Total number of beneficiaries	100

Key Activities

The development of the experience is based on specific objectives, covering the planning, implementation and analysis phases:

Planning

The development process begins by identifying the main need related to the classroom project, which is based on increasing the productivity of crops in relation to climatic variables. For this purpose, the problem tree methodology was used.

Afterwards, the students formulate the research question, which is the basis of the project and which justifies the tools to be used, the students, in an inquiry process assisted by the teachers, determine the possible mobile applications that best fit their needs. answer the research question and the context of the educational institution. (School garden).

To develop this classroom experience, the areas of social sciences and foreign language will participate; which will make their contributions to the results obtained during the course of the experience. This planning phase took place during the month of January and the first week of February of each year.

Implementation

The information on the variables is collected using mobile applications, which were used as follows:

- Measuring wind direction: using the DIGITAL COMPASS application from Axiomatic Inc., a rudimentary weather vane is placed in an open area of the school garden, students determine the direction of the wind and compile the information in the log at the beginning and end of the school day.
- Atmospheric pressure measurement: The exa tools BAROMETER application is used, the results are compiled in the log at the beginning and end of the school day. Measurement is collected in hPa (hectopascals).
- Ambient temperature measurement: The TERMOMETRO ++ application from singular programs uab is used, the results are compiled in the log at the beginning and end of the school day. The measurement is collected in degrees Celsius.
- Rainfall measurement: The PLUVIOMETRO application is used, developed by desdelosalvaje, for the measurements we used a container which was adjusted to the measurement of half a square meter of land, the results are compiled in the log at the beginning and end of the day school in cubic millimetres.

Systematization and analysis of information

In this final phase, the information is tabulated using the Excel tool, the use of learning related to the collection and analysis of information from statistics is visualized.

With the information already in the Excel platform, formulas are used to determine measures of central tendency of the information, maximums, minimums, trends and analysis of statistical graphs, to finally develop a report of conclusions.

The areas that complement the classroom project use this final report to carry out activities from the social sciences (empowerment of the territory, history, geography and reading comprehension) and from a foreign language (through the translation of the contents of the report into English), grammatical structures, among others).

Impacts and results of classroom practice

Improvement of learning by students, as they appropriate statistical skills through daily practice and use of mobile applications. The students had not been immersed in a process where they were the protagonists and generators of learning; learning, when going through the daily dynamics of the classroom, becomes easily assimilated.

Specifically, learning improved in the following way (statistics):

- Interpret the data represented in different tables and graphics: Improvement in the information interpretation processes
- Use graphical or numerical strategies to find measures of central tendency of a set of grouped data: Students can use numerical strategies to determine measures of central tendency
- Describe the behavior of the data using measures of central tendency and the range: Students can describe the behavior of the data using measures of central tendency and range
- Recognize how the measures of central tendency and the range vary when the data vary: They recognize how trends are generated with the variation of data of the measures of central tendency and the range.

It is also important to highlight in the dynamics, the participation of the areas of social sciences and English, contributing their skills to the final statistical report.

Changes generated in the environment: Knowledge in some cases is transferred to the agents of the educational community through the students; the classroom project encourages measurements to be taken at home or in the community; generating an impact on agricultural practices in the environment and promoting greater productivity in crops.

Changes in the community: Through the impacts generated by the project, improvements can be generated in the quality of life of the community, since taking into account the knowledge of climatological variables, these can be applied to the crops in the homes of students, which will result in greater production per square meter, generating surplus agricultural production that can be sold in the market or used for self-consumption.

Awards and Honors

- Winning experience in the ICT training program for Colombian teachers in Seoul, Korea in 2022. ICT training was developed in the city of Incheon, South Korea in the month of October 2022.
- Experience recognized on the night of the best years 2022, sponsored by the secretary of education of Pereira.

Measures to Ensure Equality and Effectiveness

Equality and efficiency of the project are relevant aspects in the development of the classroom project, for which the following strategies are developed gender approach: the participation of women in the project is relevant, standing at approximately 62% of the students.

Student inclusion: we also guarantee the active participation in all stages of the project of students

with psychosocial diagnoses such as attention deficit disorder and learning difficulties.

Continuous measurement taking: when referring to the effectiveness aspects of the experience, by 2023 the number of daily measurements will increase by 100%, guaranteeing more precise statistical results.

Systematization: it is worth highlighting that systematization is done through the preparation of statistical reports and the development of multimedia projects with dissemination on social networks.

Measures to Ensure the Sustainability

The educational project for agricultural strengthening through technological applications must be designed with a comprehensive strategy that ensures the sustainability of its results and impacts over time. The main measures that could be implemented are described below:

Adaptation of the institutional educational project: The educational project is the school's roadmap and in this project work is proposed as an integrative basis for skills and knowledge, using multiple methodologies such as problem-based learning.

Transversal work with areas: Manage to strengthen the project with the areas of natural sciences, foreign language and physical education.

Dissemination: Taking advantage of social networks to disseminate experiences to the public of the educational institution.

Active participation of local communities: Involving local communities from the beginning of the project is crucial. This ensures that the proposed solutions are relevant and adapted to the specific needs and contexts of each region.

Promotion of research and development: The project must stimulate research and development in the agricultural field, promoting the adoption of innovative technologies and practices that improve productivity and long-term sustainability.

ABP PROJECT: WEATHER APPS FOR CROP MANAGEMENT

September 16, 2023

https://edulabcolombia.blogspot.com/2023/09/proyecto-abp-apps-meteorologicas-para.html

Future Plan

The project can have a significant impact on long-term sustainability. Here we detail how technologies can contribute to the sustainability of the project's results and impact:

Access to updated information: Technology applications allow access to up-to-date information on agricultural practices, weather conditions and more. This ensures that students are up to date with the latest developments and can adapt their methods accordingly.

Resource optimization: Agricultural technologies, such as automated irrigation systems, soil moisture sensors and drones, help optimize the use of resources such as water, fertilizers and energy. This leads to more efficient and sustainable agriculture.

Climate monitoring and weather predictions: Weather applications and forecasting systems provide vital information for making agricultural decisions, such as when to plant, water or harvest. This helps minimize risks related to adverse weather events.

Automation and smart machinery: Agricultural automation through technologies such as autonomous tractors and cloud-connected equipment can improve efficiency and reduce fuel consumption and greenhouse gas emissions.

SHAD Educational Application

Country
Iran

Organizer
Ministry of Education of the I. R. of Iran

Duration
over 3 years

Abstract of the Implementing Organization or Individual

With the spread of the COVID-19 pandemic, all face-to-face activities were suspended for a while in Iran, like all over the world. All citizens were prohibited from passing and home quarantine was implemented for everyone. In these days, the issue of continuing the education of children and teenagers in schools was placed as the priority in the list of necessary measures on the agenda of the governments, and it was at this time that in Iran, SHAD application as a school as wide as Iran for all Iranian students was born on Iran's first mobile operator's ready infrastructure platform. SHAD is Iran's largest educational application and has been installed more than 39 million times. This application covers nearly 80% of Iran's student population so that they can continue their educational and training activities without any problems. The geographical coverage of SHAD application is national.

Problems and Objectives

The production of a national educational application entailed various challenges, including the need for sufficient and stable infrastructures, as well as the authentication of school staff and students for optimal use of special accesses and various facilities. At the beginning of registration in Shad, user information is searched in the education database and users are identified in 3 groups: student, teacher and principal. Then each group is provided with specific facilities and access. During the Corona pandemic, more than 12 million students, 600 thousand teachers and over 100 thousand principals have been authenticated in SHAD.

During three years, by providing the necessary infrastructure, Shad has brought the possibility of exchanging 87 billion messages and 21 billion files to its users.

Key Activities

In order to provide an environment where the education process can be provided for the students so that they can follow their curricula in the best way, SHAD uses various facilities and tools as follows:

Basic educational services are the base of this application, which provides the possibility to create groups and channels, voice chats and lives broadcasts, in addition, by providing additional facilities such as surveys, sample teaching presentations and a QR code reader, virtual education is facilitated.

Voice chat

In SHAD Shad, you can create groups and channels, and it is possible to have voice conversations in groups and channels. In addition to establishing communication between Iranian school staff and students, this service also provides the possibility of holding virtual audio classes.

Live Broadcast

This service provides live video communication in channels and groups and provides the possibility of reviewing lessons and holding meetings for Iranian school students; holding meetings to review lessons is

Key Data

Funding of the project	Considering the social responsibility of the government for educating all Iranian students, all basic services of SHAD are provided free of charge to its users. Since there are more than 9 million daily active users in SHAD application, a space has been prepared for educational services to operate in the form of additional services and all educationists in the country, including educational service providers and content producers, are able to deliver their products to the audience through this network.
Target groups and percentage	Children at the age of basic education - 50% Young people - 20% Adults - 30% Women/girls - 49%
Age range or Grade level and percentage	Primary school level - 59% Secondary school level - 24% Higher educational level - 17%
Total number of beneficiaries	All students, school staff and students' parents.

one of the most frequent uses of this program. Live broadcast provides the possibility of presenting a one-way presentation to an unlimited audience, and after completion, it is available to users to review.

Virtual class

The virtual class service provides two-way interaction and more for the teacher and student by using the virtual whiteboard, the possibility of file and screen sharing, and the possibility of taking tests and polls during the class.

Free sample teaching

In line with the development of access to quality teaching, the sample teaching service provides high-quality and free education for all students.

QR code reader

With this possibility, students can access the books and content introduced by the Ministry of Education by scanning the QR code.

Learning management system

In addition to the basic educational services, the learning management system, just like the classroom, SHAD provides everything that teachers and students need in the classroom for teaching and learning. There is the possibility of conducting multiple tests and descriptive tests, presenting and receiving assignments and class work and providing feedback to students, student rule call. Teacher's notebook for recording educational, disciplinary and curricular points is also provided in this system.

Survey

With the possibility of anonymous polling or user identification, the teacher can vote on a topic or question in the class and get feedback from students.

Shadino

Due to the growing popularity and applications of image-based social networks, Shadino has been provided to SHAD users as a safe platform for sharing images and videos. Also, since the main users of this application are mostly students and are in the age range of children and teenagers, the production and presentation of clean and safe content are done seriously by using artificial intelligence tools to

monitor the content and an exclusive secure web browsing service for students are followed by the name of "Shadbin".

Measures to Ensure the Sustainability

At the peak of the Corona pandemic, SHAD hosted more than 3 million users e, providing uninterrupted and uninterrupted services. This indicates the provision of services to users without technical problems. Also, the maximum number of 12 million daily active users and 20 million monthly active users has been recorded in SHAD. Currently, there are 9 million daily users and 17 million monthly active users in SHAD.

SHAD using the existing infrastructure and technical team without the need for excessive investments by increasing the features with the aim of increasing the quality and efficiency of the platform. Including the presentation of 360-degree portfolio, planning and consulting office, etc., it is continuously developing.

SHAD efficiency has now been developed compared to the original goal, and schools, teachers and students can benefit from various educational methods such as blended learning, reverse learning, and the benefits of virtual education by using a set of these facilities.

SHAD's plans for the future are to create a Farsi school for those interested all over the world, to create a foreign language school, etc., so that it can develop the range of audiences and be used in other educational fields all over the world.

GENIE: Integration of Digital Technologies in the Moroccan Education System

Country
Morocco

Organizer
Ministry of National Education and Vocational Training, Higher Education and Scientific Research, Morocco

Date started
2005

Summary

Launched in Morocco by His Majesty King Mohamed VI in 2005, the Programme de Généralisation des Technologies de l´ Information et de la Communication pour l´ Enseignement (Generalization of Information and Communication Technologies in Education and Teaching, or GENIE) is implemented by the Ministry of National Education and Vocational Training, Higher Education and Scientific Research.

It aims to integrate digital technologies universally into primary and secondary schooling in order to improve the quality of, and access to, education. The programme covers all aspects of the national curriculum, but is especially focused on STEM subjects in four languages, namely Arabic, Amazigh, French and English.

GENIE is built around four complementary objectives to:

- equip all schools and training centres with multimedia environments, and connect them to the internet;
- provide all schools with digital pedagogical resources in line with national curricula;
- train school directors, inspectors and teachers; and
- improve the utilization of digital technologies by Moroccan educational stakeholders through awareness, information, support, monitoring and evaluation.

GENIE was initiated in pursuit of outcomes such as educational access, equity and lifelong learning for allstudents and teachers at all levels within the public school system through the use of digital technologies. Through the implementation of these far-reaching reforms, the Moroccan Government seeks to lay a foundation for economic and social progress, and to progressively realize the construction of a knowledge society.

GENIE‘s features:

- It involves a large-scale national policy for digital technologies with the potential to promote significant changes in the educational system in Morocco.
- It provides a national online platform1 with multilingual digital educational resources.
- The programme is transformative, changing the role of teachers and learners in the classroom, and demonstrates sound implementation strategies, including multistakeholder partnerships and a focus on teachers and initial teacher training.

Programme

Theme	The use of ICTs to increase access to quality education
Beneficiaries	Primary and secondary school learners in approximately 11,000 schools (10,000+ schools across the country; more than 6 million primary and secondary school learners; 300,000+educators/teachers and school administrators)
Target population	National primary and secondary education, including teachers and learners
Problem	With school enrolment rates rising rapidly, the Government of Morocco faced the challenge of improving and extending educational outcomes in the digital era, and increasing the quality of teaching and learning as well as equity across rural and urban settings.
Solution	The GENIE programme is a systemic educational intervention to equip all learners with 21st century skills through the provision of safe internet access and digital content for all subjects; the training and certification of teachers in using digital technologies for teaching and learning; and open access to a digital platform with learning software and resources for learners, teachers and administrators.
Resources required	• Government collaboration and political will • Efficient and well-serviced digital systems with secure and reliable internet connectivity • Initial and continuing teacher training to enhance pedagogy through the integration of digital technology into the classroom • Engaging and up-to-date digital curriculum resources for all subjects • Buy-in and motivation to use the system among teachers and learners
Results	• 2,838 schools and 173 training centres equipped with multimedia classrooms and internet • 230,000 digital resource kits distributed • 5,000 educators received a certificate recognizing their professional development in the use of digital technologies for education • Approximately 7 million students subscribed to the national teaching and learning portal • 8,973 OERs distributed • Improved awareness of internet safety and a positive impact on the national digital culture
Challenges	• Difficulties with infrastructure, equipment maintenance and connectivity, especially in remote rural areas • The need to provide greater access to digital technologies in communities, including individual devices for teachers and access outside of school time for students • The challenge of increasing teachers' pedagogical motivation to keep up to date with developments

Digital Solution

The GENIE programme's digital solution consists of a comprehensive and enabling architecture to support the distribution, use and integration of digital technologies and resources in the public school system.

First, a diversified range of equipment was supplied to schools, tailored according to the type of establishment. Options include multimedia classrooms, interactive white boards, and tablets. Schools are connected to the internet through 3G, ADSL and Wimas, and in rural areas, satellite connections are utilized.

Second, an open national platform[1] was established for general usage throughout the Moroccan education system. The portal houses digital resources that are categorized through the Drupal open-source content management system (CMS). On the platform, free reusable units or modules are available to teachers and learners for use in the classroom.

The portal also has five principal spaces to support digital innovation, integration within schools, and the other key functional areas of the GENIE programme, particularly skills and knowledge acquisition by students and teachers:

- The first space focuses on the diffusion of national, regional and international news items related to the use of digital technologys for teaching and learning.

- The second space contains more than 1,000 online resources acquired by MENFP and developed by educational actors through various competitions to innovate and showcase the use of digital technologies for subjects within the national curriculum. This space is curated by the National Laboratory for Digital Resources.

- The third space is dedicated to reinforcing learning outside of the classroom through the TelmidTICE[2] project, which includes game-based applications targeted to all grade levels.

- The fourth space holds training modules on the use of digital technologies for education. Two types of training are supported with distance modules and courses accessible through the GENIE MOOC. The courses and applications are open-source and developed using CMS solutions such as Moodle and Canvas.

- The fifth space is for collaboration, communication, and sharing and exchanging ideas on topics related to the use of digital technologies in education and best practices in pedagogy.

1 See www.taalimtice.ma
2 See www.taalimtice/telmidtice.ma

PHASE	PHASE 1:	PHASE 2:	PHASE 3:
PERIOD	2005–2008	2009–2013	2014–2030
MAIN FOCUS	Introduce digital technologies into all public schools	The government's urgent plan of action for education reform	National vision 2015–2030 for education, training and scientific research reform
THEMES	• Infrastructure • Training • Pedagogical content	• Teachers' learning and professionalism • Appropriation of digital technologies by learners • Connectivity • Sustainable budgeting	• Quality education for all • Equity and equal opportunity • Promotion of the individual and society • Efficient leadership

Results

Following a phased approach to equip schools with digital infrastructure, by 2017 a total of 10,928 institutions were connected to the internet and 87 per cent had basic multimedia environments for teaching, learning and training purposes. In 2020, training centres and schools that were not yet equipped with infrastructure and connectivity received through a new finance law an allocation of MAD 121 million (approximately US$13 million) to remedy these gaps.

By 2019, approximately 230,000 kits with DVDs containing digital resources and information were distributed by ONUTICE to teachers, and regular updates and additions were subsequently posted to the TICE portal. Six hundred inspectors were trained to use the digital resources that had been developed and/ or acquired to support their monitoring role. Due to the MENFP's training strategy, 100 per cent of teachers had achieved the minimum qualification necessary to teach at their respective levels, and 5,000 educators had received the professional development certificate through the TICE platform.

With respect to OERs and content, by 2019 the digital material available for learners on the open platform was fully compliant with the national curriculum for all subjects. At the time of writing, there are approximately 7 million students subscribed to the national teaching and learning portal.

The 2009 study by Al Akhawayn University found that the provision of equipment and connectivity alone was insufficient for guaranteeing the effective and optimal use of technologies in the classroom because this does not address teachers' motivation and understanding of the value of the technologies for different subject areas. To shift pedagogical practice in the right direction, it is necessary for teachers to see themselves as lifelong learners and classroom facilitators. Communication and collaboration through online forums and email groups emerged as a useful practice to help teachers make this transition. The study also found that learners were generally more open than teachers to the introduction of new technologies, and highly motivated to use them, especially when time for play and exploration was allowed. A consequence of their increased interest and participation was a reduction in school absenteeism and stronger outcomes in the sciences.

Looma Education Project

Country
Nepal

Organizer
Educational Resource and Development Center Nepal (ERDCN)

Date started
2020

An Innovative Project

Relevance to the latest developments in education in the 21st century

Looma combines cutting-edge technology with best practices to:

- display A/V material (especially in offline schools). With a projector, sound, computer, textbooks, library, games (for review), Looma serves a classroom with “active learning”. Internet is not needed. All content is inside, and instantly available. Students may use Looma on tablet or mobile and download e-books and other content.
- link resources and lesson plans to chapters. The media library is keyword-searchable.
- create a lively, attractive, interactive interface for students. There are many gamified exercises, activities to learn team skills, full motion videos, TTS (Looma reads text out loud).
- adapt readily to online/individual use in Nepal and by the Nepali diaspora.

Meeting SDG 4: inclusive/equitable education and lifelong learning opportunities

Just as tablets and mobiles perform many tasks, Looma is a multifunctional education-delivery platform. User-friendly Looma applications are being considered for visually impaired students, for local telemedicine/health sites, for adult education in literacy, agriculture…).

Usefulness for UNESCO Member States in the Asia-Pacific region

https://learning.cehrd.edu.np/home
Nepal adopted Looma’s online system for distance-learning.

https://india.looma.website/home
An India Looma group is organizing.

Educational Innovations for Learning Recovery

Looma’s novel on and offline computer-based content, UI systems, and opportunity for teacher and student engagement offer “recovery” from systemic resource inequality, outmoded ‘lecture and test’ practice; and resiliency to cope with disturbances (climate, Covid…).

Timeliness

Looma’s system has four parts: hardware, software, content, and pedagogy. All are available in a Creative Commons Attribution-Non-Commercial-ShareAlike 4.0 International License. Improvements by any licensee are to be shared among all licensees.

In 2012 a Dartmouth senior engineering team was asked to design a solution. Other college teams, hundreds of students, many teachers and content suppliers, Rotary and numerous INGOs, Nepal’s government, and generous donors volunteered and donated. Field trials in Nepal gathered useful ideas. ERDCN played a key role.

In 2020 Nepal’s Looma schools closed. Teachers who knew Looma asked how to use it online with Zoom. ERDCN trained them and they resumed teaching. They told their friends. Many more were trained, and soon the government adopted the Looma system for online education in Nepal.
In Andhra Pradesh, Rotary and other donors have introduced https://india.looma.website/home.
With local encouragement, plans are being made to bring the system to India’s remote schools.

Effectiveness

Looma is a universal interactive multiuser delivery platform. A study of Looma's effectiveness, with pre and post-assessments in control and intervention schools in Nepal is ongoing (Jan '23-Apr '25).

In 2019-20, an impact study was conducted of Looma's first year in Nepal (shortened by Covid). Among the results: Looma schools moved from 2% of A grades at the beginning to 19% at the end; control schools moved from 4% to 7%. Looma students performed better in language and science and significantly better in math than control students.

Notable comments: Looma reduced the "absenteeism of teachers"; made e-textbooks available on time; provided effective A/V material; enabled teachers to customize lessons; offered additional resources; runs on solar; and has content that is free and available for everyone.

What new ways can any student learn or be taught?

- Easily access, search and see thousands of new, engaging and inspiring videos, reports…
- Experiment with simulations in virtual mechanical, electronic and chemistry labs.
- Download on a mobile and take home texts, videos, photos or other resources to study or share.
- Engage in gamified reviews and team competitions in English vocabulary, math…
- Explore Wikipedia, astronomy wonders, children's stories, English phonics…

Beneficiaries and Impacts

The LEP is the first and for now, the only affordable 'education' system serving both online students and schools that lack basic resources: power, Internet, timely delivery of textbooks, tablets… It's available for any country—adopted for Nepal's distance learning program in 2021 and now scaling in classrooms. India will shortly take the same step. The initial beneficiaries are students and teachers in field-trial schools. As access grows on- and offline, and as on-board applications expand, beneficiary groups and numbers will increase. Nepal has nearly 7 million grade-school-age citizens.

Short-term Looma makes learning easier, more accessible, more meaningful, and both personal and collaborative skills easier to learn, and practice. Longer term this will bring Nepal's population closer to having the talents needed for greater welfare. There are many improvements coming to Looma that will further enhance its utility and impact.

The LEP has received overwhelming praise from governments, schools, parents, teachers, and most importantly from the students. Teachers find the customizing option and resources helpful in planning lessons and helping students understand the content. The user-friendly design enables students to set the pace of their learning.

Inclusion

The LEP offers to Nepal's government and people a very useful and important tool with which to "mitigate" individual and group obstacles. This means: to offer not only equal access to a universal, quality education. It also means: providing specialized assistance to help disadvantaged individuals and groups share more equitably in the benefits and responsibilities of their country.

What are local, free 'specialized assistance' resources that LEP can deliver online or in-school?

- Stories of Nepalese of all ages, classes, ethnicities, genders and locales building their nation.
- Adult A/V lessons in literacy, conflict resolution, democracy, vocational specialties…
- Interesting 'gamified' software to lift vocabulary, speaking and writing skills.
- Smart demos and exercises on how to use (for students) or teach with Looma.
- Closed captions and/or voiceovers for videos to broaden access in Nepali and other languages.
- Specialized browsing tools for vision-impaired users.
- Software and tools to enable use of Looma for remote telemedicine.

Engagement of Stakeholders and Partners

The LEP engages diverse stakeholders and partners. Official contacts include Nepal's Ministry of Education, [Center for Education and Human Resource Development (CEHRD manages 30,000 schools, Curriculum Development Center (CDC) creates the curriculum], provincial and district leaders, school administrators, and school authorities. The Peace Corps (PC) staff in Nepal have shown great interest in Looma. For PC Volunteers who will teach in Nepali schools, Looma can be a valuable tool.

Following the original Dartmouth engineers, student teams from Colorado's School of Mines, Santa Clara University, Stanford and UC San Diego have helped. Rotary clubs in California, Nepal and Andhra Pradesh are committed supporters. The UMN (United Mission to Nepal) organized early field trials, WeShareSolar provided power systems, and INGOs dZi Foundation, EduTech, German Nepalese Help Association (GNHA) and Menschen in Dialog will be among the first to put Loomas in schools. Nepal's firms Neoteric and Gham Power and Bangladesh's E-technologic are providing key business and technology support.

The LOOMA global team led the project, coordinating the work of over 400 volunteers including US teachers who equipped Looma with an "active learning" philosophy and engaging lesson plans.

Originality

Looma device 'checks the "box"' of originality. In fact, it is beyond original. It is unique – there is no other device like it. If you have read this application to this point, you already know its components (form) and capabilities (function). This skillful adaptation of form and function, to serve the educational needs of rural schools in Nepal and elsewhere, has produced the truly original Looma Education Project.

Looma is designed for children and adults who struggle to access quality education. Textbooks are preloaded on Looma, available from day one—no waiting for months. Looma creates a suitable classroom learning environment with materials developed by Nepal's Government and other relevant platforms. The system is child- and teacher-friendly, easily managed in a classroom having only 50 watts of solar electricity

Sustainability, Scalability and Replicability

Looma was designed by its founders, David Sowerwine and Skip Stritter, to fill a critical gap: neither mobile phones nor individual tablets/laptops make suitable platforms for educational materials in the world's low-resourced offline classroom.

By 2012 low-power LED projectors, fast, inexpensive computers, and huge memory chips made shared (one system for a full classroom) A/V education practical. But no device integrating those features with good content and software existed. A ten-year design, test, and redesign process began.

Nepal welcomed the challenge. Not only Looma has demonstrated that it meets the needs of Nepal's offline classrooms, but there is an unexpected and valuable surprise: the dynamics of Looma's 'full classroom' environment appeal to online schools (using a projector or smart board) as well.

This innovation is being scaled throughout Nepal's schools, online where financially and technically practical, offline elsewhere. The entire package (hardware, software, OER content and new insights) is available for replication in other countries. As national curricula evolve, and new resources (including e-libraries) become available, they are easily added, and the base becomes stronger.

Educational E-learning Resources Uncovered

Country
Russia

Organizer
Eight leading Russian universities (National Open Education Platform)

Date started
2015 (National Open Education Platform)

In 2011, Russia implemented a federal standard governing educational Information and Communication Technology (ICT) and electronic learning resources. The intention was to introduce greater consistency by outlining general classification and organizational requirements for this educational domain. However, the standard fell short of providing a well-defined and unambiguous framework, resulting in a lack of uniformity in the development of enhanced ICT resource quality and compatibility. Consequently, the Russian market for ICT learning tools has been evolving haphazardly, characterized by an overwhelming supply of arbitrary offerings. This absence of clear guidelines places the responsibility on educators to independently evaluate and select ICT tools that best suit their specific educational contexts. This situation is perceived as a significant drawback to the quality of national teaching practices and overall learning outcomes. Attention may be drawn to a number of examples:

1. Dnevnik.ru

United Learning Management Systems (LMS) Dnevnik.ru is being adopted by schools nationwide, representing the largest educational school management system project in Russia. It is connected to over 6 million users and 27,000 schools, encompassing more than half of all schools in the Russian Federation. Notably, Dnevnik.ru is a commercial product, developed without direct government involvement. Despite this, the government introduced the LMS into the education market, illustrating an effective public–private partnership.

2. Online learning space Znanika

Znanika, an online learning space, provides essential tools and algorithms for student assessment and competition. With 1.5 million users and 145 thousand registered teachers, Znanika accommodates each teacher's distinctive approach to a blend of student-driven learning and teacher-led instruction. The platform is commonly utilized for student competitions, particularly in mathematics and science, as well as for evaluating the overall quality of education.

3. AI Applications

The popularity of artificial intelligence in education is evident through ten increasingly favored applications. Notably, online chatbots are a prevalent example. A Russian language chatbot has been designed to enhance communication skills and aid foreign students in learning the Russian language. Another application, Mendeley, serves as a chatbot for memorizing the periodic table and acquiring knowledge about chemical elements. Both services were showcased at the National Education Innovation Competition (KIVO), a collaborative project between the Institute of Education HSE and the Rybakov Fund aimed at supporting grassroots innovations in learning and development.

4. National Open Education Platform

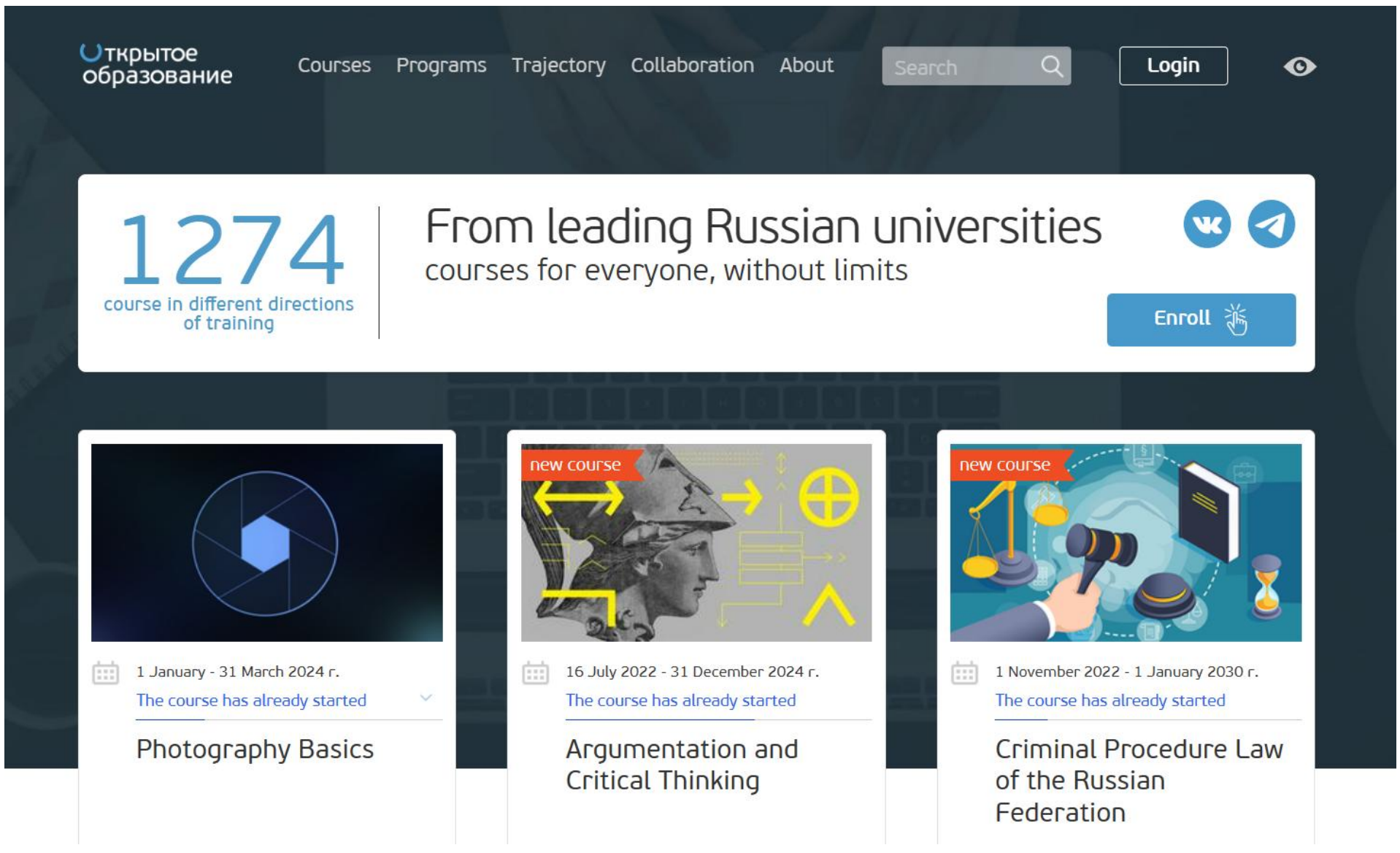
Within the transformative landscape of Russian learning and development, the emergence of Massive Open Online Courses (MOOCs) stands out as a significant ICT milestone. In 2015, following the establishment of the Council for Open Education in

late 2014, initiated by the Russian Ministry of Education and Science, eight leading Russian universities embarked on creating the National Open Education Platform (NOEP). The Council included representatives from these universities, along with officials from Russia's Federal Service for Education and Science Supervision and the Ministry of Education and Science. To facilitate the development and operation of NOEP, a Project Association was formed in April 2015, comprising the participating institutions mentioned above.

The NOEP initiative, aimed at establishing a comprehensive and globally competitive e-learning platform based in Russia, encompasses a broad and diversified agenda, highlighting the following key objectives:

- Publication of Online Courses: The project focuses on publishing online courses developed by members of the Association.
- Global Best Practices: It involves monitoring global best practices and facilitating the adoption of international standards within the educational domain.
- Quality Standards: The NOEP project is dedicated to formulating and advancing quality standards for online courses.
- Collaborative Partnerships: Collaboration with providers of higher educational programs and the pursuit of broader multi-stakeholder partnerships are key components of the agenda.

Currently, the NOEP Project Association has grown to include 17 member universities. The collaborative MOOC platform has successfully launched over 250 certified online courses. This initiative has significant policy and practice implications, notably witnessing the integration of individual MOOCs into official coursework at various levels of Russia's vocational education and training institutions. Students can redeem MOOC pass certificates for credits in respective subjects. In terms of ensuring quality training and recognizing educational outcomes, the NOEP platform offers comprehensive functionality. This includes secure student authentication, an advanced academic tracking and monitoring system providing a detailed overview of learners' attempted and completed credits, as well as evaluations and test scores. Furthermore, it facilitates engagement by authorized third parties in the learning process, offering additional resources, overseeing the evaluation process, and more.



DP Education with Free Quality Digital Learning

Country
Sri Lanka

Organizer
Dhammika and Priscilla Perera Foundation

Date started
2019

An Innovative Project

DP Education delivers free and open digital content over 60 subjects with video recording hours exceeding 17,000. Its content is available in Sinhala, Tamil and English languages, developed by the island's best teachers, university academia and industry experts. Regardless of demographic and socio-economic status, anyone can access the YouTube channels of DP Education to learn.

The reach spans over 150million YouTube views with a watch time of 790million minutes. Sri Lanka, Indonesia, India, Singapore and Australia have reported high engagement.

Since March 2020, COVID-19 school closure was nearly for two years. 4.2million school students lost immediate access to education with nearly 10billion learning loss hours. The fuel crisis and teacher strikes escalated the loss. During the said crises, DP Education was the only solution to access free quality digital education. Since it can be revisited, no one is left behind in the learning loss recovery.

This enables self-directed learning that improves time, self-management, research and critical thinking skills. Furthermore, digital literacy and competency skills are improved by knowing how to access websites, app and social media. This exposes users to become confident and responsible in the use and engagement with digital technologies for learning, working and participation in society.

Timeliness

DP Education was launched on 18th of October 2019. All main digital video lessons, over 16,700 are uploaded to YouTube and the website. This innovation will continuously expand its digital content to recover and accelerate learning.

When COVID-19 and economic crises hit Sri Lanka, a learning loss occurred that led to losses in future economic opportunities. DP Education is resiliently active from October 2019, and addressed the issues that hindered human capability development.

Issues	Timely response
Inequitable access to quality education	Availability of free digital content for the full school curriculum from grades 1 to 13, including Mathematics Science & English subjects. This supported the school students who faced immediate loss of learning.
Poor exam pass rates for STEM subjects	Online live classes, revision, past and model paper discussions were conducted.
Lack of awareness and fewer mediums to learn good health habits	Video series on pregnancy awareness and Covid prevention.

Effectiveness

Challenge 1 Inequality in education and access to digital tools

DP Education's Contribution:

- 1.4million students are accessing free digital content on all school subjects.
- Donates smart TVs to 1,500 schools and 750 religious institutions. Over 1million students, monks and teachers receive undisrupted access to learning.
- All digital content is created and taught by subjects' best teachers. Schools that have a shortage of qualified teachers and in rural areas that lack teachers, access the content. A/L examination island's first rankers benefited from the content.
- 1,000 preschool developments by providing educational toys and furniture for classrooms.

Challenge 2 Low language proficiency skills of migrants

DP Education's Contribution:

- Skill migration workforce having low affordability for IELTS and Japanese language tuition are benefiting from DP IELTS lessons, Artificial Intelligence assisted free online test-feedback system and DP Japanese language YouTube channel.No free access to recognised higher studies
- With University of Moratuwa, launched free Trainee Full Stack Developer course with over 155,000 enrolments.
- With University of Kelaniya, curriculum development is in progress for free Enterprise Resource Planning course. Lack of priority in social-emotional learning
- DP Education's Skills for Life and Public Health videos assist in developing one's cognitive skills and social-emotional health.

Beneficiaries and Impacts

Students (Number: 5,995,205)

Short-term benefits:

- Improve social emotional competence and responsible decision-making skills
- Produce qualified students in NVQ Levels 3 & 4 in vocational education
- Learning recovery
- Produce STREAM qualified student population
- Produce 1 million young coders, inclusive of 500,000 girls
- Foster employability skills

Long-term impacts:

- Holistic citizen
- Decrease unskilled labour
- Increase income in foreign remittances with high skilled migration
- Increase lifetime earnings from economic opportunities
- Increase economic productivity in the country
- Job generation in ICT sector with high GDP contribution in ICT-related export services
- Increase GDP per capita income to become a developed nation

Teachers (Number: 60,412)

Short-term benefits:

- Recover teaching loss hours
- Produce well-trained teachers earning an extra income by using the digital content
- Tech-savvy teachers

Long-term impacts:

- Produce competent students
- High money circulation in the economy
- Adaptable, digitally literate workforce

Civil Servants (Number: 1,600)

Short-term benefits:

- Improved proficiency in languages
- Soft skill improvement

Long-term impacts:

- Confident government workforce
- Citizen-centric public service delivery

Community Members (Number: 600)

Short-term benefits:

- Informed decision makers

Long-term impacts:

- Health-led economic growth

Parents (Number: 6,000,000)

Short-term benefits:

- Children are not left behind in accessing quality education
- Tech-savvy parents

Long-term impacts:

- Children employed as high-wage earners
- Decrease disparity in wealth distribution
- Digitally literateand adaptable older generation

DP Education's global digital reach is over 35 million users across 170 countries including regions such as; Asia-Pacific, Europe, Middle-East and Africa with highest engagement reported from Singapore, Indonesia, India, USA.

Inclusion

To cater the 24% Tamil speaking minority, DP Education's specific digital content are on,

- Grades 1 to 13 subjects
- Kids' Math, Science, and Arts and Crafts
- Coding
- Teaching English in Tamil

In addition, DP Education's digital content is available in all three languages. Views across YouTube channels are over,

- 70million – Sinhala
- 10million – English
- 9million - Tamil

For 17,000 Buddhist clergy and laypeople, DP Education Piriven and Pracheena Adyapanaya and Daham Pasala digital content are created. This community also lacks access to technology and faces affordability challenges. Thus, smart TVs with Wi-Fi routers are being donated.

For 100 selected community centers with computer labs, free internet connection will be given to encourage coding.

Students who are disadvantaged due to poverty, can access content through three TV channels.

Specially, school dropouts and OL/AL failed students, benefit from DP Education Skills for Life with its vocational education.

DP Education is open for anyone with disabilities to access and learn. Also, learners with disabilities can access ICT programs remotely and receive digital certificates.

Originality

Features

1. Equitable access to free, quality open education
   - Availability in Sinhala, Tamil & English languages
   - Undisrupted digital content availability on SriLankan school curriculum
   - Virtual lab practical videos for AL Physics
   - Japanese language and IELTS preparation lessons
   - Sri Lanka's first free digital IT course
   - Live classes/online exams/seminar-series for OL/AL/Grade 5 students
2. Digital Tools Usage
   - Math & Coding teachers on Zoom/WhatsApp toanswer queries
   - IELTS Smart Tests
3. Sri Lanka's first free digital availability ofBuddhist studies
4. Sri Lanka's first free online coding subject
5. Access to code.org and ABCMouse.com
6. No advertisements across platforms, includingYouTube
7. Smart classroom donations

Sustainability, Scalability and Replicability

Sustainability

- On YouTube, digital content is available for free for anyone at any time to revisit and download the videos for their learning. Therefore, the development of human capability will retain and recur.
- Recognise the audience's digital learning requirements through group discussions and cater the most requested subjects.

Scalability

- Develop and build people within the Foundation setting a scalable culture, since the team is the core drivers in creating the impact.
- Scale alliance with notable digital education providers to access their content and use the same content on DP Education.
- DP Education will increase its reach by connecting with more audiences using the existing digital content by sharing success stories.

Replicability

- DP Education's digital content is open for anyone to access and any institution and stakeholder can utilise our content at their convenience.
- DP Education will partner with other INGOs across regions to share the content as it is, since most of them are available in English/Tamil languages.
- Finally, the current active audience of DP Education can start their mini digital learning networks and replicate their learnings with potential partners.

Engagement of Stakeholders and Partners

Stakeholder/Partner	Involvement	Contribution
Government Universities	To produce over 200 ICT-related job roles, DP Education sponsors and assists, with research, university academia to create digital content.	University academia develops course curriculums, participates in delivering online content, conducts online assessments and issues digital certificates.
EdTech	• Partnered to receive ABC Mouse.com's video content on Maths and Science to dub in Sinhala/Tamil languages for kids to develop their cognitive skills. • From Groow Technologies, purchased an AI-assisted English language test system to test English language knowledge for free.	• ABC Mouse.com provided videos on Maths and Science. • Groow Technologies provides the AI test platform.
INGOs	Collaborates with UNICEF to donate 100 smart TVs, provide training, mentoring to teachers and students.	Selection of 100 schools, provision of internet connections and overall facilitation.
Government /Semi government teachers	For lesson planning and delivering	Subject expertise and experience in teaching, to deliver the best online education.
NGO Private Hospitals	a. first-aid techniques, with St John's Sri Lanka. b. fertility care, with Nawaloka Hospital	Provided their staff and assisted in script development for the videos.
Industry experts	To receive inputs in curriculum development for ICT programs.	To ensure content is up-to global, local job market requirements.

DP EDUCATION

සිංහල தமிழ் English

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A School for Life

We make learning engaging & effective, so that you are ready to achieve your goals.

Learn With Us

Our Brands

DP Education IT Campus

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Resources

Learners

Guides and resources for learners and students

Teachers & Coaches

Guides and resources for

Parents

Guides and resources for parents

Diverse Horizons: OER Landscape in Slovakia

Country
Slovakia

Organizer
Ministry of Education
(Key public education portal "Planet of Knowledge")

Date started
2011

Educational Resources

Educational resources can be divided into the following categories:

- holistic educational environments—www.edupage.org, www.naucteviac.sk, www.zborovna.sk, sk.wikipedia.org (Slovak variant of Wikipedia), www.oskole.sk and www.mapaslovakia.sk ,
- presentations crafted using Microsoft PowerPoint, Prezi, Adobe Captivate, and mind-mapping tools like Xmind, MindMap,
- Learning Management Systems (LMS)—Moodle, Blackboard, Claroline,
- software tailored for interactive boards—ActivInspire, Flow!Works, etc.
- educational applications (commercial interactive digital maps by Cartografia publishing), applets, software modules, and plugins,
- various digital tools—specialized tools such as interactive worksheets, crossword puzzles, digital forms, digital notebooks, electronic devices.

Concerning Open Educational Resources (OER), it is crucial to guarantee that educational materials created through public funding are accessible universally, facilitating learning at any time and from any location. Various supportive initiatives and portalsat the European, national, and university levels exist to promote the availability of OER.

EU Level

The Open Education Europe portal, funded by the EU (www.openeducationeuropa.eu) , grants access to a wealth of available resources. Serving as a community hub for individuals engaged or interested in digital, open, and innovative education, the platform facilitates collaboration and knowledge sharing. Notably, large-scale pilot initiatives like Open Discovery Space, co-financed by the European Commission, collaborate with educators to develop and enhance the utilization of Open Educational Resources (OER). Eurostat, the European Union Statistical Office, stands out as another vital portal offering access to EU open resources.

Several projects are underway to foster the creation and accessibility of OER. Slovak universities contribute to this initiative through Massive Open Online Courses (MOOC), a European effort supported by www.openuped.eu. Often likened to Coursera for online learning, OpenupEd spans diverse subjects, including math, economics, computer skills, e-commerce, climate change, cultural heritage, language learning, and fiction writing. These courses are accessible in 11 European languages, including Slovak, with durations typically ranging from 20 to 200 hours.

In Slovakia, the sharing of presentations occurs informally at the school level, primarily among smaller groups of teachers. Moreover, centrally provided gateways connect educators with various sites offering educational materials, teaching resources, software, information on new technologies, or commercial platforms providing news and current affairs updates.

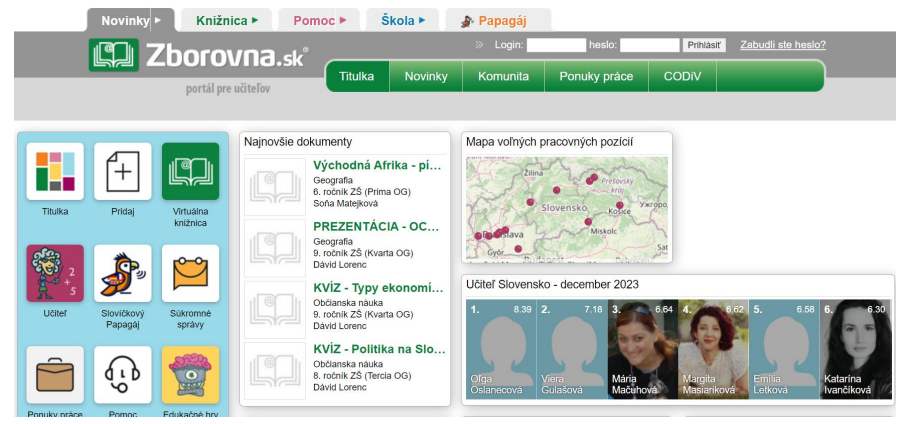
National Level

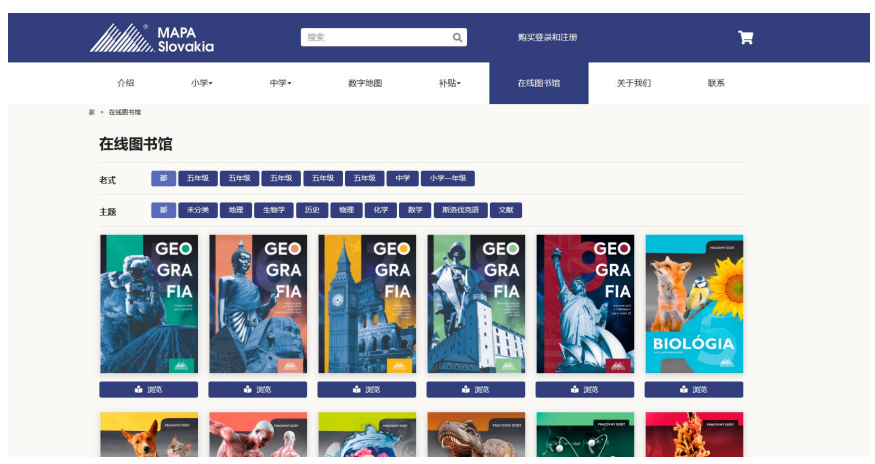
A non-profit organization dedicated to the internet, known as Open Education (www.otvorenevzdelavanie.sk), has launched a broad initiative. This initiative presents easily accessible, well-organized general information and serves as a gateway to both national and international Open Educational Resources (OER).

Since 2011, the Ministry of Education in Slovakia has been actively operating the primary public education portal named the "Planet of Knowledge." The principal objective of this portal is to furnish students and teachers with high-quality and engaging educational materials, contributing to the modernization and optimization of the learning process. Currently, the portal hosts over 30,000 educational materials spanning diverse fields like mathematics, physics, and biology. These materials encompass a variety of formats, including videos, presentations, simulations, animations, 3D models, images, photos, illustrations, interactive exercises, and lessons. Educators widely acknowledge the "Planet of Knowledge" as a valuable teaching resource.

University Level

The content available on the portal predominantly originates from educational and research projects funded by the EU, national grants, or open-access journals provided by universities. It is noteworthy that certain EU-funded resources grant free access exclusively to authorized users with login credentials, and the access period is limited, typically corresponding to the duration of the project or a few years post its conclusion. An exemplary instance of a successful nationally financed OER project is the open-access online book titled "E-methodology."





Five-Minute Course

Country
China

Organizer
The Open University Of China

Date started
2012

Background

The rapid development of society has made lifelong learning a global imperative. How to use modern information technology and diverse digital learning resources to promote universal, ubiquitous, and timely learning, expand the coverage of high-quality educational resources, and build a learning society and a learning-oriented nation serving the entire population's lifelong learning has always been the direction and goal of the Chinese government. In 2012, with the support of the Ministry of Education and the Ministry of Finance, The Open University Of China, relying on the "Construction Project of the Digital Learning Resource Center for Network Education," actively responded to the demand for lifelong learning from social development and technological progress. Combining theoretical research on micro-course resources and pilot applications in teaching, the "Five-Minute Course Construction Project" was launched.

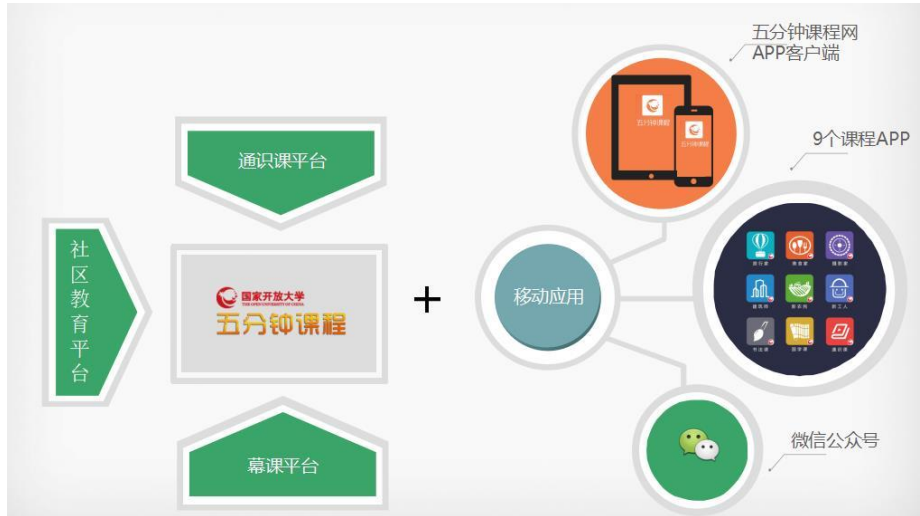
The "Five-Minute Course" is mostly composed of micro-video courses with a duration of 5 to 15 minutes. It features small granularity, precise content, diverse terminal carriers, and convenient and flexible applications. This characteristic is mainly designed to fit the scenarios of learning anytime, anywhere, relying on smart terminals such as smartphones and tablets, in line with the era of mobile internet. It meets the needs of high-quality self-directed learning and fragmented learning in lifelong learning. Compared to the traditional one-hour lecture format, the "Five-Minute Course" further refines the granularity of knowledge presentation. In addition to supporting learners in mastering an area of interest in a relatively short period, it emphasizes situational, personalized, and mobile design in multimedia, making it a more suitable knowledge carrier for the mobile internet era and lifelong learning in terms of presentation, content delivery, and instructional design. Based on this, the project also aggregates and uniformly presents a large number of carefully designed course resources through the establishment of the "Five-Minute Course Network," providing a platform for open and shared learning and communication for society.

The website of the "Five-Minute Course" is at: https://www.5minutes.com.cn/

Implementation Plan

Construction Objectives

The "Five-Minute Course" project was officially launched in 2012. The main goal of the project is to create a massive, high-quality, and personalized learning resource and platform that adapts to mobile internet learning. It aims to provide pathways and support to promote lifelong learning for everyone, everywhere, at all times. The project plans to construct 50,000 five-minute courses through the transformation, self-construction, and collaboration of high-quality resources. These courses will cover academic and non-academic education, establishing a repository that spans various categories such as professions, skills, lifestyles, and hobbies to meet the personalized learning needs of the general public. Based on learner feedback, the project will continuously enrich the five-minute courses, providing learners with diverse and abundant learning resources. The overall planning of the Five-Minute Course construction project is as follow:



Construction Plan

The implementation and construction of the "Five-Minute Course" project consist of the following phases:

The planning and pilot phase from 2012 to 2015:

This phase aims to create 10,000 courses and launch the "Five-Minute Course Network." The focus during this period is on exploring the model and standards of five-minute courses, with the university concentrating on the research and design of these courses. It establishes a large-scale development team, formulates construction norms, standards, and processes to ensure the quality and effectiveness of five-minute courses. Through practical trials and summarization during the pilot phase, The Open University Of China will identify the most suitable teaching content and methods to meet the demands of five-minute course construction.

The large-scale construction phase of five-minute courses from 2016 to 2019:

This stage aims to create 40,000 courses, with an emphasis on expanding the scope and themes of five-minute course construction. Starting in 2016, the construction of five-minute courses was included in the "Key Points of Education Informatization in 2016," with a directive to "initiate the construction of 10,000 five-minute courses." Subsequently, the "Key Points of Education Informatization in 2017" set the goal of "continuing the construction of five-minute courses, with a cumulative total of 30,000." In that year, the number of five-minute courses surpassed 30,000, marking the comprehensive rollout of the five-minute course construction. As the construction deepened, the Ministry of Education continued to emphasize the construction of five-minute courses in the key points of informatization in 2018 and 2019, pushing for the continued development and completion of 10,000 five-minute courses. The inclusion of the five-minute course construction in the key points for four consecutive years greatly promoted its progress and development.

2019 to the present:

From 2019 to the present marks a phase of continuous growth, integration, and promotion. The primary focus during this phase is to continue enriching the five-minute courses, emphasizing the improvement of content and format. Precise evaluation and optimization adjustments are applied to ensure the high quality and efficiency of the five-minute courses. Simultaneously, collaborations with various innovative technologies, enterprises, industries, and society are strengthened to increase institutional participation and usage. This aims to cover a broader spectrum of learners, providing them with a more high-quality learning experience and personalized learning solutions. Additionally, the

The Open University Of China promotes the five-minute courses extensively through emerging media such as social networks, enhancing the brand value and visibility of the five-minute courses.

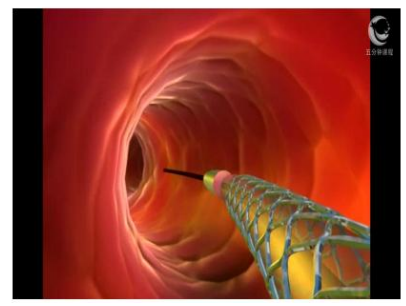
Through these continuous growth and integration measures, the influence and status of the five-minute course construction in the field of education have been further elevated. It has provided diverse and convenient learning options for talent development and student growth, expanding new perspectives and ideas for educational innovation and development.

At the design level, to better cater to the needs of fragmented, mobile, and personalized learning, the "Five-Minute Course" incorporates the following design elements:

Topic Selection: The topics are chosen based on the needs of academic and non-academic teaching. They analyze implicit knowledge behind societal hot issues and select knowledge points that are universally applicable, urgently needed by learners, and easily presented in a five-minute course. The topics cover various categories such as leisure, literature and art, history and culture, language, economics, management, education, sports, science and technology, agriculture, forestry, animal husbandry, and fisheries. The aim is to meet the comprehensive and personalized needs of knowledge updates, skill development, and hobbies in lifelong learning, resulting in a more diverse selection of topics.

Content Design: The content of the "Five-Minute Course" is more focused, emphasizing the thorough explanation of a knowledge point within a short time. Each short video is linked to a specific knowledge point, and the explanation structure of that knowledge point is carefully designed. This includes the introduction of the knowledge point, explanation, demonstration, practice, extension, and finally, a summary, all of which need to be completed within a few minutes.

Media Design: Video is the primary medium, integrating various technologies such as animation, 3D, virtual reality, and more. This integration helps visualize abstract, macroscopic, and microscopic knowledge points, providing a visually impactful and expressive learning experience. It significantly deepens the learner's understanding of the instructional content and may even achieve a lasting impact. The Open University Of China has explored eight techniques for producing five-minute courses: screen recording, live-action video, 2D, 3D, virtual simulation, web-based, virtual presentation, and dynamic imagery. These techniques are employed in a strict production process, with a particular emphasis on user analysis, such as identifying the user, understanding their characteristics, and determining their needs, to offer truly engaging five-minute course resources. Some course presentation modes are as follows:

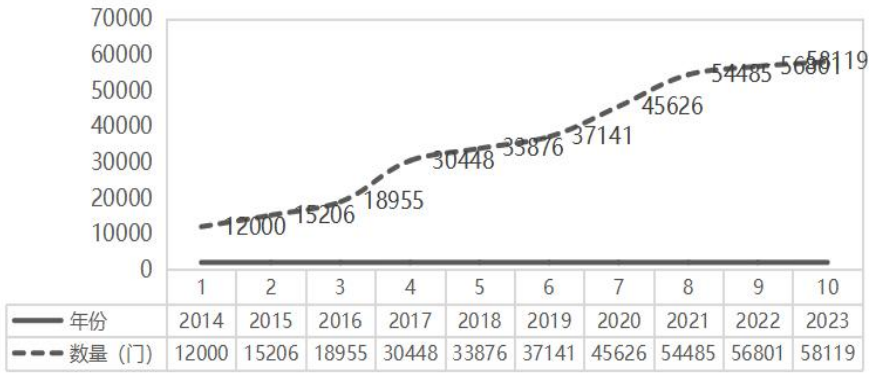

Workflow and standards: Considering teaching content, educational objectives, and development costs, choices are made based on the six-dimensional management philosophy of "direction, method, plan, specification, standard, and process." A comprehensive set of processes and standards has been established for the development and release of five-minute courses, rapidly advancing the construction of the five-minute course project.

Platform construction: Continuous comprehensive upgrades have been made to The Open University Of China's Five-Minute Course Network. An international version of the Five-Minute Course Network and a Five-Minute Course Learning APP have been launched. Collaborations with domestic and international universities and organizations have been strengthened to jointly create a globalized five-minute

course teaching platform. This aims to provide learners with a comprehensive range of learning opportunities and resources, better serving the overall strategy of the national "Belt and Road Initiative" and promoting international cooperation and exchange.

Implementation Status

Over the past decade, The Open University Of China has developed 58,000 "Five-Minute Courses," covering academic education, non-academic education, and elderly education. These courses span 23 major categories including science, engineering, education, political philosophy, economics, management, agriculture, forestry, animal husbandry, fisheries, history, social sciences, law, culture, foreign languages, media, diet, lifestyle, health, literature, painting, music, calligraphy, chess, cards, and sports. The five-minute courses are planned and designed as series based on the main lecturer and main content, with each series consisting of 10 to 30 five-minute videos. These series can be studied independently or viewed as more complete, progressive, and systematic courses, meeting the needs of learners for in-depth learning in a specific field of knowledge and skills under the premise of supporting fragmented learning.



With a vast repository of high-quality course resources as a foundation, the platform also combines different five-minute course resources to create thematic collections. Currently, 153 micro-course collections have been launched, covering topics such as Chinese educational history, Chinese opera art, traditional Chinese crafts, geriatric psychology, COVID-19 prevention and control, basic garden design, water-saving irrigation technology, and more. The design of these collections further emphasizes the advantages of "Five-Minute Courses" as modular resources in secondary development, flexible integration, and stackability.

Additionally, the project has developed some expansionary sections to meet emerging business needs and learning requirements. These include establishing a "Master" section where learners can closely interact with renowned teachers and witness their expertise, setting up a "Training" section where learners can study the design concepts and production methods of five-minute micro-courses, and creating an "Institutional Channel" section that attracts 16 micro-course design institutions for collaborative sharing, enriching the sources and composition of micro-courses.

Key Achievements

Since 2013, The Open University Of China officially launched the "Five-Minute Course Network" (www.5minutes.com.cn) and a WeChat mini-program. All 58,000 five-minute courses are made available for free learning to the entire society, benefiting more than 800,000 registered learners and over 35 million beneficiaries. Over 700 institutions in fields such as Chinese vocational education, rural education, community education, elderly education, and professional continuing education have been authorized for free use, accumulating over 400,000 authorizations. The project has received widespread praise from schools, enterprises, communities, and others, being listed as an "Excellent Innovation Case" by the Ministry of Education. It serves the China-ASEAN Education Exchange Week for resource sharing, contributes to resource sharing with "Belt and Road" countries such as Thailand and Malaysia, and has gained recognition from universities in the United Kingdom, Japan, and other countries. The "Micro-Course" has become accessible to ordinary households, truly serving the goal of lifelong learning for all.

Challenges

Despite achieving certain effectiveness and experience in the Five-Minute Course Resource Construction Project, it still faces challenges and issues. Firstly, the diversity of content demands and personalized requirements pose higher demands on course

production. Addressing how to accurately understand learners' needs and produce more high-quality five-minute course resources remains an urgent problem. Secondly, while five-minute courses meet the convenience of fragmented learning, ensuring high-quality and systematic understanding of learning simultaneously remains a significant challenge. Knowledge graphs, represented by the next generation of artificial intelligence, might offer an effective solution. Additionally, challenges persist in the credit recognition of five-minute courses. Integrating five-minute courses with existing credit banks and credit certification systems poses difficulties, and credit recognition is an area that requires further exploration.

Future Plan

1. Intensify the Construction of Five-Minute Courses

Although five-minute courses have achieved a certain scale, there is still a gap in providing public services for nationwide learning and lifelong learning. The Open University Of China will leverage its accumulated experience in the development and application of five-minute courses over the years. Through methods such as new construction, transformation, cooperation, and integration, it will continue to innovate its mechanisms, focusing on thematic development related to training new industrial workers, training new professional farmers, innovation and entrepreneurship education, rural revitalization, "Belt and Road," etc. The aim is to expand the quantity and quality of services for lifelong learners with high-quality resources.

2. Promote Recognition and Transformation of Five-Minute Course Learning Achievements through a Credit Bank

Firstly, establish a micro-credit and micro-certification system for the Five-Minute Course Network, breaking down the boundaries between academic and non-academic education. Regardless of formal or informal learning, learners can flexibly choose learning content based on their needs and accumulate and mutually recognize learning achievements. Secondly, strengthen the development of five-minute course resources in the field of academic education, providing more resource support for university online courses, all-media digital textbooks, general courses, and MOOC learning platforms. Through collaboration with schools and educational institutions, incorporate five-minute courses into the formal learning system to enhance their recognition and effectiveness in academic education. Lastly, promote the free modular combination of five-minute courses through a credit bank, facilitating personalized, diverse, and flexible learning for different learner groups, advancing the construction of a "junction bridge" for lifelong learning.

3. Iteratively Upgrade Five-Minute Courses with Next-Generation Digital Technologies

With the iterative development of digital technologies, The Open University Of China will continue to research, introduce, and apply new five-minute course development technologies, including Augmented Reality (AR), Virtual Reality (VR), metaverse technology, and Artificial Intelligence Generated Content (AIGC). It aims to innovate resource forms and development models, constructing more rich, diverse, and learner-friendly five-minute courses, thereby enhancing the efficiency and quality of course resource development.

4. Expand the Sharing and Openness of High-Quality Five-Minute Course Resources Globally

Continuously enhance the international content development and application sharing of five-minute courses. Select high-quality five-minute course topics to go online on the National Smart Education Public Service Platform. Prioritize the promotion and publicity of international versions of five-minute courses and contribute to initiatives such as the Belt and Road, China-ASEAN education cooperation, and the construction of overseas learning centers. Strengthen cooperation with international organizations and institutions such as UNESCO, The Open University in the United Kingdom, and the Japan Broadcasting Corporation. Facilitate higher-level sharing of high-quality educational resources, promote the globalization of five-minute courses, and provide a Chinese solution and model for global lifelong learning.

The Creative Use of Educational Resources

Country
China

Organizer
Xidian University

Date started
2015

Summary

Xidian University takes the opportunity of piloting the national smart education platform (referred to as the "Smart Education Platform"). It seizes the development opportunities of the national education digitalization strategic action, utilizing information technology to promote the digital transformation and upgrade of education and teaching. The university is committed to continuously driving changes in educational concepts, restructuring systems, rebuilding resources, innovating models, and reengineering processes, accelerating the construction of a benchmark university in "artificial intelligence + education.“

Resource Construction

Relying on the Smart Education of China and based on the advantages in disciplines such as electronics, information technology, and computer science, the university establishes a mechanism for continuous supply of high-quality course resources. In disciplines such as mathematics, engineering mathematics, electronic circuits, communication information, signal processing, and electromagnetic waves, the university plans and promotes the construction of Massive Open Online Course (MOOC) groups for various majors. Over 70 courses were initially launched on the Smart Education of China.

Successful cultivation of the national quality course "Analog Electronic Circuits and Technical Foundations“

Following the integrated construction approach of "renowned teacher, renowned course, renowned textbook" and the systematic training philosophy of "theory, experiment, competition," a team of national-level teaching experts collaboratively constructs the online first-class course "Analog Electronic Circuits and Technical Foundations." The course has been offered for 11 sessions on the Smart Education Platform. Simultaneously, textbooks are revised, cutting-edge knowledge is introduced, engineering concepts are emphasized, and comprehensive design cases derived from practical engineering are added to cultivate students' advanced abilities in solving complex engineering problems. The cumulative print run of the textbook exceeds 200,000 copies, adopted by dozens of domestic universities, and awarded the first prize for outstanding textbooks in Shaanxi Province.

The "Silk Road Cloud Classroom" provides rich learning resources, including instructional videos, special lectures, student works, exam questions, textbooks, and electronic teaching materials. Additionally, over 40 comprehensive experimental videos and related materials are available, along with additional resources such as "New Technology Navigation," "TI Cup Analog Competition Training Special," and "One Hundred Whys." The course has received over 90,000 visits and is praised by students as the "best analog electronics course on the internet.“

Creating the online quality course "Signals and Systems" with the "355" system

The national first-class course "Signals and Systems" was one of the first courses to be launched on the Smart Education Platform by the university. It

advocates a three-in-one education model of "knowledge foundation, skill development, and ideological and political education," achieving teaching goals of comprehensive knowledge, strong skills, and moral education. The implementation of the five-dimensional collaborative teaching resources iteration mode, including "textbook + question bank + case + project + ideological and political education," has resulted in the construction of rich and in-depth online learning resources. The course has optimized a five-tier resource system covering "basic concepts + problem analysis + complex systems + interdisciplinary knowledge + bottleneck technology," organized in a progressive and classified teaching manner. Currently, the course has been offered for 16 sessions, benefiting students from over 200 universities, including Northwestern Polytechnical University and Harbin Engineering University, totaling nearly 300,000 people. The course was selected for the digital training project for the professional competence development of young teachers in western universities, and it is open for external observation and demonstration throughout the entire process, promoting teachers to implement flipped classrooms and develop Small Private Online Course (SPOC) courses. The main lecturer received the "Outstanding Teacher" award from China's University MOOC (Massive Open Online Course), and the accompanying textbooks, revised multiple times in conjunction with the MOOC, have sold over 670,000 copies for the fourth edition, making it the best-selling single-volume textbook in its category in China. It has been adopted by over 100 universities and received the first prize for outstanding textbooks in Shaanxi Province.

Fostering Innovation

The smart education platform aggregates abundant course resources and learning data. Based on this foundation, the school continuously updates educational concepts, transforms educational models, reconstructs educational environments, and reengineers educational processes, empowering classroom teaching revolution with information technology.

Facilities: Cloud-network integration, creating a "new environment" for smart learning

Utilizing the latest technology to establish a smart campus environment through IoT sensing, the school transforms and upgrades traditional physical teaching spaces and student learning living environments, constructing an integrated online and offline teaching environment. Optimizing information network infrastructure, it builds a highly reliable data center and stable, secure, and adaptable data and application systems. The construction of smart teaching spaces includes the creation of 88 intelligent classrooms, such as 3D holographic classrooms, immersive interactive classrooms, and remote interactive classrooms. Establishing smart laboratories achieves the correlation mapping of "people-things-events" and promotes efficient sharing of laboratory resources through digitization and intelligence.

Platform: "XiDian Smart Class," creating a "new platform" for smart teaching

The "XiDian Smart Class" platform, empowered by artificial intelligence, integrates intelligent features such as rapid course creation with large resources, multilingual translation, knowledge graphs, learning analytics, virtual teachers, homework/paper plagiarism checks, intelligent Q&A, sentiment analysis, and intelligent paper format detection. This platform significantly promotes the construction of online open courses and blended online and offline teaching at the school, accumulating a large number of high-quality digitized course teaching resources. Meanwhile, "XiDian Smart Class" moves classrooms to the cloud, comprehensively meeting the interactive live broadcasting needs of online classes in different scenarios. Currently, "XiDian Smart Class" has become an integrated smart teaching platform for

undergraduate, graduate, international students, and continuing education students throughout the entire school. It is deeply integrated and connected with the national smart education platform, providing teachers and students with more convenient and diverse teaching resources and platform support. During the COVID-19 pandemic, it effectively ensured the teaching order and activities for over 30,000 students and teachers at the school.

Class: "Platform + Dual-Teacher Class," Creating a New Model for Class Teaching

The school fully leverages AI to empower teachers in teaching and has independently developed the "Dual-Teacher Class," where offline teachers collaborate with online AI teachers for joint instruction. In this innovative model, factual content is taught by AI teachers, while creative and conceptual content is delivered by offline teachers, truly achieving "human-machine" collaborative teaching. For example, in the course "C Language Programming," an innovative approach was implemented with 70% of class hours taught by offline teachers and 30% by the online "AI teaching assistant." The course utilizes a wealth of learning resources from the smart education platform, offering students online learning based on knowledge-point granularity, along with intelligent Q&A, learning trace tracking, and video intelligent retrieval functions. The intelligent Q&A system, based on semantic analysis, provides students with round-the-clock interactive learning support. By analyzing students' learning patterns and data, the system intelligently recommends teachers and resources, generates comprehensive and personalized learning reports, assists teachers in targeted guidance, ensuring that no student is left behind.

The platform provides students with gamified online self-tests, helping reinforce important knowledge points and making learning enjoyable to stimulate students' interest. In the fall of 2019, the "Dual-Teacher Classroom" was piloted in six classes with over 650 students across the entire school. The average final exam scores of pilot students were 8.92 points higher than non-pilot students, with a significantly higher proportion of high-scoring students. Starting from 2020, the model has been expanded to more than 70 teaching classes and nearly 5,000 students annually, achieving a high-quality transformation from traditional classrooms to intelligent classrooms.

"Platform + XiDian Smart Class," Creating an Integrated Teaching "New Ecology“

The course "Digital Circuits and System Design" has been offered for 11 sessions on the smart education platform, attracting over 50,000 students from more than 200 universities. The course supplements its resource library on the "XiDian Smart Class" platform, including past offline teaching videos, online live broadcast replays, information releases, real-time discussions, and surveys. During the teaching process, previewing is done on the smart education platform to establish a baseline, followed by utilizing the "XiDian Smart Class" platform to support flipped classrooms and showcase distinctive features. The synergy between the two platforms ensures comprehensive coverage of course content, leaving no gaps in learning knowledge points and skill development, resulting in a significant improvement in teaching quality.

Experiments: Remote Intelligent Physical Experiments, Creating a "New Mode" for Online Experiments

To address the challenges of practical teaching in online experiments, the school has established semi-physical online experiment systems for courses such as analog electronics and communication. This has enabled features like abnormal operation warnings, intelligent interaction, automatic generation of experiment reports, and assessment results. Students can access laboratory instruments and perform operations on real physical equipment from anywhere, at any time, completing the entire process through online remote physical experiments. Utilizing information and intelligent technology, various experiment modes such as virtual simulation experiments, remote physical experiments, and "pocket experiments" have been implemented, effectively compensating for the shortcomings of online teaching and complementing theoretical

teaching on the smart education platform. The course "AI + Analog Electronics Experiments" has developed an unmanned intelligent laboratory. Before the experiment, students engage in standardized learning of experimental operations online and undergo pre-assessment. During the experiment, they interact with virtual teachers and teachers online from different locations, with warnings for abnormal operations. After the experiment, the system automatically generates experiment reports and assessment results. The system can accommodate over 100 students simultaneously online, remotely operating real physical equipment. During the pandemic, this platform was applied in 10 teaching classes, and nearly 1,500 individuals completed experiments remotely on the platform. It was covered by numerous national and provincial media outlets and recognized as the best practice case in building a digital Shaanxi.

"Smart+" Course: Creating a "New Assessment" with Intelligent Tracking and Analyzing Learning Behavior

Applying the big data functionality of the smart education platform, a data-driven teaching evaluation system is constructed. Based on the dual-modal data features of students' online learning behavior and abilities, a comprehensive collection of multimodal data, including learning behavior and abilities, is performed. Through deep learning models, students' online learning outcomes are assessed, and early warnings and interventions in the learning process are implemented. For instance, in the nationally top-notch course "Modern Engineering Microbiology," utilizing the three-dimensional information resources of the smart education platform, intentional efforts are made to increase online feedback. A continuous collection of multimodal data, including pre-class, in-class, and post-class learning behaviors, and trajectories, has been carried out over 6 years and 12 rounds, with a sample size of 100,000. By constructing a "temporal + non-temporal" multi-parallel fusion deep learning algorithm, continuously iterating and optimizing, the system provides real-time assessments of students' learning outcomes, accurately predicts final grades in advance, monitors ongoing learning effectiveness, and provides timely assistance to help students achieve better results.

Utilizing Resources

Adhering to the principle of "Application is King" with an open mindset, the school guides teachers and students to widely apply platform resources, promoting the localization construction of MOOCs (Massive Open Online Courses) and the high-quality application of multi-mode teaching. Faced with the current situation of strong science disciplines and weak humanities disciplines in the school, the implementation of high-quality course resources from the smart education platform is advanced to create a blended course of "Smart Education Platform High-Quality Resources + Offline Teaching.“

Introducing Online Course Resources to Improve the Quality of School-Based Courses

The course group of "Chinese Modern Literary History" reorganized the knowledge system based on four sets of nationally planned textbooks. They established a teaching approach of "strengthening the foundation through offline lectures + self-expanding learning online." A teaching design system of "one body, two wings, and three levels" was formed, constructing a community of learning for teachers and students. Combining the course content, they selected five MOOCs and 12 special lectures from the smart education platform, providing students with two reading lists and 69 e-books, categorized and managed. The essential part was released in the form of "task points" and included in the formative assessment. Optional parts balanced academic and interesting aspects to ensure that students who have the ability can gain more. Simultaneously, five-stage tests were conducted to assess learning outcomes. Learning surveys showed that the majority of students endorsed the hybrid "on-campus + off-campus" and "online + offline" courses. 96.4% of students believed that the introduction of online learning resources selected by the teaching team improved learning efficiency and provided a foundation for independent learning. Additionally, 92.9% of students stated that online tasks, discussions, and tests had a significant promoting effect on independent learning, and the expanded learning resources effectively enhanced academic perspectives and comprehensive abilities.

Enriching First-Class Course Resources, Developing In-House Credit Courses

In the past year, the school has adopted more than 150 high-quality general courses from the smart education platform. In the course "Introduction to Art," the original MOOC content was revised, and a teaching method of "blending online and offline, online theoretical learning, and offline practical sharing" was employed. This effectively localized high-quality MOOCs. Using the "3-4-(3+X)" teaching model, where "3" represents online theoretical learning, offline artistic creation, and artistic practice sharing; "4" cultivates four aesthetic abilities of appreciating beauty, feeling beauty, creating beauty, and sharing beauty; and "3+X" signifies three major aesthetic trends highlighted in students' art creations and an unknown space (X) for further exploration. Nearly 90% of students believe that offline practices and sharing effectively enhance the effectiveness of MOOC learning, and 83.4% of students believe that it can improve the practical transformation ability of theoretical knowledge.

Enhancing Collaboration

The school relies on the smart education platform to advance the MOOCs in Western China Program 2.0 and the eMOOC Alliance, establishing a mechanism for inter-university resource sharing. This initiative aims to expand inter-school communication and collaboration, promote the sharing of high-quality educational resources, and achieve cooperative and coordinated development.

Leading the "MOOCs in Western China Program" to Support Talent Development in Central and Western China Universities

As the lead unit for the "MOOCs in Western China Program 2.0" working group, the school has established the online platform "MOOCs in Western China" and constructed the "MOOCs in Western China Map" to serve as the central hub for the program's dynamics, information, and communication. The school organizes regular teacher training, exploring new models of course sharing through forms such as integrated teaching training for young teachers in central and western China universities, and observation classes of high-quality demonstration courses. This facilitates cross-regional and cross-disciplinary research and teaching exchanges, helping teachers in central and western China make effective use of high-quality resources and enhancing the "hematopoietic" function of education and teaching in these regions. Currently, "MOOCs in Western China" has supported 725 western China universities in conducting online or blended teaching, accounting for 97.3% of western China universities. It has provided 172,900 MOOCs and customized course services to western China universities, assisting in delivering 3.27 million instances of blended teaching and engaging 376 million student participations. Additionally, 1.714 million teachers in western China have participated in applied training.

Establishing the eMOOC Alliance to Create a Specialized MOOC Platform for Electronic Information Courses

Leveraging the distinctive characteristics and advantages of the electronic information discipline, the school, in collaboration with several universities and enterprises, has established the nation's first eMOOC Alliance, a vertical alliance in the field of electronic information courses. The alliance brings together experts and master teachers in electronic information courses, integrates high-quality course resources, builds excellent courses, explores credit recognition mechanisms, and realizes the sharing of high-quality educational resources. The alliance aims to support talent development in electronic information-related universities and actively contribute to the national digital transformation strategy.

Conclusion

Xidian University actively promotes the construction and application of the smart education platform, exploring a "learning revolution" through digital transformation and intelligent upgrading. Leveraging the smart education platform, the university constructs a group of advantageous subject courses,

aiming to go "beyond the course, based on the course," and provides multidimensional, diverse, and hierarchical rich resources to facilitate personalized teaching for both teachers and students. With an open attitude and a pursuit of excellence, the university effectively utilizes resources from the smart education platform to implement blended teaching, enhancing learning outcomes and the level of teaching staff based on first-class resources. The university places a special emphasis on innovative applications in education, utilizing both offline classrooms and online spaces to achieve "dual-space" teaching. It combines artificial intelligence and teacher-led instruction to realize "dual-teacher" teaching. The integration of physical experiments, virtual experiments, and remote experiments facilitates "full-space" experimentation. Combining national and institutional platforms results in "dual-platform" education. The combination of platform data and artificial intelligence expands analytical and support functions, achieving "smart empowerment." The university has taken a leading role in creating a "smart education experimental field" and has initially established a new ecology of blended learning, ubiquitous learning, and personalized learning that is "accessible to everyone, everywhere, and at all times."

Part III

Promote the Deep Integration of Digital Technology and Education for Building New Educational Ecology

Letrus Writing Skills Program

Country
Brazil

Organizer
Letrus (Centro de Autoria e Cultura LTDA)

Date started
2014

Summary

While Brazil has made great strides towards eliminating illiteracy, functional literacy is still a challenge for the country, with only 2 per cent of students achieving the highest marks in literacy on the 2018 Programme for International Student Assessment (PISA) (OECD, 2019a).

The Letrus Writing Skills Program is an innovative technology solution that supports the development of student writing in Portuguese through an Artificial Intelligence (AI) platform built at the intersection of linguistics, pedagogy and computer science. Through its AI and comprehensive programme of support, Letrus provides a dynamic learning method and personalized, extensive essay feedback to students and reduces both teacher workload and the typical response time associated with grading essays.

Students who submit essays on the Letrus platform receive immediate feedback from the Automated Writing Evaluation (AWE) algorithm, which provides them with formative comments on specific areas of strength and weakness such as adherence to the formal written norms of Portuguese or the length of specific paragraphs. Essays are then evaluated by human graders who assign additional comments and final grades in alignment with the criteria used for the National High School Exam (Exame Nacional do Ensino Médio, or ENEM), the largest college admission examination in Brazil.

At the same time, teachers access class dashboards to view progress on completion, receive feedback on aggregate and individual scores and connect to Letrus support staff. Teachers receive support with implementation and monitoring, interpreting the results on the dashboard and utilizing results for targeted instruction and/or remediation.

The Letrus Writing Skills Program's features:

- innovative use of AI to automatically detect features of the essay and to classify five different skills that are aligned with the national standards for language learning in Brazil,
- hybrid AI-human feedback loop of immediate feedback from the AI and more detailed feedback from human graders, leading to more effective practice opportunities for essay writing,
- enabling teachers to follow students' writing progress and view the writing skills of their students and classes in a structured way, as well as provide the students with personalized feedback,
- ability to operate at a large scale, and promising findings demonstrated by initial research that student marks improve as more essays are written on the platform,
- aim to improve functional literacy and promote inclusion by helping students, especially from low socio- economic backgrounds, to access higher education institutions (UNESCO, 2019b).

Student's voice

"The Letrus platform is a great benefit that the school offers us, because in addition to training for writing an essay, we can find and correct our mistakes. We are increasingly prepared for entrance exams and know how to argue about several current issues."

"Using the platform to practice writing has been very good, because, in addition to bringing texts from different themes, it makes notes on what we need to improve our ability. In our writing classes the teacher's partnership with the tool makes us realize how much we are able to write better and better."

More information at: https://www.letrus.com.br

Programme

Theme	The use of AI to innovate education, teaching and learning
Beneficiaries	Teachers and primary and high school students
Target population	Primary and High school students
Problem	While Brazil has made great strides towards universal literacy, functional literacy levels remain below the levels necessary for full economic and civic participation
Solution	An adaptive learning platform which combines AI and human elements to provide responsive feedback on writing skills and personalized learning experiences for students
Resources required	Access to a device with internet access
Results	• Reach: 957 schools; 1,327 teachers; 116,677 students • Average improvement of 10 per cent after writing five essays on the platform • Proven impact: Experimental evidence shows a significant, positive impact • Proven impact: Letrus could decrease the public- private achievement gap for specific skills by 20 percent
Challenges	• Internet access / device accessibility • Financing the programme, particularly in low-resource and public schools
Strengths	• Builds on existing technologies such as Natural Language Processing resources • Rigorous interdisciplinary approach leverages linguistics and computer science • Engagement of academic partnerships • Teachers remain the pedagogical leaders for students • Applications for remote and hybrid learning models

Digital Solution

The Letrus Writing Skills Program seeks to contribute towards building a fully educated country, a more qualified workforce and citizens with critical thinking able to exercise citizenship through the development of writing skills.[1] Letrus uses a combination of Artificial Intelligence (AI) and human feedback reduce the time between submission and feedback to students, provide extensive and meaningful positive as well as corrective feedback, and reduce teacher workload. The platform enables personalized learning and responsive feedback for both students and teachers and further empowers the learning process by providing the information necessary for teachers to target pedagogy towards addressing student errors. An added benefit is that Letrus provides a practical solution to large class sizes by automating parts of the essay-grading process.

Students in participating high schools write freely in response to writing prompts on the Letrus platform and can keep track of their word count and time remaining. The platform also automatically saves essays periodically. As a student writes, the Letrus Automated Writing Evaluation (AWE) algorithm analyses the text, and once the essay is submitted, the student receives instantaneous feedback on performance related to writing norms and composition structure, together with comments to guide improvement.

Following this initial feedback, the essay can be evaluated by human graders who have access to the essay and the results of the AWE algorithm.[2] Human graders can assign additional scores, adjust grades and comments and assign the final score to the student within three days. Final scores provide a grade per skill for a maximum of 200 points, aligned to the official grading scale used by the ENEM.

As students are writing, information such as progress towards completion, average scores for structure and skills as evaluated by the AWE algorithm are provided to teachers on a personal class dashboard. Teachers can follow the progress of students on the writing task and monitor if they have logged in, started writing or finished the task, and view real-time feedback in aggregate and for individual students. Information on common errors across the class can be taken up for instruction or remediation, and teachers are able to view and adjust comments made to individual students.

Developing the digital solution technology

To develop Letrus, a minimum viable product was developed which allowed students to submit essays to the Letrus platform following the ENEM model. These essays were assessed by graders trained and experienced in the ENEM criteria and formed part of a database of 56,644 ENEM and Letrus platform essays that were analysed to identify patterns in the style, content, grammar and structure of excellent essays. This analysis resulted in eight text indicators: words, connectors, spelling mistakes, colloquialisms, paragraphs, sentences, social agents and social intervention elements. The iLetrus Index is the AWE algorithm used to interpret the essay through these text indicators to arrive at a score for the text. An additional resource, iLetrus Levels, automatically attributes a level from 1 to 5 for essays submitted.

iLetrus is built using deep neural networks and feature engineering. Deep neural networks are AI programs with multiple layers of processing between the inputs and the outputs (Witten et al., 2017). In this case, the first layer processes individual textual elements (i.e. performs calculations between words and sentences), and a second layer performs calculations based on these outputs to score the composition (i.e. performs calculations between sentences and the essay in full) (Fonseca et al., 2018). Feature engineering is a way of

1 For more information, see https://www.facebook.com/Letruseducacao (August, 2020).

2 Letrus also developed and tested a fully-automated feedback process. See the 'Results' and 'Further developments' sections for more details on the AI-only program.

preparing unique data inputs (or features) to maximize the performance of the algorithm (Rençberoğlu, 2019). In Letrus, 681 feature values are mapped for relevance across the five ENEM skills: 1) adherence to formal written norms of Portuguese; 2) conformity to the argumentative text genre and the topic; 3) selection, organization and interpretation of data and arguments in defence of a point of view; 4) usage of argumentative linguistic structures; and 5) elaboration of a proposal of intervention to solve the problem in question. The feature engineering approach is used to continuously evaluate the essay as it is written, and the deep neural network approach is used when the student completes the essay.

Comments on the platform respond to specific text indicators (e.g. the use of conjunctions, spelling, length of paragraphs, etc.). Essays also receive a general comment and comments on the five specific ENEM skills. Comments are randomly chosen to respond to specific sets of challenges and levels of achievement, and many will provide a model response. For example, an essay with a poor introduction may generate a comment with an example of a good introduction for the student to refer to.

Results

Reach

In 2019, the Letrus Writing Skills Program had been used by over 44,000 students in schools in all 26 states in Brazil, totaling over 200,000 essays made on the platform.

Engagement

In 2019, a partnership with the State Department of Education of Espírito Santo took the use of Letrus to 54 municipalities, reaching 12,000 students and 400 teachers from 110 schools. In this project, the average engagement of students was between 75 per cent and 80 per cent, and 95 per cent for teachers.

Performance

In an analysis of the evolution of students' grades and performance on specific text indicators conducted in 2019 with public schools in Espírito Santo, students using Letrus demonstrated an average of 10 per cent improvement and were found to write 32 per cent more essays than a control group. Ninety per cent of schools improved their grades. Ferman et al. (2020) engaged in a stratified randomized control trial to determine the impact on student performance of two versions of Letrus, the first incorporating human feedback and the second relying on AI alone. Each of these treatment groups included 55 schools, with 68 control schools. Data was gathered from the Letrus platform, the 2019 ENEM essay, additional writing samples, and survey questions regarding demographic information and information on school practices and perceptions from teachers and students.

Findings included that both versions of Letrus resulted in significantly improved student essay scores over the control group and that the inclusion of additional inputs from human graders did not improve the effectiveness of the Letrus program. The research suggests that teachers did not simply delegate tasks to the AI but filled in the gaps in the pure technology solution. As a result of these findings, Letrus dedicated more effort to developing the AI-only option in order to lower costs and increase access.

A further significant finding was that the use of Letrus could mitigate 9 per cent of the public-private achievement gap in ENEM essay scores, with a reduction of 20 per cent in the skill-specific gap (reported nationally to be 80 per cent).

Finally, the research measured control and intervention group performance on writing in the narrative genre, literacy skills and non-literacy skills. Findings indicated that improvements were limited to argumentative essays specifically, without significant spillover effects into other genres or subjects.

National Program of Educational Informatics

Country
Costa Rica

Organizer
Omar Dengo Foundation

Date started
1988

Summary

The Programa Nacional de Informática Educativa (National Program of Educational Informatics, or PRONIE) has been implemented since 1988 through a public-private partnership between Costa Rica's Ministerio de Educación Pública (Ministry of Public Education, or MEP) and the Fundación Omar Dengo (Omar Dengo Foundation, or FOD). Known as PRONIE MEP-FOD, the initiative was awarded the 2015 UNESCO King Hamad Bin Isa Al-Khalifa Prize for integrating digital technologies and innovative pedagogical approaches to foster the development of creativity and problem-solving skills among primary and secondary school teachers.

As one of the longest-running educational development initiatives in Latin America, the programme has raised quality and narrowed gaps in equity and digital access by applying evidence-based learning experiences through the public education system and the project's resource-rich online presence.

PRONIE MEP-FOD encourages students to interact with real-world problems and daily life situations through project-based learning approaches applied in school computer labs. Students learn through their experience and become accountable for their own development and collaboration with others.
The programme also focuses on teachers' continuous training and monitoring to improve their skills and capabilities in using educational informatics.

Since 1988, a total of 8,674,521 students have benefited from the programme in pre-schools as well as primary, secondary and TVET schools. PRONIE MEP-FOD has developed a comprehensive and systematic approach to enhance students' capacities while also giving priority to marginalized children and youth in rural and urban areas. It supports the creation of an educated and skilled labour force which will stimulate the economy and equip citizens for the future.

PRONIE MEP-FOD's features:

- Excellent partnerships between the FOD, MEP, and educational institutions.
- Implementation of a problem-based learning approach validated by Educational Informatics Laboratory (LIE) standards.
- Systematic approach in building student capacity for ubiquitous learning and developing digital technology products.
- Strong emphasis on teachers' training and monitoring for improved informatics-based pedagogy (UNESCO, 2015).

Programme

Theme	Pedagogical innovation in using ICT in teaching and learning
Beneficiaries	• 738,138 primary and secondary student beneficiaries in rural and urban areas (in 2019) • 2,973 teachers received face-to-face training, while 3,805 received a combination of face-to-face and virtual training (FOD, 2019)
Target population	Primary and secondary school learners in rural and urban settings
Problem	• Lack of innovative educational models supported by digital technologies that can help to prepare future generations for active participation in digitalized societies and economies • Lack of equitable access to digital technologies and resources, especially in rural and marginalized areas
Solution	PRONIE MEP-FOD: A multistakeholder partnership to promote the nationwide provision of digital infrastructure and innovative educational programmes
Features	• Diversified provision of digital technologies based on contextual factors such as the size and location of schools • Centred on innovative pedagogical approaches which leverage technology • Innovates as new technologies and tools become available • Leverages the value of public-private and public- NGO partnerships • Uses continuous monitoring and evaluation that informs programme design revisions
Results	• Supports the creation of an educated and skilled labour force • Equips students and teachers for a digital future • Encourages citizens to engage with and work in the digital technologies sector
Challenges	• The digital infrastructure is still incomplete, affecting about 10 per cent of schools • Connectivity remains patchy, especially for remote rural areas • Teachers' difficulties with timetabling and project implementation, and limited aptitude for teaching programming

Digital Solution

The PRONIE MEP-FOD initiative is a multisectoral partnership that has successfully introduced educational technology into public schools in Costa Rica and continues to innovate digital technologies for learning and for the empowerment of citizens. This partnership has resulted in a sustainable and comprehensive approach to learning in rural and urban settings across the nation. The initiative leverages digital technologies to engage students and teachers by prioritizing problem-solving, investigation, productivity, citizenship and communication. It is delivered through five prominent programmes: Education Informatics Laboratories (*Laboratorios de Informática Educativa*, or LIE), Learning with Mobile Technologies (*Aprendizaje con Tecnologías Móviles*, or ATM), the Development of Entrepreneurial and Employability Capacities (*Capacidades de Emprendimiento y Empleabilidad*, or CEE), Labor@ Enterprises, and a professional development programme for teachers.

Schools and classrooms are equipped with LIE and related teacher training. The updated programme LIE++: Think, Create, Code encourages students to integrate digital and coding skills into real-life problem-solving. In addition to supporting digital literacy and educational outcomes, LIE also supports youth enrichment programmes such as pedagogical robotics, a problem-solving capacity building programme, and environmental advocacy, among other skills building initiatives that use digital devices.

ATM is another programme that integrates the use of technologies into the classroom in public pre-primary, primary and secondary schools. ATM is guided by three principles. The first is to promote innovative teaching models enabled by mobile technologies in order to develop students' digital competencies. The second is to adopt a progressive, constructive approach to change, and the third is to secure equity while adapting to the changing needs and expectations of society in its different contexts. ATM is offered at pre-school, primary and secondary levels and at Costa Rica's indigenous education centres (FOD, 2021).

PRONIE MEP-FOD also drives initiatives that can benefit aspiring entrepreneurs, institutions and companies that require knowledge and skills to leverage technology. The CEE programme involves youth in entrepreneurship and innovation, building capacities that will enable them to integrate into the labour market. For example, Young Network Administrators (Jóvenes Administradores de Redes, or JAR), a partnership between the MEP, FOD and technology company Cisco Systems, offers a programme for 11th and 12th grade informatics students at public vocational high schools to prepare them for employability in the technology field. Students complete four training modules, leading to Cisco certification (FOD, 2019).

Labor@ Enterprises is another programme that focuses on employability in secondary schools. Students learn how to start and manage a company through a simulation program, in the process using digital technologies and developing interpersonal and leadership skills. Its focus on entrepreneurial business may assist young people facing unemployment to find local self-employment. By design, these approaches benefit children in rural communities who might not have been reached by other technology projects (Iglesias, 2016, p. 1). [1]

Finally, PRONIE MEP-FOD features a professional development programme that provides multiple training opportunities for teachers on integrating digital technologies into their teaching. The programme features multiple face-to-face, online and hybrid training activities supported by e-learning and virtual resources and platforms capable of supporting thousands of teachers.

1 Except where otherwise noted, information from this section is drawn from FOD (2015).

Results

The initiative has bridged the digital divide and developed learners' personal self-efficacy, professional skills, and 21st century competencies (Brenes et al., 2014). By 2020, its programmes were accessible to 92.2 per cent of pre-school to 9th grade national public school students, which is an increase of over 12 per cent from 2015 and means that education in Costa Rica is approaching digital ubiquity in the classroom. As of 2019, PRONIE MEP-FOD had supported more than 3,897 public education centres benefiting 738,138 students. Also, 16,786 secondary students enhanced their entrepreneurial and employability opportunities through the Labor@ Enterprises and JAR programmes (FOD, 2020).

Students participating in LIE++, which explicitly addresses computational thinking through programming and physical computing projects, obtained better results compared with those in the LIE-Guides programme, which includes only learning with digital technologies (Picardo-Arce et al., 2021).

Creative Use of Digital Technologies in Teaching and Learning

Country
Cyprus

Organizer
Cyprus Pedagogical Institute, Ministry of Education, Sport, and Youth

Duration
Annual basis throughout the school year

Abstract of the Implementing Organization or Individual

The mission of the Cyprus Pedagogical Institute (CPI) is the continuous professional development of educators at all levels of education as well as the substantial contribution to the planning and implementation of educational policy, taking into consideration the literature, research and the priorities set by the Ministry of Education, Sport and Youth in order to improve the quality of the educational system.

The Department of Educational Technology (DET) promotes innovations related to the use of digital technologies for teaching, learning, and assessing, guided by national and EU digital strategies. Specifically, the Department implements Continuous Professional Learning Programmes, advances digital skills in education, explores and recommends new implementations through European, research and intervention programs, maintains online and onsite learning environments, produces audio-visual, audio, and other material for the needs of the Ministry of Education, Sport and Youth, and provides training and technical support to the staff of CPI (https://tet.pi.ac.cy). In addition, DET contributes to national and European policy papers and guidelines on behalf of the Ministry and implements projects that support the work of the Ministry's Information and Communication Technology Unit.

The various actions of DET focus on the priorities of Education and Training 2020 and the Digital Strategy for Cyprus and are based on the principles set out in the European Commission Action Plan for Digital Education (2021-2027). They are also based on European digital competence frameworks such as DigComp 2.2, DigCompEdu and DigCompOrg. The geographical coverage is national.

Problems

The problems evolve around various factors:

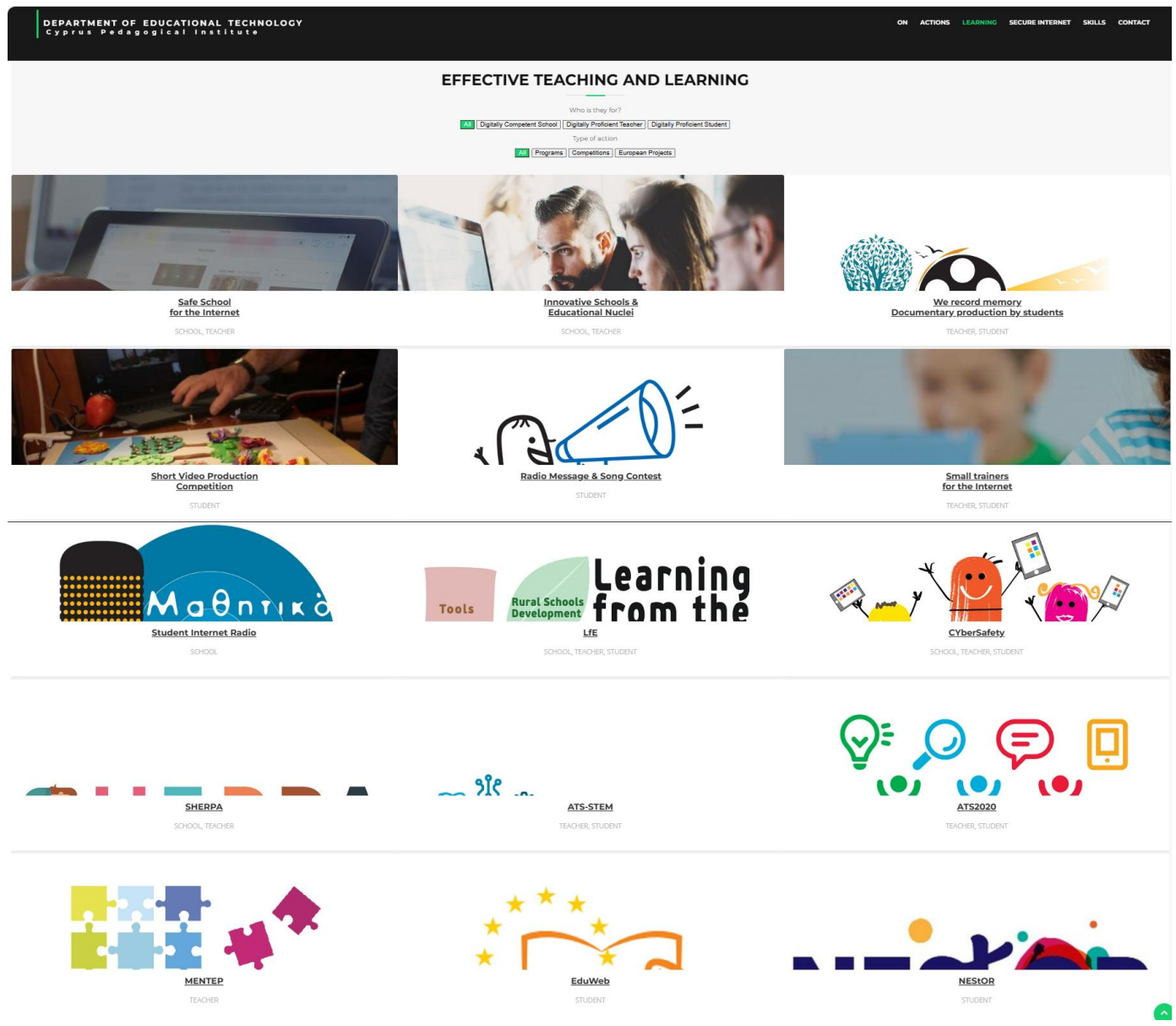
- Lack of sufficient infrastructure and equipment;
- Digital competence not rapidly advancing for all stakeholders (teachers, students, schools, governmental bodies);
- Innovative pedagogical approaches not applied in a systematic way;
- Digital literacy not yet placed at the forefront of education policy;
- A National Strategy for Digital Literacy based on international action plans and good practices is pending.

One of the primary problems involves the strengthening and further developing of teachers' digital competence to promote the effective use and integration of digital technologies in the teaching and learning process. DET has undertaken various initiatives in this regard, including the Digital Competence Development for Educators Programme, which adopts a distance learning approach and methodology, utilizing the Institute's eLearning Environment (https://elearn.pi.ac.cy/).

Another primary problem is the integration of new technologies into educational curricula, which has not yet been implemented. An effort is being designed in coordination with the ministry in the next year for the adapt of all curricula to include the digital competence indicator.

Key Data

Covered countries	The programmes cover Cyprus. The “MAKE IT HEARD” - RADIO AND MUSIC STUDENT CONTEST covers European Countries.
Funding of the project	The programmes are being implemented under national funding. The “Make it heard” contest is funded internationally.
Target groups	Children at the age of basic education Young people Women/girls Indigenous, marginalized, minority populations Persons with disabilities
Age range or Grade level	Primary school level Secondary school level Adults
Total number of beneficiaries	The number of teachers and students benefiting from the programs varies each school year. However, through the implementation of the programmes at national level, approximately 130 teachers and 1000 students benefit annually.



Key Activities

The following annual programmes on advancing education through digital technologies and open educational resources have been taking place during the school year 2022-2023, emphasizing on the horizontal key skills of the 21st century. The programme aims at effective teaching and learning at the school level, teacher level, and student level.

1. "RECORDING MEMORY" - Documentary Productions by Students

- A school-based programme offered to primary and secondary education students and teachers. The aim of the programme is to engage students in an experiential play of embodying collective and individual memory through the audiovisual recording of experiences by members of the student's family and the local community to create a short documentary film (10-45' max duration). Teachers are trained and supported throughout the duration of the program (usually a school year) on researching, filming, and editing so that they can support and guide their students through the process of research and production. All necessary audiovisual equipment is allocated to schools. Students decide on the concept they wish to explore within 4 thematic areas: cultural heritage, liberation struggles, occupied areas, and sustainability. Some of the students' films have been broadcast by the Cyprus Broadcasting Corporation (CyBC1) and were screened in local and international film festivals. Most of the films are available online at Cyprus Pedagogical Institute's platform of educational films.
- Link: www.pi.ac.cy/katagrafoumemnimi

2. Student Web Radio

- A school-based programme offered to primary and secondary education students and teachers. The aim of the programme is to involve students in the production of a web radio show or podcast (10-180' max duration) that can be broadcasted through the European School Radio web platform. The theme of the radio show/podcast may vary between school curricula to extra curricula subjects. Teachers are trained and supported throughout the duration of the program (usually a school year) on researching, audio recording, editing, and disseminating the audio work, so that they can support and guide their students through research and production. All necessary audio equipment is allocated to schools. Depending on the theme of a radio show/podcast, each school may choose to collaborate with local community professionals (e.g. journalists, musicians, human and environmental rights activists), NGOs, the Public Sector, and others.
- Link: www.pi.ac.cy/radio

3. "MAKE IT HEARD" - Radio and Music Student Contest

- A transnational contest open to all primary and secondary education schools in Europe. The contest is organised by the Cyprus Pedagogical Institute, the European School Radio, the Educational Radio Television of the Greek Ministry of Education and Religious Affairs, and the Greek National Centre of Audiovisual Media and Communication. Students can submit radio messages of up to 90 seconds and songs up to 3 minutes, relevant to each year's contest theme. Each school can submit up to 2 productions. Evaluation committees consist of professional journalists, musicians, and teachers, while the schools/students who participate in the contest evaluate the submissions as well. Awards are being given to the first 3 contestants of each category/age group. Also, the public votes for two audience awards. The theme of the contest changes every year. Last year's theme

(2022-2023) under the title “Youth for Peace” encouraged students, through their songs and radio messages, to become actively involved in building a society of peace and fraternity. The theme of the contest for the current school year (2023-2024) is “The Power of Friendship”.

- Link: https://contest.europeanschoolradio.eu/

4. Young Coaches for the Internet

- Young Coaches for the Internet aims to engage pupils in training others in creative exploitation and safe use of the Internet. With the guidance of their schoolteachers and the support of specialists on the subject, young coaches are invited to develop an action plan for their school to design and implement activities for awareness raising in their school and community about the safe and responsible use of the Internet. Pupils are invited to design and implement at least three activities, report on those activities in a reflective journal, participate in Safer Internet Day (SID) activities and organize an event at their school in order to receive a Young Coaches Certificate.

- Since 2013, when the programme first started, pupils have exceeded expectations and amazed everyone with their creativity. Among other activities, they have created and shared printed materials such as posters, leaflets, bookmarks and cartoons; digital material such as videos, blogs and animations; they have written and acted in theatrical acts; written and performed songs; provided peer and parent training presentations; organized events and talent shows; created board and online games; completed questionnaires; and run research on Internet-related topics.
- Link: https://youngcoaches.pi.ac.cy

5. Innovative Schools

- The Innovative Schools and Teacher Coaches for ICT in Teaching and Learning Programme is an annual recurring programme at primaryand secondary schools. It aims to help schools gain a better understanding of their needs in terms of using digital technologies to support teaching and learning and to develop their own digital action plan addressing the needs identified. Each school unit participating in the Programme is invited to engage in a process of reflection on the use of digital technologies in the school through the SELFIE tool. It is then invited to use the SELIFE PTK toolkit to interpret the results from the SELFIE, to set goals in terms of digital education and to develop, implement and evaluate an action plan based on SELFIE. This process is expected to contribute to the development of the digital capacity of the personnel in the school unit.
- Link: https://innovativeschools.pi.ac.cy

6. Internet Safe Schools

- The programme aims to help schools implement internet safety actions to enhance the digital skills of students and teachers, as well as to raise awareness of the safe use of the internet. Moreover, the aim of the Programme is to help schools exploit the potential of the Internet but also to prevent or deal with problems that may arise in the use of modern technologies. Through the Programme, schools that wish to do so can be certified as Safe Schools for the Internet for one school year. Among the obligations of the schools are the implementation of learning activities on the safe and creative use of the Internet in all classes of the school unit, training workshops for teachers and parents, and the pan-European certification with the eSafety Label.
- Link: https://esafeschools.pi.ac.cy/

Measures to Ensure Equality and Effectiveness

In order to guarantee that every student, and educator in Cyprus, irrespective of their situation or background, can participate in these initiatives, a set of actions is being implemented to remove any disparities or barriers that may arise. Specifically, the primary goal of these programmes is to ensure equal access for all students, educators and schools. Special education students and educators participated in many of these programs applying technology in order to facilitate students learning. Moreover efforts are being made to implement approaches and strategies that allow for the assessment of the impact of these programs, with the aim of maximizing their effectiveness. More specifically, the various actions are designed and implemented based on careful planning that responds to the specific educational and other needs of the school unit, applying empirically validated practices and assessing theirimplementation through evaluation from teaches and students. Additionally, efforts are made to adapt the materials and techniques applied based on the evaluation of the proposed activities and actions.

Measures to Ensure the Sustainability

The programmes place a strong emphasis on ensuring the sustainability of their results and impact, particularly in terms of cultivating digitally competent citizens. One key aspect is the focus on imparting techniques and skills through experiential activities. This ensures that the knowledge gained is not only theoretical but also practical, allowing students to apply it in real-world scenarios. Additionally, the programmes place a significant emphasis on fostering life skills and knowledge that can be transferred across various domains, thus enriching students' overall educational experience.

A crucial component of sustaining these efforts is the annual evaluation conducted by both students and teachers. This feedback serves as an invaluable tool in understanding the effectiveness of the implemented programmes. It allows for the identification of strengths, weaknesses, and areas for improvement. Based on this evaluation, necessary adjustments and enhancements are made to ensure that the existing initiatives continue to be relevant and impactful.

Furthermore, the programmes are committed to adaptability and responsiveness to emerging needs. The programmes try to adapt to the dynamic educational landscape, in which new challenges and opportunities may arise. This proactive approach enables the implementation of new actions that address contemporary requirements while building upon the successes of previous actions. By combining this forward-thinking perspective with a robust evaluation process, the programmes are well-positioned to sustain their positive impact over the long term.

Future Plan

The future plan for scaling up these programmes is centered around two key strategies:
The first aims towards a national implementation of these programs, collaborating closely with educational authorities. This partnership is crucial in integrating vital components like internet safety, digital media literacy, and information literacy into the standard school curriculum. This wider dissemination of the educational programmes and the embedding of these essential skills into the educational curriculum will provide an increasing number of students and educators with access to these enriching experiences. Students will be empowered to navigate the digital landscape with confidence and proficiency. To ensure the sustainability of the results and impact, there is an imperative of staying at the forefront of evolving risks and challenges.

Moreover, the DET team is committed to ongoing research initiatives and fostering partnerships with esteemed groups of experts, academics, and NGOs. This collaborative effort will enable the programmes to remain agile and responsive to emerging threats,

ensuring that they continue to address the most pressing issues in digital education. Furthermore, emerging technologies, Artificial Intelligence (AI) and machine learning are poised to be embraced. These cutting-edge tools hold tremendous potential in revolutionizing education by providing personalized learning experiences tailored to individual student needs. By harnessing the power of AI and machine learning, the aim is to equip students with the skills and knowledge they need to excel in an ever-evolving technological landscape, further cementing the enduring impact of our programmes.

Other Materials

Department of Educational Texhnology (DET) :
https://tet.pi.ac.cy/

Media Literacy website:
https://medialiteracy.pi.ac.cy/en/

DET maintains a studio of audio and audio-visual production. It has in its collection several productions and co-productions, some of which were screened in local and international film festivals and were broadcasted through Cyprus Broadcasting Corporation and National Greek TV. An online platform hosts these productions (https://paragoges.pi.ac.cy/) giving direct access to teachers, students and the general public. CPI collaborates with public and private organizations, production companies, scholars, researchers, and other professionals for the production of these films. The films are available through an online platform where one can also find educational films produced by the Educational Radiotelevision of Greece and films produced by students under the programme “Recording Memory – Documentary production by students”. More than 400 titles are available for screening on the platform.

ViLLE: Teacher Collaboration and Artificial Intelligence for Student Success

Country
Finland

Organizer
Centre for Learning Analytics, University of Turku

Date started
2005

Summary

The Visual Learning Environment (ViLLE) was created in 2005, a time when technology was gaining acceptance in education and mobile technology especially was becoming more sophisticated. Over the years, the platform has kept up with emerging trends in technological innovations. Today, ViLLE presents a comprehensive way of collecting data such as the number of completed exercises, response times, and scores which are used to identify learners' strengths and weaknesses and how they evolve over time. The embedded AI engine detects and highlights students' misconceptions, and algorithms assist educators to provide tailored support and guidance. At the same time, the agency of the users is preserved through the ability of teachers to assign learning levels and learners to select a within-task difficulty. In addition, the visualizations of analyses enable educators to examine and extract important information about their students' actions and progress, which can inform the timely delivery of personalized and adaptive learning tasks. The provision of such features has been linked not only to better learning outcomes and achievements but also to the prevention of learner attrition, as the platform acts as an early warning system.

The utilization of such a tool can address different needs and resolve educational barriers that emerge both in the individual classrooms (e.g. relating to students' progression) and at the national level (e.g. relating to tasks linked to the curriculum).

The ViLLE programme's features:

- The project uses AI tools to recommend personalized sets of exercises based on students' performance while addressing learning deficiencies.
- The lessons include interactive and gamified exercises with immediate feedback.
- The project seeks to empower teachers with detailed reports on the development of their students, which has the potential to improve educational effectiveness.
- There is evidence of both scale and impact, and adaptability to both basic and higher education contexts.

Digital Solution

The ViLLE platform was developed as a programming visualization tool in 2005, and over the years it has been adapted to the local educational context. Today, the platform presents a state-of-the-art personalized and adaptive learning path for primary- and secondary-level pupils, covering subjects related to mathematics and languages. The lessons include over 130,000 interactive and gamified exercises and more than a million individual tasks. Beyond this, the platform engages university-level computer science and engineering students in blended and collaborative learning activities.

Student users are provided with immediate feedback, and teachers receive information on the performance of classes and individual students. ViLLE makes suggestions to teachers so that they can assign learners to the levels suited to their ability. In this way, technology makes a recommendation based on actual performance, and the teacher can consider other contextual and individual factors in order to make a final decision on whether a student will engage at the basic, intermediate or advanced level. Students themselves receive semi-random exercises linked to their learning level, with an algorithm set to increase the frequency of tasks related to errors in their past performance. Students can also set their own difficulty

level within each task, and thus enjoy agency over the degree to which they will be challenged on a given day.

Teachers can use materials made by others via the linked 'From Teachers to Teachers' initiative or create exercises for their personal use. In addition, a ready-to-use material bank for teachers provides curriculum-aligned pathways in mathematics and Finnish for primary grades. It also has an introductory-level programming course for junior high school and both introductory and object-oriented programming courses for high school (Kurvinen et al., 2020).

Most exercises on the platform are automatically assessed, allowing teachers to spend more of their time supporting students.

ViLLE works in any modern browser with no additional plugins required. While computers are preferred due to the advantages of a large screen and keyboard, all of the features aimed at students can also be accessed via any modern smartphone or tablet. The platform can be accessed at schools or from any location with an internet connection.

Programme

Theme	The use of AI to enhance the continuity and quality of learning
Target population	Teachers and learners in primary, secondary and tertiary education
Beneficiaries	Teachers and learners in primary, secondary and tertiary education (350,000 teachers and learners)
Problem	ViLLE is a collaborative platform that offers students and teachers detailed information regarding their learning process in the form of immediate feedback and analytics. A network approach to development synthesizes academic research and teachers' content-creation skills.
Resources required	A device with an internet connection
Results	• Reach: ViLLE is used by 48 per cent of Finnish schools, 300,000 students and more than 14,000 registered teachers. • Engagement: Students and teachers have collaboratively created more than 4,000 courses and 130,000 exercises via the 'From Teachers to Teachers' initiative. • Proven impact: Quasi-experimental studies show that students using ViLLE perform statistically better than a control group.
Challenges	• It is difficult to create a system that provides autonomy and benefits to a diverse range of teachers, and to bring the research community, classroom teachers, school administration and policy-makers together to support joint development. • Technological advances outpace changes in the education system and its culture, and solutions need to consider the pace of both. • The system and its stakeholders behave differently at scale than they do in smaller controlled studies.

Results

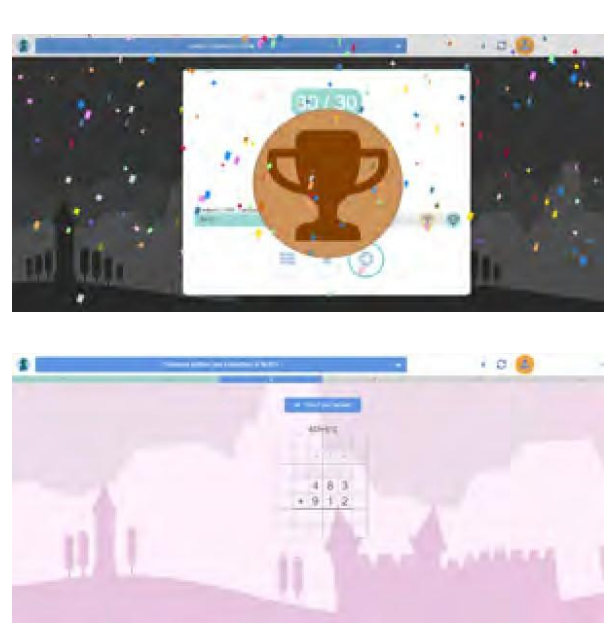
The project has demonstrated an expansion in usage over the last decade. In 2020, learners completed more than 20 million gamified tasks per month. Approximately 300,000 students and 14,000 registered teachers have collaboratively created more than 4,000 courses and 130,000 exercises via the 'From Teachers to Teachers' initiative.

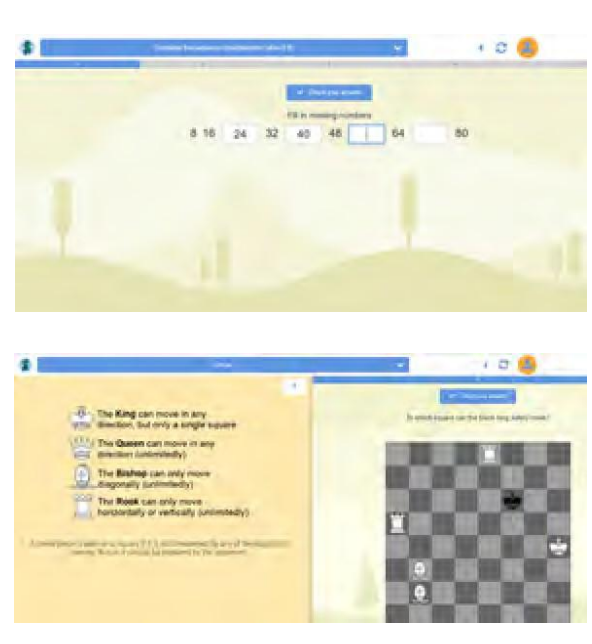
Over the lifespan of this project, results have been published from various short- and long-term studies, conducted in Finland and international contexts. A one-lesson pilot with third-graders (Kurvinen et al., 2012), a 10-week study on first-graders (Kurvinen et al., 2014), and an 18-week study with both first- and third-graders (Kurvinen et al., 2015, 2016) showed that computer-assisted learning had a positive effect on pupils and their outcomes. As a whole, the team has published in more than 50 peer-reviewed scientific journals (see Laakso et al., 2018; Kurvinen et al., 2018) and conference proceedings. Four PhDs related to ViLLE have also been completed.

A quasi-experimental difference-in-difference design accounting for an even longer time frame looked at the mathematics performance of two second-grade classes that had used ViLLE for one and a half to two school years and compared it with that of three second-grade classes from the same municipality who had not used ViLLE or any other computer-assisted method regularly. Results showed statistically significant differences, with the ViLLE classes outperforming the others on all topics (Kurvinen et al., 2020). In another study of third-graders, it was found that the control group made on average three times more errors than the intervention group (Kurvinen et al., 2018).

Research also demonstrates that university students using the platform to learn computer science and engineering through blended and collaborative activities achieve 20 per cent higher scores than those studying through traditional didactic approaches, and have lower dropout rates. On average, the models developed with formative assessment tasks were valuable for the computer science and engineering instructors as they could predict students who were at risk of failure as early as two weeks after the course initiation (Veerasamy, 2020).

Screenshots of ViLLE Learning Activities





MiLab: Virtual Science Laboratory for Secondary Schools

Country
Malawi

Organizer
Ministry of Education, Directorate of Science, Technology and Innovation (DSTI)

Date started
2022

Abstract of the Implementing Organization or Individual

Ministry of Education has been promoting the use of virtual science laboratory in the teaching and learning of science subjects in secondary schools, One such example is the use of Milab, a game-based application developed through a collaborative arrangement involving Mzuzu University ICTIncubation Center, UNDP and Directorate of Science, Technology and Innovation (DSTI) in the Ministry of Education. The development of Milab is in line with the National Development Plan(Malawi 2063) and the Mid-Term lmplementation Plan (MIP-1) that advocate for digitalization and virtualization of education materials, including Science, Technology Engineering and Mathematics (STEM) subjects and analytical sciences. Currently, MiLab allows students to conduct unlimited virtual experimentation in physics and chemistry.

In the wake of the COVID-19 pandemic- Milab app helps students and teachers conduct virtual experiments in science subjects through smartphones and tablets, as they work offline and on low-end mobile devices, Virtual science laboratories, have demonstrated the ability among learners to develop critical and quantitative thinking, experimental and data analysis skills, skills to use scientific apparatus, understanding of procedural knowledge, ability to explain the processes and applications related to science subjects, Interest and motivation which will lead to the development of positive attitude, scientific understanding of the physical world, appreciate products and influences of science and technology, ability to work together, and mental and motor abilities. The geographical coverage of MiLab is national.

Problems

Teaching and learning of STEM subjects in secondary schools in Malawi is affected by a number offactors such as:

- Lack of laboratory facilities including lab equipment and materials;
- Inequality of access to teaching and learning resources;
- Poor performance in national examination in science subjects;
- Loss of learning due to COVID-19;
- Inadequate skills to conduct scientific experiments.

Objectives

MiLab helps to mitigate problems of lack of access to physical labs, under-equipped laboratories and congestion, which affect the quality of service delivery by teachers and more importantly, stimulate interest in Science, Technology and Innovation among female learners as it is easy to follow and use and supports Open Distance and e-Learning learning. In addition, The app is very critical to learners in Community Day Secondary Schools (CDSS) where students face a lot of

challenges in learning STEM subjects. The overall objectives of Milab are:

- To promote access to quality education within the secondary school subsector;
- To promote STEM simulations and analytical sciences.

Key Activities

Since the launch of Milab on 14th October 2022, the Ministry of Education, through the Directorate of Science, Technology and Innovation, has implemented a number of initiatives aimed at rolling out, promotion, capacity building, publicity and use of Milab in secondary schools in Malawi.

1. Rollout and capacity-building programs for secondary school Science Teachers on MiLab

- Rollout and capacity-building programs on MiLab for secondary school science teachers were initiated in 2022: in 2022, the Ministry of Education through the Directorate of Science Technology and Innovation (DSTI) rolled out Milab to 19 secondary schools across the country. In 2023, the number of schools using Milab has increased to 33 with over 50 Science teachers trained.

2. Installation of MiLab under the Connect-A-School Program

- The Ministry of Education, in collaboration with Airtel Malawi Plc and UNICEF Malawi, implementing a 5-year Connect-A-School Program that will see public schools equipped with state-of-the-art technology ICT Centers and laboratories as part of its priority interventions for education digitalization. A smart TV, a workstation, and 20 tablets are available for each school. The MiLab app is installed on every tablet sent to schools, and teachers are trained on how to use MiLab as a virtual science laboratory.

3. Promotion of MiLab at the Side Event at the 67th Session of the Commission on the Status of Women (CSW67).New York, USA, March 2023

- Milab was promoted at the side event during the 67th session of the Commission on the Status of Women (CSW67) that was held in March 2023 in New York through a presentation and demonstration of Milab App on tablets and meetings with different stakeholders, including investors and philanthropic organizations.

4. MiLab as an ODeL platform

- The Milab app has been acknowledged as an important platform to support ODeL learning for stem subjects. Milab was showcased by secondary teachers and students during the 2023 National Open Distance and e-Learning (ODel) Symposium and Innovations Exhibition. The symposium was held in pursuit of the Ministry's agenda of increasing equitable access to quality education at all levels of education through open, distance and e-learning (ODel).

5. Showcasing Milab App as best practice at Human Capital Summit for Heads of State

- Malawi developed a Milab video documentary that was showcased during the Human Capital Summit for Heads of State that took place from 25th and 26th July 2023 in Tanzania as one of the best practices that Malawi is implementing to transform the education system.

6. School evidence(Video documentary)

- Some schools have testified how Milab is helping in the teaching and learning of physics and chemistry.

Key Data

Funding of the project	United Nations Development Fund (UNDP); Malawi Government
Target Groups and Percentage	861 remote secondary schools (61% of secondary schools) to access the Virtual Science Laboratory; Build capacity of 1722 science teachers on the use of Milab
Total number of beneficiaries	So far 33 Secondary Schools are currently using MiLab with over 50 Science teachers trained

Awards and Honors

MiLab App was recognized by the Government of Malawi as one of the best local innovations in the education sector and was showcased during the 67th session of the Commission on the Status of Women (CSW67) that was held in March 2023 in New York as well as the best practice during the Human Capital Summit for Heads of State that took place in Tanzania from 25th and 26th July 2023.

"MiLab App"

⇨ **Showing great impact to the application of laboratory skills by learners.**

⇨ **Developed by Malawian students, hence promoting innovation in the youths.**

⇨ **Being user-friendly and its nature of operating offline, it addresses the challenges of high cost for internet.**

⇨ **Budget line is allocated by Malawi government.**

Measures to Ensure Equality and Effectiveness

- Malawi 2063 (Malawi development blue print) under Human Capital Development) (Enabler 5) promotes the expansion of virtual Science laboratories for STEMsimulations and analytical sciences as a priority intervention so that all schools must benefit from virtual science laboratories.
- Milab app was designed with a Malawian learner in mind as such the application is able to run on low-end gadgets, runs offline and on devices with an Android platform with a minimum version of 5.5 and a minimum of 1GB RAM and it is provided free of charge.
- Milab is expanding to cover more experiments, and more science subjects including biology and Agriculture with additional inclusivity features to cater for learners with learning difficulties such as vision and hearing impairment.
- Plans are underway to come up with online and desktop versions of the MilLab App.

Measures to Ensure the Sustainability

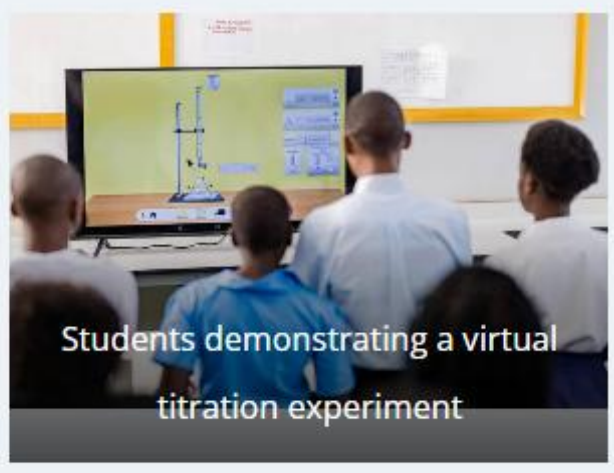
- The Government of Malawi through the Directorate of Science, Technology, and Innovation (DSTI) under Other Recurrent Transaction (ORT) has a budget line for rollout and capacity-building programs for MiLab.

- The Government of Malawi shall establish Makerspace that will become centres for innovation where the youth will be learning and developing innovations that can significantly contribute to social economic development if adopted by the government and private sector.
- MiLab is a local solution developed by a local team of innovators from Mzuzu University who take the responsibility of its further development, updating, support and maintenance.
- The Government of Malawi provides innovation grants for the further development of Milab.

Future Plan

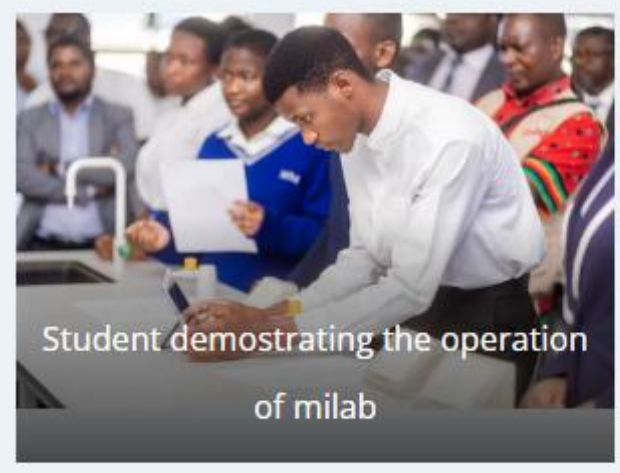
Malawi has about 1, 411 secondary schools and only 39% of them have access to a laboratory facility. Most of these schools are based in remote areas where setting up and sustaining a physical laboratory)is expensive. For Malawi to meaningfully attain national rollout, many milestones must be achieved as follows:

- At least 344,680 computer tablets (40 tablets/school) should be procured, targeting 861 remote secondary schools to access the Virtual Science Laboratory.
- At least 1722 teachers (2 teachers/school) will have to be trained on how to use Milab.
- Ten more experiments, 5 each for chemistry and physics need to be added to Milab. In addition, experiments must be extended to other STEM subjects such as biology and agriculture.
- Establishment of at least 6 Makerspaces (1 per education division) to help in assembling and maintenance of gadgets.

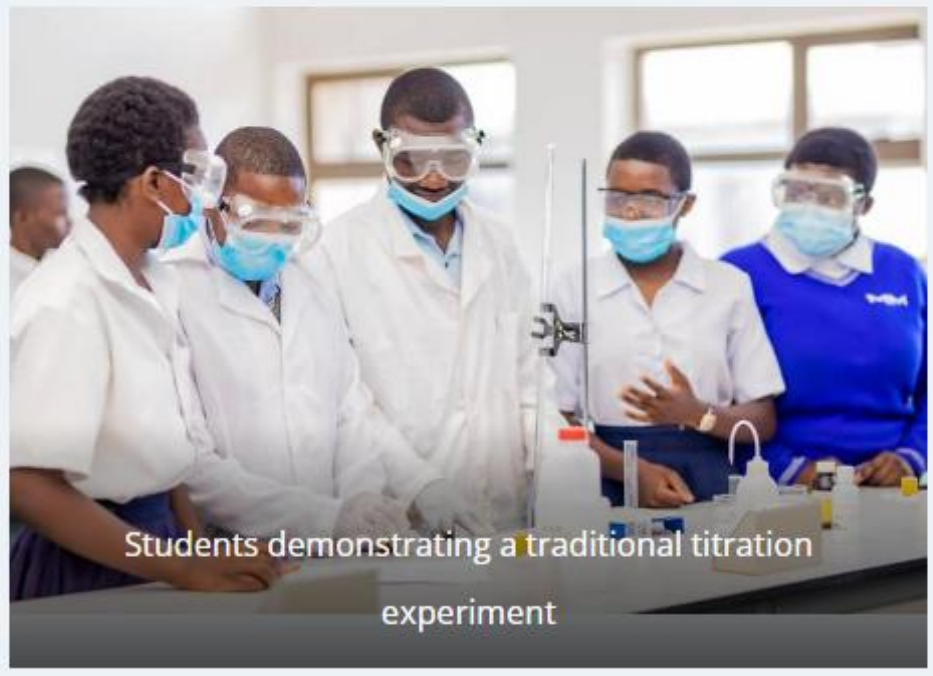


Students demonstrating a virtual titration experiment

Students demonstrating a traditional titration experiment



Student demostrating the operation of milab



Students demonstrating a traditional titration experiment

Director of DSTI symbolically hands over the innovation to Secretary of Education

Mzuzu University MILAB launch in pictures

Falak Digital Learning Space

Country
Malaysia

Organizer
System Development & Engineering Centre, Universiti Sains Islam Malaysia

Duration
4 hours

Abstract of the Implementing Organization or Individual

Falak Digital Learning Space is our USIM's new immersive learning space. Its geographical coverage is national. Equipped with immersive technology such as virtual reality and gamification, the simulation learning-based approach in astronomy studies will increase students' visibility and understanding before proceeding with real experience on-site. All content is accessible digitally by students and visitors. Besides learning purposes, this space is also open to public access as an education package in the university.

Astronomy encompasses the examination of all celestial entities situated outside Earth's atmosphere. This encompasses not only visible celestial bodies such as the Sun, Moon, planets and stars, which can be observed with the unaided eye but also objects that require telescopes or other scientific instrument to detect, such as distant galaxies and minuscule particles. To encourage student learning experience in astronomy studies, Falag Digital Learning Space has been developed.

This space has been divided into five learning stations which are:

1. Introduction to Falak

2. Interactive Sky

- Islamic Heritage in the Sky

3. Earth Revolution

- Rotation of the Earth, Sun and Moon
- Finding Qibla using Constellation
- Falak in Ibadah: Prayer Times

4. Falak Observation

- Solar System
- Solar Eclipse
- Lunar Eclipse
- New Crescent Moon

5. Orbital Desk

- Hijri and Other Religious Calendar
- Analemma and Equation of Time
- Manazil Al Qamar
- Discover Exoplanets

Simulation is becoming progressively more prevalent in higher education environments. Within STEM (science, technology, engineering, and mathematics) education, as demonstrated by studies like D'Angelo et al.(2014) and Wu & Anderson (2015), simulations are employed to enhance comprehension of concepts, their interconnections, and to promote inquiry, critical thinking, and informed decision-making.

By using a simulation approach in each station, students/participants will engage more with the material provided and make learning more fun. It also enhances students' confidence levels with gamification activities before proceeding to the on-site experience.

Problems and Objectives

Studies show that simulation-based learning will enhance the effectiveness of learning. Li (2010) utilized the "Interactive Software of Lunar Phase" for e-learning purposes demonstrating that multimedia purposes demonstrating courseware had a notable

positive impact on understanding concepts related to lunar phases, including their occurrences, origins, and durations, along with the movements of the Earth, the Sun, and the Moon. lt underscores the value of a simulation-based e-learning approach in enhancing the effectiveness of learning lunar phase concepts

USIM has initiated an immersive learning space equipped with immersive technology such as Virtual Reality and gamification. The idea behind this space is to enhance the learning experience for subjectsassociated with Islamic astrology and astronomy through a more engaging and efficient approach, leveraging the intersection of contemporary astronomy and the practical use of traditional astronomy to advance a strategic initiative that fuses scriptural and rational. knowledge and advocating for the Falak Digital Learning Space as a welcoming and accessible center for astronomy science within the community.

"Falak Digital Learning Space"

⇨ **Enhancing interactive teaching and learningexperiences through state-of-the-art technology for lslamic astronomy study.**

⇨ **Equipped with immersive technology to enhance students learning experience.**

⇨ **Promoting student-centered learning and dissemination of knowledge through innovative technologies.**




Key Data

Funding of the project	RM 500,000.00 from Malaysia Rolling Plan budget
Target groups and percentage	Children at the age of basic education - 10% Young people - 10% Students in College/University within astronomy field - 50% Lecturers/researcher and Staffs in lslamic Council in each state or country all over the world - 30%
Age range or Grade level and percentage	Primary school level - 10% Secondary school level - 10% Higher education level - 50% Lecturer/Researcher in the field and staff working at any islamic Council - 30%

Key Activities

This initiative is to develop an immersive learning space in supporting and as a student computer-aided solution with a simulation-based approach for astronomy study. This space has been equipped with five physical stations where each of station has its own theme and computer-aided solution. Activities involved in each station:

1. Rotation of the Earth - Day and Night Phenomena

- The rotation of the Earth on its axis turns one side of the Earth from darkness into light, and the other from light into darkness. lt divides the day into two halves - one for engaging in survival activities and one for resting. Thus, the alternation of day and night plays a vital role in shaping every type of life on Earth - physically, biologically; and socially. In this lesson, students will learn what causes the alternation of day and night, why the lengths of days and nights vary, and how the Sun can be used to measure the passing of time. At the end of this lesson, students should be able to: (1) Describe what causes the alternation of day and night. (2) Describe what causes the variation in the length of daytime and nighttime. (3) Describe how the Sun can be used to measure the passage of time in a day.

2. Prayer Times

- Performing the five daily prayers at the correct times is an obligatory act for every Muslim, Thus, great care is taken to ensure that the times are correctly determined. These prayer times are determined by the position of the Sun above and below the horizon in a day. The Sun takes a different path across the sky in the course of a year. Thus, prayer times change slightly and gradually from day to day. For regions near the equator and within 45° N and 45° S, the standard prayer time definitions cannot be used because the Sun takes a very extreme and abnormal path in the sky. In this lesson, students will learn what are the standard definitions of prayer times, where it is applicable and where it is not, and what causes the standard definition to fail at these locations. At the end of this lesson students should be able to: (1) Define prayer times and give descriptions of how prayer times can be determined. (2) Describe the regions on Earth in which the standard prayer time definitions is applicable and not. (3) Describe what causes the difficulty in using standard prayer time definitions in high and extreme latitudes.

3. Cresent Moon Formation and Visibility

- The sighting of the new crescent moon is one of the most important events in lslam. lt determines the start of every month in the lslamic calendar. Fasting in the month of Ramadan begins and ends when the new crescent moon is sighted. And so too is the beginning of the month of Zulhijah in which the Hajj is performed. Sighting of the new moon, in the lslamic tradition, is a very simple thing to do. When the new crescent moon is sighted with the naked eye at sunset, the new month begins immediately, The next morning will be the first day of the month. Otherwise, the new month starts on the day after. It takes about 24 hours after conjunction for the new crescent to be visible to the naked eye, In places such as Southeast Asia, the sky is cloudy most of the time, hence, sighting of the new crescent moon is not possible. Thus, religious authorities stipulate that the start of the new month can be determined by calculations. With this, Muslim astronomers formulated the criteria for determining new crescent moon visibility. In this lesson, students will learn how the new crescent moon is formed, what are the factors influencing its visibility, and where to observe the new crescent moon. At the end of this lesson, students should be able to:

(1) Describe the formation of the new crescent moon in relation to elongation, age of the moon and the percentage of illumination. (2) Describe how the new crescent moon appears at the horizon near sunset. (3) Describe the various astronomical and atmospheric factors that determine the visibility of the new crescent moon.

These are some activities (from 24 activities) run throughout the session (within 5 stations).

Measures to Ensure Equality and Effectiveness

Falak Digital Learning Space has been divided into five learning stations which are:

- Introduction to Falak
- Interactive Sky
- Earth Revolution
- Falak Observation
- Orbital Desk

Each station comes with a concept of simulation-based learning, gamification and interaction. To ensure all students/visitors understand and achieve the objective of each learning outcome, Guided Lesson and Exploratory Lesson is provided. Each station has a touchable screen, so students/visitors are allowed to go forward and backward for each topic and activity. This will allow students/visitors to learn at their own pace. Each topic comes with simulation-based learning where students/visitors are allowed to move the active cursor on the screen to see different results based on different settings and cursors. For example, in day and night alteration activities, new crescent moon. At the end of each topic, there will be simple questions to ensure students'/visitors' understanding.

Measures to Ensure the Sustainability

Falak Digital Learning Space is developed based on studies of our researcher and supporting the need for courses run by Faculty. We encourage our students and researchers to continue their research in Falak as Earth and aerospace have become fragile and unstable recently (agile aerospace). The need for recalculation of prayer time, qibla direction, to predict the new crescent moon and so on which related to the essentials and pillars of Muslims' worship. With the Falak Digital Learning Space digital content we have, we believe it will boost the next research and new related content in Falak.

Future Plan

To complete our project, we are projecting 6D views in astronomy studies with documented cases for future references like Ring of Fire, Solar Eclipse, Super Blue Moon, Meteor Shower and so on.

The most important thing is to enhance our existing digital content. We hope that USIM will be the reference center for the Muslims council in Malaysia and the nearest country with the latest technology and experts we have.

Other Materials

Mohd Hafiz Safiai, Muhamad Firdaus Ab Rahman, Mohamad Zulfazdiee Abul HassanAshari, Ezad Azraai Jamsari and Nurul ilyana Muhd Adnan (2020); THE FEASIBILITY OFISLAMIC ASTROTOURISM IN MALAYSIA Int.Jof Adv, Res8 (Nov). [162-166] (ISSN 2320.5407). www.journalijar.com

Interactive AI-based Module for Effective Literature Reviews

Country
Malaysia

Organizer
Universiti Kebangsaan Malaysia

Duration
1 Year

Abstract of the Implementing Organization or Individual

Universiti Kebangsaan Malaysia (UKM) or the National University of Malaysia was founded in 1970. UKM consistently upholds a commitment to high-quality tertiary education, and groundbreaking research, and aims to make a positive impact on society, industry and the world. Dr Abdul Rahman Mohmad is a research fellow and senior lecturer at the Institute of Microengineering and Nanoelectronics (IMEN), UKM. He is also a Senior Member of the Institute of Electrical and Electronics Engineers. He completed his MEng in Microelectronics and PhD in Semiconductor Materials from the University of Sheffield, UK in 2008 and 2013 respectively. From 2016 to 2018, he joined Rutgers University USA as a visiting scholar. His current research focuses on the development of layered or 2-dimensional materials for energy and electronic applications. He teaches various courses to postgraduate students such as research methodology, fundamental of nanoelectronics and MEMS/NEMS devices. The geographical coverage of this literature review project is local.

Problems and Objectives

For many years, postgraduate students have been trained to conduct literature reviews using standard tools like Scopus and Web of Science. Students start their literature search with specific subjects and important keywords. However, this approach often overlooks the importance of understanding the broader context or the bigger picture of a subject. To address this, we propose innovative artificial intelligence (AI) based activities that leverage ChatGPT and Xmind apps to enhance the effectiveness of students' literature reviews. By combining AI technology with conventional research tools, this module facilitates a holistic approach to literature review, empowering students to become more effective and insightful researchers.

Key Data

Target groups and percentage	Young people - 100%
Age range or Grade level and percentage	Higher education level - 100%
Total number of beneficiaries	30 people per year

Key Activities

Activity 1

- This activity focuses on enhancing students' literature review skills by harnessing the power of ChatGPT. In this exercise, students embark on a structured activity from abroad and general questions to progressively more specific topics. They are tasked with seeking information related to crucial aspects of their chosen subject, including recent progress, issues and challenges, and strategies for improvement. To provide a practical context for this exercise, we employ the well-known material, graphene, as a case study.

- Students start by asking ChatGPT to explain important topics associated with graphene research and development. They may inquire about a range of subjects, such as its properties, applications, or methods of production. Subsequently, students are prompted to select one of the listed topics for an in-depth review. For example, they might delve into the synthesis techniques of graphene, followed by an exploration of chemical vapour deposition (a specific method for producing graphene layers).

Activity 2

- In the second activity, students use the insights obtained from ChatGPT and translate them into a visual and organized format by using the Xmind app. They are required to export the output generated by ChatGPT in marked own format and then transform this data into a comprehensive mind map, This exercise serves a twofold purpose. It encourages students to develop a holistic understanding of their chosen subject by structuring information in a visually digestible manner. Additionally, it empowers them to critically analyze existing works and scholarly resources and, in turn, develop their unique perspectives. The mind map becomes a dynamic tool for students to continually update as their research progresses, facilitating the organization of ideas and a clear overview of the research topic.

Activity 3

- Next students are tasked to find relevant academic references and validate information obtained by chatGPT using Scopus (an established literature database). This activity equips students with the skills to screen through a vast array of scholarly articles ensuring that their research is based on reputable and credible sources.

Activity 4

- In the final phase, students present their research findings and engage in a discussion regarding the strengths and limitations of ChatGPT. This activity encourages critical thinking and reflection on the role of AI in research. Moreover, by evaluating the strengths and limitations of ChatGP, they contribute to a broader discourse on the integration of Al in academic research, fostering a culture of responsible and informed Al utilization in academia.

Awards and Honors

Bronze medal in kNOVASI 2023 (Congress and innovation Competition in Teaching andLearning, Bangi,Malaysia, 6-7 September 2023)

Measures to Ensure Equality and Effectiveness

To ensure the efficacy and relevance of our innovation, we carried out a comprehensive survey among our students before the design of our Al module. This survey was important in gathering information and feedback that allowed us to tailor our approach to their specific needs. Based on the survey results, we

found that all of our students had prior experience using multiple AI applications to assist them in their studies. This underscores the significant role that AI technology already plays in their educational experiences. However, a more profound and somewhat unexpected discovery was that a majority of our students admitted to having a limited understanding of the strengths and limitations associated with the AI tools they had been using. The module was then structured to equip students with the necessary competencies to utilize these tools effectively while being aware of their limitations.

Furthermore, we also conducted surveys both before and after each class session. These assessments allowed us to gauge the impact of the module on students' knowledge and proficiency, ensuring that our teaching methods align with the learning outcomes and effectively bridge the knowledge gap identified in our initial survey. The iterative process of gathering feedback and refining our approach ensures that our AI module is relevant and able to empower students with the effective literature review skills.

Measures to Ensure the Sustainability

To ensure the long-term sustainability of this project, we have made a conscious effort to prioritise cost-effectiveness and accessibility. Our approach revolves around harnessing the power of widely utilized and freely available AI applications, such as ChatGPT and Xmind, to ensure that the learning module remains accessible to all students. By leveraging these robust, cost-efficient AI tools, we aim to create an educational experience that transcends economic barriers and caters to the diverse needs of our student community.

ChatGPT, for instance, empowers students to engage in interactive conversations, thereby enhancing their information-searching skills, On the other hand, Xmind facilitates intuitive and visually appealing mind mapping, enabling students to organize and consolidate their knowledge effectively. The utilization of these AI applications not only makes our project budget-friendly but also enriches the learning experience, making it engaging and enjoyable.

Moreover, our faculty: members are actively encouraged to stay abreast of the latest developments related to the integration of A in education. This dedication to continuous professional development ensures that our educators are well-equipped to employ AI tools effectively providing students with an up-to-date and efficient approach to learning.

Future Plan

This module was initially designed with a specific focus on postgraduate students who are enrolled in the Research Methodology course at IMEN. It caters to their specific needs by providing advanced tools and techniques for literature review and research skills development. However, the long-term vision for this innovative module extends beyond its initial implementation. The intention is to gradually expand this approach to encompass other postgraduate courses offered by IMEN and eventually to the entire UKM academic community. By doing so, we can disseminate these valuable conventional tools and AI-driven approach to a broader spectrum of students across various disciplines and research areas. This expansion will empower students from different fields to conduct more comprehensive and effective literature reviews.

Furthermore, the benefits of this module are not limited to postgraduate students alone. ltis also valuable for undergraduate students, especially those undertaking final-year projects. Equipping undergraduates with these research skills at an earlier stage in their academic journey will better prepare them for future research endeavors.

Other Materials

Videos:
https://www.youtube.com/watch?v=b1XIRrpc5uA

Open Source Physics @ Singapore

Country
Singapore

Organizer
Ministry of Education, Singapore

Date started
2012

Summary

Open Source Physics @ Singapore (OSP@SG) is a national government-run programme to give learners the experience of visualization and experimentation, mostly in physics and mathematics courses. It was awarded the 2015 UNESCO's King Hamad Bin Isa Al-khalifa Prize in recognition of its innovation, sustainability and positive impact in the provision of teaching and learning opportunities via tools plugged into the programme platform (the Easy JavaScript Simulation toolkit and Tracker video analysis and modelling tool). Moreover, OSP@SG was included in UNESCO's (2016) Directory of Free Educational Resources for Teachers: Science.

The emphasis on learning in the mainstream Singaporean school context is focused on close adherence to fostering success in examinations. However, this method does not necessarily facilitate deep understanding of concepts. OSP@SG is an innovative method to provide more learner-directed concept acquisition while also allowing greater flexibility and adaptation in teaching. The open-source tools utilized by OSP@SG are freely available and customizable. This enables sharing and iterative improvements in the digital tools themselves, along with continuous innovation, efficient delivery, sustainability, and even greater impact.

OSP@SG partners with individuals as well as academics to power the variety of software tools catalogued on the Joomla content management system. The creative commons licence CC-BY-NC-SA4 permits the creation of model simulations and visualizations by anyone, but most are provided courtesy of the teams behind Open Source Physics (OSP) and Easy Java / JavaScript Simulations (EJSS), Tracker video analysis and modelling and open source code available for adjusting the simulation and video models. While there is no formal agreement between OSP and OSP@SG, the open educational resource (OER) and creative commons licensing enables reciprocal use of resources developed by the respective OSP members for world-wide benefits.

OSP@SG‘s features:

- It is an innovative OER tool for learning physics and other subjects including mathematics and science, using an open platform, open-source code and open content.
- The platform works in a collaborative way so that students and teachers can provide adaptable resources for better teaching and learning.
- It strengthens the flow of ideas from teachers to classrooms and fosters collaboration between schools, government and industry.
- It is easily scalable to the global community, as the tools and content are available worldwide.

Programme

Theme	Pedagogical innovation in using ICT in teaching and learning
Beneficiaries	• Approximately 9,800 learners and 300 teachers in Singapore • 360,000 installations of the app globally
Target population	Students in grades 3 to 12
Problem	While computer simulations are used in a wide range of fields and can augment traditional physics and mathematics lessons to improve students' understanding, most other freely available simulations are made for universities and other more specialized educational contexts rather than schools. Thus, even if these simulations are used in lessons at primary and secondary level, the resulting learning experience may not be very coherent.
Solution	Free resources and simulation software allow students to experiment with model-building and testing of hypotheses to improve their learning and understanding. Access requires only a device (mobile, computer, or tablet) and internet access. Offline access is possible via the 'download model' option on the OSP@SG website.
Results	• Students report deeper learning. • Schools report positive impacts on classroom practice. • More than 800 OERs have been created by the OSP@ SG community. • Teachers have created 18 educational games. • Computer simulation and video modelling were integrated into the national curriculum teaching guide for advanced-level physics.
Challenges	• Some teachers struggle to recognize the value in adopting the computer simulation and video modelling style of teaching promoted by OSP@SG as it does not follow the customary exam-preparation format. • The resources that are created sometimes need further revision after being presented in the classroom. • Not all students have the prerequisite knowledge needed to make optimal use of computer simulation programs and video analysis and modelling.

Digital Solution

In OSP@SG, computer simulations are created via an inquiry-directed teaching methodology that allows students to experiment with building models and testing hypotheses (Kwan and Wee, 2015). Learners discover the application of model-building through iteration, finding close-fit mathematical equations and improving their ability to match simulated or real-world data. Visualizations of real-life experiments aligned to the simulations further support their understanding.

The use of computer simulations creates efficiencies by allowing teachers and learners to explore multiple permutations of a phenomenon (e.g. What if there are three weights on one side? What if one of the weights is moved?) without the time-consuming process of setting up different iterations of a live model (see **Figure 1** and **Figure 2**).

Figure 1. Simulation of the effects of forces through a virtual lab

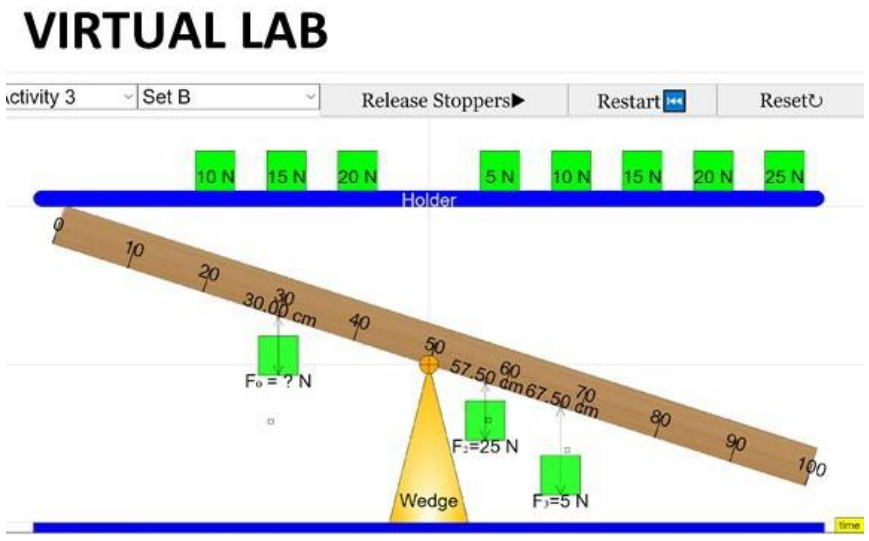
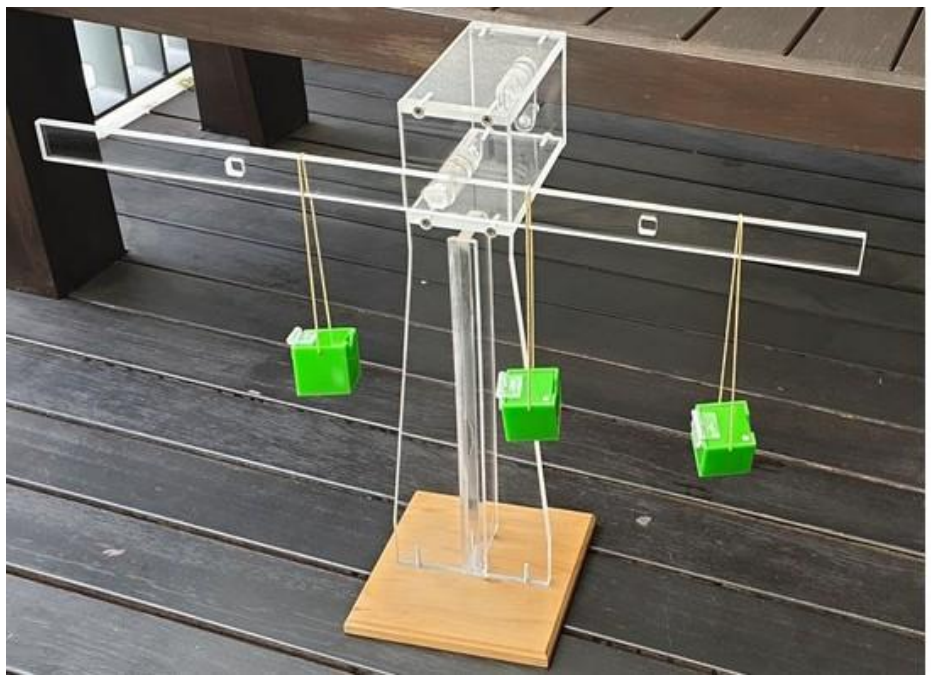
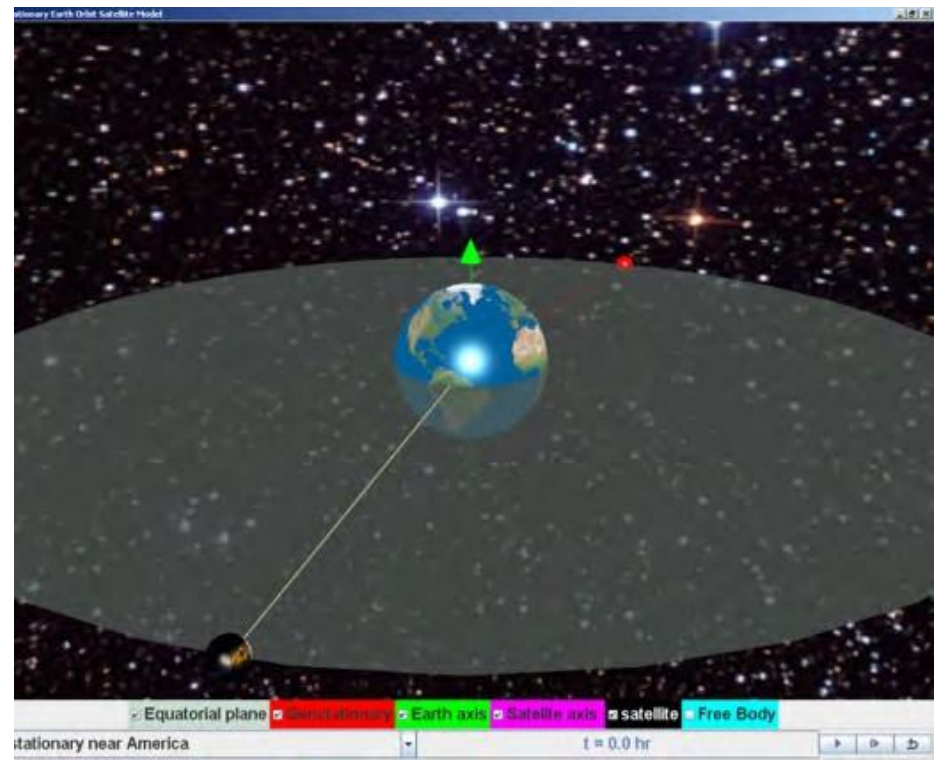


Figure 2. Studying the effects of forces using a physical model



The results achieved by different groups of students can be aggregated in a collaborative online form, creating larger datasets which are used for data visualizations such as trend lines that illustrate the relationships between variables. Additionally, simulations allow students to explore phenomena that cannot be contained in a classroom, for example, elliptical orbits (see **Figure 3**).

Figure 3. Simulation of an elliptical orbit



OSP@SG seeks to enable teachers and students to become co-designers and owners of customized digital resources, rather than passive receivers of digital content. They can explore and edit tools and use models to visualize physics concepts such as projectile motion (e.g. the trajectory of a ball thrown into the air). These allow students to form and test hypotheses and juxtapose their models against live videos of the same phenomenon on the platform (Wee et al., 2012). Researchers and education specialists can also access the platform, driving partnerships that encourage the further development and dissemination of OERs and helping to maintain the high quality and relevance of the resources available.

Results

While there has not been a large-scale controlled study on OSP@SG, its monitoring reports, pre- and post-tests, and expanding implementation suggest positive results.

The use of OSP@SG has consistently grown since its launch in 2012 at five schools. By 2015, it was being used in 12 Singaporean schools by approximately 9,800 learners and 100 teachers. As of 2020, nearly 800 OERs had been created through OSP@SG, and the website attracted an average of 30,000 visitors per month from around the world. The work of OSP@SG was recognized yearly at the national level with awards for best innovation and excellent service from 2011 to 2020. A summary by the NRF (Wee, 2015) reported that the initiative generated the following findings:

- Teachers were more effective in their teaching of difficult concepts.
- Through variations in implementation, teachers were able to customize the programme to fit different school contexts and curriculum needs.
- Sustainable practices were established as the OERs were used across different EduLab projects and were not confined to OSP@SG.
- The roles of teachers and students with regard to technology shifted so teachers moved towards facilitation and students increased their agency.
- Through mentorship by teachers, students learned more about the scientific process and developed inquiry skills.
- Interviews conducted with students (Open Source Physics EJSS Tracker, 2013), suggest that OSP@SG made a deep and sustainable impact on students' learning experiences.

In addition, OSP@SG research has generated 10 peer- reviewed articles. Their findings demonstrate that using OSP@SG to teach multiple subjects can strengthen students' conceptual knowledge in relevant curriculum topics (see for example, Wee et al., 2012; Wee et al., 2015).

Dytective: Gamified Dyslexia Risk Detection

Country
Spain

Organizer
Change Dyslexia

Date started
2016

Summary

Achieving reading fluency is considered a critical component of empowering individuals to participate meaningfully in society and is a major contributor to improved livelihoods. However, globally up to 250 million children are unable to acquire basic literacy skills.[1] While there are many factors which contribute to poor learning outcomes, one widespread challenge is developmental dyslexia, a reading-specific disability, which, by some estimates, may affect 5 to 10 per cent of the global population (Al-Lamki, 2012; Gibbs and Elliott, 2020). Despite being common and accounting for up to 80 per cent of those diagnosed with learning disabilities (Shaywitz, 1998), developmental dyslexia is still under-diagnosed and often goes untreated. This can result in school failure (Rello et al., 2016), negatively impact workplace performance (Morris and Turnbull, 2007), and reduce social independence.[2]

Change Dyslexia is a Spanish company that has leveraged linguistic knowledge and AI to develop a screening tool for the early detection of dyslexia, anda game-based environment enabling learners with dyslexia to practise important skills. The main aim of the company is to prevent school failure through the timely identification and support of learners with reading difficulties.

Its Dytective screening tool uses AI decision trees to analyse the mistakes users make in a series of timed, gamified language exercises such as selecting the correct spelling of a made-up word or correcting the errors in a passage. In about 15 minutes, the free screening tool is able to predict dyslexia with about 70 per cent accuracy, greatly reducing the time and monetary commitment usually needed to identify reading difficulties. Learners can then subscribe to DytectiveU, a personalized learning platform which provides game-based exercises proven by research to help children overcome reading and writing difficulties.

Dytective's features:

- The use of AI techniques to analyse types of errors and support the early identification of dyslexia in Spanish, a language with a transparent orthography.
- Attractive games based on empirical analyses of a corpus of linguistic errors, which provide personalized learning to improve reading outcomes.
- The high degree of accurate identification offered by the free AI screening tool, which in tests detected nearly 80 per cent of participants with dyslexia, and its wide reach to over 289,000 people in 55 countries.
- The empowerment of families and therapists with detailed reports about children's cognitive skill development, which can improve the effectiveness of dyslexia therapy.
- The dedication to reducing socio-economic barriers to dyslexia treatment through scholarships for underprivileged students.

1 See https://en.unesco.org/themes/literacy
2 See https://dyslexiaida.org/dyslexia-basics

Programme

Theme	The use of AI to innovate education, teaching and learning
Beneficiaries	Over 289,000 users in 55 countries on 5 continents
Target population	Students and adults with dyslexia
Problem	Due in part to the high cost and time commitment required for diagnosis, dyslexia often goes unnoticed or is diagnosed too late for effective intervention.
Solution	• Dytective: An online gamified test underwritten by an AI algorithm, which screens for dyslexia in Spanish; • DytectiveU: A developmental, platform-based, personalized learning support tool for people with dyslexia.
Resources required	• Online connection • Digital devices
Results	• Dytective accurately predicts up to 80 per cent of participants with dyslexia. • Users of DytectiveU demonstrate significant learning gains in only 8 weeks. • 329 scholarships were awarded to families in need.
Challenges	• The needs and preferences of different user groups require different interfaces and languages, which can be costly to create and adapt. • It is difficult to ensure added value for all target beneficiaries, children, schools, therapists and families.

> We found if we integrate the linguistic patterns we found in the mistakes people with dyslexia make into computer games we can significantly improve the performance of children with dyslexia. We integrated all this research into our platform Dytective so that every child in the world can have access to screening and treatment through play. So these children, if they work, they won't fail, and they will be able to dream.
>
> Luz Rello, Founder and CEO, Change Dyslexia

Digital Solution

The goal of Change Dyslexia is to reduce the incidence of school failure that is caused by dyslexia and associated reading difficulties in Spanish, through a multidisciplinary approach using computer games, linguistics and data mining.

Change Dyslexia's free online screening service for reading difficulties is the first step in assisting families, schools and caregivers to support students. This service is comprised of an online gamified test called Dytective and an associated predictive machine learning model. The test is designed for ages 7 to 17 and can be completed in about 15 minutes. The accuracy of the screening tool varies with age and medium but is higher than 70 per cent for most groups (Rello et al., 2020).

While machine learning techniques are broadly used in medical diagnosis, in the case of dyslexia exploration into technology for screening or diagnosis has largely been limited to eye-tracking measures, which use sensors to determine variables such as the length of time spent on each word or the number of times the eye jumps forward or backward while reading a given text. However, Dytective is designed to screen for dyslexia using a gamified online test and associated machine learning algorithm. The design of the test incorporates principles of language acquisition and specific linguistic skill sets related to dyslexia, such as phonological awareness, reading speed, and visual attention skills, and the underlying algorithm uses a Random Forest Classifier model. In this model, a series of decision trees individually divide data into groups based on shared characteristics and issue a prediction (Yiu, 2019). If the majority of the decision trees that make up the 'forest' predict that the user exhibits signs of dyslexia, the screening tool gives this as a likely conclusion. To increase the probability of detection, the exercises were designed using a corpus of real errors committed by individuals with diagnosed dyslexia. A study of 243 children and adults, 95 of whom had diagnosed dyslexia, revealed differences in not only the extent but also the type of errors made by those with and without diagnosed dyslexia (Rello et al., 2014).

The different skills addressed by the tool are structured according to the order in which they are naturally acquired. As a result, the exercises which appear earliest are the easiest for people with dyslexia as well as younger children to complete. Higher difficulty levels include words which are longer, less frequent, appear or sound similar to other words and/or involve elements of complexity such as letter blends (such as the 'str' in the English word 'straight').

Dytective players proceed through a series of timed stages of increasing difficulty, with the goal of solving as many linguistic problems as possible within the time limit. For example, players may need to correct errors in a written passage, or hear a series of made-up words and select the correct spelling from a list of options on the screen. Dytective has 32 linguistic exercises in total. The algorithm presents a likely diagnosis based on the performance of players and the errors they make (Rello et al., 2016). The Dytective tool is notable for the speed at which a diagnosis can be presented, its high degree of accuracy, and the fact that it engages learners who have already achieved a degree of literacy, as similar products often target pre-readers.

DytectiveU, a scientifically validated tool to improve reading performance, forms the second part of the solution. DytectiveU is aimed at the same age range as the test, and contains more than 45,000 exercises targeting 24 different cognitive skills related to dyslexia. Children engage with it for three to six months, during which time they can complete all the challenges of one 'world' of the game. Two more worlds are available for those requiring further training, extending support to over a year.

Based on linguistic research into the errors that dyslexics commonly make, the exercises can be accessed via the Change Dyslexia website or through the Dytective app on Android or iOS. The platform not only targets dyslexia but also highlights the strengths of individual students. As they complete activities, an algorithm compares their various cognitive skills to age-based norms and provides levelled exercises based on their performance. In this way, the games adapt per cognitive skill, so children engage in harder exercises in their areas of higher competence.

DytectiveU also offers detailed reports on cognitive skills for the use of professional therapists, enabling evidence-informed treatment, while families benefit the improved academic performance of their children (see Rello et al., forthcoming). While DytectiveU is available through paid subscriptions, families in need can apply for various scholarships which eliminate 80 to 100 per cent of the cost. These are provided by social services, ministries, and relief agencies such as Caritas,[1] to improve access to DytectiveU for underserved and socio-economically disadvantaged populations.

Results

Change Dyslexia made Dytective available for the first time in 2017. By 2019, it was the most used dyslexia screener online, with almost 250,000 users in 43 countries accessing the free tool, resulting in 141,167 registrations. That same year, more than 150 schools around Spain used Dytective, and 250 families received free treatment grants from Change Dyslexia. By 2020, a total of 285,188 children had been reached and 329 scholarships awarded.

Research involving more than 3,600 participants found that the Dytective model correctly detected dyslexia over 80 per cent of the time, and another study with over 1,300 participants and age-customized tests resulted in accuracy rates of at least 60 per cent for all age groups. Regarding DytectiveU, significant differences between a control and intervention group were observed after eight weeks of using the platform. It was also found that adherence to the use of the platform is higher when a professional therapist is providing supervision (Rello et al., 2020).

1 See https://www.caritas.org

Digital Education/Virtual Learning

Country
Syria

Organizer
Syrian Virtual University

Date started
2002

Abstract of the Implementing Organization or Individual

The Syrian Virtual University (SVU) is an accredited state university established by Legislative Decree No. (25) in the year 2002. SVU aims to be one of the leading world universities in the region. SVU also aims at developing human resources consonant with international academic and professional criteria. SVU's objective is to meet the market needs nationally and regionally. SVU is working to provide a modern learning, training and research system in the academic and vocational fields to enable the learner and the trainee to engage effectively and directly in the labor market by developing their skills and regional needs in science and technology. SVU seeks to enrich knowledge by utilizing e-learning technologies and investing in academic and professional lifelong learning. SVU is committed to establishing long-term relationships with its graduates. Quality assurance is a target.

The SVU seeks to be among universities that have a prominent ranking globally, and a pioneer in the field of E-learning in the region with the aim of qualifying human resources to meet international academic and professional standards and fulfill the needs of the national and regional labor markets in various fields. The SVU seeks also to attract the best educational and research experiences and make them part of a scientific network in which the learner and the graduate can interact.

The SVU provide a modern system in learning, training and research in the academic and professional field which allows the learner and the trainee to engage effectively and directly in the labor market by developing their skills and knowledge in diverse modern fields that are compatible with the needs and the development of the local and regional economy, and the growing use of the international network in activities and business locally. Regionally and internationally.

The geographical coverage of SVU is international, national, regional and local.

Objectives

The Syrian Virtual University aims to:

- Meet the National and Arab needs for science and technology, and qualify human resources, as well as develop the knowledge assets of our society.
- Reinforce the Arabization movement with an intention to transfer knowledge to the Arab region and link it with the global scientific process in a methodological way.
- Develop the technologies of E-learning, and consolidate it and invest in it in academic, professional and lifelong learning.
- Build long-term connections with its graduates and the institutions to which they belong.
- Motivate and develop the skills of educational and administrative staff; both full-time and part-time staff; who are considered the most important asset in improving the quality of all SVU processes.

Key Data

Funding of the project	Students' fees
Covered countries	90% of our students (40000 students) resident in Syria; 10% of our students (4500 students) resident in: All Gulf countries, Lebanon, Jordan, Iraq, Turkey, Egypt, Soudan, Germany, Austria, Russia
Target groups and percentage	Children at the age of basic education Young people Adults - 100% Women/girls - 50% Indigenous, marginalized, minority populations Persons with disabilities - 1%
Age range or Grade level and percentage	Secondary school level - 40% Higher education level - 60% Adults - 100%
Total number of beneficiaries	44,560 students

Key Activities

- Virtual Learning (Academic Level): Technical Institutes/bachelor level/Master level/Doctoral
- Virtual & Blended training
- Self-Learning Platform
- Software Consultancy & Development for local use and external entities and public corporations (Health Management Systems for higher education hospitals)
- Digital content development (Academic Content, Training Materials, Self-learning Content)
- Scientific contests organization for Kids/Youth/Higher Education Students
- Technological conference and workshops organization

Measures to Ensure Equality and Effectiveness

The University Quality Assurance team goes on to continuously develop the learning process and improve its outcomes by implementing a set of procedures that are compatible with the best academic quality assurance systems that are tailored to the specificity of virtual learning environments.
Some of the most important tasks assigned by the quality assurance team:

- Develop guidelines for the design of academic and training programs with reference to European quality assurance standards.
- Models of internal regulations for academic programs.
- Developing models for course description documents.
- Guidelines for developing learning outcomes for academic program levels.
- Guidelines for formulating test questions compatible with learning outcomes levels.
- Organizing the scientific content on the university's information systems.
- Organizing synchronized and non-synchronized sessions.
- Internal audit program and follow-up that contains:
  a. Conferring students' opinions.
  b. Conferring teachers' views.
  c. Evaluation of information infrastructure.

d. Assessment of student-teacher / supervisor communication.
e. Evaluation of the organization of scientific content on the university's information systems.
f. Evaluating the effectiveness of students' application processing system.
g. Technical evaluation of the quality of synchronized and non-synchronized sessions.

Measures to Ensure the Sustainability

SVU is a public state university with approximately 45,000 students and presents the newest technologies in terms of education, It has the full support of the Syrian state and present one of the pillars of higher education in Syria. SVU can finance itself and could have financial and academic support either from the Syrian state or from national and international corporations because it constitutes an educational hub between all the Higher education institutes and the workplace environment.

Future Plan

Syrian Virtual University (SVU) leads actually the implementation of digital transformation policy in higher education (approved by Syrian government), via a national committee headed by SVU president and composed of members from different higher education institutions. Thus, the development of SVU to become a national pole of technology for higher education should accelerate the implementation of such policy which is the main goal of the Syrian government and the ministry of higher education and research for the next 3 years. The accumulated experience of SVU in both technical and academic domains present a valuable help to the achievement of the project which needs important support to:

- Upgrade of SVU IT Infrastructure to become the national infrastructure that helps implement the blended model of learning within the higher education in Syria. The integration of the blended learning model is one of the main development axes in the digital transformation policy for higher education. It helps more than 750,000 students in Syria to become beneficiaries of academic services provided by SVU.
- Create a center of excellence in the domain of design and development of digital services, and based on the success of projects conducted by SVU in the field of digital transformation within many sectors of higher education.

The Construction of Smart Education Demonstration Zone

Country
China

Organizer
Ministry of Education

Date started
2019

Summary

The endorsement of the "Smart Education Demonstration Zone" has been secured from local governments. To promote this initiative, the education administration department will facilitate collaboration with relevant institutions. Leveraging the market mechanism, it aims to harness the potential of the latest information technology to offer personalized support and precise services for students, teachers, and parents. Additionally, the department plans to gather and utilize participant and education process data, enabling learners to engage in flexible learning anytime, anywhere, and at their own pace. The objective is to enhance the learning experience for teachers and students in the region, ensuring robust content adaptation and high teaching efficiency. This endeavor seeks to advance education equity and elevate the overall quality of education.

The Ministry of Education is actively involved in constructing and practically exploring the "Smart Education Demonstration Zone" as part of its commitment to promoting digital transformation, intelligent upgrading, and integrated innovation in regional education. The ultimate goal is to reform and innovate education concepts, models, teaching content, and methods. This initiative aims to raise the standard of regional education, accumulate valuable experiences and exemplary cases for broader promotion, and establish new approaches and models to guide the modernization of education.

The key areas of focus in building the smart education demonstration zone include:

1. Reforming Talent Training Mode:

- Transforming classroom teaching through applying intelllgent technology to explore learner-centered pedagogical patterns.
- Enhancing students' interest, initiative, and learning efficiency, fostering innovative talents with a mindset of "from 0 to 1" innovation, integrity, and ability.

2. Emphasizing AI Application Practice:

- Combining demonstration zone construction with experiments in artificial intelligence social governance.
- School-based exploration of AI practice curriculum and the establishment of an AI education curriculum system.
- Introducing the new teaching mode of "STEAM and artificial intelligence education," integrating science, technology, engineering, arts, mathematics, and AI.
- Establishing an online research community for precise teaching and research models based on big data evaluation to promote high-quality and balanced education development.

3. Balancing Designed Development and Regional Coordination:

- Encouraging each region to identify its unique characteristics and capitalize on its strengths to establish a distinctive path for smart education development.

- Actively building mechanisms for coordinated development among regions and creating an ecosystem for smart education development.
- Prioritizing the development of new education infrastructure and consistently enhancing the supporting capacity of education informatization.

Enhancing Digital Competencies of Educators and Learners, Advocating for Innovative Utilization of Intelligent Technology

The era of intelligence has elevated the demands for talent training objectives and specifications, placing a strong emphasis on enhancing digital literacy within curricula and practical teaching. In the demonstration area, the complete integration of information technology and curriculum standards is underway to enhance students' core competencies, including information awareness, computational thinking, digital learning, innovation, and social responsibility. The initiative involves the creation of exceptional online courses, the application of information technology innovations to address teaching challenges, and the enhancement of teachers' abilities in information-based instruction. Extensive practical courses in information technology are being conducted, encompassing artificial intelligence education and experimental projects, effectively boosting students' capacities to apply and innovate in information technology. Additionally, diverse forms of innovative education, such as maker education and STEM education, are being implemented to foster learners' interdisciplinary problem-solving and innovation skills.

In Beijing's Dongcheng District, a district-level "1+N+8+X" college system has been established, with a focus on establishing a practice base for teenagers. The Dongcheng District Youth Information Literacy Education College aims to cultivate students' innovative awareness and thinking, providing a platform for showcasing their innovative works and guiding teenagers in exploring the field of artificial intelligence technology. Measures to enhance teachers' professional skills and information literacy include the implementation of a teachers' intelligent training system, evaluation procedures, and reward mechanisms to help them adapt actively to technological changes like information technology and artificial intelligence.

Haidian District in Beijing is actively promoting the digital literacy of subject teachers, exploring expert-led online teaching and research, and developing a student digital literacy indicator system. The district has incorporated student digital literacy into the comprehensive student quality evaluation system and is actively engaged in school programming, STEM education, and other educational initiatives.

Changsha has established a collaborative innovation center for smart education, an innovative talent training research institute, a group of future education lecturers, and a future school research community to comprehensively advance the practice and research of smart education.

Yuncheng has initiated a three-year "Information Literacy Enhancement Legacy for Teachers," aiming to build a maker education curriculum system and explore a 5E teaching model based on student inquiry.

The information literacy improvement project for teachers in Wenzhou has established an "AI education five-in-one" ecosystem, ensuring that every school incorporates one AI curriculum, one AI team, one innovation project, one intelligent space, and one brand activity.

Qingdao has set the ambitious goal of popularizing AI education throughout the region, issuing the Guiding Outline of AI Educational System for Primary and Secondary Schools. The city has created a professional teaching team, established an education and teaching environment integrating software and hardware, extensively popularized AI education courses, and conducted AI literacy assessments.

In Chenghua District of Chengdu, the implementation of the school CIO system is enhancing the "leadership" and "guidance" in school informatization applications. Comprehensive all-staff training is underway to improve the "application" of teachers' informatization.

Advancing Classroom Teaching Reform and Establishing a Novel Teaching Paradigm

The development of innovative talents hinges on the foundation of school education, making the promotion of the "classroom revolution" a pivotal aspect in establishing the demonstration zone. Classrooms serve as the primary battleground for educational reform, and fostering a new teaching model aligned with the cognitive traits of "digital natives" is crucial. This approach enables learners to actively engage, unleash their potential, and cultivate well-rounded development. Recognizing the benefits of informatization teaching in combining large-scale education with personalized training, the demonstration area intensifies the innovative fusion of information technology and classroom teaching. It encourages teachers to creatively apply information technology to enhance teaching, reinforces student-centric teaching practices, and propels classroom teaching reform. The initiative advocates for the adoption of novel teaching methods like collaborative and constructive learning, capacity-guided learning, and design-based learning to elevate students' overall quality and skills in cooperation, practicality, and innovation. Furthermore, it identifies exemplary cases of applying information technology to address teaching challenges, leveraging the influential role of outstanding teachers.

In Beijing's Dongcheng District, the "Reform and Innovation Project of Teaching and Learning" has been implemented, utilizing big data, artificial intelligence, and other information technologies to restructure teaching content, alter classroom dynamics, reconstruct the teaching process, and enhance academic evaluation. The district promotes the "double classroom" teaching mode, integrating traditional and virtual classrooms to expand the scope of "teaching, learning, management, evaluation, and testing," ultimately improving teaching quality, reducing burdens, and increasing efficiency.

Haidian District of Beijing harnesses emerging technologies such as AI, big data, blockchain to establish an intelligent teaching environment under the "Internet+Education" paradigm, offering a comprehensive domain, airspace, and audience coverage. Personalized learning platforms, intelligent learning terminals, education assistants, and knowledge maps are employed to advance information teaching in classrooms.

Changsha City aims to comprehensively advance the application of online learning spaces and instigate the "classroom revolution." The city extensively incorporates AI teaching and various new technologies, including intelligent teaching assistants, learning companions, simulation experiments, intelligent paper, and pens, to popularize AI education. Utilizing 5G and high-definition distance interactive teaching techniques, it fosters the development of "thousands of classes" in rural network joint schools.

Guangzhou is committed to classroom teaching reform, redefining the smart classroom's basic environment configuration, teaching strategy, experimental process, and organization management. The city explores smart classroom organization paradigms, emphasizing pre-class preparation, attention to class presentation and group inquiry, accurate and individualized teaching during class, and post-class consolidation and mutual improvement. Over 100,000 students in the city participate in smart classroom experiments.

Wuhou District of Chengdu establishes a "new teaching ecology," explores a "new service pattern," and advocates a "new governance pattern." The district actively explores a three-stage teaching mode combining preset, face-to-face teaching, and expansion, emphasizing the in-depth application of blended learning.

Suzhou promotes an innovative in-class teaching mode in smart classrooms, incorporating future classrooms, flipped classrooms, synchronous classrooms, and other interconnected personalized learning fields. This creates interactive, exploratory, and collaborative classrooms, ensuring accurate and effective teaching for students.

Shenzhen Cloud School, an innovative institution combining physical schools with online education, pioneers the two-teacher teaching mode of "a main lecture plus auxiliary lecture, online plus offline." This facilitates cross-school sharing of high-quality classes and accelerates the professional growth of young teachers. Student satisfaction with the teaching mode of Shenzhen Cloud School is notably high, with over 95% expressing approval, and satisfaction with language, mathematics, and English surpassing 92%, according to surveys.

Fuzhou champions virtual experiment classes, transforming traditional school teaching from chalk, blackboard, mouth, and book to virtual experiments, VR views of underwater worlds, and virtual teaching assistants.

Implementing Data-Driven Educational Evaluation Reform for Holistic Student Assessment

In the intelligence era, the advent of new technology has transformed the conventional single, score-centric evaluation standard in traditional teaching. Instead, it places emphasis on a multidimensional assessment of students' comprehensive qualities. The demonstration zone pioneers innovative evaluation tools, delves into the application of education big data, scrutinizes the learning process, enhances the alignment between teaching service supply and learning demand, optimizes the quality and efficiency of teaching services, and achieves the effective and high-quality provision of education services. Simultaneously, it actively engages in pilot initiatives for the comprehensive quality evaluation of students, leveraging information technology. This involves exploring and implementing longitudinal evaluations encompassing the entire learning and growth process for each grade, along with horizontal evaluations covering all facets of morality, intelligence, physique, aesthetics, and labor. These evaluations are conducted using a data-driven comprehensive quality assessment solution for students.

In Shanghai's Minhang District, the incidental collection of students' learning process data is facilitated through e-books, leading to the completion of comprehensive quality evaluations for students in over 80 schools utilizing a comprehensive quality evaluation system.

The "Evaluation and Evaluation Demonstration Development Project" in Beijing's Dongcheng District has established a regional education big data cockpit to bolster comprehensive quality evaluation.

Wuhan's practical innovation in education evaluation based on big data introduces "Internet+moral education." By constructing an evaluation index system and model for students' comprehensive quality, the Wuhan Education Big Data Center collects data on students' learning processes, enabling large-scale and precise evaluations. This approach eliminates barriers in the evaluation system and guides students' long-term growth and development.

Changsha prioritizes result evaluation, process evaluation, value-added evaluation, and comprehensive evaluation, moving away from sole reliance on scores and adopting intelligent methods for assessment. The evaluation methods are diverse, and the monitoring and evaluation are inclusive.

Guangzhou actively implements smart reading projects, aiming to enhance learners' interest and proficiency in reading by collecting and analyzing reading data to facilitate personalized growth.

Nanchang utilizes big data, cloud computing, artificial intelligence, and other information technologies to build a sizable cloud computing infrastructure based

on the smart homework platform. It offers dynamic support for the collection of students' homework information through three forms: dot-matrix pen, altimeter, and fast scanner.

Strengthening Smart Interconnectivity in Learning Environments to Foster Collaborative Education Across Family, School, and Community

The primary influencers on the effectiveness of education and teaching are the behaviors and interactions between teachers and students. The intelligent learning environment plays a pivotal role in shaping these behavioral habits. With the advancements in artificial intelligence, the Internet of Things, and other technologies, the learning environment has transitioned from a confined physical space to an open, virtual, and authentic space. Fueled by data intelligence, the demonstration zone seamlessly integrates smart education into the fabric of smart cities, villages, and societies. It dismantles the barriers of data and information among schools, families, and society, fostering the comprehensive mining and integration of education data. The initiative establishes rules and regulations for the acknowledgment, openness, connectivity, and safeguarding of education big data, fostering data integration across various digital platforms at all levels. Moreover, it utilizes methods such as learning analysis and education data mining to enhance the alignment between teaching service supply and learning demand, achieve precise content delivery, and optimize the quality and efficiency of teaching services.

In Beijing's Dongcheng District, the "Future Learning Space Construction Project" is implemented, based on the unified certification of the district's education cloud service platform. It aligns with various application systems in education and comprehensively popularizes the "one person, one space" teaching and learning model district-wide under the network environment for teachers and students.

Haidian District of Beijing establishes an intelligent learning experience center, leveraging virtual reality, augmented reality, and other modern information technologies to foster scenario-based, experiential, and immersive learning experiences, stimulating intrinsic learning vitality.

Wuhan boasts 135 four-star smart campuses, 120 smart classrooms, 120 artificial intelligence laboratories, 30 standardized examination schools for physical and chemical experiments, and 30 smart libraries.

Changsha advances the construction of smart campus demonstration schools, emphasizing the empowerment of online learning spaces and the convergence of intelligent teaching assistants, tools, and resources within the space. Teachers utilize the space for education, teaching, research, and evaluation, while students engage in growth records, independent learning, inquiry learning, and personalized learning.

Minhang District of Shanghai transcends departmental and home boundaries by investing in funds, optimizing site layouts, building a smart education system, and developing a health platform. It establishes a real-time and coordinated hierarchical management and early warning mechanism to safeguard the health and safety of children.

Wuhou District in Chengdu City pilots the "One Network for All," integrating all education and teaching operations with a 5G-based Internet of Things and a software business network. It explores the "1+1+N" smart campus construction model across four school stages.

Suzhou Education Metropolitan Area Network achieves a bandwidth of 10,000 megabytes to campuses, 1,000 megabytes to classes, and 100 megabytes to desktops. The wireless campus coverage rate exceeds 90%, with 90% of schools meeting provincial smart campus standards.

Qingdao establishes an infrastructure combining software and hardware, addressing the challenge of effectively teaching AI courses through the construction and operation of a supercomputing center, teaching platform, and artificial intelligence laboratory.

The Public Service Bureau of Xiong'an New Area selects 7 "smart campus" and 16 "smart classroom" experimental schools in Xiongxian, Rongcheng, and Anxin counties, providing financial support for their development.

Advocating for the Adoption of Smart Education Platforms to Enhance Regional Public Service Capacity

The crux of advancing regional smart education lies in establishing a collaborative innovation mechanism involving government, research institutions, enterprises, and other stakeholders while overhauling the organized education system. Leveraging the public service system of digital education resources, particularly the national smart education platform, the demonstration zone brings together schools, research institutions, enterprises, and other entities to vigorously propel the digital construction of education resources. It pioneers new mechanisms for resource sharing and service supply, utilizing intelligent technology to aggregate high-quality education and teaching resources. This extends the coverage of superior education resources, effectively supporting schools, teachers, and students in information teaching and learning applications to comprehensively enhance the digital public service capacity of regional education.

The concept behind establishing the Smart Education Demonstration Zone in Beijing's Dongcheng District is to forge an intelligent, adaptable, and pervasive new education and teaching environment, creating a regional '1+7+N' smart education system. "1" represents the "data brain" of education in Dongcheng District. "7" encompasses seven demonstration projects, including an in-depth focus on teaching and learning reform, an innovation project for educational resources, a talent training and leading project, an education management and service improvement project, an evaluation and empirical development project, a basic environment intelligent improvement project, and a future learning space construction project. N denotes the formation of a new education and teaching environment with full data support and significant breakthroughs in application within "future schools," popularizing the "new teaching and learning model" and data service school management model.

Haidian, Beijing, establishes the Internet Education Research Institute, engaging in joint research on the application of intelligent technology education with high-tech enterprises, experts, scholars, and frontline teachers.

The Minhang District of Shanghai comprehensively deploys the "1258 Project," a large-scale individualized education initiative driven by data. It constructs a vertical service education cloud platform and employs intelligent teaching and learning partners to deliver personalized teaching. This results in precise services for students, parents, teachers, managers, and citizens, focusing on eight business scenarios—classroom teaching, adaptive learning, course selection, campus activities, community participation, social practice, home-school interaction, and subject experiments—to enrich application requirements.

Wenzhou centers its efforts around constructing the "digital brain" intelligent service system for education. It establishes an education data center, three digital service centers for education governance, ubiquitous resources, and school applications, creating X application scenarios.

Bengbu's "smart school" construction and application adopt a novel mechanism of "total integration and total service," evolving from a "turn-key project" to a "resident service project." This shift emphasizes not only "good construction" but also "good use,"

transforming the enterprise's operational mode from a 'product level' to a 'standard level,' promoting long-term sustainable development.

In Bishan District, Chongqing, the focus is on "double reduction" to enhance quality and efficiency. It implements ten major action systems, concentrating on the three tasks of "smart classroom, smart evaluation, and smart governance."

Lanzhou, relying on "Lanzhou Smart Education · Famous Teachers Online," adopts a distance education mode through webcasts. It centralizes resources of renowned teachers, providing remote real-time after-school tutoring for urban and rural students during spare time, weekends, and holidays. This initiative enables students to independently choose high-quality courses, listen to renowned teachers' lectures, and seamlessly connect, supplement, and expand with the current school curriculum.

Harnessing Intelligent Technology to Empower Educational Governance and Drive Educational Organizational Transformation

Establishing a novel model of educational governance with broad societal participation and driving the modernization of the educational governance system and capacity has emerged as a pivotal aspect of extensively advancing educational reform. Intelligent technology becomes a catalyst for education governance, fostering the reform and innovation of organizational forms and management modes. It enhances the scientific nature of education decision-making and the precision of resource allocation. The demonstration zone initiates and refines a scientific decision-making and educational governance mechanism aided by big data. This mechanism judiciously utilizes the national basic education database and urban development data, offering effective support for various education-related decisions. It elevates the digital governance level and serviceability of education. Dynamic simulation research in education is conducted utilizing machine learning, fuzzy mathematics, and other methodologies to create models. This allows for the dynamic simulation of the outcomes of educational decision-making, offering a scientific foundation for educational decision-making. Intelligent technology is harnessed to sense, predict, and warn about campus infrastructure and safe operations, promptly grasping the cognitive and psychological changes of teachers and students, enabling active, timely, and accurate decision-making.

During the epidemic, the demonstration areas leverage the advantages of the regional information public service support system, strategically plan, and deploy relevant teaching activities under the theme of "Disrupted Class, Undisrupted Learning," leading an unprecedented educational social experiment. Simultaneously, the experimental project of educational social governance under AI conditions in relevant regions yields positive outcomes in constructing a smart education environment and advancing the combination of large-scale education and personalized training.

In Beijing's Dongcheng District, a "data brain" is established to monitor real-time development trends in regions, schools, teachers, and students. This supports comprehensive applications in education quality monitoring, literacy evaluation, enrollment and degree management, information security control, and campus security early warning.

Haidian District, Beijing, implements the "double reduction" policy of science and technology empowerment, harnessing big data and artificial intelligence technology to create education behavior portraits for different entities. It enhances the collaborative education and management mechanism of schools, families, and society, boosting the efficiency of regional education management through data governance.

Minhang District of Shanghai achieves a unified platform for personalized teaching management and big data applications, ensuring seamless integration of platform, access, authentication, data, and protection through the One-Network Office.

Wuhan establishes a full coverage system of city, district, and university CIOs, fostering a collaborative innovation mechanism among the government, universities, research institutions, primary and secondary schools, and enterprises. It reinforces the supervision and evaluation carried out by third parties.

Xiong'an New Area of Hebei Province formulates the "Five-year Action Plan for Smart Education" based on its development context, outlining 18 action plans to provide a solid foundation for effective implementation.

Changsha, leveraging spatial big data, collects comprehensive data on the management, teachers and students, teaching, enrollment, evaluation, relationships, and safety of primary and secondary schools in the city. This data is analyzed, compared, and excavated to reflect the current state and developmental level of education in Changsha from multiple dimensions, enhancing the modern education governance level. The city conducts an artificial intelligence education and social governance experiment, guiding and standardizing the "campus" of digital learning products for teenagers.

In Chengdu City's Wuhou District, the Wuhou Education Data Center, in its initial stages, consolidates data from four application platforms, including the national student registration system, comprehensive quality evaluation data for Chengdu students, data portraits of teachers in Wuhou District, and information on myopia prevention and control in primary and secondary schools and kindergartens. This integration marks the inception of multiple application scenarios such as "development monitoring, remote supervision, teaching analysis, equipment management, myopia prevention and control, supervision and evaluation, and career statistics."

Wenzhou has instituted a mechanism for promoting a "big community" platform, spearheaded by the government's establishment of a regional inter-school community, a political research cooperation community, and an industry-education integration community. This initiative aims to propel the high-quality and balanced development of regional education.

Bengbu has implemented a collaborative innovation mechanism involving "government, enterprise, school, and research." The smart school construction project and individualized education promotion project are executed through government coordination, enterprise service, school practice, and teaching and research guidance.

In Shandong Province's Qingdao, the International Alliance for Artificial Intelligence in Education has been established to formulate a comprehensive solution for AI education.

Hexi District of Tianjin has erected a data center for the digital governance of education. This center aggregates data and utilizes a data decision visualization system for modeling and analysis. To address the challenges faced by teachers in new schools, a database for district management of teachers and school recruitment is established. Additionally, to enhance the "double reduction" policy, a private education operation supervision database is created, encompassing all institutions outside the school, including kindergartens and art and sports training schools in the area, within the scope of data governance.

Part IV

Innovate Educational and Teaching Methods for Promoting Digital Literacy for Teachers and Students

Building a Positive STEM Environment

Country
Bulgaria

Organizer
Ministry of Education and Science

Date started
2021

National Program “Building a Positive STEM Environment”

The primary objective of the National Program "Building a Positive STEM Environment" is to establish "new school centers" that serve as integrated learning spaces, specially designed and equipped to focus on cultivating competencies in natural sciences and mathematics in state and municipal schools across the country. The program anticipates the development of "innovative practices" within schools, particularly in the realms of science, digital technologies, engineering thinking, and mathematics (STEM). Emphasis is placed on transforming the "educational environment," encompassing both physical spaces within and outside classrooms. This involves reshaping existing learning areas, communal spaces, and outdoor areas to facilitate STEM activities. The program also addresses aspects like furniture and interior design to support learning and creativity, integrating digital and non-digital technologies into the physical environment, administrative processes, and teaching and learning procedures. Additionally, it aims to provide opportunities for the active participation of students with special educational needs (SEN). Several specific goals of the national program underscore its alignment with the concept of smart education:

- Enhancing Student Engagement and Skills: Cultivating digital literacy, digital arts, and creativity. Developing industry-related skills. Fostering problem-solving skills in real-life and business contexts. Promoting mathematical thinking. Instilling skills to create technological solutions. Nurturing teamwork and critical thinking.
- Motivating students to innovate and enhance technological solutions within the domains of mechanics, programming, and artificial intelligence, fostering the capability to generate new technologies and automate processes; elevating the enthusiasm of students towards pursuing university specialties and careers in technology sectors; actively contributing to the expansion of technology industries and enhancing their contribution to the country's GDP.

Projects

This national program backs two main types of projects: "Large projects" involving the creation of extensive integrated centers with a distinct emphasis, including multiple classrooms and adjacent shared spaces. These projects include:

Large Project 1: Centers for young researchers, catering to primary school students. The goal is to foster a research-oriented approach in teaching, integrating knowledge from various scientific fields. The aim is to develop Twenty-first century skills in students, including basic and functional literacy, creative and digital skills, coping abilities in diverse situations, and positive thinking. This involves a focus on creativity, project-based learning in both digital and non-digital environments, as well as the cultivation of teamwork skills and different group roles.

Large Project 2: Centers for technologies in the creative industries, targeting junior high school (5–7 grades) and high school students (8–12 grades). The objective is to create a technological learning environment for students interested in fields such as digital/video games, mobile applications, media

products, product development, digital marketing, graphics and design, etc. The emphasis is on motivating the development of creative digital skills and directing students toward professions related to video content creation, video games, digital tools, digital platforms, mobile applications, or the development of new products and services in a technological environment.

Large Project 3: Centers for digital creators, also for junior high school (5–7 grades) and high school students (8–12 grades). The aim is to spark students' interest in digital sciences and the creation of digital content with diverse applications in a real-world setting. These centers are recommended to simulate a genuine work environment in a technology company, providing space for creative activities, individual and teamwork, non-traditional learning and work settings, and high-speed Internet connectivity. The implementation of activities involves equipping the centers with 3D technology, electronic boards, microcomputers, programming tools, robotics, and maker space workshops.

Funding is also allocated to Small projects, aimed at converting and outfitting limited physical areas—such as one or two classrooms or sections within an existing space. The aim is to 'create an environment conducive to fostering skills related to creativity in digital technologies, hands-on experimentation, the nurturing of engineering mindset, problem-solving skills, and involvement in hands-on projects and tasks with a practical emphasis in science and technology. These projects take on diverse structures, including:

Small Project 1: Workshop Corners

These are "distinct spaces within rooms or offices (corners) dedicated to creativity and digital technology or the conversion of a classroom into a similar area." These corners strive to "foster the interest of a diverse range of children in creative activities and the generation of solutions (a fusion of handmade and digital products)." The aim is to develop skills for solving "real-life problems, such as (but not limited to) devising effective engineering solutions for environmental challenges, creating industrial prototypes with a 3D printer, and addressing social causes, among others."

Small Project 2: Research Laboratories

These projects may involve "mobile/portable digital laboratory kits, technical equipment, licenses for accessing platforms with electronic content in science, etc., essential for the practical work of students."

Small Project 3: Classroom for Creative Digital Creators

These classrooms are designed to stimulate "students' interest in digital sciences and the creation of digital content" within, for instance, "a classroom with adjacent common spaces." The goal is to establish an "innovative learning space" equipped with "various hardware and software technologies tailored to the students' needs, robotics and engineering kits, 3D printers, electronic boards and microcomputers, creative corners, zoos, etc."

Cafelab Colombia: A Project for Environmental Sustainability and Social Network

Country
Colombia

Organizer
Educational Institution Montessori - Seat San Francisco

Date started
2017

Abstract of the Implementing Organization or Individual

CAFELAB COLOMBIA was born out of the need to promote in students the construction of sustainability strategies based on a real intervention in environmental problems typical of aggressive agriculture based on monoculture, which generates sub-products that affect the resources of the environment. Bearing in mind that the context in which the project is developed has coffee production as its main economic base, it is necessary that the Institution becomes a research centre where the community is encouraged to use natural resources sustainably and responsibly. In particular, from the Educational Institution Montessori Seat San Francisco (located in Pitalito Huila, in the coffee-growing region of Colombia), three phases are proposed: immersion (recognition of a real problem in the coffee-growing community), transfer (in the reincorporation into productive life of all solid and liquid coffee waste) and communication (community awareness-raising). This research exercise has had an impact on the triple baseline: environmental (from the reincorporation of all the waste generated in the production of more than 21,000 hectares of coffee beans), social (in a community of more than 530 families), and economic (by becoming a great incubator of projects that serve as a generator of sustainable enterprises. The geographical coverage of CAFELAB COLOMBIA is local.

Problems

Pitalito Huila is the leading municipality in coffee production in Colombia, sowing more than 20,000 hectares of coffee beans. Our municipality faces a pressing environmental challenge due to the large amount of waste produced by the agro-industry. In particular, the whole process requires nine major steps, and 95% of the waste generated: pulp, mucilage, husks, sediment, and stalks are discarded in the environment and in water bodies, affecting their quality.

Objectives

This proposal aims to contribute to the reduction of environmental pollution generated by the various coffee sub-products, reincorporating them into the production chain, to this end, two specific objectives were established:

- To establish the current status of the disposal of the various coffee sub-products in the different stages of cultivation and the post-harvest process.
- To construct ideas for sustainable entrepreneurship, based on the reincorporation of coffee sub-products into the production chain.

Key Data

Covered countries	The project received the donation of an innovative ICT integrated classroom donated by South Korea, and 17 teachers from this country train CAFELAB COLOMBIA's lead teachers in digital competences. Likewise, the three phases of the project are developed in this classroom.
Funding of the project	The municipality's education secretary; Prizes obtained in different national and international events; South Korea invested in an innovative ICT classroom project
Target Groups and Percentage	Children at the age of basic education - 30% Young people - 20% Adults - 10% Women/girls - 40%
Age range or Grade Level	Primary school level - 5 to 10 years old Secondary school level - 11 to 18 years old Adults - 30 to 65 years old
Total number of beneficiaries	380 students & 530 coffee-growing families

Awards and Honors

1. Top 3 best schools in the world in the environmental action category. Awarded by the T4 Education Foundation in 2023 and we are currently in competition:
https://t4.education/worlds-best-school-prizes/the-five-prizes/environmental-action/

2. Double international winner, SDG "research" category, PREMIOS VERDES 2023:
https://www.retema.es/actualidad/once-iniciativas-ambientales-latinoamericanas-se-alzan-con-los-premios-verdes-2023

3. International finalist and special mention in the educational resources category for the guardians of Climate Award. Unicef, MERI Foundation and Office for Climate Education: November 2022:
https://drive.google.com/file/d/1CrzxYU2cNN4JSyWmUGUV5M4po6gb4xHs/view?usp=share_link

4. International winner, Mapping of good practices in Educación Digital de las Américas. OEA in partnership with Profuturo 2022:
https://drive.google.com/file/d/166JMKtWqxnI3_RoqzDxHs9DPQTZ28LYY/view?usp=sharing

5. Double international winner, category "promoter" and Human Development/Education, PREMIOS VERDES 2022:
https://premiosverdes.org/es/top-500-finalistas-y-ganadores/?ano=2022&pais=Colombia&categoria=Desarrollo+Humano#results

6. Latin American first place, innovative and transformative school category. Latin American Award for Innovation in Higher Education 2021:
https://www.urosario.edu.co/Innovacion-en-Educacion-Superior/Premio/#categorias_section

7. First place international. EnlightED Awards. Fundación Telefónica 2021:
https://www.enlighted.education/enlighted-awards/

Key Activities

Research classification criteria

1. **The first criteria** is defined in terms of the purpose of the research and, it can be determined that the project is framed in the basic or applied modality. According to the above, the focus is on applied research, because its purpose is to intervene in an environmental problem to help reduce the pollution caused by the generation of various coffee sub-products.
2. **A second classification criteria** is defined according to the nature of the measure. In this sense, the project opts for a descriptive and interpretative qualitative approach. This approach is the core of phase I (immersion or diagnosis); however, the contribution that the quantitative approach offers for all phases of the research is not ignored.

Phases of the research

Phase 1 Immersion

This phase responds to specific objective 1. In particular, fieldwork is carried out to find out the final disposition of the 5 sub-products identified. To fulfil this, the theory of didactic situations is followed, which are activities that serve to teach and therefore to learn.

This theory has 4 steps:

a. Action Situation. This step frames the moment of experimentation, where students try to find an immediate solution to the problem posed, giving answers from their point of view. Then, they develop readings from primary sources found on the web, books and articles that determine the existence of a real and significant problem in their community. To complement the background reading and obtain an overview of the problem, the first field trip (ecological walk through the targeted areas) is carried out.

b. Situation Formulation. In this step, instruments are designed and elaborated for the collection of information about the defined problem. In particular, value is given to the survey, interview and observation guides in the development of research with a mixed approach.

c. Validation Situation. The student researchers conceive an organisational plan that includes the choice of a type of sampling such that the sample selected is representative of the study population. In particular, the instruments were applied to a sample of 200 coffee farmers out of a total of 530. The gathering, systematisation and interpretation of results are performed by research groups (working teams of 4 people with specific roles: scientific director, secretary, spokesperson and materials manager).

Given that coffee farms are generally located in mountainous areas; the educational use of the DRONE is necessary. This instrument is capable of taking photographs and allows us to know geometric elements such as the area of the land, perimeters, the quantity of coffee and residues produced per hectare planted, among others. Similarly, programming in Micro: bit and/or Arduino is used to control variables such as air quality, humidity, temperature and PH. For the systematisation of the information, statistical applications such as SPSS are used.

d. Institutionalisation Situation. In this step, socialisation activities are conducted, where researchers make known through oral and written presentations the results obtained in the diagnosis (since 2017, students have participated as speakers in different municipal, departmental, national and international scenarios). Likewise, the diagnosis of the research project is elaborated (final documents: chapter I (problem, theoretical framework), chapter II (methodology and interpretation of results). This systematisation is also developed on collaborative walls such as Padlet, posters, flyers and creative presentations using Canva.

Phase 2 Transfer

This phase responds to specific objective 2. Thanks to the results obtained in the immersion, the students carry out an entrepreneurial idea, generating innovative products and processes from the reuse of coffee sub-products. For the development of each

entrepreneurial idea, the researchers proposed the so-called STEM (Science, Technology, Engineering and Mathematics) challenges, which contain 4 steps, as follows:

- Design: through a computational tool, the researcher solves targeted questions and proposes the best alternative solution.
- Prototyping: through the construction of elements from the reuse of coffee by-products, developing a suitable procedure.
- Test: the constructed element is tested to determine its functionality.
- Assessment: through the metacognition ladder.

This poses 4 questions:

- What have I learned?
- How did I learn it?
- What has it helped me for?
- On what other occasions can I use it?

The steps outlined are recorded in an evidence protocol. In particular, written communication provides an important opportunity to express STEM ideas. To respect the abilities and learning rhythms of the researchers, working teams are created based on Ned Herrmann's theory (colour test), defining specific roles:

- Scientific director
- Secretary
- Spokesperson
- Responsible for materials

For the elaboration of the prototypes, logs are filled in, photographic records are taken of the raw materials, the elaboration process and the finished product. In this way, prototype data sheets are drawn up. This sheet contains the following elements:

- Name of the product
- Description of the product
- Composition
- Main characteristics
- Type of preservation
- Processing procedure
- Expected shelf life
- Recommendations for use

Phase 3 Communication

In this stage, scientific dissemination material is produced for the general community in written and oral form. In particular, the two previous stages are consolidated in the production of a scientific book.

For oral communication, audiovisual production is used, the work of which is directed by the child researchers. Furthermore, we participate in international events to socialise the results obtained in the previous phases.

Results

As a result of the project, it is possible to contribute to the development of scientific competence levels in the students, as well as the necessary skills to enable them to collect and study sources of information, analyse real situations from a theoretical perspective, propose and evaluate solutions using available resources, plan and project. In addition, through the strategy, our students demonstrate appropriate ways of thinking, habits of persistence, curiosity and confidence in unfamiliar situations that are useful to them outside the classroom.

In the same way, the research students have actively participated in national meetings in which they have strengthened their scientific, mathematical, communicative and social competencies. Some of these are the camp "GENERACIÓN PAZCÍFICA" proposed by the MEN, where they reinforced their skills and knowledge, attitudes and behaviours for democracy, participation, peaceful conflict resolution and respect for plurality through debate and argumentation. We obtained third place nationally in the event called "LOS CRACKS DE LA CIENCIA" organised by Minciencias, which improved their scientific and technological vocations, and in May 2022 we participated as international speakers in the MILSET Brazil event, in which our proposal stood out as the most important of the fair, among 80 projects from 10 Latin American countries.

It is noteworthy that the proposal has allowed the Institution to become a resilient school at an international level, where through research, my

students can respond creatively and innovatively to global issues such as climate change, the energy crisis, excess carbon in nature, global food security, deforestation, and deterioration of terrestrial and aquatic ecosystems, among others. This recognition has been made from different scenarios, an example of this is the foundation PREMIOS VERDES, who have awarded us four prizes in the 2022 and 2023 editions: human development, scalability, research and the SDG, where we will have the opportunity to represent Colombia in New York in November, with an active participation in the United Nations convention and climate week to be celebrated in Panama.

All of the above has made it possible to motivate and improve the academic performance of young people in the different subjects proposed in the curriculum. According to the report of the national external tests, in the area of Mathematics there was substantial progress in the overall average (from 50% in 2016 to 57.8% in 2019, also reducing the standard deviation from 12% to 7.8% and to date the averages tend to rise). In terms of performance levels, in 2018, 64% of the students assessed were placed in the third level out of four, which indicates an increase in competences in this discipline. This has meant that 70% of the students who graduate from the Institution are now pursuing technical, technological and higher education studies in areas related to Engineering, and the drop-out rate has been reduced to 2% when it used to exceed 15% per year.

Measures to Ensure Equality and Effectiveness

Cafelab Colombia went from being a classroom practice to a project that transformed the pedagogical practices of the entire institution. At the institutional level, the proposal allowed for the study and rethinking of the curriculum. The curriculum was modified, with project-based learning as the central axis that contributes to the development of specific competence levels in students. Also, the classroom plan followed by the teachers (126 teachers permeating the lives of 3300 students throughout the institution) was modified, moving from a traditional model to a model that sought a real analysis of the sociocultural context of the community, to address issues that would allow us to respond innovatively and sustainably to the challenges posed by a world as changing as the current one.

From this perspective, the teacher today assumes the role of a researcher, who raises questions about his or her practice, relates student learning to life itself, and reflects on his or her actions and influence on the lives of others. Similarly, the student is no longer a passive receptor of information, but a researcher, a being who understands his or her reality and helps to transform it creatively. We can affirm that, through the investigation of the real and meaningful context of the community, we are guaranteeing equality and effectiveness, the latter premise, in the transformation of the school into an incubator of environmental awareness and responsible behaviour.

Measures to Ensure the Sustainability

The experience has continuity in time for the following reasons:

1. It is an environmental project that is integrated into the Institutional Educational Project and its methodological structure allowed the improvement of the area plans, classroom and didactic sequences of the teachers.

2. It is part of the significant experiences that the Secretary of Education of the Municipality supports, and it is about to be consolidated as a master proposal.

3. It is connected with different strategic allies that will contribute to its sustainability. In particular, Corporación Autónoma Regional Alto Magdalena in waste management, South Korea from the innovative integrated ICT classroom (there is an action plan established for seven years, this being the third year of technical support and continuous training), Fundación Telefónica to train students in the area of

digital skills, who will be responsible for digitally alphabetise coffee growers in the region, and directly with the SENA and SEM Pitalito in the generation of an action plan that includes digitally training 26,000 students and more than 1,200 teachers in the municipality.

Future Plan

Today, the whole of the San Francisco seat is a research and innovation centre for sustainable development, which, since the restructuring of the curriculum, is minimising the environmental impact generated by coffee production. In the medium term, the aim is to structure an environmental theme park, which will contain various learning environments for scientific and technological promotion in the development of the three methodological phases (immersion, transfer and communication). In particular, with the support of specialised companies, it is possible to train and support the coffee community (especially women heads of household who are the last link in the coffee chain) in entrepreneurial projects, which will firstly support environmental sustainability and secondly provide new income alternatives for their homes.

Other Materials

Click to read/watch:

Colombia Aprende Report

Book made with child researchers

Institutional Video Ministry of Science in Colombia

Official YouTube channel

Scientific Article

Robotics and Mathematics: A Proposal for Learning

Country
Colombia

Organizer
Eileen Navarrete Serrato

Duration
11 years

Abstract of the Implementing Organization or Individual

The lack of interest expressed by some secondary school boys, girls and young people at the IEDR Pablo Herrera in the area of mathematics has led teachers to look for strategies that involve them in their teaching and learning processes, taking into account their needs and interests. Due to this, the need arises to set up a scenario for learning mathematics with the help of Robotics from the design and construction of prototypes that provide solutions to community problems using different technological tools and that strengthens the training of citizens. critical and reflective.

In addition to this, it is considered necessary to generate strategies that allow children and adolescents to be educated users of technology with the help of robotics, ensuring that in this approach they can use it to create creative solutions to interests, needs or problems in their environment. through innovative proposals.

For the development of the proposal, in education, new visions of what school mathematics can arise, based on an educational concern: "the formation of critical citizens." Due to this and what was mentioned above, the need arises to seek strategies that contribute to the generation of learning based on the needs and interests of students, who are expected to be critical people and seek solutions to society's problems.

In the same way, it is necessary to consider some conditions to ensure that children and adolescents get involved and actively participate in the learning process considering "intentionality." Intentions are related to the ideas, hopes and expectations with which students come to school and are determined by the conception they have about the goals and reasons for learning. They can negotiate and share intentions with the teacher through an activity in which they act as a group and dialogue becomes the main element for negotiation and dynamization of learning. The geographical coverage of the *Robotics and Mathematics* is national.

Problems

For several years now, the teaching staff of the Pablo Herrera Rural Departmental Educational Institution of the Municipality of Cajicá, Cundinamarca, has sought spaces for pedagogical reflection around the low academic performance and problems of school coexistence of boys, girls, and young people, in particular. In mathematics. Situations such as the lack of interest, motivation, commitment, and responsibility in the activities proposed daily in the classroom and in the autonomous work suggested at an extracurricular level, allow us to identify behaviors such as indifference, resistance, and refusal to learn.

Objectives

General objective

- Strengthen teaching and learning processes in Mathematics through scenarios associated with educational robotics and the use of technological tools.

Specific objectives

- Design, construction, and programming of prototypes that respond to the needs and problems of IEDR Pablo Herrera students.
- Socialization of experiences and participation in national and international events of science, technology, and innovation by the IEDR Pablo Herrera robotics club.
- Use of object-oriented programming languages, specialized software, and other technological tools to strengthen teaching and learning processes.

Key Data

Funding of the project	Municipal education secretary Managers Cundinamarca government (e.g. Colciencias program)
Target Groups and Percentage	Young people - 40% Adults - 10% Women/girls - 20% Out-of-school children - 20% Persons with disabilities - 10%
Age range or Grade Level and Percentage	Primary school level - 20% Secondary school level - 60% Higher education level - 10% Adults - 10%
Total number of beneficiaries	Between 100 and 200 beneficiaries between students and teachers annually

CONSTRUCCION DE PROTOTIPOS

Key Activities

1. Formation of the robotics club

- Registration of students from 6th to 11th high school according to their needs and interests, organization of work teams and assignment of roles (Leader, secretary, treasurer, speaker, journalist). We work 4 to 6 hours a week during extracurricular hours.

2. Navigating through history

- Construction and socialization of the timeline of robotics, its advances, and principles. It is done through online consultations, videos, interviews. Each group must creatively present their query, always using technological tools.

3. A grain of sand to change the world

- Identification of community needs through a process of inquiry with residents of the municipality, talks, interviews with some teachers and parents. The work team identifies the problem to which it wants to solve and socializes it to all its colleagues using some tics tool.

4. Get to work

- The work team uses some technological program to design the prototype and then begins the construction process using Lego material or electronic material. After this, you are ready to carry out the programming either in Lego using blocks, Arduino mBlock.

5. How much have we learned?

- During the design, construction and programming process, the student carries out a conceptualization process on robotics, pneumatics, mechanics, electronics, renewable energy, and other mathematical, physical and technological concepts according to what arises in the process and their needs. Upon completion of the prototype, they must explain to the entire club the step by step of its construction using the concepts learned.

6. Let's replicate our experience

- When the prototype is finished, the teacher registers the proposal for an event outside the institution and among the entire club, the participants are selected who will share the experience with other schools or universities.

7. Let's compete!

- Every six months we participate in robot line follower and minisumo competitions. Prototypes designed, built, and programmed by robotics incubator students or those interested in participating.

Robotics has allowed students to recognize the importance of physics, mathematics, technology, etc., to propose solutions to problems in a community. This has led to a significant understanding of concepts that are proposed in the curriculum for higher grades (mechanical, electronic, wind energy, renewable energy, solar panels, pneumatics, speed, power, distance, conversions, voltages, etc.) and that from traditional practices that are very complex to teach.

The registration of the robotics project to the Ondas research program has promoted the generation of research scenarios that invite students to ask questions and seek explanations, to engage in a process of exploration and inquiry, finding reasons to learn and making use of a diversity of technological tools. Below are the questions that students have proposed for the development of their research proposals for several consecutive years:

- How can we use Robotics and some areas of knowledge such as Mathematics, Physics and Technology to propose solutions to problems or needs of the community?
- How to build line-following robots using various materials such as recycling and that respond to some needs in the environment of the IEDR Pablo Herrera students?
- How to reduce the level of insecurity in the Chuntame village with the help of technology?

Questions to which they have answered through hard work with the support of the teacher, the Ondas program, and the educational community. In addition to all the learning generated, values such as responsibility, respect, care for the body and the environment, use of free time and self-esteem have been strengthened through collaborative work.

A research hotbed was formed that has been in the Robotics Club for several years and they are the ones who lead the training processes of the students who join each year and represent the club in extracurricular activities through active participation in fairs, meetings, and conferences. of science, technology and robotics at the departmental level, which has allowed students, in addition to having a level of understanding in robotics, to strengthen communication processes through the appropriate use of language and interact with teachers and students from other municipalities and departments that work in the same line.

Parents have expressed their children's interest in belonging to this type of project because they are spaces that encourage the appropriate use of children's and adolescents' free time and allow them, through proposals, projects and work aimed at research is formed as critical and reflective subjects who use mathematics and other areas of knowledge to propose solutions to problems in their environment, no longer seeing them as a stable body of absolute truths and identifying their importance to solve real-life situations.

During the development of the scenario and due to the type of diversified tasks proposed and the use of technological tools, we were able to see that when it is possible to capture the macro-context and the micro-context of the children and young people from their community, according to Navarrete E (2015) possibilities open up to other types of situations, research scenarios have the power to open means of communication with others, to open spaces for socialization, to generate the possibility of dialogue and interaction not only in Mathematics class.

The relationship of the subject with the space determines the experience that students can have; leaving the classroom represents another type of experience. The opportunity to have other different spaces for practice and the use of technological tools can open the possibility of another type of practical experience and having the latter can open cognitive possibilities. The grade loses power in this type of scenario to such an extent that students never question a grade, the evaluation corresponds to a process during the development of the entire project where the student can correct their errors without any tension. In this type of scenario, initially, the children and young people call the teacher only to validate or not the work done, but as the scenario progresses, the students begin to gain confidence and a dialogue begins with the purpose of telling the teacher their findings. experiences and involve her in their conversations.

The proposed activities address numerical thinking activities (use of rational numbers in their different representations, justification of calculations in problem-solving), spatial thinking (representation and characterization of three-dimensional objects), metric thinking (calculation and interpretation of volume of solids, estimation, relationships between different units, use of standardized measurement units), variational thinking (representation of variation situations, direct proportionality) and random thinking (organization and interpretation of data, frequency tables, statistical graphs, measures of central tendency) and the reflections that arise and allow an approach to reflective knowledge from mathematical knowledge.

Awards and Honors

From 2012 to 2018, this programe has received many national and international awards.

Measures to Ensure Equality and Effectiveness

The Robotics Project is formed every year with students from all grades of the institution, regardless of the knowledge they have about robotics or their age. After this, work teams are organized where the skills, interests and needs are demonstrated. of each one, thus allowing everyone to play an important role during the process.

The group leaders support the design, construction, and programming processes according to the level at which each student is, thus respecting their learning processes and trying to find, with the support of the teacher, ways to motivate them so that their progress is significant and managed to impact the group and subsequently the community.

Future Plan

To continue with the experience, I consider it important to involve more teachers from the institution in the area of mathematics, technology and physics to serve the population that wants to be part of the initiative.

On the other hand, it is necessary to continue acquiring robotics and electronics material, which is why every year the management is carried out with the secretary of education of the municipality and institutions that are interested in supporting this type of initiative and that contribute to material or money to the purchase of material.

I also consider it important to continue holding the robotics meeting every year to continue strengthening experiences at the municipal level and begin to build knowledge networks that point to the same interests.

In the same way, it is very important to work with educational robotics in the classroom from the area of Mathematics, Physics and Technology, trying to make curricular adjustments that allow interdisciplinary processes to reach a larger student population.

This year we have been carrying out a study about students with special educational needs to generate a medium-term proposal that includes them in a more significant way in the project and that allows a contribution to their training processes.

Other Materials

Click to read/watch

- Video 2023
https://youtu.be/RrTiYyeSnbw
- Video Alcaldía Municipal de Cajicá
https://www.youtube.com/watch?v=gZAS0LUJKKY
- Competencia Robot velocista en Universidad UNIMINUTO
https://www.youtube.com/watch?v=rQxE4XScrw4
- Reto de innovación IEEE 2017
https://www.youtube.com/watch?v=nTR2M-tLF78
- Eventos Club de Robótica
https://clubroboticapabloherrera.blogspot.com/
- Bitácoras
http://matematicasiedrpabloherrera.blogspot.com/p/club-de-robotica.html

Publications

- Escenarios, robótica y matemáticas 2015
- Robótica y matemáticas: Una propuesta para el aprendizaje-2017
- Formar y transformar: Investigadores tejedores de vida y conocimiento-2020

EXPLICACIÓN DE SU FUNCIONAMIENTO

Digital Competence Development for Educators Programme

Country
Cyprus

Organizer
Cyprus Pedagogical Institute

Duration
In the process of designing the next phases, on a three-year time horizon

Abstract of the Implementing Organization or Individual

The Cyprus Pedagogical Institute (CPI) of the Ministry of Education, Sport and Youth (MESY) implements the Programme “Digital Competences Development for Educators” (DCDE), aiming to strengthen and further develop teachers' digital competencies in order to promote the effective use and integration of digital technologies in the teaching and learning process. Its geographical coverage is national. The intended outcome of the Programme:

Teachers should be able to use online learning environments, electronic learning tools, open digital educational content and learning communities, in order to enhance their professional development and lifelong learning skills.

Teachers should develop the necessary digital skills to become effective in providing innovative learning environments in the Cyprus educational system, in order to support their pupils to acquire knowledge, while cultivating values and attitudes, and also developing the necessary horizontal skills essential for the 21st century.

The Program is offered following a distance learning approach and methodology (and in some cases, it follows a combined/hybrid approach), utilizing the CPI's eLearning Environment (https://elearn.pi.ac.cy/). It consists of an Introductory Module and ten Learning Modules with content on thematic areas that have been defined through a process of diagnosing the needs of teachers but also following European and national directions.

The Programme supports and contributes to the implementation of educational policies of the MOESY, mainly the Policy for Digital Education and the integration of digital technologies in the learning process, as well as the implementation of the Policy for Teachers' Professional Development.

Key Data

Funding of the project	National funds/ CPI Budget
Age range or Grade level	Primary school level Secondary school level
Total number of beneficiaries	The program was offered on a pilot basis for 2 school years/ phases and about 270 teachers had the chance to register and start the programme. The goal of the CPI/MOESY is to offer this programme in the next few years and target as many teachers and possible.

Philosophy

The role of teachers is undoubtedly one of the main factors in achieving learning objectives and outcomes. At the same time, continuous developments and changes at technological level (digital technologies and their role learning) but also at socio-economic level (globalization, multicultural societies, artificial intelligence and its role in personal and professional life) require continuous professional learning and development.

The European Commission's Digital Education Action Plan (2018), https://eur-lex.europa.eu/legal-content/EL/TXT/PDF/?uri=CELEX:52018DC0022&from=EN, highlights digital competence as a key factor for effective teaching and learning, setting 3 priorities:

- better use of digital technology for teaching and learning
- developing appropriate digital competences and skills for digital transformation
- improving education by improving data analysis and forecasting

In addition, the European Commission's new Digital Education Action Plan (2021-2027), https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_el, emphasizes through its two main priorities:

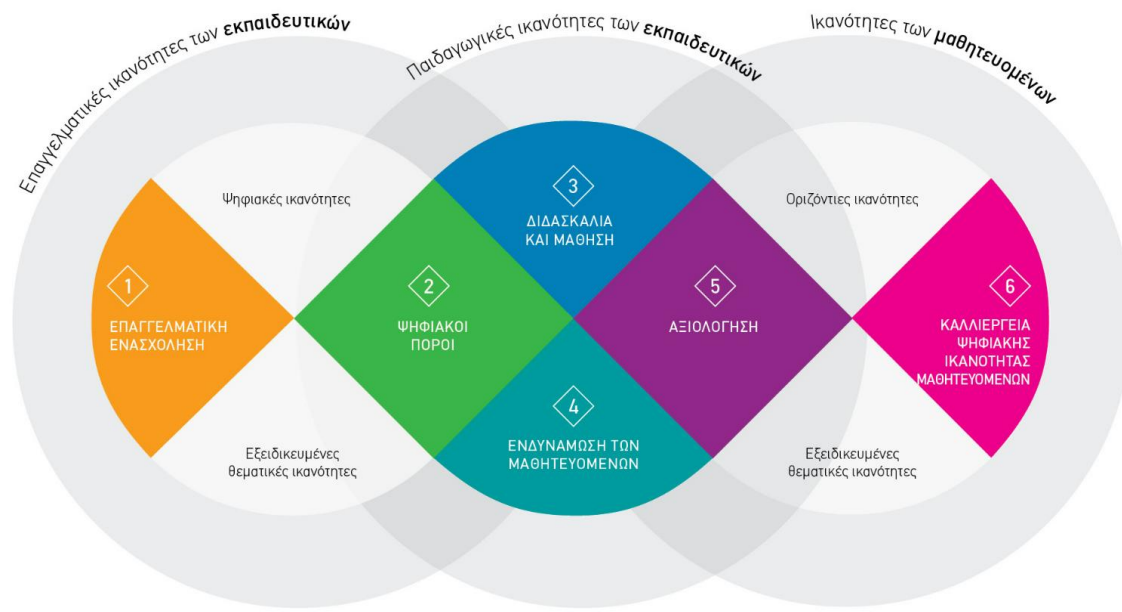
- fostering the development of a high-performing digital education ecosystem and
- enhancing digital competences and skills for the digital transformation

Digital competence is a complex concept. The European Digital Competence Framework for Teachers analyses 6 competence areas, comprising 22 competences, related to teachers' professional and pedagogical competence. The Teacher Training Program is based on the principle that teachers, as adults but mainly as professional educators, can take advantage of opportunities provided to them to implement their own personal learning planning through a circular learning process.

Following the learning process of the ATS2020 model (http://ats2020.eu), each teacher:

- define his/her learning objectives, using the SELFIE for TEACHERS online self-reflection tool which is open-access
- implement learning activities (attendance of Learning Modules), collect evidence of his/her learning and
- reflect on his/her learning path

To this end, the Program offers flexibility and options, so that it can meet the specialized needs of teachers as groups and as individuals.



Objectives

Through this Program, teachers are intended to:

- be able to leverage online learning environments, online learning tools, open digital educational content and learning communities to enhance their continuous professional development and skills acquisition lifelong learning,
- develop the necessary digital skills to be effective in offering innovative learning environments to the Cypriot education system, to support their students to acquire a basic core knowledge but also to develop to the maximum extent possible the horizontal skills required in the 21st century, while cultivating basic values and attitudes.

Measures to Ensure Equality and Effectiveness

During each phase, there are in place evaluation procedures (i.e. a pre- and post-survey for the attendants as well as the trainers of each module). Moreover, after each implementation phase, an updating procedure of the content of each module is also provisioned.

Measures to Ensure the Sustainability

The project is considered as one of the major professional development actions of CPI in regard to the area of Digital Education. Budgetary provisions have and will be made for the upcoming years, in order to reach as many teachers as possible (reminder: this is a programme that teachers choose to register/attend on a totally voluntary basis).

Implementing Experiential Learning Practices to Educate Children, Parents, and Teachers on the Safe Use of Internet

Country
Cyprus

Organizer
Cyprus Pedagogical Institute, Ministry of Education, Sport, and Youth of Cyprus

Date started
2016

Abstract of the Implementing Organization or Individual

The proposed practice is carried out within the framework of the Cyprus Safer Internet Center (SIC). The Cyprus Safer Internet Centre – CYberSafety (https://www.cybersafety.cy), building on European funding as part of the Better Internet for Kids project, aims to strengthen efforts for the creative and safe use of the Internet in Cyprus. Its geographical coverage is national. The European project team of the Cyprus Safer Internet Center consists of five partners: the Cyprus Pedagogical Institute of the Ministry of Education, Sport, and Youth (MOESY), the Digital Security Authority (DSA), the University of Cyprus (UCY), the Cyprus University of Technology (CUT), the Pancyprian School of Parents (PSP), and the Cyprus Telecommunications Authority (CYTA). More specifically, the Safer Internet Centre (SIC), through a national platform, closely linked to the Core Service Platform running a range of Safer Internetservices, aims at providing:

- An awareness-raising centre targeting children, parents and teachers, childcare workers and other professionals working with children (eg.Health professionals) about better and safer use of the internet, building on digital repositories, from which specific awareness toolkits and services will be adapted and deployed in cooperation with third parties, such as schools, industry and relevant nationalstakeholders.
- A helpline service that provides support to young people and their parents regarding harmful contact, offensive conduct (e.g. cyberbullying, hate speech, sexting) and undesirable or harmful content.
- A hotline for receiving and managing reports from the public related to illegal online child sexual abuse material (CSAM).

The Cypriot SIC provides generic services and closely coordinates its activities with the Core Service Platform, the BetterInternet for Kids(BIK) and INHOPE networks.

Problems

The primary issue/problem at hand involves the need for increased awareness among children and adolescents regarding the risks of main online danger e.g. grooming, the vulnerabilities associated with personal data on the internet, and the practice of sexting. Furthermore, there is an essential requirement to offer psychological assistance to children who have become victims of these situations and their families who have been impacted. In recent years, the Cyprus SIC, along with the helpline and reporting service 1480, has undertaken various initiatives in this regard, including organizing seminars and lectures tailored for parents, students, and educators.

Key Data

Funding of the project	The Cyprus Safer Internet Center - CYberSafety, relies on European funding as part of the Better Internet for Kids (BIK) project.
Target groups and percentage	Children at the age of basic education - 20% Young people - 30% Adults - 40% Indigenous, marginalized, minority populations - 5% Persons with disabilities - 5%
Age range or Grade level and percentage	Primary school level - 35% Secondary school level - 25% Adults - 40%
Total number of beneficiaries	The number of people benefiting from the activities offered varies each school year. However, through the implementation of this practice at the local level, approximately 5,000 people benefit annually.

Objectives

The objectives of implementing experiential learning practices for safe internet use encompass several key goals. Firstly, there is a focus on enhancing awareness among children, parents, and teachers regarding the potential risks associated with internet usage. This is achieved through engaging in experiential learning activities designed to make these risks comprehensible. Secondly, the initiative aims to foster skill development by equipping target groups with practical tools to identify and mitigate online risks. This includes imparting knowledge about recognizing e.g. fake news, understanding privacy settings, and effectively handling issues like online harassment. Moreover, the program seeks to facilitate inter-generational communication, bridging the gap between generations and promoting open, constructive dialogue between children, parents, and teachers, by creating a safer online environment.

Key Activities

An Awareness Centre supports the work for Safer Internet Centre in Cyprus – CYberSafety, by developing rich educational/informational material, resources, and tools, as well as organizing campaigns to empower children, young people, parents, carers and teachers with skills and knowledge on how to be safe online and benefit from the advantages that the digital environment can offer. Furthermore, the Awareness Centre works closely with children and young people allowing them to actively share their experiences, ideas, and views, reinforcing them to formulate suggestions and actions regarding the creative and safe use of digital technologies and the Internet.

Through the European project CYberSafety, and more specifically the Awareness Centre, various information and awareness activities are organized by the five partners participating in the project, addressing children, parents, and educators throughout Cyprus.

The collaboration between partners dealing with different aspects of technology leads to the maximization of innovation and effectiveness in implementing the proposed actions for children/adolescents, parents, and educators.

Regarding the recommended best practice, it involves organizing experiential workshops, informative lectures, and various other activities implemented by the Awareness and Information Center of the CYberSafety project. The experiential workshops and lectures, as well as the organization of various competitions and material production through active engagement of the target population, involving best practices in the field of education and knowledge acquisition through experiential learning.

Specifically, a series of strategies and techniques for experiential learning are implemented, which yield positive results and achieve the desired goals concerning the development of digitally competent students, parents, and educators. The experiential workshops, informative lectures, and creative activities for safe and responsible internet use are based on the principles of experiential and active learning. Specifically, participants are given the opportunity to assimilate the material through active participation in interactive discussions and group activities. Additionally, case studies are provided, allowing trainees to apply theoretical knowledge of digital skills and safe internet use in practical situations from everyday life. Finally, there is always an opportunity for reflection with the aim of creating a productive discussion that will enable the development of critically thinking children, parents, and educators who can become digitally competent citizens.

Cyprus SIC promotes the actions of the National Strategy for a Better Internet for Children in Cyprus (https://www.esafecyprus.ac.cy/ethniki-stratigiki) and participates in the coordination and implementation of actions of the Cybersecurity Strategy of the Republic of Cyprus (Action 9.1 "Promotion of a National Cybersecurity Information and Awareness Program" and Action 10.1 "Development of appropriate human resources").

Below, a few of the offered activities within the framework of the best practice we provide are mentioned, focusing on the development of digital skills for children, parents, and educators.

Synergies among implementing projects on the use of digital technologies creatively, responsibly, and safely, have supported this aim. The Digital Competence Framework for Citizens (DigComp 2.1) was translated in Greek, to help and guide the design and development of the different workshops and awareness raising activities:

1. University of Cyprus (UCY):

Presentations/workshops to students (primary & secondary education) on the use of internet tools with an emphasis on Privacy Protection and a workshop on Online Privacy and Online Digital Footprint.

2. Cyprus University of Technology (CUT):

Campaigns / Workshops at schools. Topics:

- "Online Social Networks threats"
- "Risk coping techniques"
- "Available parenting tools and CFAS tool"
- "Available teaching methodology and material on cybersecurity and cyber safety topics"

3. Digital Security Authority (DSA):

The DSA delivers presentations and interactive Workshops to students and teachers on topics around cybersecurity and safe internet browsing. Topics:

- “Comparison of genuine websites/emails with deceptive/malicious ones and how to recognize them. Analysis of social engineering deception methods”
- “Best practices for safe Internet use and risk identification, through examples. Analysis of the dangers of malicious files and their identification methods”

4. Cyprus Telecommunication Authority (CYTA):

Presentations/workshops on the safer use of internet. Topics:

- "Internet a tool for everyone" – for elementary

school students
- "Online Gaming and Social Media – Ways to Protect Yourself" - for high school students

5. Ministry of Education, Sport and Youth (MOESY):

Workshops for students and teachers
on Internet Safety and Educational Workshop for editing videos for students about the competition to produce a short video on internet safety.

6. Pancyprian School of Parents (PSP):

Workshops/presentations to parents and teachers of primary, secondary, and higher secondary education.
- The topic of the seminars is the following: "CYberSafety: A Better Internet for Children in Cyprus"

Student Video Production Contest: Cyprus Pedagogical Institute organizes an annual competition of short films by students within the thematic area of the safe and creative use of the Internet. Students' video production aims at developing children's skills in relation to Media Literacy as well as at constructing knowledge and shaping their attitudes regarding this crucial and important thematic area. Through this creative and learning process, students engage in activities related to the production of digital video, such as researching about Internet safety issues, writing the story and script related with the key messages and narrative they want to pass to the audience, rehearsing, directing the camera, sometimes performing, editing and other post-production tasks. Moreover, students going through the process of authoring and communicating their messages and digital online content, contribute towards a better Internet for children, in accordance with the educational objectives of creating a safe Internet culture and empowering creative, innovative use of the Internet. Six films receive awards and are also presented during the main Safer Internet Day national conference.

During the 2022 – 2023 school year (from October 2022 to May 2023), a total of 114 activities were conducted, benefiting 4,538 students, 348 teachers, and 270 parents.

The Awareness Centre of the Cypriot SIC maintains a strong connection with children and young individuals, encouraging them to actively express their experiences, thoughts, and perspectives. This approach empowers them to propose ideas and take concrete actions toward fostering creative and secure use of digital technologies and the internet.

Measures to Ensure Equality and Effectiveness

With the aim of ensuring that all children, parents, and educators in Cyprus, regardless of their circumstances or background, can benefit from these activities, a series of measures are being taken to eliminate any inequalities or obstacles that may arise. Specifically, the primary goal of these actions is to ensure equal access for all students, parents, and educators by providing support based on specific needs, which often relate to the background of specific groups (e.g., children with migration backgrounds, children belonging to the LGBTQ community, etc.) or targeted interventions that address specific population groups that may face additional challenges in terms of accessibility to technological/digital tools. Ensuring equal and unhindered access for all target populations to experiential learning practices through experiential workshops, lectures, and various other activities, as proposed above, is our primary concern.

Regarding the effectiveness of the actions implemented within the framework of the proposed best practice for digital security, efforts are being made to implement approaches and strategies that allow for the assessment of the impact of these actions, with the aim of maximizing their effectiveness. More specifically, the various actions are designed and implemented based on careful planning that responds to the specific educational and other needs of each audience, applying empirically validated practices. Additionally, efforts are made to adapt the materials

and techniques applied based on the evaluation of the proposed activities and actions.

Measures to Ensure the Sustainability

Regarding the development of digitally competent citizens, the continuation and sustainability of the techniques taught and transmitted through the experiential activities carried out is considered very important.

At the level of the wider project under which the proposed best practice for the safe and responsible use of the Internet is implemented, regular and frequent checks are carried out to verify the smooth implementation of the actions in question by all five partners participating in this project. At the same time, through the implementation of the actions and objectives set in each principle of the European project and the submission of a new proposal, the continuation of funding from the European Union is ensured, so that the actions for digital citizenship, which are aimed at students, parents and teachers to continue to be carried out, in order to ensure the continuation of previous actions, with the implementation of new programs that arise after examining needs.

Regarding the maintenance of long-term results and practices as they arise in the context of experiential workshops, informative lectures and various other actions carried out, a strong effort is made to strengthen the skills, knowledge, abilities, and critical thinking of the people involved and institutions, to enable them to apply the acquired knowledge in other contexts, maintaining the initial impact of the actions implemented.

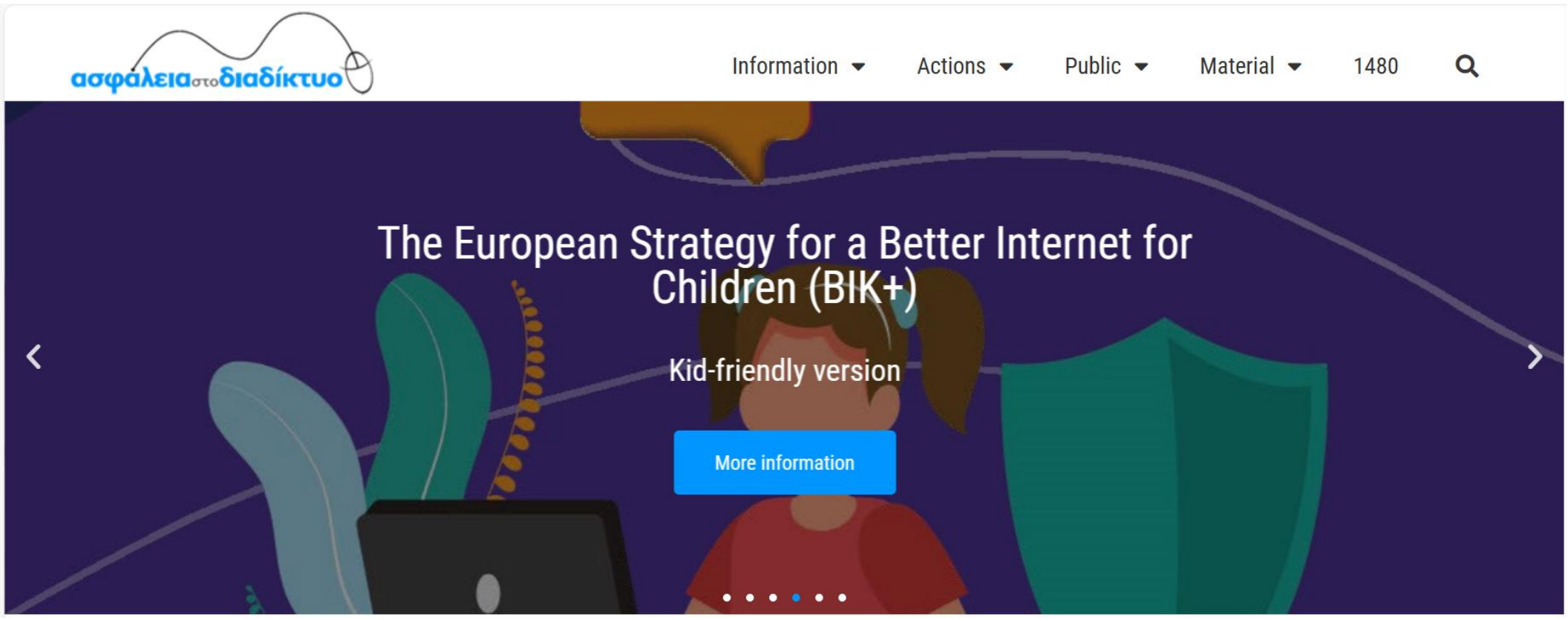
"The plan establishes a network of youth ambassadors and emphasizes continuous improvement through feedback mechanisms and evaluation metrics."

Future Plan

Scaling up involves firstly, extending awareness programs beyond parents, students, and educators to engage the wider community, including local businesses, community organizations, and social groups. Secondly, collaborating with educational authorities to integrate internet safety and digital literacy into the school curriculum ensures consistent, age-appropriate training for students. Thirdly, utilizing digital platforms and social media to disseminate information and provide resources enhances engagement with the target audience, complemented by interactive online courses and workshops for remote learning. Regular community workshops, webinars, and forums address emerging online threats, fostering open discussions with field experts. In the future, continuous research, and partnerships with CYberSafety experts aim to stay updated on evolving risks. Embracing emerging technologies, such as AI and machine learning, will help develop tools for risk detection and prevention, with user-friendly apps or web extensions for safer online experiences. Moreover, collaboration with international organizations, government agencies, and NGOs facilitate resource sharing and funding access for large-scale initiatives.

Also, extending the network of youth ambassadors (Youth Panel: https://cybersafety.cy/activities/youth-panel/) and implementing feedback mechanisms, along with defined evaluation metrics, ensure program effectiveness, reduced online incidents, increased reporting, and improved participant knowledge. Lastly, emphasis will be given on the effective information to children with special or specific needs, including those from disadvantaged and vulnerable backgrounds (e.g., Youths and children with refugee and Immigrant background) about online risks.

By scaling up and following this plan, Cyprus can create a safer and more resilient digital community, where individuals of all ages are equipped with the knowledge and skills needed to navigate the internet securely in an ever-evolving digital landscape.



Other Materials

Educational Games / Comics and other material:

1. eFollowMe game and competition:

University of Cyprus (UCY) organised, prepared, and executed the eFollowMe digital footprint game competition for the school year 2021-2022.
Link: http://efollowme.cs.ucy.ac.cy/

2. Happy Onlife game:

The game “Happy Onlife” was designed and developed by the Joint Research Center of the European Union (https://web.jrc.ec.europa.eu/happyonlife), as a tool to educate and inform, both children aged 8-12 years, as well as parents/guardians and teachers, to raise awareness on the creative use of digital media and the internet. During the school year 2022-2023, CPI arranged through the Ministry of Education to print and distribute the game to all primary schools in Cyprus.

3. CFAS tool:

The CFAS tool developed by the Cyprus University of Technology (CUT). The tool will be disseminated through workshops and social media channels. CUT will organize presentations, trainings, seminars, workshops to students, parents, and educators, to spread awareness regarding Online Social Networks threats, Risk coping techniques, available parenting tools and the tools developed: CFAS and Available teaching methodology and material on cybersecurity and cyber safety topics.

4. The Gamer girl:

The content of the comic is Lizzie is a gamer who enjoys playing online games. Suddenly she receives an online message and makes a fatal mistake, which will change her life. At the end of the course, she learned a lesson. This illustrated story seeks to inform children and young people about the risks involved via online communication and the issues of protecting privacy and personal data. For more information visit this page: https://internetsafety.pi.ac.cy/wpcontent/uploads/sites/3/2023/05/the-gamer-girl-1-1.pdf

The Implementation of STEM Programme in Primary Schools

Country
Cyprus

Organizer
Department of Primary Education

Date started
2019

Abstract of the Implementing Organization or Individual

The Department of Primary Education has implemented the teaching of STEM activities in nine (now 14) Primary Schools since 2019, across Cyprus (the geographical coverage is national). These activities are taught after hours and twice a week, as extracurricular activities to children age 11. The pupils participate in these activities on a voluntary basis and collaborate amongst them in order to solve everyday problems or tasks, under the STEM philosophy.

Problems and Objectives

The main problem the progamme is facing, is its gradual expansion. We need to be careful so as to expand the programme in schools where pupils are actually interested in pursuing it so as not to commence it and then be forced to stop it in the following years, due to poor turnout. The main objectives are the familiarity with digital technology and the implementation of digital technology through the STEM approach in everyday problem solving situations.

Key Data

Funding of the project	Government funding
Target Groups and percentage	Children at the age of basic education - 5%
Age range or Grade Level and Percentage	Primary school level - 5%
Total number of beneficiaries	150 pupils

Key Activities

Evaluation of the pilot application of the STEM Program in a number of elementary schools for the school year 2019-2020[1]

The Ministry of Education, Culture, Sports and Youth (YPPAN), with decision of the Council of Ministers (May 15, 2019) proceeded with implementation of the "pilot application of the STEM Program (Science-Technology Engineering-Mathematics) in Primary Education" from October 2019. The Program aimed to cultivate both the necessary nodes skills for the citizen and professional of the 21st century, as well as his scientific literacy. During the current school year 2019-2020, institution was piloted in nine schools in all provinces, which were selected based on specific criteria.

The present research focuses on exploring the views of those involved in the pilot application of the STEM institution with the aim of identifying aspects that work efficiently as well as elements that create difficulties. The research addressed the following two research questions: (1) How did the institution of STEM actions and what are the views of those involved about issues related to their implementation procedures? and (2) To what extent do the stakeholders feel that the innovation objectives have been achieved?

The findings of this particular evaluation highlight issues that can lead to remedial changes in case continuation of the institution. First of all, the need to re-evaluate it is demonstrated of the relationship between STEM actions and the PES institution and the need re-evaluation of the selection criteria of the participating school units. Additional issues relate to ensuring timely and appropriate staffing and in the further processing of the teaching material.

Future Plan

The project has been expanded for the first time in five new Primary Schools, during the current school year (2023 – 2024). There are plans for further expansion in the following years.

1 See https://www.pi.ac.cy/pi/files/keea/pdf/___STEM2020.pdf

eDia: A System for Diagnostic Assessment

Country
Hungary

Organizer
Centre for Research on Learning and Instruction, University of Szeged

Date started
2007

Overview

The significant challenges associated with standardized school instruction stem from the acknowledgment of substantial variations among students in various dimensions, which often go unrecognized. Teaching methods are frequently not aligned with individual students' developmental levels and readiness. To address this issue, we propose a solution grounded in an expanded concept of assessment for learning, integrating screening, formative, and diagnostic assessment functions in the initial years of primary school (Grades 1–6; Ages 6–11).

Hungary's eDia presents a specialized system for diagnostic assessments, utilizing technology to furnish teachers with assessment data related to student performance. This empowers teachers to choose diverse teaching programs that better suit individual students. Moreover, Hungary establishes interoperability between formal adult education and non-formal training, develops a control and assessment system based on digital learning process outcomes, and incorporates measurement into the training and learning process. Adopting this approach ensures flexibility in adult education outcomes, allowing for the redistribution of learning resources based on different students' preferences. This dynamic process aims to enhance the alignment between the supply and demand of teaching services.

eDia

The primary objective of the system is to furnish students and teachers with regular diagnostic insights in three key educational domains—reading, mathematics, and science—from the commencement of schooling until the conclusion of the sixth year of primary education. The system aims to empower teachers to align assessment and development with their students' knowledge levels. The eDia platform seamlessly integrates the entire technology-based assessment process, encompassing item development, building item banks, online test administration, and data analysis with feedback mechanisms. The eDia Teacher Module provides teachers with opportunities to personalize both assessment and enhancement.

The cognitive underpinnings of the system are articulated in the assessment frameworks, adopting a three-dimensional approach in each domain. These frameworks distinguish the psychological developmental (reasoning), disciplinary content, and application dimensions of learning. Empirical validation of the three-dimensional model indicates that students' knowledge can be differentiated and measured across reasoning, disciplinary, and application dimensions in the crucial domains of learning during the early schooling phase. The system enables the monitoring of students' development in a total of nine dimensions.

Carefully mapped frameworks populate item banks, featuring nearly six thousand innovative (multimedia-supported) items in each dimension. The combined item banks for the primary domains boast over 53,000 assessment items. In Grades 1–3, instructions are presented in written form on the screen and accompanied by a pre-recorded voiceover to mitigate reading difficulties and enhance assessment validity. Continuous development of item banks is informed by empirical experience, employing Rasch analyses for the scaling procedure, facilitating the comparison of

students' achievements. National average achievements (ability score) are set at 500, with a standard deviation of 100 for each grade and domain, offering a reference point for interpreting students' achievements. Deviations from the average are easily discernible, ensuring comparability of performance within the same grade and dimension.

The eDia system currently provides two fundamental forms of feedback. The first involves immediate student-level feedback post-test completion, represented visually with a display of 1–10 balloons, where the number of balloons corresponds to the student's achievement.

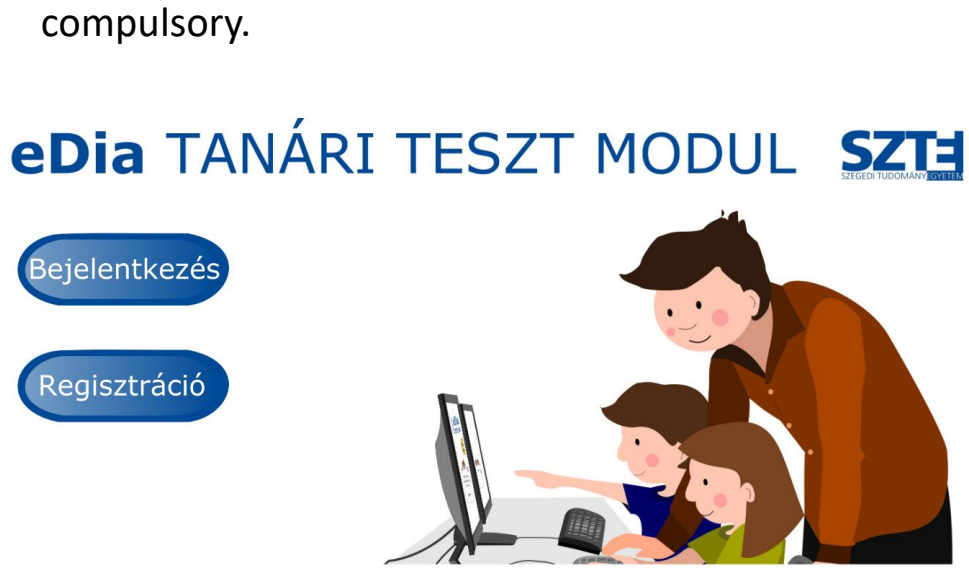
This concise feedback communicates to students their proficiencies and areas for improvement in all three dimensions. More detailed feedback, including normative benchmarking data, is accessible for teachers, revealing the student's position in each dimension relative to the class, school, region, locality type, and country averages. In addition to numerical data, students can download a comprehensive textual assessment and a PDF document richly visualized with diverse graphic solutions.

The online system has been operational for several years in over 1200 partner schools in Hungary, representing approximately one-third of the entire primary school system. The standard operating mode entails the system offering assessments for participating classes throughout the school year.

With the diagnostic information at their disposal, teachers can design and implement further personalized assessments and interventions using the eDia Teacher Module, with the impact of their activities visible in the subsequent assessment. Through the eDia Teacher Module, teachers have direct access to item banks, enabling them to create customized tests aligned with their teaching practices and assess students at any time (visit teszt.edia.hu).

Beyond its primary function of promoting personalized and individualized education, the eDia platform has been utilized for assessments in various domains, including writing skills, musical abilities, English as a second language, health literacy, financial literacy, visual skills, civic competencies, combinatorial reasoning, inductive reasoning, problem-solving, learning to learn, ICT literacy, creativity, social skills, motivation, and collaborative problem-solving—from pre-school to higher education in Hungary and several other countries.

According to teachers' feedback, regular use of the eDia system not only provides precise information with objective reference points about students' development in crucial learning domains but also supplies data on the effectiveness of their teaching, facilitating school-level strategy development. Beyond the direct effects, teachers stated that it enhances their assessment literacy. According to students' feedback, the varied interactive tasks and prompt feedback enhance student learning motivation, with students viewing eDia tests as engaging games rather than regular assessments. The system is free to use and relies on school and teacher-level decisions. In the school year commencing in September 2018, there were 71,670 test solutions logged into the eDia system just in the main assessment domains (reading, mathematics, and science). In the school year starting September 2019, this number rose to 98,749. In the following school year, it was 30,597, and in the most recent one, after four months of teaching, there were already 79,440 completed tests in the eDia system. This clearly indicates that schools and teachers are motivated to use the system, perceiving it as useful and supportive, given that the frequency of eDia use is based on their voluntary decision rather than being compulsory.



Blended E-learning

Country
Pakistan

Organizer
Federal Directorate of Education, Ministry of Federal Education & Professional

Duration
3 years

Abstract of the Implementing Organization or Individual

Ministry of Federal Education and Professional Training endeavors to provide a conducive environment for teaching and learning with a focus on academic excellence, surging desire for knowledge, attitudinal change inculcating tolerance, unity, faith, discipline, and compassion, developing a sense of purpose and high achievement with the vision for tomorrow.

Administration of 433 Federal Government educational institutions in Islamabad Capital Territory (ICT), is providing educational services to students from prep to post-graduate level. Federal Directorate of Education (FDE), is headed by the Director General and promotes the use of information technology in FDE and Educational Institutions, determined a high-priority need for the monitoring and control of 433 educational institutions. Employees' attendance, time response, productivity, performance, and profile management. FDE is currently using technology to monitor the attendance of all staff members at its headquarters as well as institutions. Closed circuit cameras (CCTV) are installed to monitor the security and surveillance. In order to go for a paperless environment, FDE has introduced an Eoffice management system for official correspondence.

FDE is striving to embrace technology in its headquarters and its institutions. It has introduced several projects for inculcating technology in the teaching-learning process. A few initiatives are the introduction of Science, Technology, Engineering, Arts, and Mathematics (STEAM). Blended E-Learning, and smart board projects. FDE also collaborates with private entities and has introduced Jazz Smart School a computer lab with Jazz Pakistan in girl's schools. The geographical coverage is local (Islamabad).

Problems

Pakistan is lacking in technology intervention in teaching-learning process. Annual Statistics of Education Report (ASER) 2018 reports that only 50% of students studying in grade 2 to grade 5. In this context, it was conceived to introduce technology as pilot project in Blended E-Learning. Blended learning is a multi-channel approach to learning which blends face-to-face interaction with the teacher, use of digital content (videos, images, interactive media, etc.), online and offline resources, and opportunities for students engagement with content outside of class time. This blending is used to accelerate learning, improve quality of conceptual understanding, and provide high-quality reports and analytics on student performance.

Objectives

- To provide blended learning education solutions across 200 classrooms of grades 1-10 in around 60 government schools of Islamabad Capital Territory.
- To test the concept of blended learning of education using digital solutions and its impact on learning outcomes of students.
- To Improve learning and conceptual understanding of around 20,000 students and build digital records of their learning performance at class level and consolidated level for all schools.

Key Data

Funding of the project	Public Sector Development Program (PSDP)
Target Groups	1. Children at the age of basic education 2. Young people
Age range or Grade Level and Percentage	Primary school level - 37% Middle level - 41.31% Secondary school level - 21.39%
Total number of beneficiaries	35,702

- To acquire, contextualize open-source digital content, and get developed additional digital learning content for blended learning.
- To train classroom teachers at Primary level and subject teachers at Middle and Secondary levels in blended learning approaches.
- To provide access to open-source blended e-learning resources in offline mode inside classrooms.
- To monitor the learning outcomes of students in real-time through interactive assessments.

Key Activities

The following are the milestones of this project:

- Ml - Content review with FDE approval
- Four days of teacher training
- Classroom setup, LMS baseline configuration complete, dashboards operational
- Six monthly cycles of teacher, student report cards and approved by FDE and program reports
- Project completion report

Measures to Ensure Equality and Effectiveness

- Appointment of a quality assurance officer (QAO) to formatively assess the quality of the project.
- Appointment of a quality assurance officer (QAO) to formatively assess the quality of the project.
- Access of the QAO and project director to real-time data for monitoring and evaluation.
- In order to ensure the quality of the contents, the National Curriculum Council vetted the teaching-learning material.

Measures to Ensure the Sustainability

To sustain the achievement of the innovation Ministry of Federal Education and Professional Training (M/o FE&PT) is working on the establishment of its own Learning Managementsystem. After the expiry of the project tenure by educational service providers the gadgets shall be connected to the learning management system owned by the ministry. So the gadgets shall be fully utilized even after the maturation of the project.

Future Plan

Currently, the project is being run in 200 classrooms. To expand the facility to other schools Federal Directorate of Education is working on a project of upscaling the facilities to all its institutions.

Digital Literacy Programme

in Selected Public Schools of Khyber Pakhtunkhwa

Country
Pakistan

Organizer
Elementary and Secondary Education Department Government of Khyber Pakhtunkhwa

Date started
2017

Abstract of the Implementing Organization or Individual

The Digital Literacy Program was first launched by the Khyber Pakhtunkhwa lT Board in 2017, to impart lT skills to young government school students in line with the need for modern technology awareness among the younger generation. The project was successfully executed and on the realization of excellent results. It was proposed to continue the same program under the umbrella of the Department of Elementary and Secondary Education. The project aims to impart lT training to age-specific students, This program is about teaching computer basics and block-based programming. Its geographical coverage is regional.

The target audience of the project is students of classes 6th, 7th and 8th. Currently the course outline consists of 3modules ie Basic Digital Literacy Programme, Early Age Programming and Entrepreneurship for kids.

1. Basic Digital Literacy Program
- Basic digital literacy
- Microsoft Office
- Web literacy
- Social Media Ethics

2. Early Age Programming
- Problem-solving and Algorithms
- Code.org
- ScratchMobirise
- App inventor

3. Entrepreneurship for kids
- Introduction to entrepreneurship
- Development of a business idea
- Development and pitching of a basic business model to the class

Problems

- Lack of proper internet connectivity in some areas
- Low voltage; Lack of Power Backup in some schools; Power Backup Maintenance where available
- Maintenance of Computer hardware and accessories

Objectives

- To introduce digital literacy in government schools of Khyber Pakhtunkhwa with functional IT Labs
- To develop educational content for a digital literacy programme
- To train E&SED IT teachers; and instructors of selected schools on digital literacy educational content
- To ensure training of government school students (Class Vl to Vill) of selected schools on digital literacy educational content

Key Data

Funding of the project	Annual Development Program (ADP)
Target Groups	Children at the age of basic education
Age range or Grade Level	Secondary school level

Total number of beneficiaries

Selected District Khyber Pakhtunkhwa

Year	No. of Schools	Male student	Female student	Total
2017-2018	57	2,152	848	3,000
2018-2019	300	10,107	7,457	17,564
2019-2020	225	7,145	7,800	14,945
2020-2021	225	5,011	5,529	10,540
2021-2022	336	23,390	26,673	50,063
2022-2023	600	26,586	36,164	62,750

Total number of beneficiaries

New Merged Districts Khyber Pakhtunkhwa

Year	No. of Schools	Male student	Female student	Total
2020-2021	8	712	245	957
2021-2022	8	765	255	1,020
2022-2023	20	1,345	655	2,000

Key Activities

1. PMU staff recruitment

- **Targeted impact:** Empowering and enabling government school students to access, learn and implement modern trends regarding digital literacy at an early age.

2. Training of IT teachers on course contents

- **Targeted impact:** Capacity building
- **Input:** Human resources
- **Output:** 235,200 students of 1170 government schools of Khyber Pakhtunkhwa trained on digital literacy course contents

3. Imparting training to students and delivering course contents

- **Targeted impact:** Human resource development
- **Input:** Financial resources
- **Output:** 6400 students of 36 government schools of Newly Merged districts trained on digital literacy course contents
- **Outcome:** Improved digital literacy

4. Student assessment

- **Targeted impact:** Awareness of digital literacy
- **Output:** IT Teachers of 1170 government schools of Khyber Pakhtunkhwa trained on digital literacy course contents

5. Establishment of incubation centres

- **Output:** IT Teachers of 36 government schools of Newly Merged Districts trained on digital literacy course contents

Awards and Honors

Khyber Pakhtunkhwa students received the following awards with the help of this program:

- APICTA Asia Pacific ICT Alliance Award

Students from the province received the Crescent and Star Award in the junior student category.

- Pasha ICT Awards 2019

Students from the province took 1st and 2nd place in the junior student category.

- Comppec Nust 21-April-2019

Students from the provincial government school finished in the top three in the early programming category.

- P@SHA ICT Awards 2021

Saqib Tanvir, a student from the province, won the first place, and another student, Muhammad Anees, won the second place in all Pakistan.

- P@SHA ICT Awards 2022

Muhammad Adnan, a student from the province, finished third in all Pakistan.

- APTICA Awards 2022

Muhammad Adnan, a student from the province, achieved excellent results in the junior student category.

*Source link: https://kpeap.com/achievements

Measures to Ensure Equality and Effectiveness

A formal progress evaluation of training and reports. For monitoring and evaluation purposes the performance indicators for the projects include the following:

- Number of students enrolled in digital literacy programme.
- Number of students capable of understanding digital literacy course contents to be determined through quarterly assessments.

- Number of students that successfully pass out the final assessment.
- The transfer of knowledge from the Digital Literacy Trainers to the participating school IT teachers and instructors.

Measures to Ensure the Sustainability

The future is digital and the employers of the modern world expect their workforce to have the skills needed to live, work, and thrive in a digital society. To make sure government school students remain competitive in the digital world, it is essential that digital literacy becomes a part of the curriculum at an early age. E&SED want our new generation to be digitally literate. To inculcate the essence of digital literacy and envision the youth with the technologies of future and make the digital literacy program sustainable, it is critical to revamp the existing IT curriculum and align it with international standards.

Future Plan

The following measures may be taken as a future plan to scale up the digital literacy program:

1. Establishment of IT Labs: Currently the Digital Literacy Program is being implemented in the schools with the function IT lab. In order to scale up the program in all schools of Khyber Pakhtunkhwa, it is proposed that IT Labs may be established in all the schools of the province so that digital literacy program can be started in all the primary, middle, high and higher secondary school across the Khyber Pakhtunkhwa.

2. Revamping Existing IT Curriculum: The future is digital and the employers of the modern world expect their workforce to have the skills needed to live, work, and thrive in a digital society. To make sure government school students remain competitive in the digital world it is essential that digital literacy become a part of the curriculum at an early age. To inculcate the essence of digital literacy and envision the youth with technologies of the future, it is critical to revamp the existing IT curriculum and align it with international standards.

3. IT Teacher Training: Training of all IT Teachers of Khyber Pakhtunkhwa on new concepts of block-based programming to deliver digital literacy course content in a more proficient manner.

Cultivating ICT Competencies for Tomorrow

Country
Slovakia

Organizer
Government

Date started
1985 (ICT has been part of the school curriculum)

Student ICT Competencies

In Slovakia, there has been a notable transformation in digital literacy access in recent years. Currently, 60% of individuals aged 14 and above have adeptly embraced ICT without encountering significant challenges. A study focusing on Basic, Application, and Ethical ICT Competencies among students in selected Slovak universities reveals that almost 81% of students feel proficient in utilizing various digital resources for interaction and collaboration with peers. Furthermore, between approximately 62 and 77%, students express competence in productively using applications, utilizing key informatics and network resources, employing digital tools to gather information from diverse sources, and addressing problems while making decisions using appropriate tools and digital resources. Conversely, only around 19% feel adept at using models and simulations to explore complex topics, and 21% feel confident in creating original works as a form of personal expression.

Initiatives and Activities

ICT has been an integral part of the school curriculum in Slovakia, mandated as a subject at all levels of compulsory education for several years. Its introduction dates back to 1985 at upper secondary school, 2005 at lower secondary school, and finally, 2008 at primary school. ICT learning objectives encompass knowledge of computer hardware and electronics, proficiency in using computers and mobile devices, utilizing office applications, information searching, multimedia usage, programming skill development, and social media use (the latter two applicable only in secondary education). Central steering documents for primary and general secondary education integrate ICT learning objectives, emphasizing its role as a tool for nurturing cross-curricular skills like creativity, critical thinking, problem-solving, communication, collaboration, initiative, and self-direction.

The Slovak government's initiatives in digital competence align closely with the EU, involving extensive programs, projects, and portals. Special initiatives such as eSkills Week, launched in 2010, equip young individuals with tools and knowledge to understand the career opportunities in ICT and the relevance of digital skills in the broader labor market. The IT "fitness test" conducted in 2010, 2012, and subsequent years evaluates the IT skills of secondary school and university students, tracking changes over time and making international comparisons. Another initiative, the IT Academy, targets schools and universities, focusing on training teachers to utilize digital technology and innovative practices to enhance digital skills in Slovakian students.

Teacher ICT Competencies

Across most EU nations, including Slovakia, educators are encouraged to integrate ICT into various subjects such as languages, mathematics, and natural sciences. At the primary school level, general teachers handle the instruction of ICT, while at the secondary school level, specialized ICT teachers take charge of this subject.

In Slovakia, the initial teacher education for all

specialized secondary school teachers encompasses ICT-related skills integrated into the core curriculum. This includes training in internet use, subject-specific applications, multimedia operations, website creation, and pedagogical aspects. The first three skills are also part of the core curriculum for general teachers. Post-initial teacher education, it is imperative for teachers to continually advance and update their ICT knowledge and skills through Continuing Professional Development (CPD). This ongoing development should offer opportunities for teachers to deepen their comprehension and expertise in using ICT as a tool for innovating teaching and learning methodologies. Websites and platforms designed for teacher collaboration on incorporating ICT into teaching and learning can be valuable resources for primary and general secondary education teachers looking to enhance their skills. Moreover, teachers can access support staff to aid them with ICT-related matters (60.4% of Slovak pupils in Grade 4 attend schools with staff available to assist teachers with ICT, while the EU average is 73.1%). In Slovakia, the evaluation of teachers' ICT skills has been reliant solely on internal assessments.

ATS STEM Project

Country
Slovenia

Organizer
National Education Institute (NEI)

Date started
2019

Overview

The ATS STEM initiative in Slovenia facilitates the digital evaluation of students' cross-cutting skills in educational institutions, emphasizing aspects such as feedback, self-assessment, timely response, introspection, objective evaluation, quizzes, continuous assessment, and processes. It enhances educational assessment capabilities while addressing students' cross-cutting skills and proposing solutions based on extensive feedback. The project has enabled the aggregation of student learning achievements through big data, leading to the formulation of precise solutions. Key project components include feedback mechanisms, digital tools, self-assessment processes, prompt responses, reflective practices, reproducibility, objective evaluations, adaptability, recall, appraisals, quizzes, progress updates, virtual assessments, ongoing evaluations, and procedural aspects.

ATS STEM Project

The ATS 2020 project (Assessment of Transversal Skills; 2015–2018) and the subsequent ATS STEM project (Assessment of Transversal Skills in STEM; 2019–2022) have introduced innovative elements in smart education. The ATS 2020 project particularly emphasized processes that ensure both skill development and evaluation through integrated activities. Building upon this, the ATS STEM project has further advanced this learning model. The project's significant contribution lies in the development and implementation of the next generation of an Integrated STEM curriculum through the ATS STEM model. This model encompasses the framework of STEM core competencies, principles of STEM learning design, essential features of formative assessment tasks, and critical aspects of digital assessment. Both models are rooted in personalized and collaborative learning, maintaining a curriculum balance between subject-specific knowledge and cross-cutting skill(s). These initiatives collectively develop and integrate various elements of smart education, fostering a comprehensive approach to educational assessment and skill enhancement.

Element 1

Collaboration involving a team of at least three class teachers from diverse subjects is essential. These teachers collaboratively develop learning and teaching plans, create effective learning scenarios, collectively reflect on teaching and learning outcomes, assess students' progress, and evaluate the overall process. This collaborative effort necessitates the moderation of 3–4 cycles annually within the same classroom or student group. Each cycle should specifically target a leading skill or sub-skill, such as focusing on argumentation as a sub-skill of critical thinking. The cyclic approach is crucial due to the limitations in transforming traditional teaching methods without the provision of other smart education conditions within schools.

Element 2

Emphasis on authentic situations is another critical component. The success and meaningfulness of the teacher team are contingent upon addressing challenges and solving problems in authentic situations, drawn from real-world contexts. This approach has been a longstanding practice in teaching and serves to stimulate teachers' problem-solving and critical thinking abilities.

ATS STEM Framework of Integrated STEM Features

Element 3

Active and conscious student participation is introduced across all stages of learning. The comprehensive development of specific transversal skills (communication, collaboration, problem-solving, digital skills, and personal skills) is planned through the joint definition of goals and success criteria, involving both students and teachers, and possibly external experts. Students and teachers collaboratively choose learning paths and digital tools. Collaborative learning encompasses peer learning, mutual support, motivation, peer feedback, not limited to teachers' feedback, peer reflections, and particularly students' self-evaluation based on predefined success criteria. These processes contribute to formative assessment, self-regulation, and more.

Element 4

The effective utilization of digital platforms, termed "development e-portfolio," goes beyond the traditional understanding of a collection of results. The e-portfolio becomes a tool used collaboratively by students and teachers on a daily basis. Each student maintains a single e-portfolio for all subjects taught by the participating teachers. Consequently, the e-portfolio evolves as teachers and students articulate goals, success criteria, describe activities, fill in learning scenarios, provide feedback (initially positive and then addressing areas for improvement), offer feedback on feedback, and present learning results and evidence of learning. The digital platform facilitates timely reflections and feedback, including voice feedback, which, in turn, serves as valuable learning analytics, incorporating evidence of student results and activities.

Vocational Education Digital Transformation

Country
China

Organizer
Wuhan Vocational College of Software and Engineering

Date started
2012

Abstract of the Implementing Organization or Individual

Wuhan Vocational College of Software and Engineering, founded in 1951, has been dedicated to vocational education for over 20 years. It consistently adheres to the mission of serving regional economic development, closely aligning with Hubei's "51020" industrial layout and Wuhan's "965" industrial system. The college primarily focuses on cultivating technical and skilled talents for industries such as "optical core, screen, terminal, and network," intelligent manufacturing, digital economy, life and health. It is recognized as a national exemplary software vocational and technical college, a national demonstration (backbone) higher vocational institution, a national high-quality higher vocational college, and a construction unit for Hubei's "Double High-level Initiative" (A-level).

Situated in the hinterland of "Wuhan·China Optics Valley," the college occupies an area of 949.7 acres with nearly 17,000 students. It comprises 13 secondary colleges offering 52 enrollment majors. The college has 4 key construction majors supported by the national demonstration (backbone) higher vocational institutions, 5 backbone majors recognized as national "high-quality programs," 2 majors supported by the central finance to enhance industrial service capabilities, 3 majors selected for the national modern apprenticeship pilot, 8 provincial brand and characteristic majors, and 13 majors with the designation of Chu Tian Skillful Instructors in Hubei Province. Additionally, it has 2 undergraduate pilot classes. The alignment of major offerings with national strategy and Wuhan's pillar industries reaches 92.3%. The college has consistently been listed in the "Top 50 Service Contributions" and "Top 50 Teaching Resources" among Chinese higher vocational colleges. The employment rate of graduates is above 97%, with 60.14% choosing to stay in Wuhan, and 39.02% pursuing further education. In the years 2018-2022, students have won 313 awards in various national skills competitions, ranking seventh nationally and first in Hubei. The college excels in multiple talent training quality indicators, placing it among the top higher vocational institutions in the country.

Vocational Education Digital Transformation

Actively promote the digital transformation of education and teaching. Offering over 30 majors including big data technology, industrial robots, the Internet of Things, cloud computing, information security, etc. Virtual reality (VR), augmented reality (AR), and digital twinning technologies are widely used in professional courses to digitally transform the core courses with "digital technology + data elements." Leading the construction of a national vocational education big data technology professional teaching resource library, participating in the construction of 7 national-level resource libraries, connecting to the national smart education platform, and customizing 9 professional group resource libraries. Over 200TB of various digital teaching

resources have been developed, and the school has been rated as an excellent sub-center of the National Digital Learning Resource Center for seven consecutive years. Undertaking the construction of the Wuhan Lifelong Learning Network, with over 200,000 registered users and more than 10,000 course resources.

Focusing on the digitization of talent development. Implementing a plan to enhance the digital literacy of teachers and students, comprehensively improving the digital skills of teachers and students. Coordinating with 38 industry associations, 272 enterprises, and 163 institutions, leading the establishment of 7 vocational education groups including the Hubei Information Technology Vocational Education Group, Hubei Intelligent Manufacturing Vocational Education Group, and Hubei Cross-border E-commerce Vocational Education Group. Collaborating with companies such as Huawei and FiberHome, establishing 6 featured industry colleges including the Digital Craftsman Industry College and Kunpeng Industry College. Establishing 4 national-level productive training bases, with 77 off-campus training bases on the "National Heavy Machinery Street" in Optics Valley. Establishing 4 national-level collaborative innovation centers, winning the first prize for scientific and technological progress in Hubei Province, achieving a historic breakthrough among provincial vocational colleges.

Focusing on the digitization of service management. Using information technologies such as F5G, Wi-Fi 6, and the Internet of Things to build campus wired and wireless network communication infrastructure. Constructing a data sharing and exchange center, completing data governance for core business systems, establishing campus-level data standards, breaking down data barriers, and promoting data-empowered application systems. Building a "one-network operation" digital platform, establishing a comprehensive student growth platform, creating an "all-in-one" student digital community, and advancing the fully integrated, multi-form, and three-dimensional operation of informationized education management.

Highlighted Outcomes

Wuhan City Intelligent Manufacturing Public Training Platform

Jointly established by Wuhan Vocational College of Software and Engineering and Wuhan Huazhong CNC Co., Ltd., the platform focuses on intelligent manufacturing education and research, advanced technology research and promotion, faculty training, as well as innovation and application of teaching materials and tools. Together, we are creating a collaborative innovation platform between the university and the enterprise to jointly cultivate talents in the field of intelligent manufacturing. The platform covers an area of 2574 square meters and includes 176 sets of virtual and real combined equipment, such as industrial robot assembly and debugging, maintenance of intelligent manufacturing unit, and high-end CNC machining. In key technical areas related to the design, manufacturing, testing, assembly, application, and maintenance of intelligent equipment, the platform enables synchronous virtual and real operations, individual operation of robots, and comprehensive application, thereby achieving the training of digital craftsmanship talents. With the support of the platform, it has been approved as a national vocational education "dual-teacher" training base for equipment manufacturing, Jingchu Craftsman Academy, and a demonstration base for industrial worker training in Hubei Province. It has also established three provincial-level management centers for 1+X certificate programs, including industrial robot application programming, multi-axis machining technology, and maintenance of intelligent manufacturing units. The platform successfully hosted more than 30 events, including the provincial selection competition for the CAD mechanical design category of the World Skills Competition, and received recognition with titles such as technical experts awarded by the provincial and municipal governments or departments (30 people), Jingchu Craftsman, outstanding mentor in Hubei Province, Hubei Provincial Skills Master, and Wuhan Chief Technician (16 people).

Social E-commerce Industry College

Established by Wuhan Vocational College of Software and Engineering and Zhonglian Education, this is a collaborative education platform integrating industry and education. The Industrial College collaborates with prominent Chinese companies such as Tianxiaxiu Digital Technology (Group) Co., Ltd. and leading enterprises in the e-commerce industry. It has developed a comprehensive framework consisting of "one college, two ecosystems, three integrations, four centers, and five bases." The Industrial College has introduced the commercial big data analysis platform of industry-leading enterprises to practice the cultivation of talents in digital operation. It has invested in state-of-the-art new media operation equipment, introduced live e-commerce practical projects, served the development of the digital trade industry, and supported rural revitalization. The college has established a national competition training base for Internet marketing professionals and business data analysts, implementing simultaneous education and training. It has built an industry-academia-research service platform, developed digital course resources, actively promoted the integration of science and education, incubated social e-commerce entrepreneurial teams, cultivated innovative projects, and deepened the integration of specialized knowledge and creativity. The Industrial College is driving the high-level construction of our school's e-commerce professional group. In 2022, this professional group became one of the first to serve as a key professional group for the modern industrial cluster in Hubei Province. In recent years, it has nurtured three national technical experts in the commercial service industry, three technical experts in Hubei Province, and obtained approval for four national planning textbooks. It has won more than 30 awards in national vocational skills competitions.

The Kunpeng Industrial College

Jointly established by Wuhan Vocational College of Software and Engineering, the Yangtze Kunpeng Ecological Innovation Center, and Huawei Technologies, it currently has four virtual simulation training rooms, 370 virtual simulation and physical equipment, and is an authorized Huawei VUE examination center. Based on the Kunpeng full-stack technology system, the Industrial College provides enterprise teaching resources and a real business environment, jointly building an industry-education integrated innovation platform. Serving the economic and social development of the Wuhan region and connecting with Hubei Province's trillion-yuan strategic industry for the new generation of information technology. The college deeply integrates core technologies such as CPU, NPU, operating systems, and databases into the curriculum system. Using the Huawei ENSP enterprise network simulation platform for simulating and experimenting with routing and switching equipment in business networks, it completes teaching practices in network construction, management, and usage. Based on a "one-stop" intelligent teaching platform, interactive courseware, and a teaching resource library, it achieves a combination of virtual and real, cloud and offline, enhancing teaching efficiency. Incorporating Kunpeng computing industry standards and knowledge structures, it cultivates high-quality technical talents with expertise in data communication, cloud computing, network security, and the ability to adapt, migrate, develop, and incubate solutions in the Kunpeng software ecosystem. This program provides a talent reserve for the long-term evolution of the Kunpeng computing industry, with 45 students obtaining Huawei HCIE certification.

Internet of Things Industry College

Using the Smart Building Digital Twin System as the teaching platform, it is provided with equipment and technical support by leading companies such as Hikvision, Guangkong Tesilink, and Sensetime, and jointly built, shared, and managed with more than 10 top enterprises including iFlytek. The Industrial College consists of two main areas: the Internet of Things Industry Application Exhibition Hall and the Enterprise Workshop. The exhibition hall provides audiences with an immersive perception of the vitality of smart buildings. The enterprise workshop has three main modules: the data center, the new infrastructure workshop, and the smart city workshop. The data center's main functions include acquiring smart building data, integrating information, and

optimization. The new infrastructure workshop mainly involves the technical application of new energy charging stations and energy measurement. The smart city workshop mainly provides teaching in the digital scenarios of fire protection, security, and buildings. The Industrial College actively promotes industry-education integration, undertaking training for small and medium-sized enterprise employees in smart building engineering and artificial intelligence trainers. It incubates student entrepreneurial teams, trains professionals in the Internet of Things engineering, and other digital professional positions, empowering Digital China.

The Fire Industry College

Co-built by Wuhan Vocational College of Software and Engineering and FiberHome Telecommunication Technologies Co., Ltd., the enterprise has donated over 7 million yuan worth of optical communication OTN and IPRAN equipment. The industry college possesses more than 300 sets of 5G full-network virtual simulation software and has equipped over 50 sets of optical communication OTN, SPN, and IPRAN devices. It can simultaneously accommodate 600 people to conduct communication network planning, construction, operation, and optimization skills training through virtual simulation.

The college and enterprise jointly establish the course system required for the "plan-build-maintain-optimize" positions in communication network, creating a teaching scenario that combines virtual and real elements. This aims to cultivate talents with digital innovation skills in intelligent operation and maintenance of communication networks, serving as a support for the trillion-level pillar industry of "Wuhan China Optics Valley" in the new generation of information technology (optical core, screen end, and network). The Fire Industry College has achieved a dual-circulation system of "talent cultivation internally and technical service externally" through "project joint research, base joint construction, standard joint formulation, talent joint nurturing, and faculty joint sharing." The collaborative project "Key Technologies and Industrial Applications of 5G Carrying" won the first prize of the 2021 Hubei Science and Technology Progress Award. The two parties jointly developed the "5G Carrying Network Operation and Maintenance" certificate, which was approved as a pilot school for the national 1+X vocational skills level certificate. They also published the textbook "5G Carrying Network Operation and Maintenance (Junior and Senior)" and provided 5G new technology training to countries such as Indonesia and Chad, exporting mobile communication skills and technology standards.

Part V

Build Inclusive Digital Learning Systems for Strengthening Crisis Resilience

COVID-19 Response and Recovery Plan

Country
Cambodia

Organizer
Ministry of Education, Youth and Sport (MoEYS)

Date started
2020

Education Innovations for Learning Recovery

The innovation was a necessary response by MoEYS to mitigate effects of the COVID-19 pandemic. Cambodia received accelerated funding from the Global Partnership for Education (GPE) COVID response fund. However, the national action response plan was in place before this, involving multiple technical departments within MoEYS, and co-ordinated action from partners. Cambodia's priority for improving digital education was massively accelerated, including online access to learning materials (such as lesson video clips), online meetings and resources distribution. This also involved the creation of an e-learning section to the official MoEYS website, allowing access to all.

The relevance to inclusive and equitable education was carefully monitored, with adjustments made throughout the period. While schools were under restrictions, teachers and communities worked to distribute centrally-produced but locally-printed paper-based resources, ensuring inclusivity and equitability in providing support for families who could not afford a nominal copying charge. To further emphasise inclusivity, videos were made with sign language, resources were translated for minority languages and the Special Education Department (SED) adapted many resources, including using Braille printing.

The whole programme relates strongly to the theme of learning recovery, in that all the interventions were designed and co-ordinated to ensure continuous and remedial learning took place.

Timeliness

The national response plan was published by MoEYS in July 2020, by which time response efforts and resources production were already underway with support from MoEYS technical departments of IT and curriculum development. MoEYS digital education budget was augmented by support from partners, including: WB, ADB, UNICEF, UNESCO and EU. GPE funding was available from November 2020 until March 2022. Around 70% of funding went directly to schools as grants, a much higher proportion than any previous project.

Materials developed were 2,385 videos for primary education (Khmer language and mathematics) with around 1,574 additional worksheets available; this gave curriculum coverage plus an additional 901 videos / 400 worksheets for social studies and science.

Similarly, for secondary education, 1,500 videos were created and over 1,000 additional worksheets, covering the curriculum.

These made resources available for: children's continuous learning, remedial education, and a stored 'full curriculum' set of resources for future use.

Effectiveness

The effectiveness was monitored over the period of implementation. There was a fairly consistent reporting of 50% of children being able to access materials online and worksheet distribution was measured at 90%+ in 2021. This was probably as effective as was possible under the circumstances where Cambodia's electricity and signal coverage is still developing.

Monitoring of key educational indicators was restricted, but the intervention appeared to show impact of student retention. The mid-term re-enrolment figures showed no student loss and the 2022 drop_x0002_out figures indicate only a minimal decline from the pre-COVID figures.

The effectiveness of the e-learning portal is greatly improved, but will require further adaptations to be more user-friendly to parents and non-educators. At the current time, the website is quite practical for teachers' use.

Home Learning Package (HLP, early grades) resources are currently (2023) being sold in high volumes nationwide, indicating the continued support from parents for their children's learning.

Remedial education has long been a problem in Cambodia. Support materials were produced with assistance from local NGO Kampuchea Action to Promote Education (KAPE) and initial surveys showed a high take-up. These, and the associated support materials (videos, etc.), are expected to have continued use in Cambodia.

Beneficiaries and Impacts

Children: 2.7-2.8m

The beneficiaries were the children of Cambodia, covering the entire basic education system. Because of the holistic nature of support, all children were able to benefit, and external surveys showed that over 90% of students reported being able to use materials (ADB, 2021).

Teachers: c.88,000

All teachers received professional support. Some was direct professional support from teaching packages and online help (meetings, recordings, messages) and a clear benefit to teachers was the number of 'model lesson' videos they were able to access.

Parents: c. 1.5m directly; up to 5.5m indirectly

Parents received mostly indirect support, with the exception of the delivery of the HLP. This was delivered to 750,000 children (early grades materials), although all parents were able to indirectly benefit if they had a TV, a radio, a smartphone or other online access.

Children: short-term were able to continue learning during a period of disruption which included restrictions such as extended school closures (around 250 days total). Long-term, children have access to videos and worksheets covering the whole curriculum for the remainder of their schooling.

Teachers: short-term were able to continue their professional roles under difficult circumstances. Long-term, teachers have access to an extensive resources bank that is constantly developing and is accessible for their professional development.

Parents: short-term, parents were able to directly support their children. Long term, the access to materials will improve parental support, and many parents now have the understanding that they have the capabilities and responsibilities to assist in their children's education

Inclusion

This innovation focussed directly on inclusion on multiple levels: strong efforts were made to address the needs of all children and included:

(i) The use of Cambodian Sign Language (CSL) on all videos produced for learning (direct support to around 1,500 students)

(ii) Supply of additional budget to schools to allow the printing and safe distribution of paper based resources for families with low internet access and scholarship students who were known to be vulnerable financially (direct support to around 20% of all students, around 560,000 children)

(iii) The adaptation of remedial learning materials by the Special Education Department, not just with CSL but also using Braille for children learning in special schools (support for around 180 students)

(iv) Translation of lower grades materials into ethnic minority languages (six languages, directly supporting around 16,000 students)

(v) Additional interventions in carefully selected 'vulnerable' geographical areas (areas with high student drop-out) with localised support and additional materials provision (including support from development partners with technical expertise in supporting such areas) (direct support to estimated 270,000 children)

(vi) M&E indicates that both genders were equally support in their learning during the pandemic; further research is being undertaken on the post-COVID situation and learning outcomes.

Engagement of Stakeholders and Partners

The innovation is the first in Cambodia to fully involve parents in their children's education at a grassroots level.

Parents were provided with access to learning materials through various different media: online (MoEYS website and Facebook), through social networks (using Telegram), through two dedicated TV channels, through paper-based resources and – in the case of ethnic minorities – through dedicated minority-language radio broadcasts as well as translated materials.

The engagement from different sectors involved interaction with the health sector, in that the educational materials were combined with social media information campaigns on the value of education and the necessary health protection measures involved in continuous learning for a safe return to school.

The social protection sector was indirectly involved, as the Government addressed direct needs of vulnerable families with cash disbursements. Social media messages also focussed on a co-ordinated message of 'Do it today, don't wait for tomorrow' which encouraged student retention, home learning, hygiene measures, parent-school contact, and more.

Finally, MoEYS worked with other stakeholders to produce the HLP for pre-school and early-grades learning which contained simple resources and exercises that parents could use with their children. Multiple partners contributed to these materials, which were produced and distributed centrally.

Originality

Firstly, the use of digital education prior to 2020 was extremely limited: Telegram groups were limited, signal coverage was limited but improving, and MoEYS was only distributing digitally to educators, rather than involving parents. For many participants in materials creation, they were new not just to video production (technical support was sought where required) but also in online practice such as 'zoom' meetings. MoEYS considers that this intervention has accelerated digital education by at least five years.

Secondly, the scale of the intervention in terms of delivery of home-learning materials was unprecedented for Cambodia. The innovation eschewed the 'target areas' approach for delivery of materials on the grounds that every area within Cambodia would benefit, although the relative needs were higher in some areas. There was a strong moral justification for providing for all children, especially as the materials were new.

Thirdly, the innovation of fully national Telegram groups made a difference to the speed and surety of the delivery of materials. Once MoEYS had the structures in place, distribution of digital materials was instantaneous.

Fourthly, this was the first time that Special Educational Needs had been so fully integrated into a national programme and with so many levels addressed.

Sustainability, Scalability and Replicability

The sustainability of the innovation is very high, as all learning materials are stored safely online and fully backed-up on secure hard drives. There was high input from the Department of Information Technology (DIT) and specialist external technical support (NGO: Open Institute) for ensuring that technical measures were implemented for systems resilience.

For Cambodia, the innovation does not require scaling, as full curriculum coverage was achieved. However, there are requirements to update the materials as the curriculum changes and, in particular, to work on splitting some of the whole-lesson educational videos to be 'by activity'. Because of the new experience and capacity within MoEYS, these adjustments can be made without large-scale input or financial costs.

The replicability of this system depends on the situation of other countries. In the case of MoEYS, the strategy was very much based on the Cambodia country-specific factors available: for example, MoEYS can distribute resources to all school directors nationally using a Telegram group. Strong leadership from central levels was also necessary to ensure interventions such as TV/ radio broadcasts.

MoEYS extends the invitation to other countries to make contact for further discussion of this innovation and welcomes the chance to share good practice.

Initiatives for Inclusive and Accessible Education

Country
India

Organizer
Central Institute of Educational Technology (CIET)
National Council for Educational Research and Training of India

Date started
Re-modeled due to COVID-19

Summary

To mitigate the impact of the COVID-19 pandemic, the National Council for Educational Research and Training of India has re-modeled the teaching-learning practices and introduced a series of initiatives for delivering quality education. The initiatives are based on a large-scale technological infrastructure combined with diverse educational content, encompassing dedicated TV channels and radio programmes, digital platforms for school education, and online courses for teachers and educational administrators.

The initiatives provide multimodal access, reaching over 1.5 million schools, 240 million students and 8.5 million teachers. More than 370 digitalized textbooks, supported with a large number of videos, audios and online courses for students and teachers, were made available in 11 local languages. Notably, Universal Design for Learning (UDL) was adopted in the creation of the learning content, ensuring equal access for learners with special needs. In response to education disruptions, the initiatives have enabled flexible and personalized learning and supported students' continuous engagement with education.

Beyond the pandemic, the initiatives continue to scale up and expand, especially to adapt the learning content to new digital platforms with an aim to create a range of options that can match pace with the ever-changing educational needs of learners from different sections of Indian society.

More information at: https://ciet.nic.in

Digital Education Initiatives

1. PM e-VIDYA

- PMeVidya is an innovative and unique initiative by the Ministry of Education, Government of India to sustain education by leveraging ICT and to facilitate learning and teaching at school level. It offers multifarious educational resources in multi-platform mode viz. digital/online through 12 DTH TV Channels, community radio, content for Divyangs (CwSNs), podcast etc. Takes advantage of the several streaming patforms available accross the country to telecast educational content in audio/video mediums.

2. ePathshala

- The digital india campaigns has promoted extensive use of ICTs in the teaching learning process. TheePathshala, an initiative of Ministry of Human Resource Development (MHRD), Govt, of india and Nationa Council of Educational Research and Training (NCERT) has been developed in November 2015 for showcasing and disseminating all educational e-resources including textbooks, audio, video, periodicals, and a variety of other print and non-print materials.

- Students, Teachers, Educators and Parents can access eBooks through multiple technology platform that is mobile phones and tablets (as epub) and from the web through laptops and desktops (as Flipbook). ePathshala also allows user to carry us many books as their device supports. Features of these books allow users to pinch, select, zoom, bookmark, highlight, navigate,share and make notes digitally.

3. DIKSHA

- DIKSHA (Digital Infrastructure for Knowledge Sharing) is a national platform for school education, an initiative of National Council for Educational Research and Training (NCERT), under the aegis of the Ministry of Education (MoE), GoI. Launched in 2017 by Honourable Vice President of India – Shri M. Venkaiah Naidu, DIKSHA has been adopted by almost all the States, Union Territories, central autonomous bodies/boards including CBSE. DIKSHA was developed on the basis of the Strategy and Approach Paper for the National Teacher Platform released by the then Honourable Minister for Human Resource Development, Shri Prakash Javdekar in September, 2017. DIKSHA can be accessed by learners and teachers across the country and currently supports 36 Indian languages. Each State/UT leverages the DIKSHA platform in its own way, as it has the freedom and choice to use the varied capabilities and solutions of the platform to design and run programs for teachers, learners and administrators. DIKSHA policies and tools make it possible for the education ecosystem (educationist, experts, organisations, institutions - government, autonomous institutions, non-govt and private organisations) to participate, contribute and leverage a common platform to achieve learning goals at scale for the country. NCERT Textbooks are licenced under CC BY NC-ND and all the resources are licenced under CC BY NC-SA. Under the PM eVidya initiative of the GoI, which was declared as part of the Atma Nirbhar Bharat, DIKSHA has been declared as 'One Nation, One Digital Platform'.

- DIKSHA is built on open source technology, made in India and made for India, which incorporates internet scale technologies and enables several use-cases and solutions for teaching and learning. DIKSHA is built using MIT licensed open source technology called Sunbird, which is a digital infrastructure for learning and solutions and offers over a 100 micro services as building blocks for the development of platforms and solutions.

Solutions on DIKSHA - Diverse, Flexible and Evolving

4. MooCs on SWAYAM

- The National Council of Educational Research and Training (NCERT) has been designated as National coordinator (NC) for the development and dissemination of Massive Open Online Courses (MOOCs) for SchoolEducation specifcally catering to Classes iX to Xl. These courses will be accessible throuch "SWAYAM" (StudWebs of Active- Learning for Young Aspiring Minds) portal and mobile app.

- SWAYAM is dedicated to bridging the digital divide, extending educational opportunities to students who have thus far been underserved by the digital revolution, thereby enabling them to participate more fully in the knowledge economy. The courses offered on SWAYAM MOOCs are interactive and meticulously curated by the nation's most esteemed educators, and the best part is that they are available FREE of charge to all learners.

- The courses featured on SWAYAM are structured into four distinct quadrants:

(1) Video Lectures: Engaging video presentations that facilitate effective learning.
(2) Specially crafted Reading Material: These materials can be conveniently downloaded and printed, providing accessibility for offline learning.
(3) lf-Assessment Tools: Students can gauge their understanding through self-assessment tests and quizzes.
(4) Online Discussion Forums: A platform for students to seek clarification from mentors, engage in discussions, and address doubts with their peers, thereby fostering interactive learning.

- NCERT is dedicated towards reaching students through these courses, enriching their learning experiences, and ultimately helping them achieve the desired learning outcomes.

5. NISHTHA - National Initiative for School Heads' and Teachers' Holistic Advancement

- The Department of School Education and Literacy has launched a National Mission to improve learning outcomes at the elementary level through an Integrated Teacher Training Programme called NISHTHA under the Centrally Sponsored Scheme of Samagra Shiksha in 2019-20. NISHTHA (National Mission to improve learning outcomes at the elementary level) is a capacity building programme for "Improving Quality of School Education through Integrated Teacher Training". It aims to build competencies among all the teachers and school principals at the elementary stage. NISHTHA is the world's largest teachers' training programme of its kind.The basic

- objective of this massive training programme is to motivate and equip teachers to encourage and foster critical thinking in students. The initiative is first of its kind wherein standardized training modules are developed at national level for all States and UTs.

6. NCF Tech Platform

- As per the National Education Policy, 2020, following four NCFs will be developed: National Curriculum Framework for Early Childhood Care and Education (NCFECCE) National Curriculum Framework for School Education (NCFSE) National Curriculum Framework for Teacher Education (NCFTE) and National Curriculum Framework for Adult Education (NCFAE) In this regard, a comprehensive strategy has been worked out jointly by the Ministry of Education (MoE) and NCERT. As per this strategy, at the State level- all states/UTs will first prepare their State Curriculum Frameworks (SCFs) passing through the process of district level consultations, mobile app survey and development of position papers by the State Focus Groups in 25 areas/themes identified as per the NEP, 2020 including ECCE, Teacher Education and Adult Education. These draft SCFs will provide inputs to the development of NCFs. States/UTs and Autonomous organisation working under MoE, all will attempt this process to provide inputs for the NCFs. Recommendations of NEP, 2020 will be kept in view during the whole process.

- At the National level, NCERT will conduct a survey on MyGov Portal and get feedback from diverse stakeholders on the issues related to curriculum implementation. NCERT will also conduct 2-3 district level consultation in each of the states/UTs for collecting feedback from the grassroot level. Analysing inputs received from the district level consultations, states and national level survey on MyGov portal, National Focus

- Groups will prepare 25 position papers in the identified areas. Drawing insights from these position papers and draft SCFs, four NCFs will be prepared. The whole process will be done using paperless approach including consultations and preparation of reports at all levels using Tech platform specially designed for the purpose. In view of this, a comprehensive Tech Platform will be developed by the NCERT and NIC, MoE. On this platform all the states/UTs will be provided with e-templates for the consultations, surveys, position papers, etc., and will continuously be supported by the nodal officers nominated at the central level. States will also nominate their nodal officers for smooth and speedy flow of this process. Draft NCFs will be translated in 22 languages given in VIII schedule of the Constitution and shared with the states/UTs for their comments. Taking care of their comments, the NCFs will be given final shape and will be placed before Ministry of Education for the approval processes. After approval, the documents will be disseminated to states/UTs for revising the draft SCFs and also for the implementation of NCFs.

7. ICT Curriculum

- The National Policy on lCT in School Education has set the goal of preparing youth to participate creatively in theestablishment, sustenance and growth of a knowledge teachers and children must be treated not merely asconsumers but also as active producers. The dicital india Campaicn strives to transform india into adigitally empowered society and knowledge economy by focusing on the three vision areas (1) Digital lnfrastructure as Core Utility to Every Citizen, (2) e-Governance and Services onDemand and (3) Digital literacy and empowerment of citizens. The present curriculafor lCT in education is a step towards realizing the goals of both the Nationa Policy and the National CurriculumFramework. This

- curricula is designed to promote creativity, problem solving, and introduce the stakeholders to the world of information and technologies.

- Guiding Principles
  - The curricula shall be generic
  - The focus shall be on learning to compute and create
  - Adequate opportunity for hands on learning and exploration
  - Promotion of safe and secure use of ICT
  - Innovative and full utilization of infrastructure and resources

8. Accessibility in School Curriculum

- Efforts toward equitable education and inclusive education aim to address educational needs that arise as a result of belonging to SEDG's as well as those that arise despite having no association with SEDGs. Addressing the special educational needs demands availability of resources in multiple modes and flexibility in content delivery for personalized adaptive learning. Mentioned below are the major initiatives taken by NCERT for making education accessible to all including children belonging to SEDG's, recognized in NEP 2020.

Curricula for Teachers

Objectives

- Use ICT tools, software applications and digital resources effectively
- Integrate ICT into teaching-learning and evaluation
- Acquire, organize and create digital resources
- Participate in teachers' networks
- Evaluate and select resources
- Practice safe, ethical and legal ways of using ICT
- Use ICT for making classrooms more inclusive

Course Organization

Induction and refreshers courses for teacher

Induction- 01(120 hours) + 3 refreshers (120 hours each) = Diploma in ICT in Education - Basics (for all teachers)

Advanced Modules

Additional refereshers and one advanced induction is available to extend learning of teachers through a range of exposure to ICT. Based on availability of time/ resources, the stakeholders can choose advanced modules. The Advanced modules are of 45 days duration.

The National Policy on ICT in School Education has set the goal of preparing youth to participate creatively in the establishment, sustenance and growth of a knowledge teachers and children must be treated not merely as consumers but also as active producers.The Digital India Campaign (2015) strives to transform India into a digitally empowered society and knowledge economy by focusing on the three vision areas i. Digital Infrastructure as Core Utility to Every Citizen, ii. e-Governance and Services on Demand and iii. Digital literacy and empowerment of citizens.The present curricula for ICT in education is a step towards realizing the goals of both the National Policy and the National Curriculum Framework.This curricula is designed to promote creativity, problem solving, and introduce the stakeholders to the world of information and technologies.

Guiding Principles

- The curricula shall be generic
- The focus shall be on learning to compute and create
- Adequate opportunity for hands on learning and exploration
- Promotion of safe and secure use of ICT
- Innovative and full utilization of infrastructure and resources

Course Overview

Course	Teachers	Students	
		Students (VI-VIII)	Students (IX-XII)
Duration	Certificate - 1 year Diploma - 2 years	3 years	4 years
Mode	Blended (face to face and online)	Face to face	Face to face
Session format	Instructor led and hands-on	Instructor led and hands-on	Instructor led and hands-on
Evaluation	Record of achievements through e-portfolio and summative assessment	Record of achievements through e-portfolio and summative assessment	Record of achievements through e-portfolio and summative assessment
Award	Certificate/ Diploma in ICT in Education	Certificate	Certificate
Certification	SCERTs/SIEs/NCERT	Boards of School Education	Boards of School Education

Curricula for Students

Objectives

- Develop digital literacy skills
- Access various tools and applications for learning
- Operate a variety of hardware and software
- Use the ICT facility with care
- Create a variety of digital resources
- Practice safe, legal and ethical means of using ICT

Course Organization

Class I - V

Game based ICT integrated activities

Class VI - VIII

Spans 3 years

30 weeks per year

3 sessions per week

Class IX - XII

Vocational Course -11 Courses

Each course - 4 Levels across class 9 to 12

Online Mektep Educational Platform

Country
Kazakhstan

Organizer
Centre for Educational Programmes, Nazarbayev Intellectual Schools Autonomous Educational Organisation

Date started
2020

Background

Global events such as pandemics, economic crises, wars, and conflicts induced educational systems all over the world to look for new ways to maintain quality education. Due to the country's COVID-19 pandemic situation, the President of Kazakhstan directed that all educational institutions start the 2020-2021 academic year online. As a result, public schools needed to have a remote access to the educational content. There were, however, no platform and digital learning resources that corresponded to curricula and met the State Standards. As a result, in 2020, the Centre for Educational Programmes (CEP) of Nazarbayev Intellectual Schools AEO (NIS) collaborated with Bilim Media Group (BMG), an innovative IT company, to launch a digital educational platform named Online Mektep.

Online Mektep is a digital educational environment that includes educational resources (online lessons) and technological solutions to enable effective remote interaction between teachers and students. The platform was designed to ensure that every Kazakhstani student has equal access to quality education and prepare mainstream schoolteachers for digital teaching. Online Mektep is a tool for:

- organising distance, traditional and blended learning;
- monitoring and analysis of students' academic performance for parents and teachers;
- school management.

Timeliness

Online Mektep has become an effective solution used by the educational system to respond to challenges in 2020. The design process started on 25 June 2020. NIS teachers were engaged in the development of the platform content.

To provide students of mainstream schools with timely access to the digital platform, a phased content development and implementation process was scheduled:
1. Term 1 lessons – July-August 2020 (5,656 lessons in total);
2. Term 2 lessons – September-October 2020 (5,656 lessons in total);
3. Term 3 lessons – November-December 2020 (7,102 lessons in total);
4. Term 4 lessons – January-February 2021 (5,668 lessons in total).

Online Mektep was launched on time. Since 1 September 2020 more than 52% (3,910) of Kazakhstani schools have joined the platform. The content development was finalised by May 2021 to provide students with an access to all subject courses. The platform is currently operational and being regularly updated.

Effectiveness

The effectiveness of the project is evidenced by the fact that it is the first online platform for distance and blended learning in Kazakhstan, which provides unique learning materials developed for every lesson in all subject courses in two languages.

Online Mektep enabled to:
1. Launch an online learning platform for students with a simple and easy-to-use interface, excellent performance, and fault tolerance.
2. Access to digital educational resources developed in compliance with Kazakhstan's State Compulsory Educational Standard, for Grades 1 to 11, in the Kazakh and Russian languages.

Materials developed include:

- 24,074 lesson plans for Grades 1 to 11 in all school subjects (42 subjects);
- 550,000 exercises and tasks.

Online Mektep intends to support mainstream school students and teachers in distance and personalised learning in the event of a force majeure. 297,510 teachers and over 2.3 million Kazakhstani students use the platform. During the pandemic, the platform had over 1.6 million daily visitors and over 3.55 billion views.

Beneficiaries and Impacts

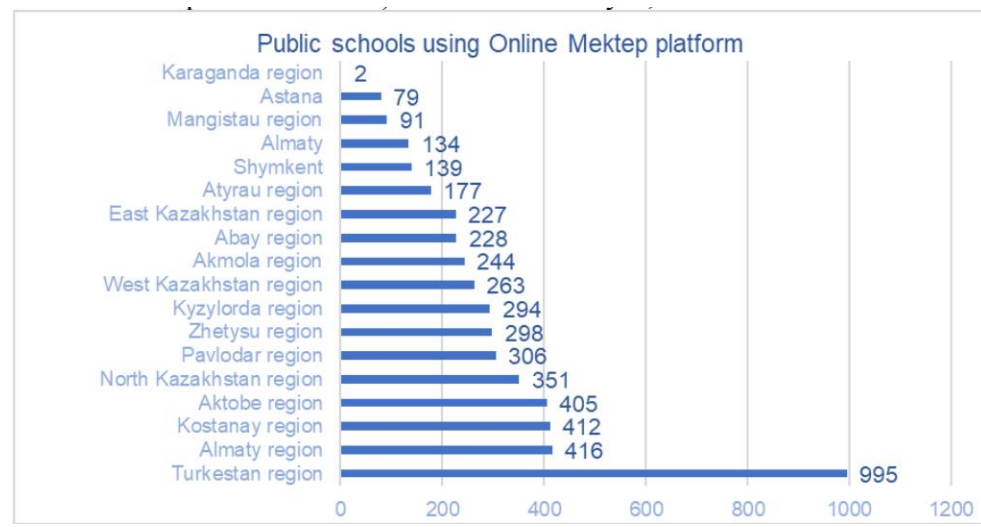
Students, teachers, parents, and school administration are the primary beneficiaries of the project. The number of active users is 2.3 million students (62% of student population) of 5,105 schools (5,061 public and 44 private schools). There are totally 7,694 schools in Kazakhstan.

Online Mektep is used by almost equal numbers of girls (1,148,636) and boys (1,187,582). School teachers also actively use the resources available on the platform: 297,510 teachers have registered to use the platform.

The following user groups will benefit from Online Mektep in the short term:

- Students: can access their personal timetable, take classes in any format, complete interactive tasks, and track their progress.
- Teachers: can deliver asynchronous interactive lessons and hold videoconferences for synchronous lessons, assess, and monitor students' knowledge, provide feedback to students and parents, and use the E-register.
- Parents: can track their child's academic performance, view their timetable, ask questions to teacher and school administration.
- School administration:can manage the learning process (track teachers', students', and school staff's activities, manage the timetable, monitor the quality of lessons) and make administrative decisions.

The project's expected outcome and long-term impact is to increase the quality of the educational process, as well as students' and teachers' digital and information literacy. The platform's launch has boosted digital educational offerings in Kazakhstan and raised the competitiveness of online learning.



Inclusion

The issue of educational equity gap between urban and rural students is often raised in Kazakhstan. By providing access to digital educational platform, this project provides students in rural schools (70% of all schools) with high-quality resources (lessons, materials, methods) developed and delivered by the country's leading educators. Thus, the project helps reduce equity gap between rural and urban students.

Students of 2723 ‘multi-grade schools’ in sparsely populated and remote areas benefitted from using the platform. In such schools, a number of subjects are taught by the same teacher.

The platform is used by 190,402 students, which is 96% of all students of multi-grade schools. Online Mektep provides access to secondary education to students from different ethnic groups. The following provides tha data of “Students-users as of December 2022”:

Language of instruction	Boys	Girls
Kazakh	782,999	755,254
Russian	400,686	389,389
Uzbek	2,424	2,146
Tajik	1,646	1,757
English	97	90
Total	**1,187,852**	**1,148,636**

Subscription to Online Mektep is provided at the expense of public funds and is free for students and teachers.

Engagement of Stakeholders and Partners

The project is divided into two stages: design and implementation.
Stakeholders at design stage:

- CEP;
- BMG;
- NIS teachers;
- Mainstream school teachers.

Stakeholders at implementation stage:

- Authorised State body;
- Local executive bodies;
- Heads and educators of educational organisations.

CEP supervised the content development process. CEP employees worked as subject experts_x0002_moderators who trained teachers to develop the lesson content, and provided the developers with timely feedback to improve the quality of materials.

A wide range of experts were involved in the platform design.
1. The content was developed by the outstanding teachers-practitioners:

- 436 NIS teachers;
- 146 mainstream school teachers.

2. BMG provided technical support and content digitisation: methodologists, announcers, editors, managers, engineers, graphic and animation designers, camera operators. The content was reviewed by the State authorised body under the Ministry of Education.
The platform integrates Zoom software to enable communication between students and teachers. Zoom integration allows teachers to have video conferences within the platform without switching to other services.

Online Mektep is also integrated with Kundelik, an E-register. Owing to this integration parents can keep track of their child’s progress, view homework and communicate with teachers. This integration has reduced the workload of teachers on filling out registers.

Originality

1. A comprehensive system for distance learning and a wide range of functions within one platform: online learning, tracking personal progress, monitoring, feedback from the teacher; managing a separate classroom and school; effective training organisation through video conferencesand chats.

2. Complete coverage of subject programmes. Online Mektep is Kazakhstan’s only platform that assures the implementation of the State Standard by providing equal educational opportunities and full coverage of subject programmes.

3. Lesson content management. The platform contains theoretical materials (video lectures, summary) and practice for a lesson (9 to 27 tiered tasks per lesson, where A is the basic level, B is advanced, and C is high), allowing students to develop functional literacy in a consistent and systematical way.

4. Implementing personalised blended learning. The platform has implemented distance learning through synchronous, asynchronous and mixed formats, and

those were used for the first time across the country in the framework of secondary education.

Online Mektep provides a student with opportunity to:

- learn independently amid a pandemic, quarantine, natural cataclysms;
- master a programme independently during sick leave, competitions, and while homeschooling;
- independently revise learning material over vacations to fill existing gaps.

Sustainability, Scalability and Replicability

Online Mektep was the most visited portal during distance learning (2.3 million students and 297,510 teachers), indicative of high demand and high-quality content.

Platform sustainability is evidenced by its use in the post-pandemic period. Teachers use the platform resources (video tutorials, animations, lesson notes) in blended learning.

Updating and improving the platform content is a priority for further development. This year it is planned to add 9 new tasks to the existing 24,000 lessons. It will help update the task database, ensure the effectiveness of learning, and boost the platform's attractiveness to new and existing users. Updating and improving the content will not require considerable additional resources.

In addition, a new Ustaz (Teacher) module has been added to provide methodological support for teachers. The module helps teachers enrich their bank of tasks, create own content, including preparation for subject Olympiads.

The project's long-term goal is to increase the number of users and involve all Kazakhstani schools.

Despite the fact that the content is developed according to State Standards, the resources are universal, can be replicated and scaled to other countries. Currently, Central Asian countries such as Uzbekistan and Kyrgyzstan have showed interest in the platform.

#UˇciDoma: Project in response to COVID-19

Country
Montenegro

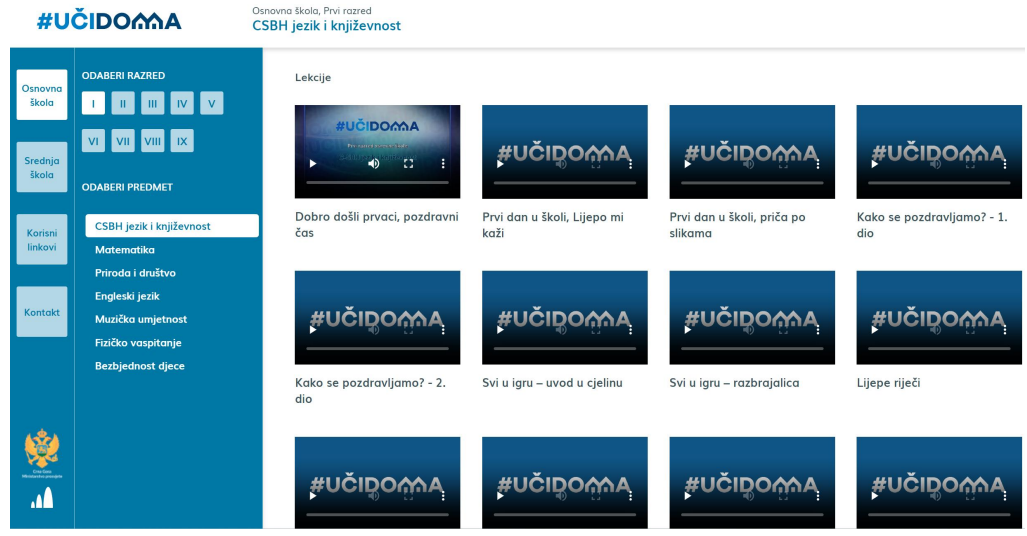
Organizer
Ministry of Education, Science, Culture and Sports

Date started
2020

Overview

In Montenegro, the Ministry of Education, Science, Culture, and Sports of Montenegro devised and executed the initiative #UˇciDoma (#StudyAtHome) during the academic year 2020/2021. Educational sessions were recorded and transmitted through three TV channels—TVCG 2, MNE Sport, and MNE Sport 2, now designated as "study-at-home channels." These recorded classes can be accessed on the platform www.ucidoma.me and the teacher portal.

#UˇciDoma



With the shutdown of schools in response to the COVID-19 pandemic, approximately 118,000 students in Montenegro have been directly impacted. In light of the pandemic, the Ministry of Education proactively introduced diverse distance learning opportunities tailored to various education levels. These initiatives encompassed a portal facilitating teacher-student communication, organized by classes and subjects, along with a dedicated YouTube channel featuring recorded classes. The #UˇciDoma (#StudyAtHome) project, incorporating the Amplitudo platform, garnered positive feedback, involving the recording of around 1700 lectures and the active participation of several schools. Primary school content was disseminated on the YouTube channel #UˇciDoma, and the Amplitudo-developed program was accessible through a mobile app. In addition to traditional teaching methods, a range of tools such as Moodle, web portals, video materials, and video conferencing were employed. Moreover, the COVID-19 period witnessed the increased utilization of the MS Teams platform and the Zoom application in Montenegrin schools and colleges.

In the year 2020, as the global reach of the COVID-19 pandemic expanded, a significant number of countries implemented the temporary closure of schools, affecting over 91% of students worldwide. The crisis underscored the necessity for the right to education to be adaptable and responsive to diverse contexts and the evolving needs of societies. Education, universally, stands out as the paramount means to ensure the flourishing of individuals and societies alike.

Knowledge Platform

Country
Pakistan

Organizer
Multi-party participation

Date started
2018

Summary

Knowledge Platform aims to recover learning losses via inclusive/equitable access to personalized and gamified education content for 100 million students in Pakistan. We are creating innovative learning solutions that focus on individualized learning needs, require low tech, can work on any device with or without continuous access to the internet. We have created 4,000+ animated videos on Math, Science and English, 40,000+ questions, 600+ activities and games to be used in online, offline and in-class blended learning fashion via web or mobile apps. Our blended learning program has empowered teachers to deliver better learning outcomes. We also provide extensive support for teachers, students, parents and the school ecosystem without any biasness to effectively use learning technologies and easily adopt digital pedagogy principles. Our inclusive practice model has proven results and case studies that shows the effectiveness of our solution. Our mission is to improve learning outcomes, boost student engagement and improve quality of education at scale in public and low cost private schools of Pakistan. We currently serve 300+ active schools and 300,000+ students are enjoying access to exciting learning experience through our platform.

Timeliness

Knowledge Platform started developing content and learning management system in 2016. By 2017, an MVP of Learn Smart Classroom product was introduced in the market. In 2018, Knowledge Platform signed a deal with Jazz to execute a pilot project for 35,000+ girl students in 75 public schools under Jazz Smart Schools program. By 2020 when COVID-19 happened, most of our technology components and content development was completed and we were able to provide a rapid response against extensive school closures and a shift to online learning. Our innovation arrived at the appropriate time, and we began our journey by covering the students' learning losses during the pandemic. As soon as life returned to normal, the entire invention and idea smoothly transitioned to the result-proven in-classroom adaptive learning system. The innovation implementation is a continuous process and we aim to reach 100 million students.

Effectiveness

Knowledge Platform has effectively addressed the following challenges:

1. Recover significant learning losses: Knowledge Platform conducted an in-depth research on Education Technology & the Coronavirus Pandemic to understand its impacts. We have provided continuous and equitable access to education, particularly in underserved communities and remote areas to not only cover the impacts of the coronavirus pandemic, which has extended through most of 2021 and 2022 as well, but to overall improve education quality.

2. Personalized learning: Knowledge Platform provide personalized learning experiences to address the diverse learning styles and abilities in a classroom setting. With our adaptive learning tools, students can receive individualized instruction that matches their specific needs and abilities.

3. Student engagement: Knowledge Platform has made learning more engaging and interactive through videos, games and activities to help students understand complex concepts.

4. Teacher effectiveness: More than 10,000 teachers were trained to improve their teaching effectiveness by providing tools for lesson planning, grading, and student assessment.

5. Cost-effective education: Knowledge Platform has reduced the need for expensive traditional educational resources. With the use of our digital resources, schools can save money and provide more affordable education to students at less than US$ 0.5 per student per month.

Beneficiaries and Impacts

Students (Number: 500,000+)

Short-term impact:

- Accessibility
- Improved engagement
- Enhanced collaboration
- Personalized learning
- Immediate feedback
- Remedial learning

Long-term impact:

- Improved academic performance (60% overall improvement in results)
- Lifelong learning
- Increased continuous access to education
- Improved career prospects
- Enhanced digital literacy

Teachers (Number: 12,000+)

Short-term impact:

- Improved efficiency
- Enhanced communication
- Student learning gap identification
- Increased access to resources
- Enhanced parent teacher collaboration

Long-term impact:

- Improved student outcomes
- Increased job satisfaction
- Improved professional development
- Lifelong learning
- Improved career prospects
- Enhanced digital literacy

School Leaders (Number: 1,100+)

Short-term impact:

- Cost saving
- Improved efficiency
- Enhanced communication
- Data-driven decision making
- Increased access to resources

Long-term impact:

- Improved academic performance
- Increased teacher retention
- Improved student outcome
- Increased access to education
- Enhanced digital literacy

Education Communities (Number: 11,000+) & Public Groups (Number: 42,000+)

Short-term impact:

- Knowledge Sharing
- Increased access to resources
- Enhanced collaboration

Long-term impact:

- Inclusivity
- Enhanced digital literacy
- Passive income unlocked
- Improved efficiency
- Time saving

Inclusion

We understand that the language and representation of individuals in our content has a significant impact on attitudes and beliefs, and we take this responsibility seriously. To ensure gender equality, avoid gender, age, race, ethnicity, origin, or any status bias, we have implemented several practices in our content creation, technology creation and review process. Content creation is one of the critical aspect so our content creation guidelines can be found here: http://bit.ly/3l89TPw

These cover guidelines on inclusive language, diverse representation and cultural sensitivity. We also

regularly engage outside experts, to review our content and provide feedback on any areas where we can improve. A detailed external review of our content from a gender lens where we scored over 95% can be found here on page 46: http://bit.ly/3X4QJr4

Also, we have signed agreement with Ministry to distribute free digital content over six TV channels available on all satellites, terrestrial and cable TV networks in the country. We believe that education should be accessible and empowering to all individuals, regardless of gender. By avoiding gender bias and promoting gender equality in our content, we hope to contribute to a more equitable and inclusive society.

Engagement of Stakeholders and Partners

In order to ensure digital inclusion and internet access we have formed partnerships with Pakistan's leading 4G internet providers such as 1) Jazz and 2) Zong to ensure equitable and inclusive connectivity by offering 1) Free internet package 2) Subsidized internet package for students accessing Knowledge Platform products.

Signed agreement with Ministry of Federal Education and Professional Trainings (MoFEPT) to distribute free digital content over six TV channels available on all satellites, terrestrial and cable TV networks in the country. The content is also planned to be broadcast on Radio networks.

Distributing high quality free content through www.eTaleem.gov.pk website setup by the Ministry of Education Pakistan.

Launched English Language Learning competition in partnership with McDonald's.

Launched smart phone/tablet financing scheme in partnership with CreditPer.

Signed strategic EdTech collaboration with largest book publisher Oxford University Press Pakistan to progressively bring digital versions of its best-selling school education portfolio in Pakistan.

Originality

What distinguishes us is the partnership of cutting-edge LMS, digital content, and effective and proven practise models to identify learning gaps and provide remedial learning for our learners. We divide the curriculum of a subject into small and measurable skills that compose its taxonomy aligned with the Core National/Single National Curriculum of Pakistan. Once a taxonomy is in place, videos, activities/games and assessments are developed for each skill, with active application of effective pedagogical and instructional design approaches. For more information, please refer to http://bit.ly/3HvWgkM. The key features of the innovation are as follow:

- Digital content facilitating conceptual understanding and higher cognitive skills
- Interactive Learning Management System
- Real Time Performance Dashboards
- Digital Homework Centre
- Content Recommendation Engine for Students based on AI
- AI based Diagnostic Assessments
- Exam Preparation Tool
- Social and collaborative learning through groups and media streams
- Digital content library
- Leaderboard for students
- Lesson plans for teachers and students

Sustainability, Scalability and Replicability

Overall: Our program is simple to use and has been battle-tested across schools in Pakistan. We have also executed successful interventions in Philippines, Myanmar and China.

Hardware: We use standard and modular hardware that is generally available and does not require any special configuration and that last well beyond three

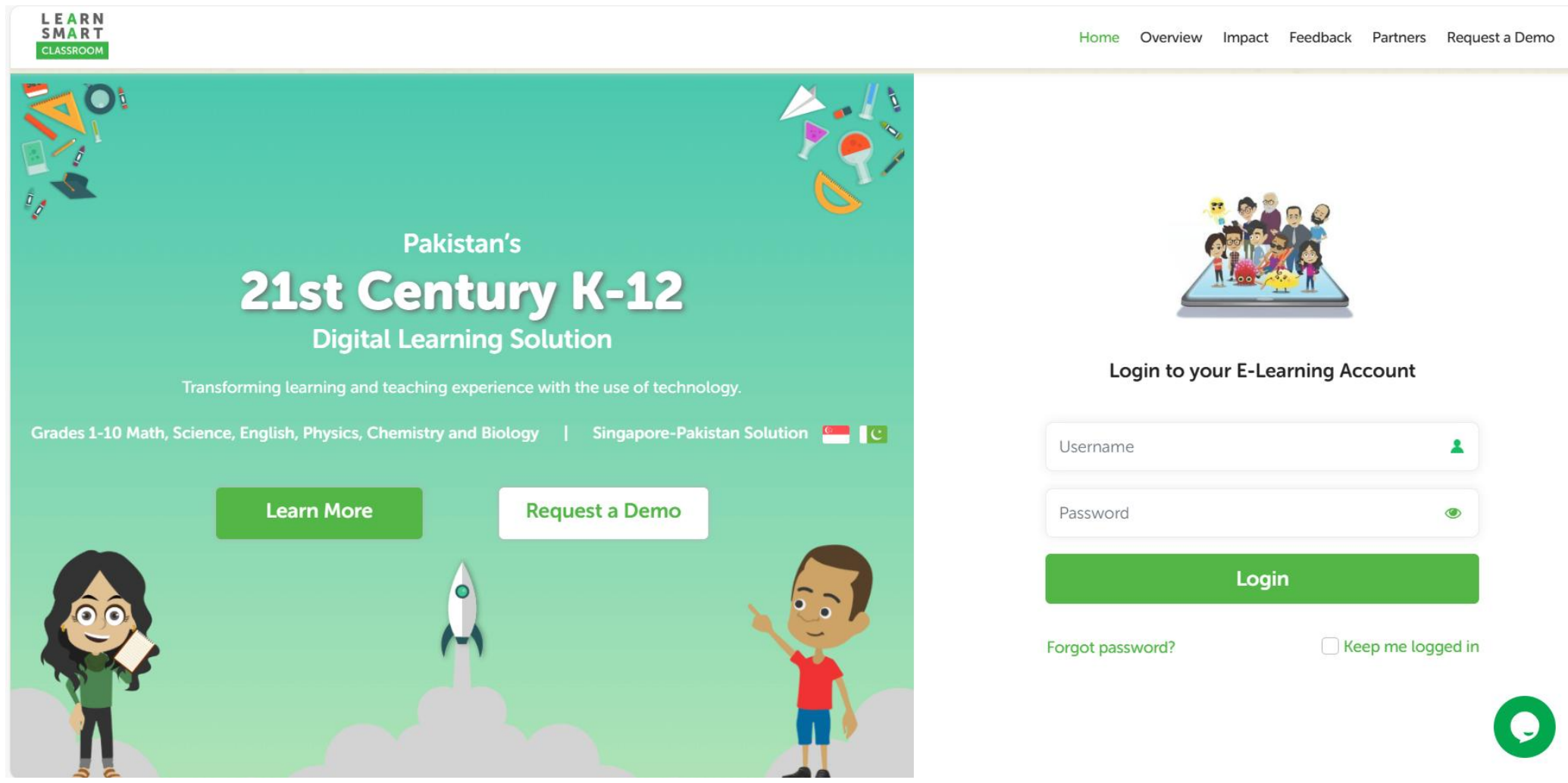
special configuration and that last well beyond three years. This greatly reduces hardware risk. Also, hardware may be replaced by open-market purchases.

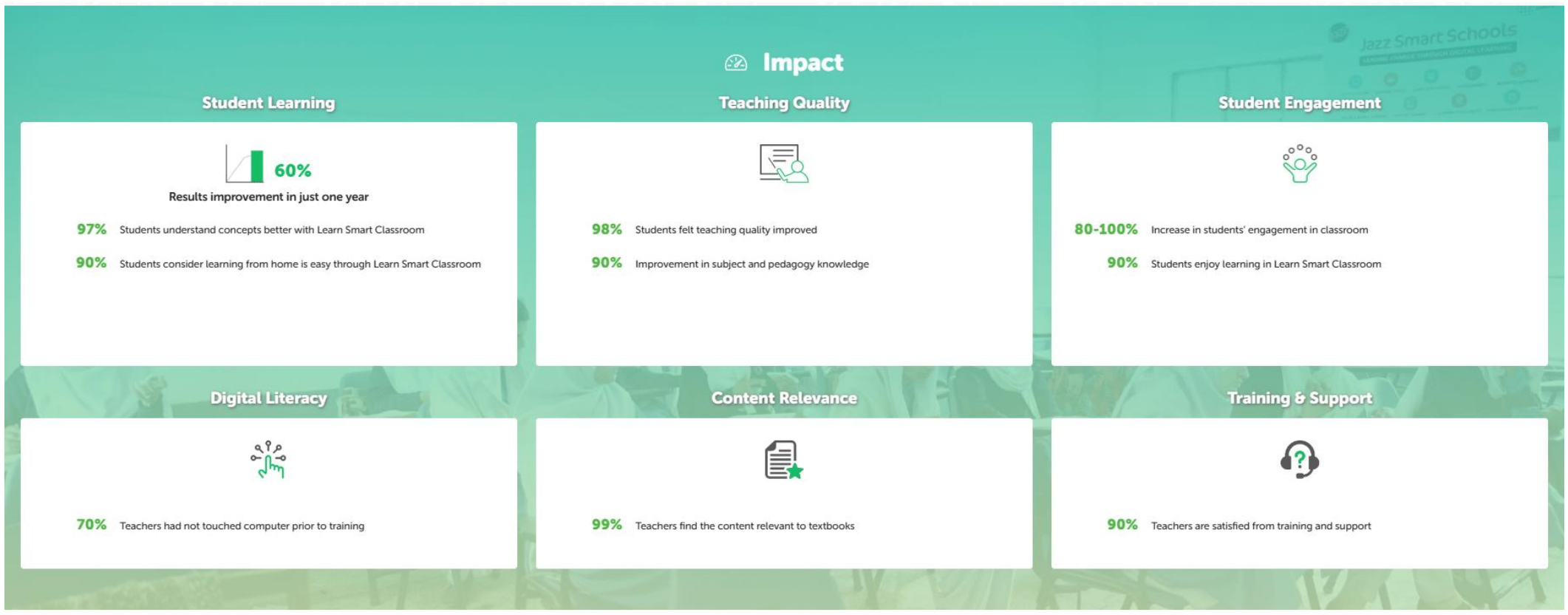
Content Modularity: Our content is divided into micro-skills (typically over 100 skills be grade per subject). This makes it very easy to map our content to any textbook in the world.

Cloud and Data Synchronization: Our technology is hosted on cloud and can be made accessible for any student in the world. We provide two-way data synchronization, which makes it easy for schools and teachers to use both in-class and from-home.

Training & Support: We provide training and support to administrators and technical staff to strengthen their capacity to run the program by themselves.

Monthly and Quarterly Reports and Related Online Engagement: Monthly and quarterly are provided to all applicable constituents. These reports and engagement strengthen staff capacity to run the program by themselves.





Digital Learning Journey in South Africa

Country
South Africa

Organizer
Government

Date started
1994

The policy landscape for Digital Learning in South Africa is intricate and dynamic, comprising a complex network of policies, laws, and regulations governing an expanding education system. It intersects with information and communication technologies (ICT), media, publishing, broadcast, skills development, and social development sectors, reflecting diverse perspectives from various stakeholder networks. These digital policies are intricately connected to overarching education policies and strategies, including the South African Schools Act, the National Education Policy Act, and the 2001 National Plan for Higher Education.

This review focuses on three key Digital Learning-related policies: ***the e-Education White Paper*, or *White Paper 7***; ***the White Paper on Post-School Education and Training***, and ***the National Integrated ICT Policy White Paper***. It is noteworthy that these policies align with the broader 15-year strategic vision outlined in the National Development Plan (NDP) 2030 by the South African government. The NDP 2030 envisions a transformative role for digital technologies in shaping educational advancements.

e-Education White Paper

The e-Education White Paper, also known as White Paper 7, underscores the significance of fostering connections among learners, teachers, and professional support services. It advocates for the establishment of eLearning platforms while aiming to link learners and teachers to enhanced information and ideas through an effective integration of pedagogy and technology, supporting education reform. The primary objective is to empower every basic and further education and training learner to confidently, creatively, and responsibly utilize ICT by 2013. This objective is underpinned by a robust policy framework comprising four key components: equity, access to ICT infrastructure, capacity building, and norms and standards.

The policy delineates the characteristics of a typical e-school, encompassing meaningful ICT usage for learning, competent principals and teachers adept at managing and teaching with ICT, ICT access supporting curriculum delivery, and community connectivity. While equity is a recurring principle and objective, with a focus on access to digital resources, social justice is notably absent in White Paper 7. The term "redress" is mentioned twice in the context of equity.

Research by Vandeyar (2015) reveals that district and provincial officials possess a superficial understanding of the policy, lack a sense of ownership, and perceive their role mainly as policy disseminators. These officials also face challenges of capacity and competency for policy implementation, and siloed behavior among different directorates within education departments hampers effective implementation. Mooketsi and Chigona (2014) confirm, based on their study of teachers in a black township in the Western Cape, that teachers are unaware of the policy, and their adoption of digital technologies lacks a foundation in understanding White Paper 7. Other studies, such as Ford & Botha (2010), highlight challenges and failures in policy implementation resulting from a techno-centric design of Digital Learning initiatives. Ineffective implementation has restricted the policy's ability to achieve its stated goals of improving access, quality, and equity in education.

White Paper on Post-School Education and Training

The White Paper on Post-School Education and Training, implemented in 2013, encompasses education and training provisions for individuals who have completed school, those who haven't, and those who have never attended school. It emphasizes the necessity for fair access to suitable technology. Despite the absence of a comprehensive national policy on Digital Learning (DL) in higher education in South Africa, this White Paper acknowledges the indispensability of ICT for effective education provision and its central role in open learning. The document proposes plans to enhance ICT access, advocates for carefully planned implementation of teaching and learning interventions using ICT, and commits to promoting open learning while supporting the development and utilization of open education resources (OER). The term "equity" is mentioned 15 times in the text, discussed as a policy principle alongside "social justice," mentioned seven times, and "redress," mentioned four times. Equity is addressed concerning gender, race, and disability, ensuring employment equity, and providing financial aid to the most economically disadvantaged students.

The policy draws a distinction between equity of access and equity of outcomes, framing social justice as central to the policy and integral to historical struggles for social change. This policy was adopted amid debates transforming the post-schooling sector in South Africa, influenced by student voices advocating for free, decolonized higher education. Central to these debates are challenges questioning whether this White Paper truly promotes equity and social justice, with some arguing that the labor market-centric nature of the transformation agenda narrowly focuses on skills and overlooks broader systemic issues perpetuating exclusion and marginalization. Current discussions on alternative pedagogical and epistemological models within the context of decolonization often exclude digital aspects of the transformation project. Digital Learning literature in higher education marginally addresses equity and social justice concerns.

Ng'ambi et al. (2016) anticipate that the next phase of digital integration will require higher education institutions (HEIs) to respond to more widespread digital access, cloud-based services, and the growth of OERs and Massively Open Online Courses (MOOCs). However, their analysis does not include challenges faced by black students from impoverished backgrounds regarding digital access and the lack of policies reflecting this reality. Czerniewicz and Rother (2018) applied an equality lens to analyze discourse in institutional policies at four South African universities, concluding that explicit reference to the enabling role of technologies to support equity imperatives is absent from these policies. Nqubane-Mokiwa (2017), in response to UNISA's open distance and eLearning (ODeL) policy, warns of the potential to perpetuate exclusion and inequality, particularly for black students in remote areas without access to connected devices for meaningful participation in ODeL.

National Integrated ICT Policy White Paper

The National Integrated ICT Policy White Paper delineates the government's strategy to offer access to modern communication infrastructure and services, fostering the involvement of new players and ensuring participation by all citizens, particularly those in rural areas. The policy introduces provisions such as the creation of a wireless open access network (WOAN), managed by a public-private sector-owned consortium; open government and access; net neutrality; cybersecurity and combating cybercrime; establishing a conducive environment for universal service and access; and achieving predetermined targets for broadband access nationwide. It underscores the significance of e-literacy and e-astuteness as crucial areas requiring intervention and advocates for collaboration among stakeholders across government, business, education, civil society, and global development partners to decisively address these issues. The policy suggests enhanced coordination to build e-literacy skills, assess skills gaps, and meet capacity needs to drive digital transformation, with support for training at public access sites. It envisions integrating e-skills programs

into primary, secondary, and tertiary education institutions for the benefit of all students. Notably, this policy does not explicitly reference equity or social justice but emphasizes equality 23 times and social inclusion twice, contextualizing them within constitutional rights, the NDP's aspiration for an inclusive society, the potential of ICT to reduce poverty and inequality, and the government's obligation to ensure access to digital networks and services for all.

While all three policies express aspirations to promote equity in digital access and skills development and consider equity as part of interventions for social inclusion, they differ in their equity orientation. The two education-focused Digital Learning policies exhibit a stronger commitment to equity, human rights, and social justice compared to South Africa's cross-cutting ICT policy, which is more exposed to and influenced by the needs of the ICT industry. This orientation explains the technology determinist market logic in the ICT policy, centered on global competitiveness and economic growth. The economic pressures faced by the ICT industry often lead the government to compromise on equity issues due to a trade-off between equity and economic growth, resulting in tensions within the policy and the broader DL activity system involving subjects, objects, communities, and divisions of labor.

Action Plans & Implementation

Isaacs (2015) presents a detailed overview of various national action plans, strategies, and flagship programs in primary and post-school education that align with the implementation of national policies. By that time, the national education system had undergone the experiences—both failures and successes—of large-scale initiatives such as Gauteng Online, the Khanya Project (Ford and Botha, 2010; Sadek, 2016), leadership development modules (Musgrave & De Wet, 2017), and the Ukufunda Virtual School (Isaacs, Roberts, and Spencer-Smith in press; Spencer-Smith & Roberts, 2016). In their assessment of the state of ICT in education during 2015/2016, Meyer and Gent (2016) propose a progress pathway that underscores the need for system capacity building due to the sluggish implementation of policies. Additionally, Operation Phakisa in Education (OPE), a recent flagship initiative in South Africa aimed at executing White Paper 7, serves as a comprehensive presidential initiative designed to accelerate implementation within a short timeframe (DPME, 2016). These reports and articles affirm that considerations of equity and social justice were not prioritized, as their primary focus was on facilitating access to relevant digital resources and providing training for teachers in technology integration into pedagogical practices.

See Chapter 11 South Africa's (Unequal) Digital Learning Journey: A Critical Review. Chee-Kit Looi, Hui Zhang, Yuan Gao, Longkai Wu. 2020. (eds.) ICT in Education and Implications for the Belt and Road Initiative. Lecture Notes in Educational Technology. Springer Singapore.

Ubongo Digital Education Programmes

Country
Tanzania

Organizer
Pan- African Non-profit Social Enterprise

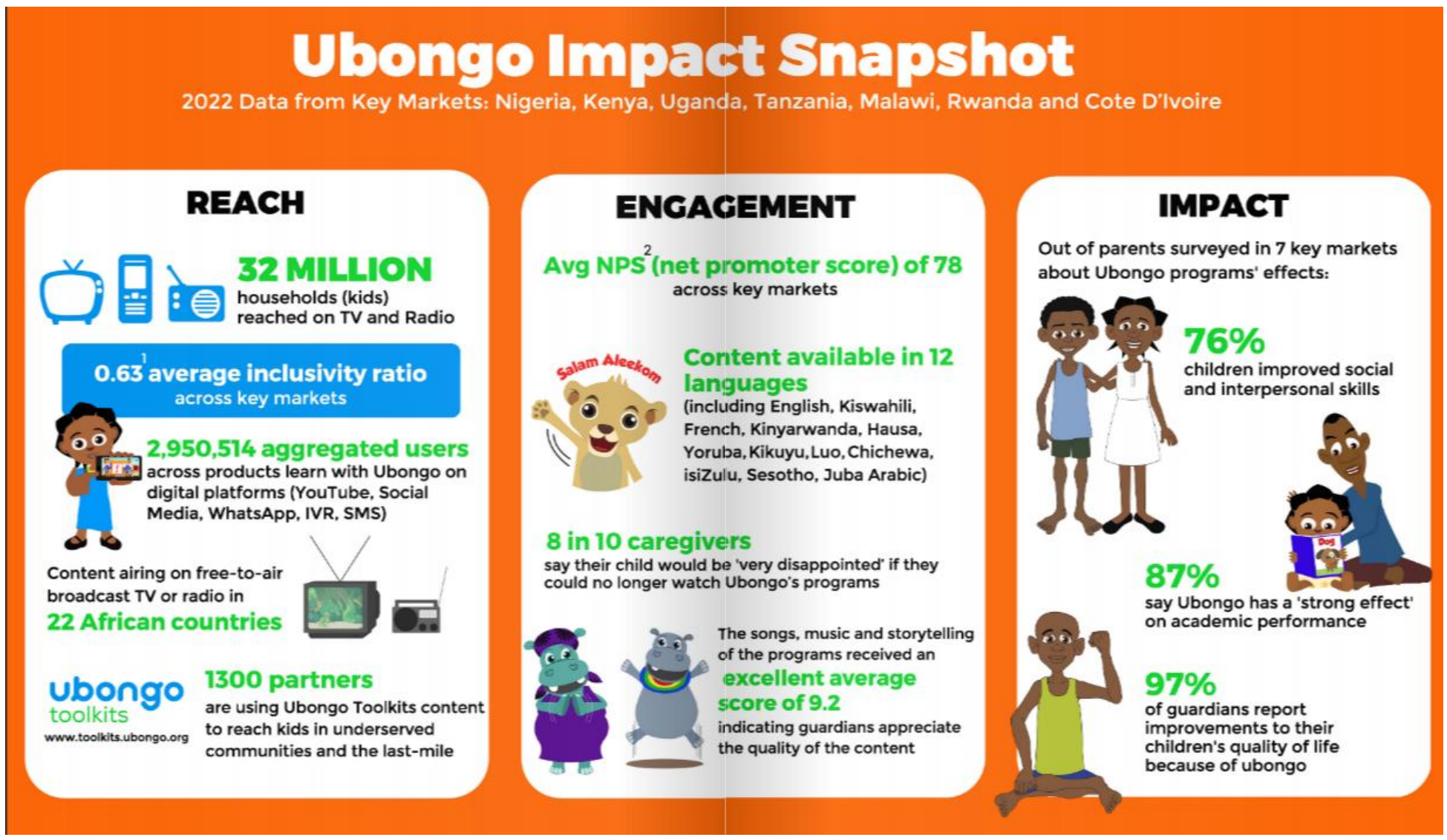
Date started
2014

Summary

Founded in 2014 in Dar es Salaam, United Republic of Tanzania, Ubongo is a Pan- African non-profit social enterprise that leverages the power of entertainment, technologies, research and child-centred design to bring effective and localized learning to school-age children and their parents. Ubongo's TV and radio programmes have reached 27 million families in 22 African countries through multiple platforms with a 84% TV saturation rate and 50% radio saturation rate in Tanzania. The resources are also available on mobile and web-based technologies.

Ubongo has demonstrated its ability to develop, adapt and distribute new content and its effectiveness to support disruptive learning environments, home-based learning and context-specific education, such as for refugees and children recovering from traumas.

During the school closures caused by the COVID-19 pandemic, Ubongo's free TV programmes have expanded from 11 to 18 countries to support learning at home. It also launched a new radio show and published weekly home-based lesson plans across Ubongo's digital platforms. As one of Africa's most popular education entertainment initiatives, Ubongo has a positive impact on children's school readiness, cognitive development and social-emotional learning, which has been rigorously tested by several external evaluations.



What we do

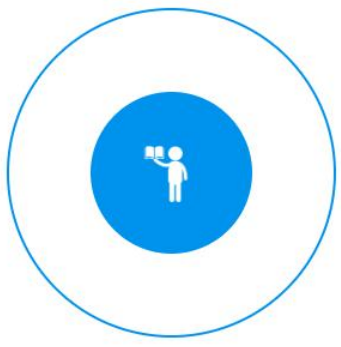
As Africa's leading edutainment company, we create fun, localised and multi-platform educational media that reaches millions of families through accessible technologies. Our programs significantly improve school readiness and learning outcomes for kids, and also promote social and behavioural change for kids, caregivers and educators.

Mission

To use top quality, localized edutainment to help Africa's 440 million kids learn, and leverage their learning to change their lives.

Vision

To equip Africa's next generation with the educational foundation, critical skills and positive mindsets to change their own lives and communities for the better.



How we do

Human-Centered Research

We believe that the best way to develop effective content, products and services is to design WITH the user. Our in-house user-testing team conducts research, focus groups, and prototypes ideas with kids (our core audience), in order to craft content that is relatable and meets their needs.

Content Co-Creation

We produce localised and engaging video (animation and live action), music, audio drama and print materials, as well as interactive content that communicates powerful messages to kids, caregivers, and educators. Our multilingual team based in Dar es Salaam includes writers, animators, musicians and producers, all of whom are trained to effectively teach and communicate messaging while creating top quality entertainment.

Distribution to Millions

We are Africa's biggest classroom and currently reach 32 million households in 12 languages and 41 countries on TV, radio , mobile and digital through our three edutainment programs: Akili and Me, Ubongo Kids and Nuzo and Namia. We're continuously investing in scaling our distribution across both geographies and channels, including radio, TV, mobile and print.

Impact Evaluation

We are a research-driven organisation and assess impact continuously. We track viewership and listenership for all programs, conduct focus groups, collect user feedback digitally and also do experimental research to rigorously evaluate effects. From mobile surveys to randomised control trials and longitudinal studies, we work with partners to design and implement research that enables us to learn and improve quickly.

Shows

Kids learn best when they are highly engaged and having fun! Our cartoons use engaging storylines in local languages, catchy songs, beautiful animation and beloved characters to educate and entertain kids... helping them learn and love learning.

1. Akili and Me

- Akili and Me is our preschool edu-cartoon that teaches 3 to 6-year-olds numeracy, pre-literacy, English as a second language, art and socio-emotional skills… for holistic early childhood education. Young learners join 4-year-old Akili on her learning adventures in Lala Land, and are invited to actively engage in helping her learn.

2. Ubongo Kids

- Ubongo Kids is our primary school STEM cartoon that helps kids aged 7 to 14-years-old find the joy in learning math, science, technology, engineering and live skills through fun, animated stories and catchy original songs. The show follows Kibena, Kiduchu, Koba, Baraka, Amani and their animals fiends on problem solving adventures in Kokotoa Village.

3. Nuzo and Namia

- Nuzo and Namia, 7-year-old twins, find solace in their grandmother's stories of adventure. After her passing, they discover a magical bookshelf in her house that takes them to different African countries. With the help of Bubelang, a magical creature, they embark on cultural adventures, building character and boosting their reading skills.

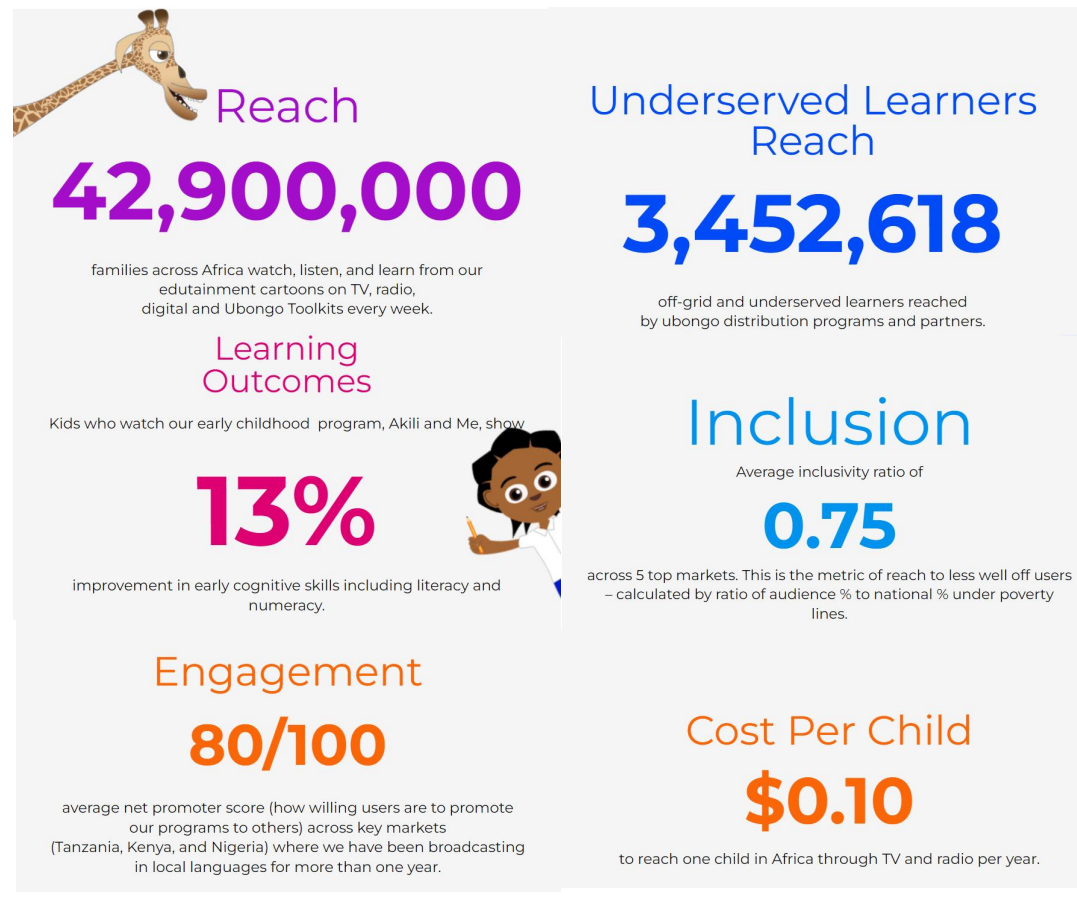
4. Akili Family

- Akili Family (“Tunakujenga” in Kiswahili) is our caregiver brand that empowers parents and guardians to support children's cognitive development and well-being at home, with public service announcements, videos, social media tips, worksheets and more.

Impact

By 2030, we plan to have 120 million kids across Africa learning with us, improving their cognitive, social-emotional, and life skills. To ensure that our edutainment is preparing the next generation of African kids for success in school and life, we work with research, media, and learning partners to rigorously evaluate our reach, engagement, inclusivity, and learning outcomes.

More information at: https://www.ubongo.org/



Disrupted Classes, Undisrupted Learning

Country
China

Organizer
Ministry of Education

Date started
2020

Background

The outbreak of the COVID-19 pandemic in early 2020 has a huge global impact. People from all occupations were requested to keep social distance and staying at home to slow the spread of the virus. Schools in 188 countries have been forced to close, affecting more than 1.7 billion students' learning process, which upended current education practices, models, and processes going forward. To ensure undisrupted learning during the pandemic and keep the teaching and learning activities moving forward, many countries and institutes have been seeking the best long-term distance solutions. In response, the Chinese Ministry of Education (MOE) launched an initiative that entailed “Disrupted Classes, Undisrupted Learning” and launched an online learning platform – the National Primary and Secondary School Network Cloud Platform (https://ykt.eduyun.cn, now renamed as 'National Primary and Secondary School Smart Education Platform'). These measures allowed teaching and learning processes to be conducted virtually via multiple media technologies (including cable/wireless TV, network platforms, digital resources, paper-based textbooks, etc.), to ensure student's receive high-quality education at home based on the abundant resources.

Governance and Implementation Strategies

During the COVID-19 outbreak, the governance mechanism in China is Central governance and inter-ministerial coordination mechanism model. The planning process is co-led with the local government. The local government is combined with the implementation of local conditions in various schools.The MOE and the Ministry of industry and information technology established an inter-ministerial coordination mechanism, and private and the third sector was engaged to support the implementation. Close cooperation between departments is an important guarantee for large-scale online education. During the period, some new policies for distance learning were developed and adopted for both of central government level and local government level.

In the face of the needs of online education during the epidemic and its future development, the government should play multiple roles in policy guidance, overall coordination, and effective supervision, etc. The government should also coordinate enterprises, schools, research institutes, families, the society, etc., in order to build smooth communication platforms, select suitable learning resources, provide convenient learning tools, encourage diverse learning methods and support flexible teaching methods. Effective support services for online education will be provided through the close cooperation of multiple parties.

1. Chinese Ministry of Education initated the planning

During the COVID-19 outbreak, the Chinese MOE has launched the “Disrupted classes, Undisrupted Learning” initiative, providing flexible online learning to over 270 million students from their homes.

2. The distance learning for COVID-19 was planned from 3 stages

According to decision from President Xi Jinping, the Central Committee and the State Council on prevention and control measures against COVID-19, the MOE made a decision to postpone the opening of the school in time, and immediately launched the "Disrupted Classes, Undisrupted Learning" initiative.

Firstly, make timely plans and develop the guidance. The MOE has set up a special working group to study and formulate the work plan of "Disrupted Classes, Undisrupted Learning" during the extended opening period of primary and secondary schools. In response to parents' anxiety about the delayed start of school, on January 29, through the mainstream media such as Xinhua news agency, the MOE made it clear that the MOE will coordinate the relevant teaching resources of the national level, relevant localities and schools, provide rich and colorful, alternative and high-quality online education resources, covering all parts of the country, and provide support and services to carry out "Disrupted Classes, Undisrupted Learning".

Secondly, build the platforms to ensure distance learning. With strong support from the Ministry of industry and information technology and National Radio and Television Administration, the MOE officially opened the national cloud platform for primary and secondary schools and the air classroom in the air of China Education Television (CETV) on February 17, which was also the time when most provinces planned to officially open their schools. The MOE and the Ministry of industry and information technology have established an inter-ministerial coordination mechanism to coordinate network operation and maintenance enterprises and effectively guarantee the smooth operation of online platform.

Thirdly, enrich resources and ensure quality. Based on the comprehensive training of students, improve their comprehensive quality, especially make full use of the " teaching materials" of the pandemic period, strengthen students' patriotism education, epidemic prevention knowledge, life safety and other aspects of education, strive to provide rich high-quality education resources, and specially issue the notice of the first lesson of the resumption of primary and secondary schools by the Central Government.

3. The planning process is co-led with the local government

The local government is combined with the implementation of local conditions in various schools. In order to support students' learning, the MOE integrates the national, relevant provinces and schools with high-quality teaching resources, and opens the national network cloud platform and TV air classroom in primary and secondary schools during the extended period of school opening, and provides free learning resources to local schools to use. Local learning resources shall be combined and should make overall arrangements to avoid "one size fits all" in light of different situations, especially to prevent all schools from organizing teachers to record online courses regardless of their conditions, thus increase unnecessary burden on teachers.

The MOE and the Ministry of industry and information technology establish an inter-ministerial coordination mechanism, strengthen the organization and implementation, and coordinate the basic telecommunication enterprises and relevant access service enterprises to ensure the operation of the platform. Local communication administrations establish corresponding coordination mechanism with education authorities to guide local basic telecommunication enterprises and access service enterprises to do related work well. Local education departments strengthen the organization and leadership of the work of "Disrupted Classes, Undisrupted Learning", take responsibility, seriously formulate the implementation plan, pay attention to the implementation effect.

4. Close cooperation between departments is an important guarantee for large-scale online education.

In the extensive online education effort, the Ministry of Education, the Ministry of Industry and Information Technology, the National Radio and Television Administration, and other relevant departments collaborated closely. On February 17, 2020, they officially launched the National Primary and Secondary School Network Cloud Platform and the China Education Television Air Classroom. Simultaneously, network maintenance enterprises were coordinated to ensure the smooth operation of the network cloud platform, providing crucial support for the "Disrupted Classes, Undisrupted Learning" initiative.

All schools should formulate the school opening work plan in accordance with the requirements of the technical plan for epidemic prevention and control of all kinds of schools at all levels jointly issued by the National Health Commission and the MOE, and in combination with the local epidemic prevention and control situation and the actual situation of schools.

5. New policies for distance learning were developed and adopted

For central government level, for example:

- In January, 2020, MOE issued the Notice on the Postponing the start of Spring Semester in 2020, and issued a notice calling on education authorities across the country to organize expert teams to provide psychosocial support to teachers, students and people affected by the COVID-19 outbreak.

- In February, 2020, MOE issued the Notice on Supporting Education and Teaching with Information Technologies during the Period of Epidemic Prevention and Control, and MOE and the Ministry of Industry and Information Technology (MIIT) issued the Notice on the Arrangement of "Disrupted Classes, Undisrupted Learning" Initiative during the Suspension of Primary and secondary Schools.

- In March, 2020, The Ministry of Education, in collaboration with the National Health Commission and relevant disease control authorities, has issued guidelines for the prevention and control of the COVID-19 pandemic in higher education institutions, primary and secondary schools, as well as childcare facilities.

6. Private sectors were engaged to support the implementation

The MOE has organized the China Education and research computer network and China Mobile, China Telecom, China Unicom, China Satcom and other telecom operators to strengthen the protection of the public service platform of national and local education resources and the network of all kinds of schools at all levels, so as to carry out online learning and provide fast and stable network services. The education network should ensure the safe operation of the education video conference system, and provide support for timely understanding of the epidemic situation and commanding the epidemic prevention and control work.

The MOE organized China Mobile, China Telecom and China Unicom to expand the service ability of National Education Resources Public Service Platform (http://www.eduyun.cn). Relying on the national public service system of digital education resources and various educational public service platforms, schools in all regions should smooth the application of online learning space, and actively support the development of school education and teaching activities, including issuing notices, organizing Online teaching, and guiding students' learning. Besides, during the pandemic, some private sectors in China provide the ICT tools, targeted for both of synchronous and asynchronous live teaching for teachers and learners, such as Dingtalk.com (Alibaba groups), Tencent Ketang (Tencent groups), and so on.

Cases

1. DingTalk Story to deliver live-streaming classes

- As mentioned in the above part, DingTalk is a multi-terminal platform (e.g., PC, Web and mobile devices) for free communication and collaborationMore than 5 million students from more than 10,000 universities and primary schools in 17 provinces attend live-streaming classes via DingTalk.

- In response to "Disrupted Classes, Undisrupted Learning", DingTalk further developed a distance education package that can help both teachers and learners. For instance, this package provides health reports on students, online class reports and live interaction. DingTalk also provides real-time class announcements, school notices. Additionally, DingTalk provides free access to online and live classes for schools and colleges across China via computers and mobile devices, supporting more than one million students to learn at the same time. These online classes offer online teaching, online homework submission and correction, online examination and other learning simulation scenarios. Finally, DingTalk provides free access to online conferencing for all teachers, managers, and principals, ensuring fast and normal coordination between all school members (teachers, directors, etc.).

2. Using Tencent Meeting to support synchronized online teaching

- Many schools in China adopted Tencent Meeting as the live-chatting platform to support online teaching during COVID-19 disruptions. Once logged in, teachers can initiate a class or meeting. Deliver the live-streaming lessons. Teachers can kick off the lesson with a motivating introduction to attract students' attention and stimulate them to think. Then, teachers can present new content or organize interactive activities, including asking questions or holding group discussions using the chat function of the platform. Teachers can monitor and engage students with eye contact through the device camera.

3. The "Edmodo for parents" mobile application

- According to the parents' need to stay close to students' learning situation, the mobile application, "Edmodo for parents," allows parents to sign in and monitor their children's online class with permitted accounts. Rather than only obtain information about students' performance only from teachers, parents can use the following functions to know and assist students' learning both online and at home: First, parents can access information and materials students need to support their learning process with those resources and tools to keep track of students' performance. Moreover, this app provides the synchronized information about the assessment result, scores of assignments and quizzes once they are graded by teachers. Besides, class notifications and interaction among parents and teachers are also achieved through this app's notification and message functions.

4. “Rain-Classroom” to deliver synchronous and asynchronous classes

- Rain-classroom is a smart teaching tool jointly developed by Xuetang Online and the office of online education of Tsinghua university. The purpose is to comprehensively improve the classroom teaching experience, enhancing the interaction between teachers and students, and making online teaching more convenient. Using Rain-classroom, teachers can publish the pre-class preview courseware with MOOC videos, exercises and audios to students' mobile phones, so that the teachers can easily diagnose the

problems of students' learning and give feedback in time.

- Rain-classroom also provides classroom live broadcast, during which student can answer real-time questions and interact with teachers through “bullet screen”. In addition, Rain-classroom provides teachers and students with complete three-dimensional data support, personalized reports, and task reminders.

- On February 17, 2020, Tsinghua University started its online classes on Rain-classroom. In the first week of the new semester, 264,000 teachers and students were attending Rain-classroom, completing 10,635 online lessons involving 3,923 courses, with a total of 395,000 hours. Among these courses, 152 courses were undertaken by 73 foreign teachers from various schools and departments, and delivered in the United States, the United Kingdom, Japan, Canada, France, Australia, and Germany. This is the first time in the history of higher education in the world that a large-scale, real-time, interactive, long-distance and decentralized online teaching system has been implemented.

5. “Squirrel AI”: Using AI teachers to create personalized learning

- The Squirrel AI online learning system is different from ordinary live lessons. It not only supports online teaching and learning, but also provides AI service to students' online learning. First, Squirrel AI sets a personalized learning path to locate students' weaknesses in learning accurately to shorten learning time and improve learning efficiency. Secondly, it can visually display students' learning status, monitor learners' learning behaviors in time, provide big data learning analysis, and support learners to view their learning reports on-time. Third, squirrel AI provides different functional views for teachers and principals to monitor and manage their live classes.

- After the outbreak of coronavirus in China, Squirrel AI responded quickly and provided 500 million free online learning courses for primary and secondary school students nationwide. On January 26, 2020, Squirrel AI conducted online training for public school teachers, compiled user manuals, organized account registration, and established guiding teams. At present, more than 160 public schools located in Shandong, Hubei, Fujian, and Jiangsu provinces are using squirrel AI for classroom learning, covering the subjects of Chinese, Math, English, Physics, Chemistry. More than 200,000 students across the country use squirrel AI accounts to study online. It is expected that the demand for squirrel AI student accounts will soon exceed 500,000.

Part VI

Safeguard the Right to Education for the Most Marginalized Groups for Ensuring the Inclusive Access to Digital Education

Addressing Teacher Shortage in Rural Area of Armenia Through Distance Learning

Country
Armenia

Organizer
National Center of Educational Technologies /NCET/, Ministry of Education, Science, Culture and Sports of the Republic of Armenia

Date started
2021

Abstract of the Implementing Organization or Individual

National Center of Educational Technologies (NCET) was founded in 2004 and its mission is to develop technology-driven education system in Armenia. The main objectives of the organization are:

- To introduce ICT in general schools in Armenia and to ensure their further availability;
- To rate general, preliminary (artisan), vocational, higher and postgraduate institutions, that implement educational program;
- To rate the educational programs that implement general preliminary(artisan), vocational, higher and postgraduate education institutions;
- To maintain administrative registers of the education sector;
- To implement ICT trainings for schools;
- To tackle different challenges in RA education system by the usage of ICT.
- To spread the usage of digital technologies in Armenian schools through the network of Mentor schools;
- To boost school-school cooperation.

Problems and Objectives

The main objective of the project is to address teacher shortage in rural areas of Armenia through distance learning. Its geographical coverage is national. Specific objectives of the project are:

- To develop a community of Mentor Schools in Armenia with utmost teaching and learning capacities using digital technology;

Key Activities

Despite diferent measures and policy changes that Armenian government is undertaking to reform general education system in Armenia and to tackle the problem of teacher turnover and shortage in rural areas, the unattractiveness of remote locations as well as low salary still makes it difficult to recruit and retain teachers and the situation remains unsolved.

As of data on March 2020, more than 100 rural schools of Armenia had been identified to have shortage of teachers, especially in STEM subjects. At the same time, the rapid development of modern technologies and Al especially after Covid 19 and their usage in education has enabled to address different challenges in the education system.

In 2021, the National Center of Educational Technologies initiated the “Addressing Teacher Shortage in Rural Areas of Armenia through Distance Learning" project aiming on the one hand to tackle the problem of teacher shortage in rural areas of Armenia, and on the other to develop a community of e-schools in different regions of Armenia with the utmost capacities in using technology in teaching and learning. The project is implemented through a

network of 24 Mentor Schools in different regions of Armenia. NCET team is developing the capacities of Mentor School teachers in using technology in teaching and learning and providing continuous mentorship and support. Teachers of mentor schools after the development of distance teaching capacities teach online to rural school students with teacher shortage. As of May 2023, 221 teachers of Mentor Schools were teaching online to 115 rural school students with teacher shortages. The number of beneficiary students is 6440.

Key Data

Funding of the project	During 2021 March- December, the project has been co-funded by UNICEF Armenia. Since January 2022, the project is funded by Government.
Target groups and percentage	Children at the age of basic education - 100% Young people - 21.6% Women/girls - 48% Indigenous, marginalized, minority populations - 5.3% Persons with disabilities - 2.1%
Age range or Grade level and percentage	Primary school level - 21.5% Secondary school level - 78.5%
Total number of beneficiaries	6,661

Measures to Ensure Equality and Effectiveness

The project ensures that all students of rural area schools of Armenia have equitable access to quality education. The project is implemented through integrating quality assurance procedures and documents to Mentor schools thus ensuring the quality and effectiveness of the project and the online lessons. The quality assurance procedures and documents include:

- The description of main activities of teacher and mentor.
- Quality Assurance Indicators and implication of PDCA cycle.
- The annual self-assessment of Mentor Schools.

The quality of the online lessons is monitored through:

- Teacher observation and feedback.
- Teacher Mentoring and Support.
- Continuous Professional Development Trainings.
- Surveys with project beneficiaries at the end of each semester.
- Subject-based external assessment at the end of each semester.

Measures to Ensure the Sustainability

Project sustainability is ensured on institutional and national level. Usage of ICT in teaching and learning is supported on the governmental level through:

- number of changes in regulations.
- launching National LMS for hybrid learning in general public schools of Armenia.
- project financing.

Project sustainability on institutional level is carried out by following actions:

- continuous development of capacities of Mentor schools in using technology in teaching and learning and spreading best practice in their community.
- quality assurance mechanism integration in Mentor schools.

Future Plan

The project aims to further develop the network of Mentor Schools throughout Armenia and to give them the label of e-schools. These schools will serve as resource centers in their regions by:

- teaching online to rural school students with teacher shortage;
- carrying out trainings on using technology in teaching and learning in their communities;
- enhancing capacities of rural schools where Mentor school teachers are teaching online in using technology in teaching and learning;
- boosting school-school cooperation.

Digital Schools

Country
Bangladesh

Organizer
JAAGO Foundation

Date started
2011

Summary

JAAGO Foundation won the UNESCO King Hamad Bin Isa Al-Khalifa Prize for the Use of Information and Communication Technology (ICT) in Education in 2016 for its Digital Schools innovation, a promising development towards quality education for all implemented in rural Bangladesh.

While Bangladesh has made great strides toward high participation in education by school-aged children, there remains a need to focus on the quality of education delivered, which varies by location. Schools in rural areas face a number of challenges including intermittent electricity access, a lack of digital technology infrastructure such as computers and internet access, poor resourcing, a shortage of qualified and trained teachers and high poverty.

Since 2011 Digital Schools have offered an opportunity for rural disadvantaged learners to access quality teaching despite these challenges. In partnership with telecommunications networks, Digital Schools connect qualified and trained central teachers to remote primary school classrooms through simple video conferencing software, bringing quality instruction in English, Bangla and Mathematics. Learners are supported on-site by trained facilitators to complete activities and classwork.

Conducted research has shown that Digital Schools learners achieve similar learning outcomes to peers in comparison schools, even though Digital School learners face higher poverty and have parents with lower educational attainment than their peers. JAAGO Digital Schools learners have also achieved a 100 per cent pass rate on all national examinations they have taken part in.

The Digital Schools model requires only an internet connection, hardware and video conferencing software, and as such, offers huge opportunities for disadvantaged learners as a model that can be replicated across the country using existing skills within communities.

JAAGO's features:

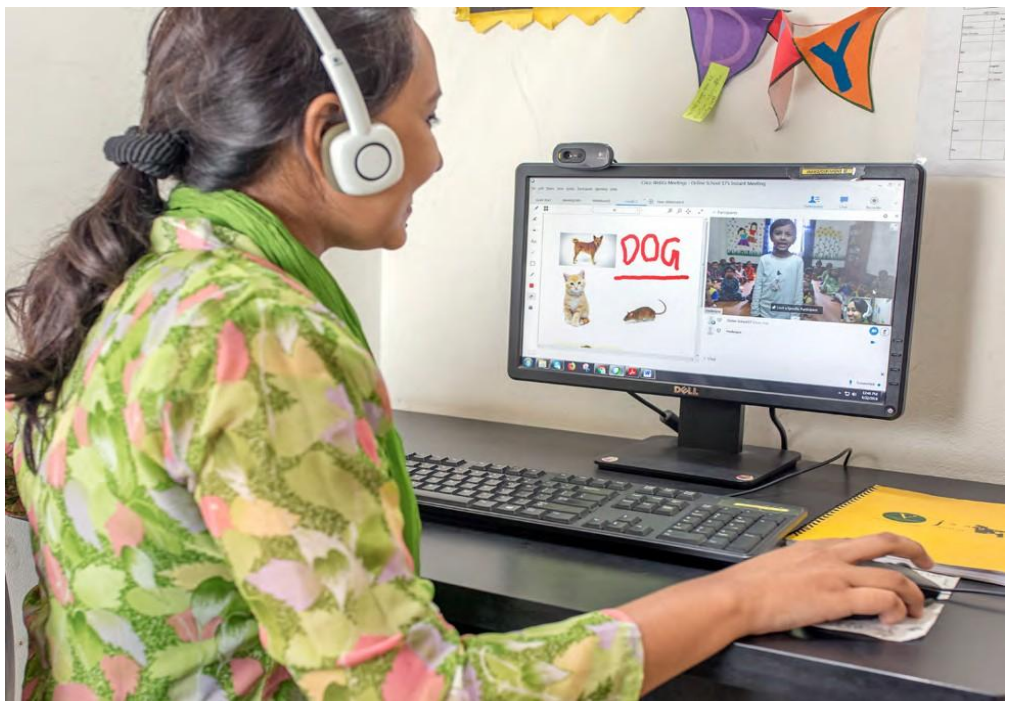
- JAAGO has introduced the first free-of-cost quality education using digital classrooms exclusively for underprivileged children in Bangladesh;
- The practical use of digital technology enables synchronous learning which helps with bridging the quality gap between urban and rural schools in Bangladesh;
- Despite constraints such as limited electricity and internet access and a lack of qualified teachers in rural areas, JAAGO Foundation developed a strong solution to deliver quality education by maximizing the potential of common technology.

Digital Solution

JAAGO Foundation originally began its operations in Dhaka's Rayer Bazar slum area in 2007, seeking to provide quality English language medium instruction to underprivileged children. However, the Foundation soon realized a far greater need for such provision existed in more rural areas outside Dhaka. In response, JAAGO sought to expand its reach to rural areas of the country. However, the Foundation soon found itself hampered by a lack of qualified and quality teachers in rural areas, while the more

Programme

Theme	The use of ICT in education for disadvantaged groups
Beneficiaries	3,500 disadvantaged rural learners
Target population	Disadvantaged rural primary school learners
Problem	Poor quality education in rural areas, driven by a lack of qualified and quality teachers outside of urban areas.
Solution	JAAGO Foundation's Digital Schools provide access to quality instruction delivered remotely by central teachers supported by on-site facilitators.
Resources required	• Infrastructure and software: Multimedia classroom application with a webcam and speakers; Internet access; Electricity (including alternative sources for outages) • Human Capital: Trained central teachers and local facilitators • Content: Adapted curriculum content; PowerPoint; YouTube • Systems: Administrative; Quality assurance; Monitoring and Evaluation
Results	• Good performance of children in English and Mathematics • High attendance and a drop-out rate of 0 per cent
Challenges	• Poor digital technology and electric infrastructure • Sustainable/guaranteed funding • Pedagogical content knowledge of central teachers and facilitators



qualified teachers in Dhaka could not be persuaded by higher salary and benefits packages to leave the comforts of the city.

In order to solve this challenge without compromising the quality of its programmes, in 2011 JAAGO Foundation identified, developed and launched their Digital Schools model, an innovative and cost-effective digital learning solution. JAAGO Digital Schools use video conferencing technology to connect qualified teachers to rural areas of Bangladesh, leveraging digital technology to overcome both the geographical gap between students and qualified teachers and the knowledge gap between urban and rural areas of Bangladesh. The model requires only an internet connection, input and output devices and simple video conferencing software and can be implemented by existing skills within communities.

Results

The evaluation by Salam and Ahmed (2015) found that students from JAAGO Foundation Digital Schools performed comparably to students from control schools in the key subjects of English and Mathematics, while the performance of students in Bangla was higher in control schools. However, the evaluation noted that the educational qualifications of parents of children in Digital Schools were significantly lower than qualifications of parents of children in the comparison group. In total, 83.6 per cent of mothers and 87.4 per cent of fathers of students in Digital Schools had attained only a primary education or less, compared to 1.7 per cent of mothers and 3.8 per cent of fathers in control schools. Additionally, infrastructure in Digital Schools was found to be lacking in comparison with control schools. The combination of low parental education levels and poorer school resourcing, both key factors in educational outcomes, led the evaluators to conclude that 'in comparison with other indicators of education, surprisingly, the achievements of the Digital schools are better than that of the national level schools' (Salam and Ahmed, 2015, p. 9). These findings suggest that Digital Schools benefit from high levels of commitment from parents and children. Indeed, the evaluation found parents and learners to be invested in and appreciative of the Digital Schools model, particularly the quality of English instruction.

The evaluation further found evidence of good pedagogical practices in Digital Schools such as the use of digital/real-life teaching aids, quality teaching and learning materials and participatory teaching approaches.

It was noted that variation in content and the number of learning aids were below expectation and that while most of the central teachers had Bachelors and Masters Degrees, only 8.7 per cent of facilitators had an academic background in education. This lack of formal pedagogical knowledge among facilitators was identified as a constraint.

More recently, as of 2020 JAAGO Digital Schools students took part in national examinations including four Primary Education Certificate examinations (administered at the end of five years of schooling), two Junior School Certificate examinations (administered at the end of eight years of schooling) and one Secondary School Certificate examination (administered at the end of ten years of schooling). JAAGO students achieved 100 per cent pass rates on these examinations (JAAGO Foundation, 2020).

ThingLink Visual Learning Technology

Country
Finland

Organizer
ThingLink

Date started
2011

Summary

ThingLink, a Finish technology company, was awarded the 2018 UNESCO King Hamad Bin Isa Al-Khalifa Prize for its cloud-based software solution which lets users easily enrich images, videos and 360-degree media with additional information, notes, sounds, narration, video or links.

This innovative software has multiple learning applications including improving digital literacy and the quality of school and post-school curricula and learning. Through this online tool, learners can virtually access environments beyond their physical reach to develop cultural awareness and engage in experiential learning. ThingLink further empowers learners to create and document their own learning and allows educators to customize lessons to support students with different learning skills. The tool allows teachers to create virtual tutorials for their lessons and share them in ThingLink's global image database. Through this database and an engaged community of teachers, ThingLink's web service offers a resource base to support and expand access to quality learning.

ThingLink's features:

- ThingLink was selected as a Prize-winning project due to its:
- intuitive software, which is flexible and able to support users' learning experiences, regardless of educational level,
- support of learners' virtual mobility and offering a creative space for marginalized learners such as those with disabilities or limited ability for expression,
- accessibility to educators across formal, informal and community learning environments,
- capacity to support interaction between teachers and students who can become producers of openly accessible resources for the ThingLink database (UNESCO, 2018).

More information at: https://www.thinglink.com

Digital Solution

ThingLink has developed a user-friendly digital tool which enables users to enrich online visual media such as images, videos and 360° virtual reality content with additional information in the form of text, sound or voice notes, images and videos. Using this technology, teachers, trainers and students can create multisensory learning experiences that both contain and collect data. Because ThingLink is a cloud-based image-tagging tool, these resources can then be distributed across the internet.

With ThingLink, students can learn in a real-world context without being physically present. As a result, ThingLink's interactive image technology can include and engage displaced, vulnerable and even illiterate students in education and learning communities. Over 5.5 million educators, students and professionals in 190 countries use ThingLink to document projects, products, lessons, cultures and communities, creating advanced opportunities for cross-cultural information-sharing.

Learning materials created with ThingLink can be integrated with most Learning Management Systems and shared on platforms such as Microsoft Teams. This

Programme

Theme	The use of innovative ICT to ensure education for the most vulnerable groups
Beneficiaries	Over 7 million content creators and 30 million learners in 190 countries (7 million registered content creators; 30 million monthly learners active students)
Target population	School and tertiary level students and teachers
Problem	• Students of all ages have limited access to experiential learning opportunities outside of their immediate context, creating challenges in teaching for deep and cross-cultural understanding • Access to learning opportunities remains a challenge for some students, such as those with disabilities or those who speak minority languages
Solution	ThingLink's quality interactive visual media software empowers teachers and students with tools to easily build multi-sensory learning experiences in the cloud.
Features	• Innovative, user-friendly software which allows users to create and share immersive multimedia learning experience • Digital materials, such as interactive images, videos, drawings and audio files available in open access • Teachers and communities of teachers trained to use the tool and share their lessons • Partnerships with educational and TVET institutions, private sector and governments
Resources required	• mobile devices • internet connection
Results	• Students learn new skills using multiple forms of media • increased virtual collaboration among students and teachers
Challenges	• Lack of technology resources and connectivity • Shortage of trained teachers • Localization • Language(s) of educational content

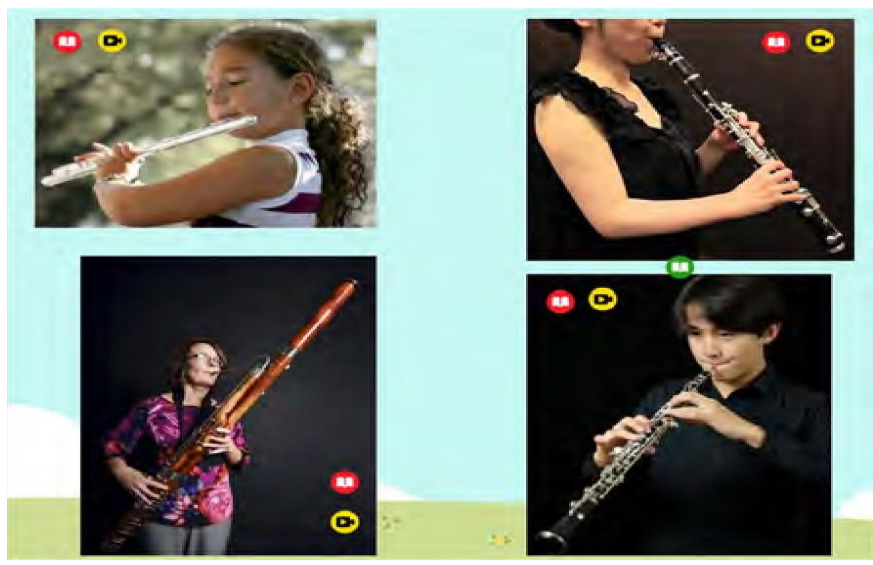
opens opportunities for both wide viewership and advanced monitoring of learning achievement.

Examples of ThingLink products

The ThingLink tool has extensive applicability across a wide range of institutional environments, including educational institutions at all levels, media, businesses and governments. ThingLink has been used for classroom learning at schools and universities, e-learning corporate training, editorial and marketing functions, paid online courses and online publishing (ThingLink, 2018a). This section shares a few examples of the ways in which users have engaged ThingLink.

The 'woodwind collage' in Figure 1 shows the viewer a selection of woodwind musical instruments being played.The viewer can click the icons in the image to launch additional information: The red 'book' icon links to textual information and the yellow 'camera' icon links to a video performance. Viewers are thus given visual, textual and auditory information on one page.

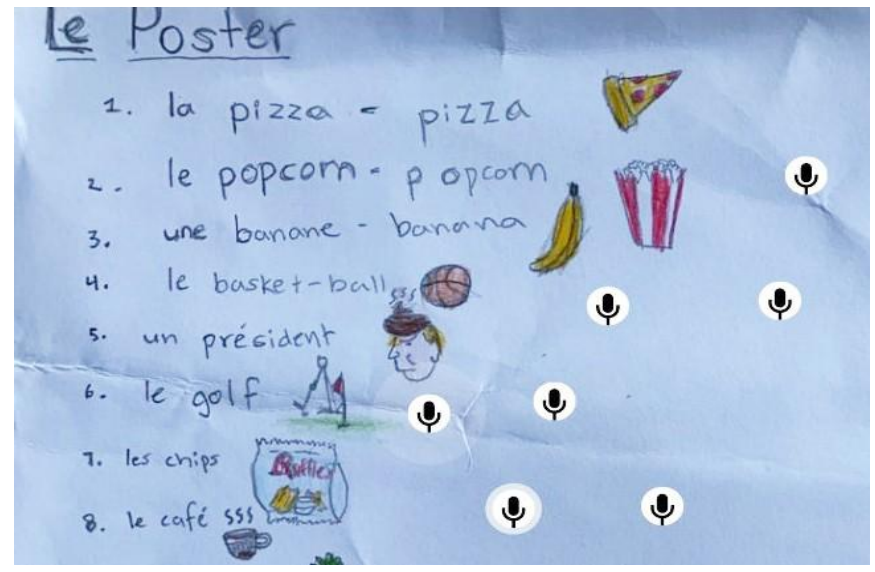
Figure 1. Woodwind collage, a ThingLink project



In Figure 2, a primary school student has combined a digital image of her hand-drawn poster of foreign language words and microphone links to the correct pronunciation of each word. In this process, she has reflected her interdisciplinary learning using ThingLink, demonstrating her own physical drawing skills, digital skills and knowledge of the foreign language.

Activities such as these are suitable for school or home and can also be developed in collaborative groups

Figure 2. Foreign language practice, a ThingLink project



working from different locations. For example, 5th grade students of Romea Canini took turns and used their own voices to tell the legend of the Republic of San Marino, the oldest and the smallest independent state in the world.[1] Teachers also use ThingLink to create narrated introductions to subjects across grade levels. In just one example, Professor Annamaria Bove from the Instituto Comprensivo Nocera Inferiore turned the UN infographic on the Sustainable Development Goals into an interactive resource, explaining each goal in detail and linking to more information (see Figure 3).

Figure 3. Sustainable Development Goals interactive infographic, a ThingLink teaching resource

ThingLink has also been used to introduce working environments[2] and safety drills,[3] and created a virtual tour of the Finnish education system in collaboration with the Finnish National Agency of Education.[4]

1 The result can be viewed at: https://www.thinglink.com/mediacard/1193230132706279426?fbclid=IwAR16qec3ysWEHUbtLoHpP9hcog0fv

2 An example is available at: https://www.thinglink.com/mediacard/1172877973385117697

3 An example is available at: https://www.thinglink.com/mediacard/1184044991484264449

4 The tour can be viewed at: https://www.ccefinland.org/finland-education-tour

Kiron Campus

Country
Germany

Organizer
Kiron Open Higher Education

Date started
2015

Summary

More than 70 million refugees and displaced people have fled their homes to avoid violence, poverty, conflict and persecution. These people undergo physical and mental strain both during their migration and while trying to adapt and pursue integration, education and work opportunities in an unfamiliar host community. Refugees, asylum-seekers and other displaced people often face legal, linguistic, educational and financial barriers to pursuing their goals.

Kiron Open Higher Education has a mission to provide access to learning opportunities for vulnerable populations. Kiron harnesses the potential of Massive Open Online Courses (MOOCs) as enablers and supporters of high-quality education, designing curricula and certifications through aggregating and curating of Open Educational Resources. Kiron's goal is to ensure equitable access to quality education for refugees, asylum seekers and internally displaced people through all stages of resettlement, as well as underserved communities in the MENA region.

Through partnerships with government and academic institutions, MOOC providers, foundations, third-sector organizations and volunteers, Kiron is able to offer tailored academic and support programmes to help underserved communities achieve their educational and life goals, as well as support stronger integration into host communities.

Kiron students study for free through the Kiron Campus education online platform and are supported by volunteers, academics, industry mentors and online tools. The platform can be accessed from any device with an internet connection. The Kiron education model provides support through language courses, an online community and mentoring, and opportunities to interact with host community students. While the initial mission of the organization was to help students access higher education and transfer to partner Universities, over the years Kiron has expanded its education programmes to focus on skill-based courses in order to connect students to career opportunities.

Kiron's features:

- Kiron supports the integration of a disadvantaged population into the higher education system and the labour market by addressing the barriers often faced by refugees, asylum seekers and internally displaced people.
- Kiron has established a strong programme and support network for vulnerable people through partnerships with academic institutions, MOOC platforms, international agencies and volunteers, which enables Kiron to address both psycho-social and academic needs of students.
- Kiron's education programmes have promising outcomes that can empower refugees and internally displaced people.

More information at: https://kiron.ngo

Programme

Theme	The use of ICT in education for disadvantaged groups
Beneficiaries	Refugee students in the European Union, Jordan and Lebanon (More than 11,000 learners)
Target population	Refugees, asylum seekers, and internally displaced people and underserved communities in the Middle East
Problem	Refugees and migrants face social, legal, educational, financial and geographic barriers to higher education opportunities in host countries and communities.
Solution	Technology, academic partnerships, student supports Phase 1 Platform training Phase 2 University and/or employment and/or entrepreneurship
Resources required	• Strong partnerships with government, funding, academic and third sector organizations • Agile teams comprised of education and subject experts, developers, data analysts and designers • Existing MOOC courses/resources • University curricula • Funding procured from donor organizations and relief aid • Support structures: Ű Study Hubs, Ű University application guidance, Ű Skill Booster programmes for employment and workplace-relevant skills training
Results	• Average course completion rates of 34.6 per cent, more than triple international averages • 132 known successful transfers to a university
Challenges	• Specific targeting of female refugees and simplified registration requiring less data boosted female enrolment • Refugee needs are broader than academic university access and include specific skills training such as language training, entrepreneurship, etc. • Exact data on transfers to universities is difficult to ascertain due to reliance on self-reporting

Digital Solution

To respond to the needs of both host communities and refugee populations, the Kiron Open Education model seeks to improve the socio-economic situation of refugee populations through offering free access to learning opportunities in order to improve preparation for university programmes and employability.

Kiron uses digital technology and quality curricula linked to academic and professional quality standards to enable access to quality and inclusive education and training. The programme also aims to validate refugees' prior learning and promote language acquisition, participation in social and civic life in host countries, intercultural exchanges and access to job markets. Language acquisition is central for student empowerment, since 90 per cent of migrants on arrival in Germany have no prior knowledge of the German language (IIE, 2020).

Students enrolling in the programme attend online courses via a learning platform called the Kiron Campus. The Kiron Campus platform leverages more than 500 existing Massive Open Online Courses (MOOCs) and Open Educational Resources (OERs) from various providers that feed into four study tracks (Business and Economics, Engineering, Computer Science and Social Science). Kiron students are able to study outcome-based curricula free of charge, regardless of asylum status, from any geographical location with an internet connection. Enrolment is provided on an ongoing basis, so students can begin studying at any time without administrative delays.

The Kiron model in Jordan and Lebanon is based on the concept of Blended Learning, which incorporates emerging web technologies such as platforms, with instructor-based learning (UN, 2020). In these two countries, to support students Kiron also set up Study Hubs, centres designed to provide students with the best possible learning environment, to facilitate links between Kiron students and other students from local universities and to provide students with additional access to training and educational support. A major added value of Study Hubs is that they provide a physical place for students to meet and support each other, thereby creating an active Kiron community.

The Kiron community has evolved with the goal of connecting students worldwide and fostering a productive learning environment. The current online community encourages Kiron students to present and share their experiences, exchange information on courses and support each other online.

At the time of the award, coursework was supplemented by holistic student support services including counseling services for those who encountered traumatic experiences before or while fleeing their home countries; a mentoring programme that connected students with professionals to assist in preparing for their studies through vocational orientation and internship opportunities; and a Buddy Programme which linked Kiron students to local students in the new country of residence.

The early model linked students to higher education. Once refugee students had satisfactorily completed the Kiron curricula they were eligible to enter regular Bachelor's degree programmes at accredited partner universities as second or third-year students, having already completed one or two years of study through Kiron Campus. This was intended to lower the costs involved in higher education provision and provide time for partner higher education institutions to plan for refugee student intake. While this remains one pathway, Kiron Campus has since expanded to include alternative pathways and short courses (see the section on Further developments for more information).

Results

While the results of external evaluations are not yet available to the public, Kiron internal monitoring indicates that 84 per cent of students complete their first course and continue to a second course (Kiron, 2016). Course completion rates are at 34.6 per cent, more than triple the reported global averages of 2-10 per cent. As of 2019, 132 known students had successfully transferred to universities (Kiron, 2019a).

Students give positive feedback on being able to study flexibly from home and on the interactive features of the platform. Students report that they have improved their ability to study online, their technological skills and their language ability, as well as gained in their general knowledge (Kiron, 2019b).

Additionally, in 2017 Kiron organized examinations with the TH Lübeck for some computer science modules. The success of students on these examinations showed that Kiron students were able to study online successfully to gain the skills required by a German higher education institution and that Kiron can produce curricula through MOOCs which are comparable to German university educational quality standards.

Connected Learning Initiative

Country
India

Organizer
Tata Institute of Social Sciences

Date started
2015

Summary

The Connected Learning Initiative (CLIx) was developed through a collaboration between Tata Trusts Mumbai, the Massachusetts Institute of Technology (MIT), and the Tata Institute of Social Sciences (TISS), with a commitment to serve marginalized communities in India to overcome poverty, deprivation and unemployment through quality learning and teaching.

CLIx leverages local, national and international partners and open resources to create an ecosystem that supports the integration of technologies, classrooms, laboratories and assessment activities.

CLIx modules are available in three of India's national languages and cater for high school learners in underserved communities, leading to improved outcomes in mathematics, science, English, digital literacy and other 21st century skills. The initiative leverages government provision mandates on digital technologies and adds value through instructing students and teachers in how to maintain and support these technologies.

The initiative concentrates on platform-based, blended-learning and interactive technologies for secondary school learners and for teachers. The TISSx teacher platform offers courses for professional development. Its OERs are accessed through three modalities: an online platform, a local server-based platform with opportunistic use of the internet, and an offline 'unplatform' that can be installed on devices. These options enable CLIx to reach even the most underserved and under-resourced areas. CLIx further creates communities of practice where teachers can interact with subject and curriculum experts as well as courses which culminate in a blended learning credential. The project has been deployed in urban and rural contexts, and was rapidly and successfully replicated in four states in India.[1]

The CLIx project's features:

- Formation of a multistakeholder partnership of universities, foundations and local governments to tackle the challenge of improving the quality of education.
- Focus on innovative teaching and learning processes, with an emphasis on transforming traditional educational practices, even when the infrastructure is not ideal.
- Attention to teachers' engagement and professional development, with blended learning strategies designed to promote content knowledge and better teaching practices.
- Development of quality, open-source digital educational materials.
- Production and use of data to track the results of the project and promote evidence-based decision-making for national and local governments.

1 The information in this section is drawn from https://www.tissx.tiss.edu and https://clixoer.tiss.edu

Programme

Theme	The use of ICTs to increase access to quality education
Beneficiaries	76,226 learners and 3,509 teachers
Target population	Disadvantaged secondary school learners and teachers
Problem	Despite high levels of enrolment in India's large school system, the education is generally of low quality, particularly in rural areas.
Solution	The Connected Learning Initiative (CLIx), a holistic digital- technology-integration programme including infrastructure maintenance support and four tools for engagement: 1. The CLIx platform for students 2. The TISSx online learning platform for teachers 3. The Telegram messaging app, which creates a community of practice for teachers and stakeholders 4. Design Labs for teachers, which support quality materials and practice
Resources required	• Basic hardware infrastructure • Teacher and administrator buy-in • Government and local partnerships • International open-source learning platform (Open edX)
Results	• 548 schools were served • Students taught by CLIx-trained teachers performed significantly better than a control group in targeted subjects • All students, including those from traditionally marginalized groups, significantly increased their technological skills
Challenges	• Maintaining computer equipment and training students to support this • Some teachers' perceptions of digital learning as passive • Reluctance of some teachers to engage with learning through technology

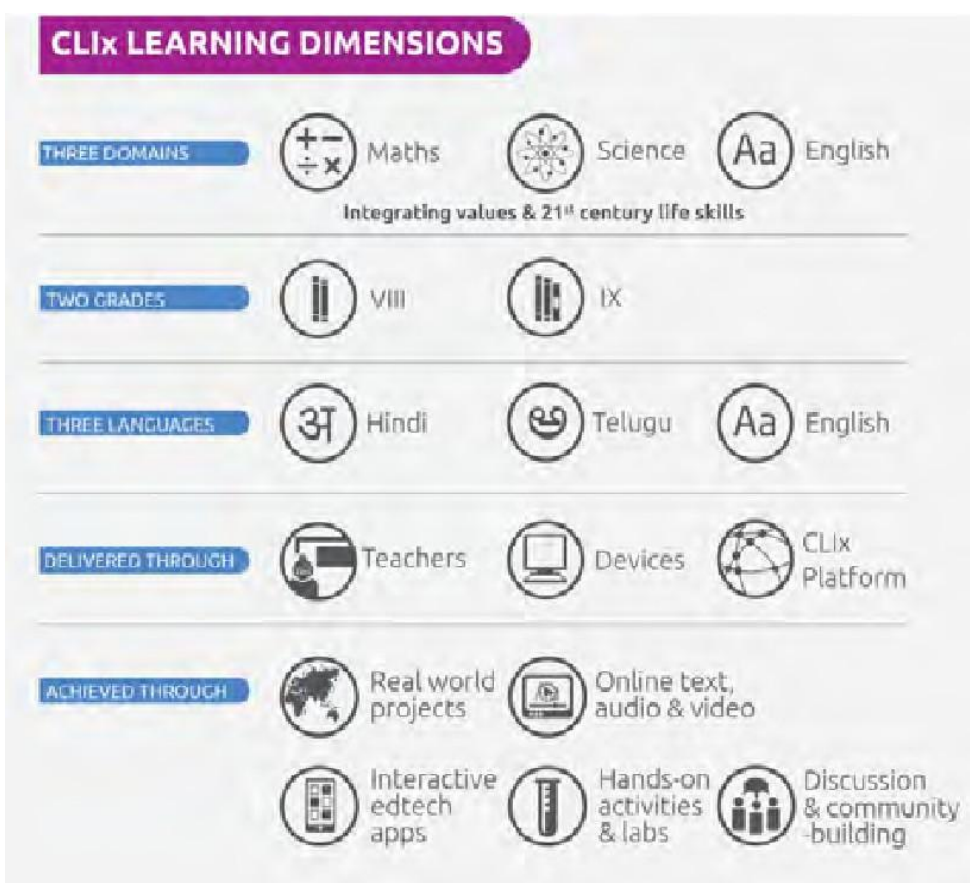
Digital Solution

To address these challenges, CLIx offers a scalable model with global relevance for quality teaching and learning. It makes use of modern technology and the established success of MOOCs in higher education to improve the academic prospects of high school students from underserved communities. CLIx is a holistic model which includes teacher training and support; computer maintenance provided through national policies; and the construction of interactive or game-based modules for high school students in three national languages, Hindi, Telugu and English.

The three core facets of the CLIx ecosystem are:

- The CLIx platform for students which is integrated with the school curriculum to encourage digital and non-digital learning.
- The TISSx platform for teachers, which focuses on professional development.
- The Telegram messaging app, which creates a community of practice among teachers and other stakeholders within the project.

Figure 1. The dimensions of learning in the CLIx programme



The CLIx platform houses core learning modules aligned with the National Curriculum Framework, including 10 STEM modules, five digital literacy modules, and 40 hours of communicative English and life skills, as well as 16 types of open assessments. The modules include a combination of digital and non-digital tools, with four pillars of delivery: classroom activities; lab activities; technology-enabled activities; and review and assessment.[2] The CLIx modules use low-cost and locally available materials and tools, and external learning applications can be added over and above the pre-existing modules.

The platform also features applications that broaden collaboration between learners such as discussion boards and Buddy Login, which allows groups to log into the platform. A maximum computer-to-student ratio of 1:3 ensures high levels of access, peer collaboration and interactive experiences with the technology.

The platform works both online and offline, with the offline version referred to as the 'unplatform'. The online version uses a cloud-based model of anytime, anywhere access, while the offline version is modelled as an 'internet in a box'.[3]

2 See https://www.thehindubusinessline.com/news/variety/how-tiss-tata-trusts-are-making-mits-teaching-programme-clix-with-students-in-rural-india/article23384818.ece

3 See http://clix.tiss.edu/our-clix-software-platform-which-way-to-go

Results

The CLIx programme has achieved substantial scale, currently offering over 15 modules in mathematics, science, English and digital literacy in three languages to 548 schools equipped with labs. The programme involves 3,509 teachers and serves 76,226 students in grades 8 and 9.

The baseline study was conducted in the 2016/17 academic year with a sample set of 165 CLIx and 55 control schools across 4 states. The endline study was conducted in 2018/19 (CLIx, 2019), and showed that:

- Groups taught by teachers who received higher levels of CLIx professional development performed significantly better in English, science and mathematics than the external control group.
- All students including those from scheduled castes, tribes and classes[4] made gains in basic and intermediate technical skills and application-based technological skills.
- Students from marginalized communities in CLIx schools performed better than their counterparts in non-CLIx schools in all three states.
- Teachers demonstrated engagement and participation in online subject groups, and improved their digital skills and beliefs about technology in education.
- Students displayed enhanced skills in collaboration and autonomy and improved their conceptual understanding in the CLIx subject areas.

4 Scheduled castes, tribes and other classes are Hindu sub-communities who have previously experienced oppression and social isolation due to negative perceptions of their status as per the varna system of Hinduism (Gopinath, 2018)

Can’t Wait to Learn

Country
The Netherlands (Headquarters)

Organizer
War Child Holland

Date started
2011

Summary

War Child Holland's programme Can't Wait to Learn (CWTL) was awarded the 2018 UNESCO King Hamad Bin Isa Al-Khalifa Prize for its innovative EdTech solution that provides quality gamified learning programmes delivered via tablets. The programme helps to mitigate learning losses which arise from lack of access to schooling in times of conflict and civil crises.

War Child Holland delivers its programme across five countries: Chad, Jordan, Lebanon, Sudan and Uganda, with a pilot conducted in Bangladesh. The Can't Wait to Learn system is aligned with local national curricula to provide quality education to children and youth in conflict situations, ensuring that learners can return to formal schooling without being left behind. Rigorous monitoring and evaluation coupled with input from learners guides the curriculum programme which is engaging, highly customizable and locally focused. Can't Wait to Learn offers the advantages of functioning offline, running on solar power and allowing students to learn independently at their own pace.

The Can't Wait to Learn model currently reaches over 30,000 learners, growing exponentially from an initial trial of 66 learners in 2012. Can't Wait to Learn demonstrates positive impacts not only on learning but also on the psychosocial well-being of children and offers solutions at scale that improve value for money.

The Can't Wait to Learn’s features:

- This innovative game-based educational platform increases access to and quality of learning in Education in Emergencies (EiE).
- The programme adapts to local contexts via integration with curricula from local ministries of education and feedback from learners, which allows for continuous improvement and greater contextualization.
- Can't Wait to Learn accounts for self-paced learning and supports teachers and facilitators in guiding learners while conducting monitoring of attendance and performance at a global level for research purposes.
- The proven cost-effectiveness of the Can't Wait to Learn programme, which is provided free of charge to children beneficiaries, furthers its use in any crisis or country conflict setting.

More information at:
https://www.warchildholland.org/intervention-cwtl

Digital Solution

Can't Wait to Learn (CWTL) is a digital learning solution that consists of an innovative game-based mathematics and reading curricula, delivered through a flexible model designed to support learning in areas where state and private formal education institutions and practices are either non-functional, over-burdened or inaccessible. Can't Wait to Learn is adaptable across countries to take into account different national, cultural and linguistic characteristics, and is resilient enough to survive uncertainty and crisis through reduced dependence on the typical inputs required by formal schooling. Can't Wait to Learn can therefore address the learning needs of children who don't have access to conventional schooling opportunities as a consequence of conflict or war conditions, isolation or resource deprivation, and can also be used as a complement to formal teaching methods.

Programme

Theme	The use of ICT to ensure education for the most vulnerable groups
Beneficiaries	30,000+ across five countries
Target population	Conflict-affected, out-of- school children and youth in marginalized communities needing quality education
Problem	Lack of access to and interruption of formal education for children and youth in conflict zones
Solution	Offline access to engaging self-paced quality learning using solar-powered tablets, with the support of teachers or facilitators
Resources required	• Infrastructure: Solar panel charging stations; periodic internet access; tablets with durable protective cases; stationery for drawing (colouring markers, paper, etc.) • Human capital: Teachers and facilitators to guide learners; technical experts in education and project implementation • Content: Digital game-based learning software • Systems: Monitoring and evaluation
Results	• Students show rapid learning, motivation and engagement and positive impact in psychosocial benefits • Improvements in both numeracy and reading scores regardless of gender • Programme sustainability and successful replicability to other countries • Adoption into the formal education system proving practical application outside the intended initial scope
Challenges	• Availability of teachers, education practitioners, mentors and facilitators not guaranteed • Security in conflict zones is unstable and a threat to programme continuity • Lack of funding for a proven innovation on its way to scale

Children and youth engage Can't Wait to Learn through offline tablets pre-loaded with numeracy and reading game-based software. Since the software curriculum environment on the tablet is self-contained, learning is also not dependent on the availability of a typical classroom environment and compensates for situations where teachers are not available, as the software enables learners to progress at their own pace.

Figure 1. Can't Wait to Learn's reading game in Sudan: rapid recognition sentence

Figure 2. Reading Game World in Lebanon from War Child Holland's educational programme Can't Wait to Learn (CWTL)

To pique learner interest and engagement, the educational content and concepts are presented in the form of a series of mini-games that encourage learners to progress through different difficulty levels and thereby to master the underlying content and skills.

The self-paced games are co-designed with children to reflect their context and aligned to the national curricula, providing children with the opportunity to transition to formal schooling. The software developers specifically invite learners to provide feedback in the design process and integrate learners' stories and drawings into the software. As a result, the co-created software design and appearance reflect the children's lived local context, which improves their connection with the learning scenarios and raises learning propensity.

Results

The Can't Wait to Learn model has proved to be replicable, with the scope of the programme extended from an initial trial of 66 learners in 2012 to reach 30,000 children by the end of 2020. Also as of 2019, Can't Wait to Learn was delivered in six countries despite contextual challenges such as infrastructural and human capacity resource constraints. Currently (2021), the programme is implemented in five countries. The programme has managed to control costs through a sound evidence base and rigorous coordination to support operational logistical and cost decisions, seeking to achieve a substantial decrease in per-learner costs through economies of scale.

In terms of learning outcomes, research demonstrates learning achievements by Can't Wait to Learn students. In Lebanon, over a 12-week period, learners achieved a 7 per cent improvement on average in mathematics scores. In Sudan, when compared to learning through traditional approaches, children using the Can't Wait to Learn method achieved nearly twice the learning gains in mathematics, and nearly three times the learning gains in reading. The same group also outperformed government alternative learning programmes, achieving milestones at roughly twice the rate of children in these programmes (Topham, 2019).

One College Student Per Village

Country
China

Organizer
The Open University of China

Date started
2004

Summary

In 2004, there were 780 million people living in China's rural and remote areas, accounting for 80 per cent of its total population. In these areas the economy lagged behind, there was a shortage of university resources, and many people had a low level of education. China's Ministry of Education (MOE) launched the 'One College Student Per Village' scheme in order to improve education and alleviate poverty in these areas. The Open University of China (OUC) was entrusted with carrying out the scheme, and adopted digital technology in order to fulfil this mission. In recent years, the integration of smart technologies such as AI and big data has transformed education. The scheme increased the integration of these technologies into its teaching programmes, including agricultural economic management, botany and zoology, with the aim of guaranteeing learning continuity and quality.

In order to ensure that AI was fully applied in the scheme, the OUC enhanced the local educational infrastructure by setting up 538 cloud-based and smart classrooms in high-poverty areas in 31 provinces, municipalities, and autonomous regions. Simultaneously, a smart learning platform and mobile apps for smartphones and tablets were developed to meet learners' needs.[1]

One College Student Per Village's features:

- The programme uses AI to provide customized learning plans, select targeted and qualified resources, and give instant and traceable feedback.
- It reduces cost and workload, enabling teachers to concentrate on critical learning needs.
- The programme provides evidence of its outreach and impact in rural areas in China.
- The scheme boosted local economies and enabled more learners to remain in their hometowns.

Digital Solution

One initiative in which China has long engaged to support development, reduce poverty and improve equality is the establishment of open universities and distance learning in order to promote a culture of lifelong learning among its citizens (Zhang and Li, 2019; Cui, 2018). In this tradition, in 2004 the OUC launched the One College Student Per Village scheme through open and distance education enhanced by digital technology. In 2017, AI technology was integrated into the project in order to create customized learning plans, select targeted and qualified learning resources, provide instant feedback from automated assessments, and decrease the burden of routine administrative work for teachers. As students engage in their coursework and assignments, AI is used to trace each learners' journey. Data is collected on indicators such as professional background, time spent on the platform, clicks on learning resources, message posts, assignment submissions and test scores, and this is then used to analyse their learning habits and needs.

Individualized study plans are developed based on this analysis, and adaptive reminders are used to track and stimulate the pace of learning. Virtual reality (VR) is harnessed in online learning resources to illustrate abstract and complicated content, which is helpful for learners with limited prior education and in remote areas where practical teaching facilities are not available. For example, in the forestry programme, VR

1 See http://tongshike.multimediapress.cn/video/2020/12/14/20201214160791252298O_6.mp4

can vividly recreate lessons on how to prune fruit trees, just like in the fields.

Learners submit assessments to the smart learning platform, which can give automatic replies to objective questions, while automated essay scoring is used to mark writing assignments. After marking, any relevant knowledge that the learners have not mastered will be provided to them for further study. Teachers can also review the marking results to determine common areas of need and prepare for future teaching sessions.

Finally, a knowledge corpus was set up featuring a smart robot that can answer learners' questions based on spoken or text inputs. This reduces the teachers' workload so they have more time to concentrate on lesson delivery, resource construction, and research.

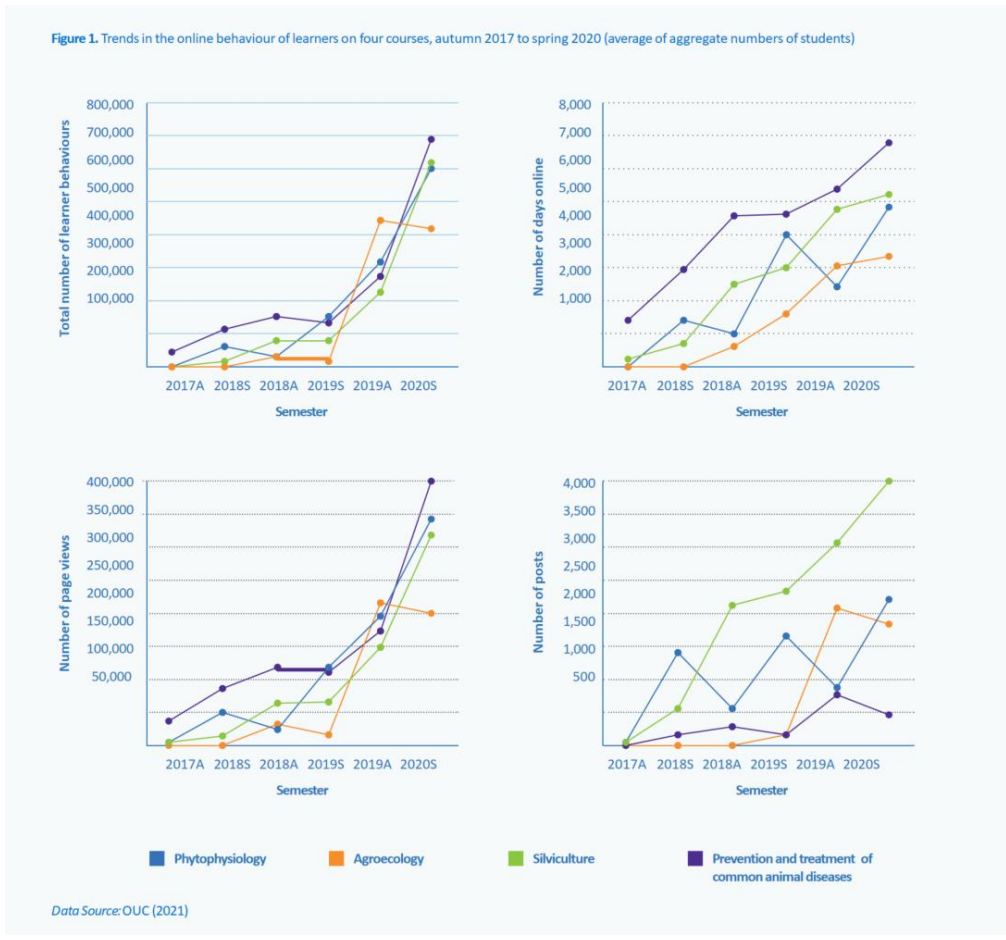
Programme

Theme	The use of AI to enhance the continuity and quality of learning
Beneficiaries	825,827 learners (68.25 per cent male, 31.75 per cent female)
Target population	Young people and marginalized communities
Problem	Inadequate access to quality education for local people resulted in a lack of qualified workers, particularly in more rural areas.
Solution	A smart learning platform created both online and offline learning environments for learners in rural and remote areas.
Resources required	• Mobile devices • Internet connection
Results	• 529,321 learners have graduated from the scheme • More than 500,000 village cadres have been trained
Challenges	It was often hard to get a clear picture of what the learners needed, and thus it was difficult for teachers to provide teaching plans that met the needs of learners.

Results

Since 2004, the scheme has been implemented in 1,513 of the OUC's county-level study centres in 31 provinces, municipalities, and autonomous regions, of which 967 (64 per cent) are in underdeveloped central and western regions of China (MOE, 2020). As of December 2020, the scheme had enrolled 836,272 learners and trained more than 500,000 village cadres. A total of 552,685 learners graduated between 2004 and 2020. The programme's monitoring shows a steady rise in usage until 2019 when a sharper increase occurred for most indicators (see Figure 1).

The data also suggests that the inclusion of some forms of AI has contributed to improving certain aspects of learning. Since VR was adopted, learners spend more time online, and both their page views and posted messages have increased. The average growth rates for learning behaviours in the four courses tracked from 2017 to 2020 were between 16 and 300 per cent, and formative assessment scores increased by up to 42 per cent for some subjects.



There is also evidence that the scheme has boosted local economies. OUC research indicates that 90 per cent of learners remain in their hometowns, and graduates who open businesses improve their economic situation and can provide job opportunities for local villages. A study by Manyin et al. (2019) indicates that by the end of 2016, 33,205 former students had started their businesses in Zhejiang Province and that 60 per cent of graduates in Hunan had become local business owners. In one case, a student who participated in the scheme in Hunan helped many rural villagers from Guchong in Zhijiang Dong Autonomous County to improve their agricultural practices, leading to their orange harvests bringing in 80 million yuan (about US$12.4 million).[2]

Finally, there is evidence that the scheme has reduced the administrative workload for teachers, freeing them up to engage in research. A study conducted by the OUC shows that the research output of teachers has increased by 36 per cent since the AI was applied (OUC, 2021).

2 See http://www.gov.cn/xinwen/202104/30/content_5604157.htm and https://baijiahao.baidu.com/s?id=1630866194477217489

Achievements

Focusing on Poverty Alleviation and Educational Support, Benefiting Vulnerable Groups and Underdeveloped Regions, Promoting Educational Equity

In the implementation of the "One Village, One" project, the Open University of China has placed special emphasis on addressing the educational needs and development in the central and western regions, as well as economically underdeveloped areas. Through a multi-pronged approach, the project has precisely targeted poverty alleviation in education, strengthened the supply and services of higher education, and promoted educational equity. Initiatives include:

- Establishment of a tuition-sharing mechanism, with the national university bearing some costs, local governments providing subsidies, and individuals contributing. Preliminary estimates indicate a reduction of over 140 million yuan in fees for rural students.
- Collaboration with local education poverty alleviation projects, providing free education to students from impoverished families.
- Policy preferences for the central and western regions, promoting a balanced distribution of the "One Village, One" project. Of the 1,513 county-level learning centers, 63.9% are located in the central and western regions, significantly expanding higher education coverage in remote and underdeveloped areas.

Cultivating High-Quality Local Talent Rooted in Rural Areas, A Driving Force for New Rural Construction

Through the comprehensive implementation of the "One Village, One" project, the Open University of China has played a pivotal role in cultivating a significant number of high-quality, practical talents for the construction of new rural areas. According to sampling surveys, approximately 90% of farmer

students trained under the project choose to stay in their hometowns (with specific percentages for Jiangsu, Zhejiang, Jiangxi, and Hunan being 95%, 89%, 92%, and 86.4%, respectively).

These tens of thousands of farmer students who have rooted themselves in their hometowns have evolved into pioneers and role models leading various aspects of new rural development and innovation, earning widespread recognition. In Hunan province alone, around 800 farmer students have been elected as representatives at the provincial, municipal, or county party congress or people's congress due to outstanding achievements.

Optimizing the Grassroots Cadre Team and Strengthening Rural Grassroots Organizational Construction

During the implementation of the "One Village, One" project, the Open University of China has actively collaborated with government departments to train grassroots cadres. Key efforts include:

- Selective admission of rural grassroots cadres and reserve cadres during student selection.
- Creating conditions to encourage graduates to work in grassroots organizations in rural areas.

The combined efforts have shown significant results in enlarging and optimizing the grassroots cadre team. In Hunan province, among the 51,912 graduated farmer students, 68.2% have entered village-level leadership positions, and 10.3% have been included in the reserve cadre selection. In Jiangxi, 6,259 students from the 2012-2016 cohorts have been chosen as village cadres.

These hundreds of thousands of new "village officials" with modern higher education actively explore new ways, methods, and paths to strengthen rural grassroots organizational construction, facilitating the transformation of rural grassroots governance. They advocate for the establishment of village meetings, villagers' representative committees, public supervision groups, or village supervision committees, promoting transparency, enhancing democratic processes, institutionalizing, and standardizing grassroots organizational construction. This has increased the authority and appeal of village-level organizations among the population, guiding the smooth progress of various new rural construction initiatives.

Driving Farmer Entrepreneurship for Prosperity, Promoting Rural Industrial Structural Transformation and Upgrading

With support from various sources, a significant proportion of farmer students actively engage in entrepreneurship. According to surveys, among the 51,085 farmer students recruited in Zhejiang, 65% have participated in entrepreneurial activities. In Hunan, approximately 60% of graduated farmer students have become leaders in local entrepreneurship, while in Jiangxi, from the 2012-2016 cohorts, 1,763 students have successfully started their own businesses, establishing 1,109 farmer cooperatives and uplifting 9,651 impoverished households.

Entrepreneurship among farmer students has led to a transformation in the traditional, individual, and decentralized operating models at the family level in rural areas. It has been replaced by organizational structures such as "company + base + farmers," "cooperative + farmers + base," sole proprietorship, and equity participation in enterprises. Main entrepreneurial activities include:

- Introducing bio-technological innovations for the transformation and innovation of traditional farming and animal husbandry, creating distinctive agricultural products with brand effects and competitiveness.
- Establishing e-commerce platforms to expand channels for the sale of agricultural products.

- Developing agricultural processing industries or eco-tourism based on local distinctive industries or resources.
- Establishing businesses in trade, processing, and services related to the needs of farmers for production and daily living.

The entrepreneurial actions of farmer students in local areas often inspire emulation from the public, attracting a considerable number of similar or complementary industries. This has formed a pattern of emerging industries characterized by small-scale industries and large clusters. The significant impact on employment, entrepreneurship, and prosperity among the farmer population often brings about a social effect of "boosting an industry, revitalizing the local economy, and enriching the local residents." The scale, market orientation, and industrialization of agricultural operations have greatly promoted the diversification and sophistication of rural industrial structures.

Establishing Brand Effects, Enhancing the Social Impact of the Open University of China

The Open University of China, taking on social responsibility and leveraging the advantages of its educational system and open education, has pragmatically and innovatively advanced the "One Village, One" project, generating a positive brand effect. A large number of "cultured, technically proficient, and business-savvy" farmer students are spread across the vast territory of the country, combining study with practical work, achieving outstanding results, and receiving full recognition from local governments and widespread praise from society. This has not only earned the university a solid reputation but has also expanded its social influence.

The "One Village, One" project has been recognized as a "livelihood project" in many provinces and cities, receiving numerous commendations and awards from local governments. This has driven the development of other educational projects at the Open University of China, playing a significant role in strengthening the university's system construction.

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Appendix

Title	Website	Contact
Reimagining Teaching & Learning via DELIMa Platform	https://d2.delima.edu.my/	fadzliaton@moe.gov.my
The Student Learning Space	https://www.learning.moe.edu.sg/	Mohamed_Imran_MOHAMED_IHSAN@moe.gov.sg
Digital Learning Resource Platform	https://rtr.profedu.uz/	auabdul87@gmail.com
Meteorological APPs for Crop Management	https://edulabcolombia.blogspot.com/	arangomas@gmail.com
SHAD Educational Application	http://shad.ir/	dabirkhaneh.medu@medu.ir
Creative Use of Digital Technologies in Teaching and Learning	https://tet.pi.ac.cy/	studio@cyearn.pi.ac.cy
MiLab: Virtual Science Laboratory for Secondary Schools	/	dsti@education.gov.mw
Falak Digital Learning Space	/	mfirdaus,rahman@usim.edu.my khadijah@usim.edu.my
Interactive AI-based Module for Effective Literature Reviews	/	armohmad@ukm.edu.my
Digital Education/Virtual Learning	https://svuonline.org/	Pl_manager@svuonline.org
Cafelab Colombia: A Project for Environmental Sustainability and Social Network	https://www.cafelabcolombia.com	ramonmaje@gmail.com
Robotics and Mathematics: A Proposal for Learning	https://clubroboticapabloherrera.blogspot.com/	eileennavarrete174@gmail.com
Digital Competence Development for Educators Programme	https://elearn.pi.ac.cy/moodle/course/index.php?categoryid=77	roushias.ch@cyearn.pi.ac.cy
Implementing Experiential Learning Practices to Educate Children, Parents, and Teachers on the Safe Use of Internet	http://internetsafety.pi.ac.cy educational-workshops/	papasolomontos.chr@cyearn.pi.ac.cy
The Implementation of STEM Programme in Primary Schools	/	dde-tpe@schools.ac.cy
Blended E-learning	https://fde.gov.pk/	inam_jahangir@yahoo.com
Digital Literacy Programme in Selected Public Schools of Khyber Pakhtunkhwa	https://kpeap.com/	waittillireply@gmail.com
Addressing Teacher Shortage in Rural Area of Armenia Through Distance Learning	https://www.eschool.am/	apoghosyan@ktak.am