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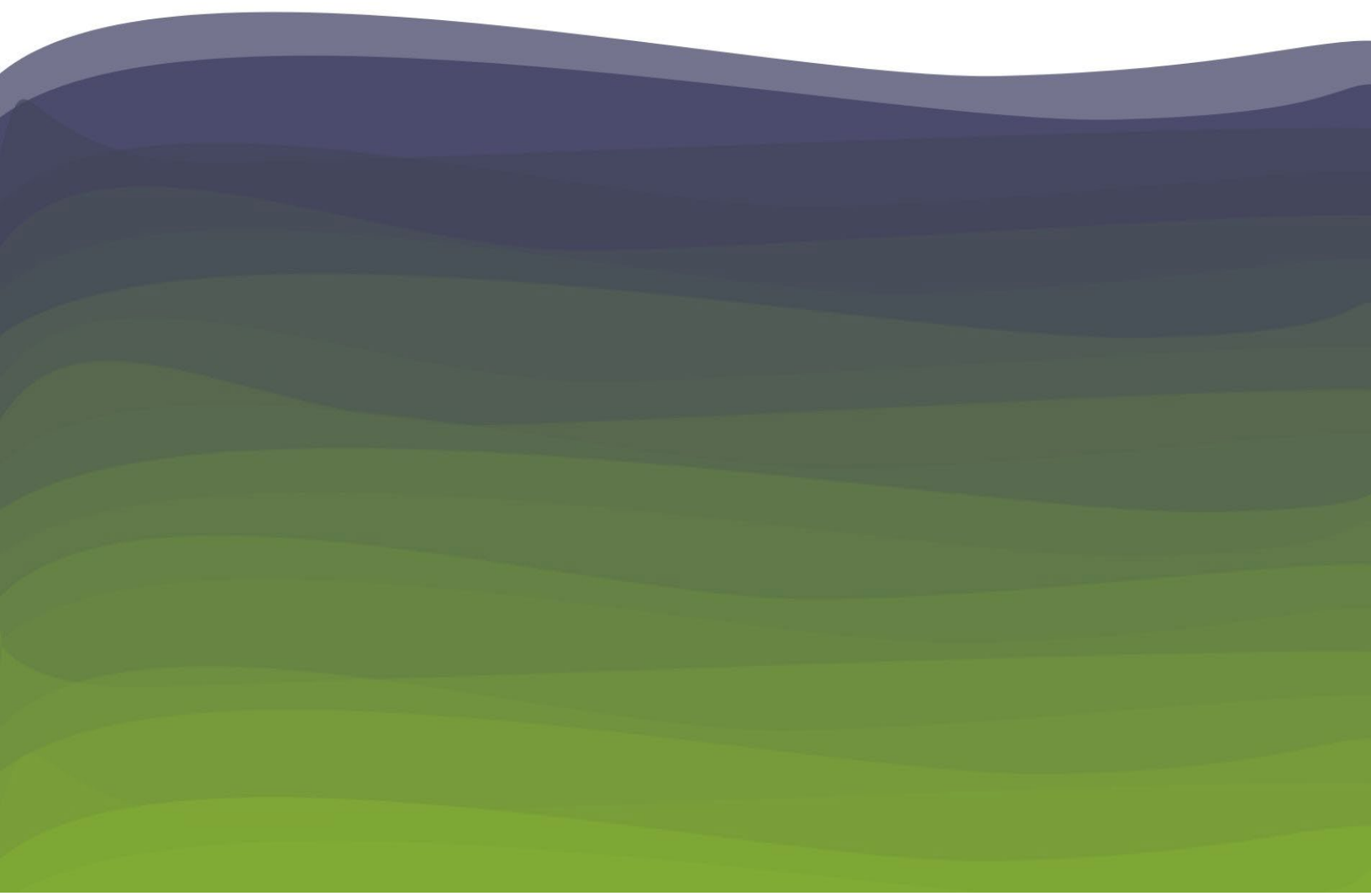
COMMUNITY-BASED LEARNING IN HIGHER EDUCATION

Analytical Report



2025

COMMUNITY-BASED LEARNING IN HIGHER EDUCATION

Analytical Report

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Published by the UNESCO Institute for Information Technologies in Education
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This publication can be referenced as: UNESCO IITE. 2025. Community-Based Learning in Higher Education: Analytical Report.

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Acronyms and abbreviations

AI	Artificial Intelligence
AMR	Antimicrobial Resistance
ART	Antiretroviral Therapy
CAD	Computer-aided design
CBL	Community-based learning
CHW	Community health worker
CiDT	Centre for Instructional Design and Technology
Co-op	Co-operative
CRM	Customer Relationship Management
CUI	Conversational User Interface
CSR	Corporate Social Responsibility
EASLHE	European Association of Service-Learning in Higher Education
Edtech	Educational technologies
ELE	Exploratory learning environment
EUA	Emergency Use Authorization (WHO concept)
EUA	European Universities Association
HEI	Higher education institution
HIV	Human Immunodeficiency Virus
JM	Jump-Maker
LLM	Large language model
LMS	Learning Management System
MakCHS	College of Health Sciences (Makerere University)
MIC	Medicines Information Centre
MoH	Ministry of Health
MOOC	Massive Open Online Course
NGO	Non-governmental organization
NLP	Natural language processing
ODL	Open and distance learning
PBL	Project-based learning
RAG	Retrieval-augmented generation
SaaS	Software as a service
SDG	Sustainable Development Goal
SMS	Short message service
TB	Tuberculosis
TEL	Technology-enhanced learning
TM	Third Mission
UNESCO IITE	United Nations Educational, Scientific and Cultural Organization Institute for Information Technologies in Education
UNIMED	Mediterranean Universities Union
USR	University social responsibility
VFT	Virtual Field Trip
VLE	Virtual Learning Environment
WHO	World Health Organization
WIL	Work-integrated learning

Executive summary

This publication explores the integration of digital technologies into community-based learning (CBL) initiatives at open and traditional universities. It presents findings for Activity 4.1.1. 'Conducting desk research of community-based learning and case studies of CBL in open education, and facilitating the development of partner network of higher education institutions and organizations involved into CBL' within phase II of the project 'Promoting ICT Capacity Building and Open Education in the Era of Artificial Intelligence and Digital Technologies', jointly implemented by the United Nations Educational, Scientific and Cultural Organization Institute for Information Technologies in Education (UNESCO IITE) and Shanghai Open University.

The project adopted an approach of desk research to identify and outline the theoretical foundations of CBL, focusing on those that utilize advanced digital technologies such as Artificial Intelligence (AI) in the delivery and implementation of CBL initiatives. Eleven case studies of open and traditional universities that have applied digital technologies to implement CBL were identified and developed into case studies of innovative practice in integrating digital technologies onto CBL. These cases represent a range of contexts, regions, purposes, technologies and role-players. The universities that participated in the research for the project are Athabasca University (Canada), CHRIST (Deemed to be University) (India), Open University Malaysia (Malaysia), Stanford Graduate School of Education at Stanford University (USA), National University of Singapore (Singapore), College of Professional Studies at Syracuse University (USA), The Open University UK (United Kingdom), the University of Cape Town (South Africa), the University of New South Wales (Australia), Makerere University (Uganda), and Shanghai Open University (China).

Higher education institutions (HEIs) are increasingly expected to fulfil what is known as a Third Mission, in addition to their core mandates of teaching and research. This mission relates to broader social impact and outreach to benefit the communities in which they are located, as well as broader learning contexts. The world population faces significant changes brought about by rapid technological development and innovation and advances in AI that will impact the way societies and individuals function and work. Furthermore, many nations are facing the challenge of an ageing population and are considering ways to continue to engage older members of the population in meaningful work, which requires ongoing upskilling, training and education. HEIs can contribute their resources and knowledge production in support of lifelong learning needs and goals of society, beyond their core mandates.

The report outlines the theoretical fundamentals of CBL, including the growing scope of 'community' as a concept in CBL and broad and evolving definitions of CBL. It reviews eleven detailed case studies on the use of advanced digital technologies such as Artificial Intelligence and machine learning in CBL projects and programmes at specific universities, which can be seen as models for other HEIs seeking to establish or expand CBL initiatives or the application of digital technologies in learning.

Section 1 of this publication outlines the methodology used in the research process and discusses how the case studies were selected, analysed and developed. Section 2 presents theoretical foundations for CBL, including its scope, purposes and exploration of the evolving concept of 'community' in a digital era. Case study participants' definitions and descriptions of CBL are included in this section within the context of their CBL initiatives. Furthermore, the Third Mission of

higher education institutions (HEIs) is outlined from a theoretical perspective, as this relates closely to CBL initiatives. Concepts such as service learning, Corporate Social Responsibility (CSR), and higher education reform are discussed in relation to the significance of CBL, community engagement and social development.

Section 3 of the publication presents an overview of CBL practices using digital technologies, with an outline of features and innovative practices that emerged during the analysis of the HEI case studies selected for analysis. The key features identified across the case studies are summarised in a table according to their description, purpose(s), composition of the learning community, technologies used in learning and modes of collaboration. This is followed by a summary of the key lessons and impacts of each case study and the challenges and sustainability of its initiative. Emerging trends evident from the analysis of the case studies also appear in this section.

Section 4 presents recommendations for CBL development at HEIs, derived from the analysis of the case studies and the evolving context of CBL and digital technologies for learning. These recommendations address some of the challenges of scaled and sustainable CBL practices within the broader context of the role of HEIs in supporting lifelong learning, ensuring access to learning, and formalizing CBL in HEI policies.

A summary of each case study is provided in Annex 1 and may be of interest to readers who are interested in the specific context, design and impact of each initiative. The case studies explore different digital tools used in CBL, the overall design and context of their application in learning, objectives and intended learning outcomes of learning programmes involving digital technologies, modes of interaction with communities, features and challenges of using the chosen technologies, impacts of the programmes, and their sustainability and scalability. Annex 4 contains a questionnaire designed to elicit responses from HEIs to build their case studies.

Introduction

As the world moves towards an increasingly digitized, knowledge-based society, HEIs are compelled to reflect on their mission and the way they can contribute to this transition. HEIs are producers of knowledge and innovation. They also provide contexts for preparing students to become responsible and engaged citizens able to solve problems and contribute to their communities. Bringing these two broad purposes together creates a nexus for CBL. HEIs can no longer be competitively or ethically involved in 'outreach' or philanthropic activities as a mere adjunct to their core functions of teaching and research; they are expected to integrate research and the production of knowledge and technologies with social, economic and cultural development, through student, faculty and community engagement. This 'Third Mission' of HEIs is the foundation for CBL (EASLHE, 2021).

The question of how HEIs can become providers of scaled, sustainable learning programmes and initiatives that impact societies, beyond their traditional role of producers of knowledge and providers of formal qualifications for specific academic disciplines is a critical starting point for this paper. Advanced digital technologies, including Artificial Intelligence (AI), machine learning and large language models (LLMs), when deployed in learning programmes, have the potential to support scaling, personalizing and making learning more accessible. Open and distance learning HEIs already have some experience in providing learning opportunities to large numbers of enrolled students, using digital technologies to facilitate asynchronous and synchronous learning. The growth of Massive Open Online Courses (MOOCs) offered by traditional and open HEIs and other lifelong learning providers, delivered via digital technologies such as web-based applications, was regarded as a significant step towards democratizing learning and increasing access to learning for large numbers of learners. However, these programmes involved mainly knowledge transfer, with little (if any) engagement within a learning community. They have thus limited potential for impact in the context of CBL. In a virtual environment, CBL relies on the available infrastructure and the community's ability to engage 'live' in various ways (Goyal, 2021), with multidirectional feedback loops, collaboration and achievement of common learning objectives.

A second critical issue for this paper is the definition of 'community' in CBL. Prior to the digital era, community was typically local, involving participants living, working and learning in close proximity to one another, or collaborating on an issue affecting their specific locality or their group. This concept of community has evolved to include virtual communities comprising people with shared objectives and purposes who may exist in different regions and areas of the same country, or even in different parts of the world. Digital technologies that enable collaboration, engagement and learning in virtual contexts are also enabling the creation of diverse communities of practice and service that are not limited by geography. It is now possible, for example, for a group of learners who want to be able to respond to crisis contexts in different parts of the world to participate in virtual 'field trips' to those locations in order to design appropriate responses and support.

Sustainability of CBL initiatives in a digital era is a third focus area for this paper. Technology itself poses several challenges in the context of HEIs and learning – it requires financial investment for its adoption and ongoing maintenance. Funding sources should be secured for sustainable implementation of CBL involving digital innovation. Technologies evolve rapidly, which means that HEIs need to constantly adapt to new types of technologies and their various applications suitable for their programmes. This is especially true for AI, which is evolving apace – presenting both opportunities and challenges for HEIs to adopt various AI applications in their operations. Capacity

building becomes a priority, as users need to learn how to engage with these technologies in order to participate in CBL initiatives.

This project employed desk research to explore the evolving nature of CBL that utilizes digital technologies to engage learners and to identify case studies of innovative practice that can serve as models for other HEIs wishing to expand or develop their CBL initiatives. Eleven case studies are presented in this paper, with their trends and features discussed in relation to the three key points of inquiry for the paper. It is hoped that the lessons drawn from these case studies will be useful for any open or traditional HEI wishing to fulfil its Third Mission.

1 Methodology

Desk research was undertaken to perform qualitative research for this report. A range of keywords and terms related to CBL and digital technologies in learning were used to identify academic sources and case studies of CBL in the higher education context, especially those using digital technologies.

The keywords and search terms included:

- Advanced digital technologies in CBL
- Artificial Intelligence (AI) and learning
- CBL in higher education/universities
- CBL open universities
- CBL practices
- Communities of practice
- Community-based learning (CBL) definitions
- Community engagement in higher education
- Digital technologies in community-based learning
- Educational technologies
- Experiential learning
- Learning community
- Learning technologies
- MOOCs
- Open learning technologies
- Personalized learning through technology
- Project-based learning
- Service e-learning
- Service learning and digital technologies
- Technology-enhanced learning
- Third Mission
- Types of digital technologies used by universities/in higher education
- Virtual classroom

Peer-reviewed sources related to these terms were identified for further clarification and perspective on the broader topic. This process also involved identifying case studies and examples of universities that use advanced digital technologies in community-based learning.

A selection of universities (mixed and open) in different regions were identified for further investigation based on innovative approaches to CBL and the ready availability of information online about completed or ongoing projects and initiatives. These institutions were contacted for further inquiry. A questionnaire (see Annex 5) was designed to elicit written responses from participating HEIs and for virtual interviews. One challenge encountered during this process was difficulty in establishing contact with representatives at the institutions. Initial and follow-up attempts were

made through email, phone calls and online query forms, with limited success. Institutions included in this report are ones that responded to contact and expressed willingness to participate in the research and to share their practice.

Several interviews were conducted with representatives of programmes and initiatives (the questionnaire template is in Annex 5) to build case studies. Some representatives completed a questionnaire digitally and were available for further investigation. The case studies were analysed to identify key practices and lessons about CBL and digital technologies in each context. The approach used for analysis was, first, to examine definitions or descriptions of 'community' in learning and 'community-based learning' in each case study, within the context of each project or initiative. This included the role players involved in each initiative and how they contributed to 'community'. The second aspect for analysis was the overall objectives or intentions of each initiative. Some case studies focus on specific projects while others relate to a more extensive approach to learning engagement across the institution. The third aspect for analysis was trends and innovations in technologies used for community-based learning in each initiative. Specific technologies were identified, as well as their representation in features, design, modes of interaction and scalability of each case. Analysis also focused on the sustainability of the initiative and how challenges described by participants were or are being addressed. Key unique lessons from each case study were identified. These lessons are presented as summaries for each case study in Table 1 of this report. Analysis then focused on identifying trends across the case studies, and these are summarised in Table 2 of the report.

2 Theoretical foundations of community-based learning

CBL associated with higher education has a range of purposes, including the application of formal knowledge and skills in real or simulated contexts, continuing professional development, community outreach and social impact, collaboration for innovation, opportunities for inclusion of diverse perspectives in learning, and others.

CBL integrates problem-based service learning, volunteerism, and experiential learning across various disciplines (Carlisle et al., 2017). Traditionally (before the widespread adoption of digital technologies in learning), CBL in higher education was generally understood to refer to students working with local communities to apply their acquired knowledge in projects and initiatives for social good or impact, or 'learning that incorporates the community and immediate environment into the teaching approach' (Binti & Rahman, 2019). Furthermore, it is grounded in 'the belief that all communities have intrinsic educational assets and resources that educators can use to enhance learners' learning experiences' (Lynch, 2024). Learning is thus reciprocal and collaborative, drawing on a range of resources and knowledge that extend beyond the academic content of a specific learning programme.

Definitions and applications of CBL are expanding in an era of digital engagement and learning. A 'community' may be understood as a group of people with shared goals or interests, engaged in collaboration, and it is no longer limited to geographic location; the Internet and digital applications and platforms enable communities to exist virtually, without being constrained by physical location. Increasingly, CBL is also understood more broadly as a virtual context in which students and learners engage in collaboration, problem-solving and learning. One example of this is virtual exchanges that bring together students from different HEIs and countries to solve problems collectively or exchange cultural and social knowledge. A community could unite learners engaged in the same learning programme or project, collaborating with each other and with others outside of their learning context (such as a virtual or local geographic community) to solve a problem or deepen their learning and experience. It may involve collaboration between individuals across different contexts who come together for a shared purpose. Faculty members of a university may also form a community of learners engaging in community-based learning to solve a problem by integrating knowledge from various disciplines. Several case studies presented in this report describe inter-faculty engagement and collaboration to drive innovation or develop new products and technologies to support student learning. Other case studies reflect services provided to a community outside the HEI facilitated by students who deepen their experience simultaneously.

As CBL has evolved into the digital space, a clear distinction needs to be made between online learning and CBL, which is enhanced or facilitated by online learning, and collaboration technologies and tools. The distinction is that CBL typically occurs 'live', where community members can engage offline or online in various modes, as needed. This may include online learning but must be distinguished from online models such as Massive Open Online Courses (MOOCs), in which learning occurs synchronously or asynchronously (usually asynchronously), involving knowledge transfer, with little interaction between learners enrolled in the same course or programme. CBL, in a virtual context, relies on the community's ability and available infrastructure to engage 'live' (Goyal, 2021).

The concept of a 'community of practice' is useful and relevant to CBL. Jean Lave and Etienne Wenger (2015) defined communities of practice as 'groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly'. They describe three key characteristics of a community of practice: (1) a shared domain of interest, (2) the

community itself, which builds relationships among members to enable learning, and engages in activities of collaboration to support each other and share information; and (3) the practice, which implies that each community member is a practitioner who shares resources with other members of the community in the form of experience, tools, and ways of addressing problems, requiring sustained interaction. A community of practice may extend well beyond the academic sphere and the local community, encompassing any parties interested in solving the problem or improving a situation through collaboration and applied expertise. There is an additional focus on an expectation of equitable learning experiences for participants (Adams et al., 2023). The characteristics of a community of practice and the emphasis on equity for participants are represented in each case study of CBL within an HEI in this report.

Each participant interviewed for this research was asked to give their definition or understanding of CBL within the context of their learning programme, project or institution. Responses received reflect that the term is broadly defined and applied.

Definitions and descriptions of CBL given by respondents who answered this question included:

- A specific, culturally located community of Indigenous Peoples designing programmes of learning for and within their community to meet their specific needs, and a community of distance education students pursuing business studies courses working collaboratively in virtual simulated workplaces to practise collaborating and making business decisions using their applied knowledge and diverse perspectives.
- A community of primary professionals engaging in continuous professional development (through collaboration) which positively impacts the communities they serve (within a project).
- Enabling of a research community and ecosystem through collaboration, which impacts a much broader community.
- A pedagogical approach that integrates academic study with community engagement. It involves learners actively participating in real-world projects and addressing community needs. This approach fosters a deeper understanding of course material, develops critical thinking skills, and cultivates a sense of social responsibility.
- At the very basic level, a community is a group of people with a similar goal or working together on something. In the digital world, for example, it could be a community of practice, of teachers. So much of what we do attempts to be community-based; it depends on the specific projects.
- Enabling a community that experiences a systemic barrier to be able to achieve their goals. As a distance learning institution, our conceptions of community are often virtual and based on shared interests or challenges. This project is built on a longer-standing participatory research initiative with … a community that largely exists in online groups and forums with hundreds of members. There was a shared goal and learning within the community, … as well as learning for us as academic researchers about the [community's] experiences and requirements for the design of a system.
- This community-based learning is, essentially, continuing professional development, in-service; importantly, in a primary healthcare environment (in the context of a project).
- A collaborative, inclusive learning model where students from various backgrounds work together on common projects, share knowledge, and build leadership. This model transcends traditional classroom settings by integrating digital education, leadership development, and social responsibility into its core… building intergenerational and interdisciplinary support

networks that include not only students but also teachers, parents, university volunteers and professionals. These diverse groups work together to bridge social and economic divides, ensuring that everyone has the opportunity to learn, grow, and contribute meaningfully to their communities (in the context of a project).

- Creating a multi-interactive learning environment through digital technologies and AI, where learners, teachers, and AI agents learn and collaborate in a virtual community. This model emphasizes knowledge sharing, interactive learning, and enhancing student autonomy, making it particularly suitable for open education and lifelong learning scenarios.

The participants' definitions and descriptions of community-based learning within the context of their projects and programmes reveal that in a virtual context enabled by digital technologies, the scope of 'community' is no longer limited to geography, and the technologies themselves enable significant accessibility and opportunities for CBL practices that would not have been possible without them.

The Third Mission of higher education institutions

HEIs are increasingly expected to fulfil a 'Third Mission' (TM) in addition to their traditional core functions of teaching and conducting research. This expectation has been amplified by the development of knowledge economy and globalization, with geographic, economic and social boundaries evolving and dissipating. Significant environmental, social and economic challenges are ubiquitous across the globe, and HEIs have a role to play in working collaboratively with governments, civil society, industry, and other agencies to find solutions to these problems, using the knowledge produced within these institutions. However, TM remains a complex, at times ambiguous, and constantly evolving concept. It may be perceived as having an entrepreneurial focus, as a force for social and economic development, or as a set of activities that seek to transfer knowledge and technologies that support innovation, social welfare and human capital development. Service learning is a way for HEIs to achieve their TM (Compagnucci & Spigarelli, 2020). In a policy brief, the European Association of Service-Learning in Higher Education proposes that higher education is a key tool for promoting sustainable human development and that social responsibility is an ethical requirement of HEIs (EASLHE, 2021). Service learning is perceived to be an ideal methodology for developing engagement between HEIs and civil society. The American Psychological Association defines civic engagement as 'individual and collective actions designed to identify and address issues of public concern.'[1] The EASLHE promotes the institutionalization of service learning in HEIs. This implies that HEIs should formalize their service learning practices so that they are an integral part of the culture and operations of the institutions. This is further reflected in the UNESCO International Commission on the Futures of Education report, which proposes that higher education should include pedagogical strategies such as cooperative work between students, development of research projects, problem-solving, field studies, action research and community projects, among others (UNESCO, 2021).

There are several other examples of global collaboration initiatives that bring together students, HEIs, non-governmental organizations (NGOs), governments, and other organizations in CBL activities. One example is the Learning Planet Alliance, established by the Learning Planet Institute[2], a global community of practice dedicated to co-creating a learning society through collaboration

[1] American Psychological Association. https://www.apa.org/education-career/undergrad/civic-engagement
[2] https://www.learningplanetinstitute.org/en/international-2/

between NGOs, HEIs, schools, students, activists, youth movements, social entrepreneurs and businesses. Its mission is to share knowledge about new ways of learning, teaching, performing research and mobilizing collective intelligence for social good, in order to address the challenges of our time. The Institute's Digital Ecosystem hub develops and deploys AI and other digital technologies to support learning and transformation for the Sustainable Development Goals (SDGs). Projects [3] is the Software as a service (SaaS) platform developed by the Institute to enable collaboration among project team members. Another example is UNI(di)VERSITY (socially responsible university for inclusive societies in the era of migration), a coalition of four organizations: Sapienza University, the Mediterranean Universities Union (UNIMED), *Fundació Solidaridad* of the University of Barcelona, and the European Universities Association (EUA) (UNIMED, 2023). The project is based on knowledge exchange to promote social inclusion of refugees and migrants in destination countries and in HEIs in those countries. Campus Compact[4] is a third example of a collaborative alliance with a mission to promote CBL. It facilitates institutional collaboration between colleges and universities in the United States of America, empowering them to get involved in addressing social issues and furthering the goals of equity, justice and prosperity for all. These examples illustrate the principle of collaboration and knowledge sharing as a foundation for CBL projects and the achievement of institutions' TM.

During service learning as a form of CBL, 'application of learning in real-life contexts should complement the objectives of students' future careers. Therefore, service needs to be relevant, meaningful, and tightly integrated into the curriculum. Participants in service learning should demonstrate a balance of abstract and concrete knowledge, the development of social intelligence, and civic responsibility' (Mikelic´ Preradovic´, 2015). There are thus pedagogical and values-based aspects of service learning and CBL. Service learning is also a way of putting into action a university's community outreach mission, combining the goals of higher education with community needs through students' active participation in service learning activities (Bringle & Hatcher, 1996). Service should enhance students' knowledge and experience while contributing to the benefit of a community or solving a problem that impacts a community. Each case study presented in this report reflects these aspects of CBL.

The expectation that HEIs should have a mandate for social impact is reflected in initiatives such as the World University Rankings for Innovation (WURI)[5], which includes categories for student support and engagement, social responsibility and innovation in terms of the adoption of infrastructure and technologies by institutions to support their programmes. The abstracts for ranked institutions reflect some interesting practices emerging in individual projects and programmes that include communities of learning and inquiry.

The TM is also connected to Corporate Social Responsibility (CSR), a term not limited to the context of HEIs but increasingly interwoven with the mission of HEIs. CSR is 'the idea that [an institution] should be interested in and willing to help society and the environment as well as be concerned about the products and profits it makes'.[6] Another term applied to this concept is university social responsibility (USR). Coelho and Menezes (2021) describe how USR has gained momentum in European higher education, as globalization and pressure to prepare students for civic responsibility

[3] https://discover.projects.learningplanetinstitute.org/en?_gl=1*57j7gn*_gcl_au*MTYwODQzOTI3OS4xNzM3MDA2MzAy*_ga*MjEyMzkzMzk3Ni4xNzM3MDA2MzAw*_ga_G48PJF30X5*MTczNzAwNjMwMC4xLjEuMTczNzAwNjYxMS4wLjAuMA

[4] https://compact.org/about

[5] https://www.wuri.world/

[6] https://dictionary.cambridge.org/dictionary/english/corporate-social-responsibility

grows. The university is 'important when it comes to structuring the social and cultural dimension of the knowledge society' and is responsible for promoting multiple learning spaces and needs to develop opportunities to allow students to learn in context and in cooperation with others, like USR projects based on service learning (Santos in Coelho & Menezes, 2021).

In the European context, the Bologna Process[7] involves 48 countries in collaboration to reform higher education, with an emphasis on ensuring learning mobility, access and equity. One of the principles embedded in this agreement is that students should participate in civil society activities, which may be CBL or service learning projects, such as the European Union Erasmus+[8]. It is a project established by participating governments to promote education, training, youth and sports across member states, through collaboration and formally funded opportunities for students to be involved in activities such as social inclusion, exchanges, and community-based initiatives. Erasmus+ illustrates the growing expectation that students be involved in civic responsibility initiatives, and that institutions (including HEIs) should create opportunities for this type of learning and engagement. The European Observatory of Service-Learning in Higher Education (2021) supports and tracks such programmes, collecting data on service learning initiatives and the institutionalization of service learning. A key project is the Service-Learning, Inclusion, Diversity and Digital Empowerment Manifesto (SL&DE) which can be used for targeted groups engaged in service learning, working with communities at risk.

A way to exercise CSR or USR is through CBL programmes and projects. El-Sakran (2020) describes how the concept of CSR and a philanthropic mission has gained traction in the United Arab Emirates (UAE), alongside the establishment of a growing number of private HEIs in the UAE in recent years. In that region, HEIs have become the primary source of technological innovations to facilitate the transition from oil-based economies to knowledge-based ones. El-Sakran points out that although CSR has not traditionally been developed in HEIs in the Arab world, it is growing now as HEIs in Arab countries seek international accreditation with requirements for CSR, and the need to educate Arab students to use their academic knowledge to contribute to the social and economic development of their societies. In fact, the UAE Standards for Institutional Licensure and Program, 2019, mandates in Standard 11 for accreditation that 'The institution seeks to identify and respond to needs within the community and engage representatives of local business, schools, professional bodies, government entities, alumni, ethnic communities and citizens' (Abuelrub, 2019; El-Sakran, 2020). However, a specific emphasis on CBL is not always associated with CSR. For instance, the Arab Open University has developed a Community Engagement and Outreach Policy (Arab Open University, 2018) that outlines its mission and strategies for engaging in community development, but the policy does not mandate nor mention any examples of CBL in the form of service or experience learning by students. Instead, the emphasis is on 'outreach', which does not necessarily include a learning component in community engagement.

[7] https://education.ec.europa.eu/education-levels/higher-education/inclusive-and-connected-higher-education/bologna-process

[8] https://erasmus-plus.ec.europa.eu/about-erasmus/what-is-erasmus

3 Overview of CBL practices using digital technologies at HEIs

This section synthesizes lessons learned from innovative case studies and examples of different forms of CBL implemented at ten HEIs from around the world. The case studies represent a mix of traditional and open universities that agreed to participate in the research for this report. Detailed case studies are presented in Annex 1. They contain descriptions of the context of the institution, the objectives and scope of the CBL project or programme, the purposes for using certain technologies, the programme's design and features, challenges, impacts, and potential for scalability. They also outline the impacts and key lessons derived from the project about digital technologies used in CBL. Several of the case studies are characterized by features of project-based learning (PBL) as a form of CBL, with potential scalability of the project outlined by the participants.

Advanced digital technologies such as AI in learning are emerging as tools to support differentiated and individualized learning experiences and have the key potential benefits of learner engagement, access to learning, and enabling of tailor-made projects and contexts (Garbade, 2021). These features of AI are apparent across the eleven case studies. For example, these technologies allow students with barriers to learning (such as those with disabilities) to engage and collaborate closely with other students, community or project members, and faculty. There is thus a strong case for including examples of these technologies in the scope of this report, because a student who faces barriers to learning may be limited in the ways they can engage with broader communities if they do not have targeted support.

Several features and innovative applications of AI are evident in the case studies. Natural language processing (NLP) is used in the design and implementation of chatbots capable of engaging with users (including those with barriers to access) and providing personalized support and responses to users' questions and needs. Generative AI is also harnessed in some projects to enable personalized chatbot responses and support for learners and users, enabled by large language model (LLM) technology. AI-generated mentors and characters programmed into learning content are an example of this application. They able to respond to learners and offer specific types of feedback based on prompts and inputs from learners. AI data analytics to support learners and learning is another feature that emerges in several case studies. Data analytics enables the identification and early prediction of learning challenges and supports learning facilitators and learners themselves in accessing the most suitable types of supportduring the learning process. In cases involving a medical or healthcare context, machine learning using extensive data and examples to train the model supports the diagnostic capacity of an AI-enabled platform, which saves time and human resources, especially in resource-constrained contexts. All eleven case studies use digital technologies and virtual conferencing applications for collaboration and community engagement, to some extent, enabling location-independent learning and problem-solving and enabling access to learning opportunities in ways that are not always possible without these technologies.

Trends related to the key features, purposes and technologies used in innovative CBL projects

Table 1 below summarizes the key features of the institutional case studies, followed by an analysis of trends identified across the case studies. Each case study is entitled after the university with which it is associated, along with the country location. The features are summarized according to a brief description of the name and outline of the initiative, its overall purpose, the composition of the learning community involved in the initiative, digital technologies used for CBL, and modes of

collaboration used for community learning engagement. Some case studies are specific projects in which CBL has been undertaken to solve a problem or innovate learning in some way; others are institution-wide initiatives.

Table 1 Key features of CBL case studies

Institution	Description	Purpose	Learning community	Technologies	Modes of collaboration
Athabasca University (Canada)	AI-powered virtual work co-operatives (co-ops): four work co-ops designed to enable students to gain work-integrated learning (WIL) experiences virtually.	Design and use simulations to provide work experience to distance learning students from remote areas and with full-time life commitments that prevent them from applying their learning through WIL.	Faculty of Business staff. Students enrolled in business courses through distance education. Vendors who collaborate with staff to design virtual experiences. Ernst & Young Canada's Neurodiversity Centres of Excellence (expertise provided for learning design).	University Learning Management System (LMS). Generative AI-powered simulations accessed through the LMS. Machine learning used to refine interactions between students and AI mentors and characters.	In-person learning sessions. Remote learning (asynchronous and synchronous).
CHRIST (Deemed to be University) (India)	WeJump: training school students in digital and leadership skills to enhance their future social mobility and economic participation.	Provide underprivileged and underserved youth with opportunities to learn digital skills, intercultural competencies and leadership skills to enhance social mobility and future employability. Reduce socioeconomic barriers. Provide equitable access to skills training. Foster change-making leadership among youth.	WeJump programme director. Student volunteers from CHRIST University and foreign universities. Underserved youth from various communities in India. Funding and collaboration partners: • Seoul Women's University. • Women's Christian College. • Chonnam National University.	Hardware: laptops provided to participants. Software: • AI for personalized learning experiences among students. • Scratch block-based programming app. • MIT App Inventor. • Python (web programming skills). • Generative AI (ChatGPT). • DALL-E. Content creation tools: Canva, ClipChamp. LMS: Google Classroom. Meeting apps: Google Meet, Zoom.	Personalized digital learning experiences. In-person workshops and training. Virtual workshops and training. LMS student access for learning and collaboration.

Institution	Description	Purpose	Learning community	Technologies	Modes of collaboration
Open University Malaysia (Malaysia)	Individualized online learning designed by Centre for Instructional Design and Technology (CiDT) to: • Leverage digital learning technologies for diverse learning needs. • Provide distance learning access to education (59 programmes). • Support CBL and social development projects through the Learning is Fun (Lif) programme.	Leverage AI for data-driven insights to develop individualized online learning solutions. Enhance learner engagement. Support flexible learning options.	Multidisciplinary team (instructional designers, multimedia programmers, graphic designers, educational experts). Distance learning students from diverse contexts. Incarcerated students. Students in remote Borneo communities. Malaysian Prison Department. Sekretariat Malaysia Prihatin (NGO).	LMS with AI- and data-insights-driven, personalized, interactive content. AI-powered chatbots, virtual tutors and assessment systems. Mobile apps (on smartphones) to access the LMS and learning content. Gamified learning (learners earn 'rewards' while engaging with learning materials).	Asynchronous learning. Collaboration between students and between students and faculty members via the LMS. Discussion forums. Online tutorials.
Stanford Graduate School of Education, Stanford University (USA)	Stanford Accelerator for Learning providing: • virtual field trips for students to engage with specific environments virtually (exploring natural features, the effects of climate change and other influences on the environment). • virtual humanitarian response training for those interested in providing education in refugee camps (simulations enable learning about food security, health services, safety).	Advance educational research and innovation to ensure that learners thrive in an ever-changing world. Use virtual technologies to provide simulated experiences to further their learning and social and environmental engagement.	Researchers. Educators. Innovators. Policymakers. Community leaders. Students. Schools. Families. Organizations with an interest in learning promotion and equity. Neuroscience specialists.	Various digital technologies tailored to specific Accelerator-supported projects, including: • AI and virtual simulations. • Machine learning. • 360-degree photographs (used in visual simulation design).	Co-design of solutions to address educational challenges via virtual and in-person collaborations. Interdisciplinary teams collaborate in various ways according to project needs.

Institution	Description	Purpose	Learning community	Technologies	Modes of collaboration
National University of Singapore (Singapore)	IDentif.AI platform to: • Use AI to innovate drug combination therapies. • Enable an extensive community of practice to address public healthcare challenges.	Urgent need for drug combination therapies to treat COVID-19 patients led to development of the IDentif.AI initiative. Uses AI to efficiently and quickly identify suitable drug pairings and repurpose existing drugs to treat patients.	Ministry of Education. Research Centres of Excellence, Singapore. Biomedical engineers at the National University of Singapore. Scientists. Medical researchers. Clinicians. Infectious disease experts. AI specialists. Programmers. The Singapore National Centre for Infectious Diseases (NCID). National University Hospital. DSO National Laboratories (Singapore).	Digital medicine platform based on AI-discovered quadratic relationships derived from biological responses to drug interventions. Collaboration apps (such as Zoom).	Interdisciplinary teams collaborated on meeting apps such as Zoom during COVID-19 pandemic. Later, they combined virtual and in-person meetings.
College of Professional Studies, Syracuse University (USA)	iConsult Collaborative provides: • Experiential learning in the application of digital technology solutions for business community support, especially start-up businesses. • Real, verifiable work and consulting experiences for international female students (work experience is listed on their resumés to improve their employment prospects.)	Overcome barriers preventing international students from access to WIL and consulting experience which affects their future employment prospects in the US. Facilitate female students to gain technology work experience in the US. Connect domestic and international students with local start-ups and businesses.	Director of iConsult Collaborative and the College of Professional Studies. Local start-up business clients. Domestic and international students enrolled in business courses and programmes who apply to participate in consulting projects.	Virtual meeting and collaboration apps such as Zoom. A set of digital technologies tailored to digitize the actual workflow of the projects.	Project team collaboration and client contact facilitated through virtual meeting apps and in-person meetings.

Institution	Description	Purpose	Learning community	Technologies	Modes of collaboration
	• Mentoring to teams of students with skills suited to a specific business need as they provide solutions to the business need and work directly with start-up businesses. • Consulting services including web solutions and development, marketing, data warehouse design, business intelligence, and data analytics and visualization.	Apply students' knowledge and skills to real business problems and needs.			
The Open University (United Kingdom)	'Taylor' chatbot developed by the Institute of Educational Technology (IET) serving as AI-powered virtual assistant to facilitate accessibility for disabled students.	Enable disabled students to disclose information about themselves to the university so that they can access targeted support. Through the Digital Accessibility Standard, to ensure all staff implement best practices in learning accessibility.	Institute of Educational Technology (IET). Online forum groups of disabled students. University staff. Disabled Students Group (based at the university). Research team. International partners and disabled students from other countries.	Microsoft Azure (AI). Conversational user Interface (CUI). Mobile and desktop apps. Customer Relationship Management (CRM) system (for student communications). Large Language Models. Retrieval-augmented generation (RAG). nQuire platform (to gather suggestions from the disabled community).	Disabled students communicate via Taylor chatbot. Broader team collaboration via a range of collaboration apps.
University of Cape Town (Briony Chisholm PhD	WhatsApp-based Antiretroviral Therapy (ART) microlearning provided to rural	Provide evolving HIV and TB treatment protocol training to healthcare workers in remote clinics	ART specialist trainer(s). Community healthcare workers and nurses in remote, rural clinics.	WhatsApp messaging application.	Training and learner collaboration conducted using WhatsApp (including voice notes).

Institution	Description	Purpose	Learning community	Technologies	Modes of collaboration
study) (South Africa)	healthcare workers in remote clinics.	who face barriers to training access. Deliver microlearning to healthcare workers using the WhatsApp messaging app, during lunchtimes. Enable nurses and healthcare workers to engage with each other and with the trainer, during and after microlearning sessions.	Briony Chisholm (PhD Candidate and project designer). Medicines Information Centre (MIC) in the Division of Clinical Pharmacology at the University of Cape Town. National HIV and TB Healthcare Worker Hotline.		Face-to-face focus group meetings.
University of New South Wales (Australia)	Academic Success Monitor to: • Use data insights for student learning and support. • Facilitate accessibility, equity, inclusion and student engagement and access to support through data analytics.	Facilitate early intervention for at-risk students and encourage student engagement and agency in learning. Support a diverse student community (including international students and First Nations students) in their learning using data analytics. Reduce drop-out risks through early identification of problems and early targeted intervention. Enable data-driven pedagogy – using data insights to tailor teaching and instruction to learners' needs.	Students from diverse backgrounds enrolled at University of New South Wales. Staff and faculty members from across the university. Student support representatives.	AI for data analytics. Machine learning. Human-centric AI-communication. Generative AI-generated outreach messages to students.	Multidisciplinary team communicates via virtual and in-person meetings. Academic and support staff communicate with students via the Academic Success Monitor app. Students and faculty also engage via university LMS.
Makerere University (Uganda)	The AI Health Lab to: • Use AI for diagnostics in low-resource healthcare settings, capacity	Enable diagnosis of diseases such as malaria and infectious diseases in low-resource healthcare settings, in the absence of	Ministry of Health (Uganda). Institutional Review Boards.	Machine learning (to train the system based on high volumes of slide images and data).	Healthcare workers and technical specialists who confirm diagnoses based on AI-powered microscopy tool collaborate via in-

Institution	Description	Purpose	Learning community	Technologies	Modes of collaboration
	building and community learning. • Undertake microscopy in the absence of technicians through an adapter for a smartphone that allows healthcare workers to photograph patients' tissue and blood samples for diagnosis (using AI and human specialist confirmation).	on-site specialists and technicians. Provide 'decision-support' tool addresses the gap in diagnostic specialization.	Ethics committees. Department of Information Technology. College of Health Sciences (MakCHS) (Makerere University). Diagnostic specialists and clinicians. Healthcare workers in remote and low-resource settings. Community members and patients in low-resource settings.	Computer-aided design (CAD). 3D printing.	person and virtual meetings.
Shanghai Open University (China)	AI and metaverse-based online teaching and community learning platform to: • Use AI and metaverse to create an interactive, intelligent education platform for virtual learning. • Facilitate an interactive, immersive learning environment for a diverse range of learners and learning.	Build a series of demonstration applications in open education covering teaching, learning, assessment, training and graduation. Support the achievement of community-based and individual learning goals. Support academic and non-academic learning and training.	Programme designers. Learners enrolled in academic (degree) programmes. Learners enrolled in virtual training programmes. Government. Universities across China and schools in remote western China.	LLMs (mainly open source). Metaverse-based platform. AI-driven data analysis. Immersive and virtual classrooms. VR devices. Mobile and laptop computing devices.	Synchronous and asynchronous communication and learning via university LMS. Personalized recommendations provided to learners from AI-powered assistants.

Purposes of CBL initiatives

Community- and project-based initiatives in the past primarily involved university students engaging with local communities to benefit from applying learning to a community need or problem, while contributing to social good in some way. Projects were typically limited to a specific class of students and a specific local community. As digital technologies have become more endemic in society and in learning, the purposes of CBL have also evolved. A trend in several case studies is the actual development of new technologies to solve social, educational or environmental problems, as a key purpose for community-based learning, project-based learning and work-integrated learning.

For instance, the AI Health Lab initiative at Makerere University tackles a countrywide social and healthcare challenge in remote and low-resource communities by developing a completely new technology to solve the problem (diagnostics in the absence of on-site specialists). While the development of the technology is central to the project, involving specialist teams of developers and experts, it also solves a critical healthcare problem that affects many communities in East Africa so the technology should have applications beyond the borders of Uganda. Furthermore, the iterative approach to improving the design and usability of the technology relies on input from healthcare practitioners who, although having no background in digital technologies, must be involved in its design to ensure that it is fit for use in real contexts. The added benefit of valuable in-service training for practitioners in remote settings became an additional goal of the project. Similarly, the Academic Success Monitor data analytics initiative developed at the University of New South Wales focuses on developing an AI-powered system that can identify students at risk of dropping out of their learning communities, while involving these students in its design and implementation.

Case studies also reveal a strong purpose of achieving access, equity, and inclusion in learning. This is because digital technologies have the potential to personalize learning, provide support to learners, and address specific barriers to learning access. In short, CBL projects of this kind have the key purpose of enabling learning. The virtual co-ops at Athabasca University are examples of such projects. Students must demonstrate competency in WIL as part of their business course or degree requirements. However, the distance learning students' remote geographic location and other commitments pose significant barriers to meeting this requirement. The AI-powered virtual co-ops provide a carefully designed and curated context for them to engage in real work challenges and decision-making. An additional learning point from this case study was that students reported that if they self-identified as having Attention Deficit and Hyperactivity Disorder (ADHD) or being on the Autism Spectrum the mode of learning was especially suited to them and improved their learning.

This point illustrates the unintended impacts of applying digital technologies in CBL learning communities. During the evaluation phase, additional benefits emerged that became meaningful for further implementation of the initiative. The iConsult initiative at Syracuse University gives international students with barriers to USA work experience opportunities to solve real business problems in the start-up community, applying their digital technology skills and acquiring verifiable work experience through the initiative. Accessibility was also a key purpose of the WhatsApp ART training project (PhD study at UCT). Remote healthcare workers need regular upskilling in evidence-based therapies and treatments for patients living with HIV and TB, but their work conditions prevent them from accessing training. Delivery of learning through a low-data, simple technology has solved the accessibility challenge and enabled these practitioners to access learning that they can apply in treating their patients with the most up-to-date protocols.

The composition of learning communities for CBL initiatives

In each case study, the learning community involved in CBL extends beyond the scope of a traditional geographical context with a group of students and a local community. Several universities innovating in the CBL space have extensive and diverse groups of students, faculty members, NGOs, government departments, community members, interdisciplinary teams, private organizations, and other participants who are involved in the initiative in some way. In addition, these learning communities evolve and grow over time. For example, the WeJump digital and leadership skills training project at CHRIST University initially involved underserved youth from a limited number of communities in India, as well as university student volunteers and faculty members who oversaw and ran the initiative. However, over time, other participants in the learning community joined the initiative as it scaled, including other universities, NGOs, and donors and supporters from other countries.

The National University of Singapore IDentfi.AI platform started as an interdisciplinary team of university specialists learning about and designing an AI-powered platform to identify drug therapies required at very short notice in a crisis context. It has since grown into an extensive learning community of diverse specialists, researchers, and experts in AI and medical research that extends beyond Singapore and includes participants from various governmental and global organizations. This is due to the scalability of the projects, but it also shows that digital technologies enable collaboration among and between learners and practitioners across extensive, non-geographically limited communities, as long as they share a common learning goal and purpose. Similarly, the development of the 'Taylor' chatbot at The Open University, started with collaboration among a learning team comprising digital experts, designers, programmers and the Disabled Students Group at the university. It grew in scope to include disabled student voices and representatives from across the globe, all forming part of a learning community that contributes to improving and extending the capacity of the chatbot and the services provided to students with special learning needs. CBL projects undertaken with the support of the Stanford Accelerator for Learning, also involve multidisciplinary teams of participants and stakeholders to solve education challenges that exist in diverse settings. Learning communities for these projects are often extensive and not limited to geographic location.

Technologies used in CBL initiatives

The case studies included in this report were selected because they integrate technologies into CBL initiatives in some way. A trend across all case studies is that community learning and collaboration are facilitated by simpler technologies such as virtual meeting applications (for example, Zoom and Google Meet), sometimes in combination with live or in-person meetings. This demonstrates that technology enables flexible collaboration to implement the project. It also enables virtual teams of learners and participants that would not exist without these technologies. The HEIs also use an LMS to deliver learning content and to facilitate interaction between faculty members and students in projects based within the HEI. For example, Open University Malaysia's LMS is the central platform for learning, but AI has been used to innovate in data analytics for learning and to personalize learning content and experiences for learners. Technology experts work closely with instructional designers and subject matter experts to tailor the most suitable learning experiences for students, including those with specific barriers to learning, such as incarcerated individuals and those living in remote communities in Borneo. Accessibility is carefully considered during the design process, with mobile applications made available for students who have smartphones instead of desktop computers or laptops. Accessibility considerations in design also impact the choice of technologies

used for the initiative. The clearest example of this is the use of WhatsApp, a low-data, simple mobile application that enables healthcare workers in underserved areas with Internet connectivity challenges to access training and learning. The lesson learned here is that 'advanced' is not always preferable; technology should be fit for purpose, and must be fit for the purpose and meet the needs of the project. Sometimes 'simpler is better'.

More sophisticated technologies such as AI, machine learning, generative AI, and LLMs are applied primarily to design specialized and personalized learning experiences, and to enable data analytics to support learning. The Open University's Taylor chatbot, the AI mentors embedded in Athabasca University virtual co-ops, and the AI-enabled prompts sent to at-risk students at the University of New South Wales are all examples of this type of application of AI and more complex evolving technologies. The Stanford Accelerator for Learning's development of virtual field trips using AI and machine learning has enabled school students to experience geographic locations and environmental contexts to which they otherwise may not have had access. This allows them to participate in broader forms of CBL, such as analysing the impact of climate change on the geography of a local community or exploring conditions in a virtual refugee camp so that they can plan targeted humanitarian responses.

In cases where advanced technologies are being used or applied to CBL projects, there should always be a human-centred approach to the design and implementation of the project. None of the projects indicates that a tipping point has been reached where AI is acting as an autonomous agent or taking over critical roles performed by humans. It is used as a means of collaboration, problem-solving and ensuring accessibility. For example, the diagnostic tool developed by Makerere University's AI Health Lab has the capability to diagnose common diseases based on large volumes of data in the form of visual slides and images on which it has been trained using AI and machine learning, but ethical considerations have ensured that its predictive diagnoses are always confirmed by a human specialist operating remotely from the site at which a patient's tissue or blood sample is analysed. Similarly, the University of New South Wales's Academic Success Monitor tool can send targeted messages to students autonomously, based on data analytics, but faculty members and support teams retain control over the process.

Technologies and modes of collaboration for learning

Technology plays a key role in how participants in the CBL initiatives collaborate and participate in learning. The key trend is that communities of learning and practice can exist and collaborate using virtual meeting applications and, in some cases, the HEI's LMS. There is typically a blended combination of asynchronous and synchronous access and participation in learning. In most cases, some face-to-face collaboration for learning is possible. For example, the WeJump initiative at CHRIST University hosts in-person workshops and training for school students, as this is a preferred mode of interaction, but it also incorporates online and virtual training and workshops into its programmes. At Athabasca University, during the interview with faculty members it was mentioned that, although the institution is a distance learning university, there are some seminars and virtual co-op discussion classes that involve synchronous participation. Students willingly participate in these classes because 'live' human interaction is preferred to entirely asynchronous interaction. To facilitate the co-design of solutions, The Graduate School of Education at Stanford University's Accelerator for Learning has an 'accelerator studio' that serves as a community of experts contributing knowledge and resources to its projects. This studio provides a structured environment where participants work together, share insights, and receive support from specialists in various fields.

Trends related to the impacts and sustainability of CBL case studies

Each institutional case study presented in this report reveals key lessons about its impact in relation to CBL and the objectives of the programme. Each initiative has certain challenges associated with its design and implementation, but these were generally addressed comprehensively to ensure sustainability and scalability of the initiatives. Sustainability is generally related to the financial and technological resources required to continue implementing an initiative and growing it to serve a wider audience or sphere of impact. It is also affected by issues such as the rapid evolution of digital technologies themselves, which means that systems need to be updated, upgraded and maintained on an ongoing basis. Several initiatives rely on grant funding, donations or sponsorships, which are potential risks for longer-term sustainability. However, once the initial design of a project or programme is established, scaling it is easier and relatively cost-effective. Table 2 below summarizes key points about the impacts, challenges and sustainability of the institutional case studies, followed by an analysis of trends identified across the initiatives.

Table 2 Summary of key impacts and lessons, and sustainability of CBL case studies

Case study	Key lessons and impact	Challenges and sustainability
Athabasca University: AI-powered virtual co-ops	• Virtual co-ops provide carefully designed and curated work experiences that enable students to engage in curated work scenarios. • Simulated work experience is strongly inclusive of students with barriers to accessing traditional learning. • AI can be leveraged to support learners in uncovering personal, cultural and business-based biases. • AI can be used to create diverse virtual characters with specific characteristics and behaviours, to enrich the learning experiences of students engaging with them. • Virtual co-ops provide a psychologically and physically safe context for students to participate in WIL. • Just-in-time learning built into the design ensures that students can apply concepts recently learnt to the WIL co-op.	• AU is exploring ways to scale the programme to reach a broader audience. • Modules can be repurposed to suit different learning programmes. • Scalability is impacted by the need for funding to develop new modules.
CHRIST (Deemed to be University): WeJump digital and leadership skills training	• Training underserved youth from diverse communities in digital competencies prepares them for social mobility and economic participation in a global workforce. • University student volunteers develop mentoring skills and are empowered through training school students in leadership skills, digital skills and inter-cultural communication. • Digital competencies enable youth from underserved communities to showcase their skills through peer teaching and open	• Institutional support from collaborating universities enables the programme to expand and reach a greater number of students. • Funding for laptops relies to a large extent on donations, which could impact scalability and sustainability. • The model itself is highly scalable and can be implemented in any context where student participants have access to the hardware and basic software apps used in training.

Case study	Key lessons and impact	Challenges and sustainability
	workshops, developing their confidence and future economic participation competencies. • Community engagement has been enhanced through broad participation in the programme. • CBL, which involves both online and offline collaboration, is a successful model for consolidating learning. • Open-source technologies such as Scratch enable students to develop programming skills without incurring extensive access costs.	• The model has been implemented in several Indian states to date.
Open University of Malaysia: Digital technologies to address diverse learner needs and increase educational accessibility through inclusive design	• CBL is embedded (with and without the use of digital technologies) in various courses and covers activities such as environmental clean-ups, educational outreach and social justice initiatives. • Digital technologies are used in learning delivery to ensure the inclusion of learners in the learning community. • Digital technologies enable remote and underserved communities to access higher education remotely. • Through digital platforms and partnerships with government agencies and non-governmental organizations, higher education opportunities are accessible to incarcerated individuals, senior adults, and members of traditionally underserved communities. • Incorporating AI into online and distance learning allows for more personalized educational experiences for a wide range of learners with different demands. • Conventional CBL activities may not intrinsically incorporate AI and digital technologies for engagement, yet these technologies enhance students' access to CBL opportunities inside their curricula and learning networks. • The use of digital technologies in the realm of education fosters inclusivity and significantly enriches community engagement in the learning process.	• Physical infrastructure and human resources. • Cloud-based platforms are used to enable the delivery of learning. • Students do not always have access to devices such as laptops, so mobile-friendly apps are available for learning using smartphones. • Modular design of learning content facilitates extensive scalability and access for large numbers of learners. • Open University Malaysia invests in regular updates of hardware and software to ensure sustainability. • Collaboration with technology and industry partners enables resource sharing, best practices and cost-effective learning delivery (through a sustainable digital ecosystem).
Stanford Graduate School of Education: Virtual field trips and simulations for humanitarian response training	• Virtual field trips have enabled thousands of learners to engage with complex social, environmental and humanitarian issues in meaningful ways. • Technologies and pedagogies based on simulations make abstract concepts more accessible to learners.	• The People Who Help Other People Learn (PWHOPL) is a seed grant to support learning programmes in which adults who are not formally qualified as teachers are involved in community development projects. • Federal research grants, foundation grants, sponsorships and individual

Case study	Key lessons and impact	Challenges and sustainability
	• Combined with research on neuroscience and learning, digital technologies such as AI and virtual simulations enable CBL across many themes and contexts. • Interdisciplinary collaboration between different faculties and specialist fields enriches the design and creation of learning solutions and initiatives that bring learners together to solve community problems. • Communities of learning are local, global and thematic. • Virtual simulations provide a context for realistic learning about populations living in crisis, enabling site analysis and responsiveness to those populations.	donations and contributions are used to develop and implement projects. • The Accelerator invests in digital infrastructure to ensure technological sustainability for future projects. • Individual projects may be highly scalable if required, but sustainability depends on income from external sources.
National University of Singapore: IDentif.AI platform	• Digital technologies and AI used in a project initiated during a global pandemic led to the growth of multidisciplinary communities of learning (globally) that formerly operated independently. • An entire ecosystem of expertise has developed from the initiative. • The AI-driven platform consolidates learning from different scientific disciplines and enables timely solutions to a problem affecting entire societies. • Bringing together a broad range of experts and entities has strengthened Singapore's readiness to handle future pandemics. • The combination of multidisciplinary experts and AI-driven technology has accelerated the process of finding combination drug therapies.	• The project initially addressed drug therapies for COVID-19 but has since been scaled to identify drug therapies for Antimicrobial resistance (AMR) and ESKAPE pathogens (highly virulent bacteria). • Challenges have been mainly related to the scientific and medical research industries which operate in strict regulatory environments, sometimes impeding the swift approval of suitable drug combination therapies and the specific types of laboratories designed for infectious disease research. • Sustainability depends on continuing collaboration and resource and knowledge sharing between stakeholder organizations and experts.
Syracuse University: iConsult Collaborative	• International and domestic students gain real work consulting experience to apply their knowledge and skills and improve their employability. • The purposeful appointment of female students to team leader roles enables women to gain experience in the technology field (where they are under-represented). • Student-led consulting in the technology field has had positive impacts on digital inclusion projects such as OurAbility – in which AI was used to enable disabled people to apply for jobs. • Project impact and communities of practice and learning have extended beyond the projects completed – enabling an ecosystem of support to the start-up community.	• The workflow approach to each project can easily be scaled to include a greater number of client projects and student participants. • iConsult Collaborative was initially developed using grant funding from the Kauffman Foundation. • Decentralized funding means that the school has autonomy over its expenditure; the Director established a budget to pay stipends to student programme managers. • The model is flexible and efficient, therefore sustainable. • One challenge is finding quality projects for students to gain maximum consulting experience, as some client requests are simpler and less complex than others.

Case study	Key lessons and impact	Challenges and sustainability
	• Several layers of community and learning have developed through the projects.	• Matching student experience from the pool of volunteers with client requests is sometimes challenging.
The Open University: 'Taylor' virtual assistant for disabled students	• Collaboration between academic researchers and the disabled community enabled the co-creation of solutions for barriers to learning experienced by the disabled community. • A formal set of policies on accessibility guides the development of technology initiatives to support inclusion, responsiveness and accessibility in learning. • AI technologies incorporated into chatbot design enable the chatbot to have personalized conversations with users and to suggest specific support to them according to their needs. • The demand for assistive technologies is growing, and Taylor's capabilities can be expanded through developments in AI technologies. • An extensive global learning community has developed from the initiative, enabling knowledge sharing and co-creation of educational solutions for the disabled community, based on principles of equity, inclusion and accessibility.	• 'Taylor' has proven scalable, able to handle a large student base with minimal manual oversight. • It has the potential for adoption at other universities. • The rapid evolution of AI technologies presents challenges and opportunities. There are rising expectations from users and the development team has to stay ahead of the curve by using LLMs and RAG technologies to enhance Taylor's capabilities. • Partnerships with external stakeholders interested in AI-driven assistive technologies enable knowledge sharing, collaboration and sustainability.
University of Cape Town (Briony Chisholm PhD study): WhatsApp-based ART microlearning for rural healthcare workers	• A 'community' is not always geographically connected; professionals working in isolation in remote contexts form a community of practice through shared experiences and shared knowledge. • Communication technologies such as WhatsApp provide platforms that enable community collaboration and engagement. • In underserved and under-resourced contexts, 'low-tech' solutions are more suitable than 'high-tech', data-hungry technologies or those that require more sophisticated or expensive hardware devices. • The training project confirmed the mentorship potential of the HIV Hotline and its staff in supporting remote healthcare workers and their patients. • WhatsApp business app used on a smartphone has accessibility features that enable learners with specific needs to participate in the training (for example, the	• Technology infrastructure was a challenge, as not all participants had reliable access to the Internet and experienced connectivity difficulties during training. • Language and terminology barriers required simplification of language used in training. • Message fatigue was reported by some participants. • The pilot was funded through an educational grant from a pharmaceutical firm. • Scalability is possible by extending the range of topics included in the training curriculum and reaching a larger group of participants. • Sustainability would depend on the future involvement of the National Department of Health, NGOs and the private sector.

Case study	Key lessons and impact	Challenges and sustainability
	ability to enlarge text for those with vision difficulties), and voice notes. • Post-evaluation of the training showed significant improvement in clinical knowledge among the group of participating healthcare workers, as well as improvements in the care offered to patients.	
University of New South Wales: Data insights for student learning and support	• Human-centred design is central to every phase of development and implementation of the Academic Success Monitor. • An iterative approach to development enables the project to adapt to feedback and yields constructive results and a sense of ownership from stakeholders. • Ethics around the use of AI and digital technologies are considered from inception right through the development of the Academic Success Monitor and any other tools that incorporate AI, including data privacy. • AI enables dynamic risk and success assessment – machine learning algorithms allow the system to continually assess each student's risk of disengagement based on historical performance data and behavioural indicators such as login frequency. • Personalized student support using AI and machine learning enables the right support to be provided to a student at the right time. • The tone of messages sent to students is appropriate to the level of risk and is always supportive and constructive. • Students, faculty members and central support teams have their own dashboards to interface with the system. • AI can be used effectively to design systems that support equity and engagement within a learning community. • Faculty members benefit from reduced cognitive load as data analysis about student learning is automated. • Students have been shown to be more engaged in their learning and to experience greater agency after adopting the Academic Success Monitor.	• Large-scale data integration is complex, requiring significant backend coordination with multiple stakeholders to create a unified data lake. • Capacity building was a challenge in the initial stages of the project (faculty members needed training on how to interpret data insights effectively). • The initiative is highly scalable, and the pilot has proven successful across several faculties. It can be launched university-wide. • The project team has plans to integrate additional support services such as mental health resources and language assistance (the Academic Success Monitor can be expanded). • The university invested in project development over three years and has a budget for ongoing operational costs.
Makerere University: AI Health Lab for diagnostics in low-	• AI and machine learning were leveraged to design an innovative tool for diagnosing infectious diseases and malaria in resource-limited contexts.	• New technologies were unfamiliar to field practitioners, who needed training and support to use them.

Case study	Key lessons and impact	Challenges and sustainability
resource healthcare settings	• Multidisciplinary teams were involved in developing the tools, and these grew and developed into broader professional communities with no geographic limitations. • AI-driven diagnostic tools were harnessed to enhance professional learning for healthcare practitioners who face barriers to traditional learning due to geographical factors; the project has had a strong learning impact on the healthcare sector. • Human specialization remains the key factor in confirming diagnoses; although algorithms are trained on large visual data sets of sample tissue slides, and AI can perform diagnoses, ethics dictate that these are always confirmed by human specialists who view the slides. • An unintended impact has been that laypeople in local communities have had an opportunity to become familiar with the types of advanced digital technologies that may become more prominent in their lives in the future.	• In some settings, the local community had some fears about these new technologies being used in their local clinics, so project team members had to hold meetings and workshops with community leaders to explain how the technologies should be used in clinical settings to support healthcare. • An iterative approach had to be adopted to improve the design of the technology, as users practised using the tools in the field. • Long-term sustainability of the project is at risk as it is currently dependent on short-term grants and funding.
Shanghai Open University: AI and Metaverse-based Online Teaching and Community Learning Platform	• Open and distance education serves individual, social and economic needs, including among older members of society. • AI and metaverse-based online teaching and learning serves a broad spectrum of learners. • AI tools used in open and distance education can be harnessed to increase access to lifelong learning opportunities for people throughout their lives. • Metaverse-based learning enables personalized learning and support, at scale, for learners in academic and non-academic learning and training programmes.	• Sustainability is ensured through significant investment in technology tools and infrastructure for scaled online learning by government and the institution.

Emerging trends

Each case study has specific impacts that were apparent during the implementation of the project and that emerged during the evaluation. A few key trends emerge from across the case studies. The first is that CBL projects and initiatives have both intended and unintended impacts. Where technologies are applied in CBL, there is a sense of an 'evolving' impact that has been enabled by the technologies in some way. One consequence of this is that, unlike in the past when technologies were not extensively applied to CBL, it is not useful to limit the assessment or measurement of learning or project outcomes to the initial intended purpose. Learning communities should instead be open to other outcomes that may emerge from the project.

For example, Athabasca University's virtual co-ops had several positive but unintended impacts on learners with Autism; although the co-ops were not designed to be specifically inclusive of students identifying themselves as being on the Autism Spectrum, the modes of learning made the initiatives highly accessible to them. Had the faculty members and designers taken a more restricted approach to assessing the outcomes of the project, they would not have become aware of this benefit. The iConsult Collaborative at Syracuse University was initially intended to give students opportunities to gain business consulting skills. An unintended impact was the development of an ecosystem of business support in the start-up community, and 'returning clients' who subsequently requested further consulting services and contributed word-of-mouth advertising for the Collaborative's work in the business community. National University of Singapore's IDentif.AI platform was initially intended to solve the problem of urgent need to drug pairings to treat patients during a global pandemic. Another unintended impact was that the initiative has now scaled into a global initiative and involves diverse multidisciplinary teams working on drug therapies for other diseases, and facilitating pandemic readiness in Singapore. The 'Taylor' chatbot at The Open University, was initially designed to enable students in the disabled community to disclose information about themselves to the university to access support. An unintended impact was that users would demand greater capability of Taylor, which can be addressed through evolving technologies such as machine learning to train the chatbot. Prior to the adoption of digital technologies in CBL projects, evaluation and assessment of project and learning outcomes was more straightforward, with an expectation that what transpired during the project would be connected tightly to the curriculum. However, deploying digital technologies in these projects requires a more flexible, experimental and iterative approach to learning.

A second key trend is that the communities of learning tend to be diverse and may even grow and evolve as projects evolve. This may partly be because several case studies while being engaged in knowledge and technology production create a platform serves as a locus for learning. Examples are the AI Health Lab at Makerere University, in which the CBL is focused on an iterative approach to developing a tool to support disease diagnosis; the AI-powered virtual co-ops at Athabasca University, which are developing specific intellectual in the form of modular co-ops; and the Academic Success Monitor at the University of New South Wales. Each of these projects has several key objectives, such as solving a healthcare problem or improving student engagement in learning, but also includes technology and knowledge production as an outcome. Participants join the learning community as and when their expertise or input is needed. Linked to this, case studies further illustrate that everyone is a learner. Faculty members from different disciplines learn from one another; students co-create technologies and solutions to problems with their teachers and with other community members; and different fields of specialization can share knowledge and enhance their own practice. In this sense, knowledge sharing is a common outcome evident in each project, occurring in multiple directions.

A third trend is that advanced technologies are primarily effective not necessarily in scaling mass delivery of learning (although this is possible), but in facilitating personalized and individualized learning experiences enabled by data analytics. Several case studies have had issues of accessibility, equity and inclusion as features of their projects, and the design teams have used advanced technologies such as AI and machine learning to support equity, inclusion and accessibility, especially for communities of learners who have specific barriers to learning or participation in the workforce.

Challenges and sustainability

A common challenge identified across almost all the case studies is that technology can be costly, so sustainability and scalability often depend on multiple sources of funding. HEIs that plan to extend CBL projects harnessing technologies or to use technologies to enhance existing CBL initiatives need to secure sustainable sources for funding the development and use of these technologies. There are also ongoing operational costs related to maintaining technology. For instance, the University of New South Wales has created a budget for the operating costs related to its Academic Success Monitor project, to ensure sustainability. However, other initiatives, such as the AI Health Lab at Makerere University and the development of virtual co-ops at Athabasca University, rely on grants and short-term funding for development, which puts their sustainability and scalability at risk. The WeJump initiative at CHRIST University relies on external partnerships and sponsorships to provide hardware to students who participate in its trainings and workshops. Although the costs of technologies tend to reduce over time with increased uptake (as noted by the team at the University of New South Wales), one potential challenge is that digital technologies are evolving extremely rapidly, which may require constant updating of systems, purchasing of new software applications and tools, and staff upskilling across the scope of the initiative.

Connected to the challenges of fast-changing technology is the issue of capacity building. In several case studies, participants noted that where new technologies were introduced in CBL projects members of the learning community had to be trained to use them. Makerere University's AI Health Lab project is a good example of an initiative that involves members of very rural and underserved communities who are suspicious of technology. Therefore, it is difficult to get their support for using technology in their local healthcare sites. The project team had to add a layer of capacity building that involved arranging meetings with community leaders to explain the technologies to them before these could be implemented in the clinics. Implementing Academic Success Monitor at the University of New South Wales also required careful consideration of capacity building to upskill faculty members in interpreting data to gain insight into student engagement. In the National University of Singapore IDentifi.AI project, biomedical engineers had to learn about the nature of clinical settings so that they could effectively engage in identifying suitable drug therapies.

Each case study has the potential for scalability, and some have already proven scalable, enabled by digital technologies. This is a significant trend, especially in projects that have a large potential scope for impact, such as healthcare contexts in rural and remote communities in Africa.

Another trend that became apparent during the interviews and collation of the case studies is that in many cases the projects were not initiated through department- or institution-wide planning but by passionate individuals who saw opportunities to design these initiatives and demonstrated personal leadership in initiating and driving them. Furthermore, when additional case studies of interest and innovation were identified during desk research, there were several instances in which an individual who had led a project was no longer associated with that institution, and there was no other person driving it in their absence. This 'personal passion project' characteristic of innovative CBL initiatives poses a risk to the sustainability of effective projects unless their implementation includes specific planning for continuity and sustainability that does not rely on the autonomy and leadership of one or two people.

4 Recommendations for further development of CBL

The Third Mission of HEIs, as well as the rapid global transition to a digital and knowledge-based society, establishes a foundation for CBL (in its various forms) to become a core function of HEIs. The expectation that HEIs play a pivotal role in research, knowledge production and the development of new technologies to contribute to social, economic, environmental and cultural development for the wellbeing of the global population far exceeds the traditional notion of social responsibility in HEIs as 'outreach'. Case studies in this report demonstrate this call for a Third Mission – that HEIs should embed CBL and social responsibility into their core missions. Case studies also demonstrate that digital technologies can be deployed very usefully in CBL activities and projects, but that they need to be context-specific and focused on serving human needs.

Several recommendations for developing CBL in open and traditional HEIs can be drawn from the case studies and the literature reviewed.

1) **HEIs should join or establish regional and global networks to support the achievement of their TM.** There exist several coalitions, networks, and associations aimed at sharing knowledge in the areas of CBL and service learning and supporting initiatives undertaken at HEIs for the greater good. Sharing knowledge and resources allows HEIs to benefit from grants and funding secured under these formalized networks of collaboration, enabling them to support CBL initiatives that fit their own mission and context.

2) **CBL and service learning should be institutionalized at HEIs, guided by clear policies.** For HEIs to adopt social responsibility as a core function alongside research and teaching, they should formalize this function through policy. However, such policies should not constrain an iterative, dynamic and organic approach to CBL within university departments to address the learning needs of students, faculty and society, as opportunities for CBL initiatives may occur in response to changing circumstances, and new problems and challenges. The EASLHE, for instance, proposes (at the institutional level) nine policy recommendations for service learning, including representing service learning in the HEI's strategy plan, ensuring the sustainability of service learning projects, and appointing a service learning committee to formulate, review, and recommend general HEI curricula, operational guidelines, policies and tools and criteria for evaluating service learning. Through this process, service learning or CBL at the HEI is clearly differentiated from 'outreach', which may not include CBL and may have no expectation of sustainability. Participants who were interviewed for this report noted that their institutions have policies on digital technology use, and in some cases, there are guidelines for CBL activities. However, the autonomy of HEI departments and colleges (such as at Syracuse University and Stanford University, for instance) results in a more 'organic' approach to CBL, often initiated by individual faculty members with a specific interest in service and experiential learning projects.

3) **CBL, and the concept of 'community', should be broadly defined by the HEI, as it may take many forms in the digital age.** Digital technologies have eroded geographical borders and expanded communities of interest beyond the local community. Evidence and examples of international alliances and coalitions established to promote and support CBL illustrate the idea that communities of practice, interest and inquiry now exist virtually, facilitated by collaborative technologies. This is further reflected in the case studies included in this report. For example, the Identif.AI platform developed at the National University of Singapore now comprises a global community of practice and learning, facilitated by AI and simple digital technologies that enable

'live' and asynchronous collaboration. Several case studies also illustrate how faculty members themselves as learners making up a learning community, as they collaborate to solve a problem or create new knowledge by applying their expertise across multidisciplinary specializations. This deviates from a more traditional notion of service learning and CBL involving a teacher or faculty member as one category of members that manage CBL, with students being learners within the community. CBL may be applied to any community of practice that has a specific goal to solve a problem for greater good.

4) **Where digital technologies are applied in CBL, they need to be context-appropriate; sometimes 'less is more'.** Wherever technology is deployed in CBL projects, especially in resource-constrained communities and contexts, the availability of hardware, software and Internet access may be problematic for learners and learning programmes. The success of initiatives thus depends on selecting digital technology suitable for those contexts and learners. Programme design should prioritise the existing availability of digital infrastructure and how technology resources will be provided to learners if necessary. For example, the PhD study involving training delivered through messaging app WhatsApp to a community of CHWs in a rural province of South Africa illustrates the importance of clearly understanding the context of the community to select an appropriate technology to facilitate the CBL project. Athabasca University students participating in virtual co-ops, face similar challenges in accessing the virtual project if they live in remote communities or on Indigenous Reserves. The university is working on ways to make the CBL project accessible to them. Makerere University AI Health Lab project also had to consider the simple technologies already available to remote health workers – such as mobile phones – and tailor its diagnostic tools to fit those simple technologies.

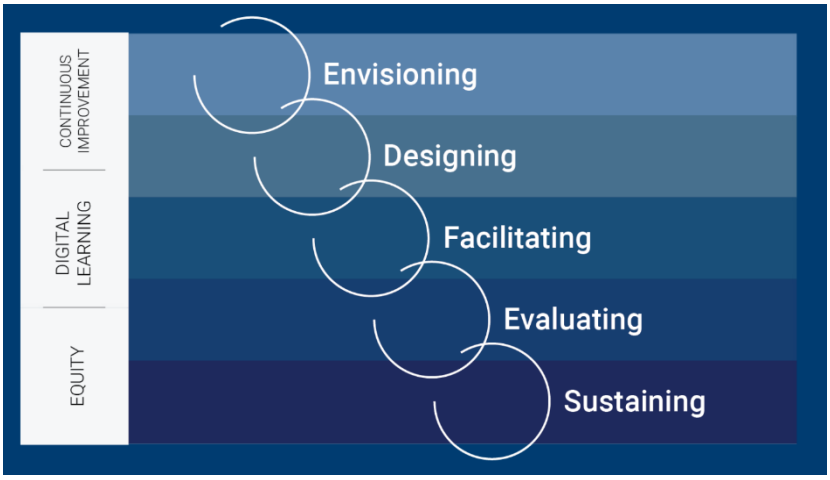
5) **The institution should have a well-established digital infrastructure for CBL initiatives involving the use of these technologies.** Where an HEI intends to launch a large-scale initiative using advanced digital technologies for CBL, it needs to ensure investment in its own technological infrastructure to support the initiative, and ensure that the maintenance of the infrastructure is sustainable. The Open University Malaysia case study demonstrates, for example, that in order to achieve the goal of making learning accessible to large numbers of students, and having the capacity to personalize that learning, the institution must ensure that there is suitable infrastructure in place to enable the achievement of these goals.

6) **Financial sustainability of the CBL project or programme should be secured during the planning phase, as far as possible.** CBL initiatives that rely on digital technologies inevitably incur costs for acquiring, maintaining and upgrading the hardware and software required to deliver learning. These costs can be significant and prohibitive in some situations. Resourcing is a challenge that is likely to be faced by open universities in particular, especially if their budgets are limited and their fee structures and revenue do not allow for extensive digital innovation. It is thus critical that project designers perform thorough cost analyses for the infrastructure and secure the financial resources to roll out, sustain and scale the initiative (where relevant). Several participants from the case studies indicated, for example, that their projects were initially funded by grants, but that there was no long-term, secure access to resources for maintaining or scaling the project. One exception was the University of New South Wales, where a clear vision and strategy for data analytics for learning initiative was established across the institution, with allocated resourcing that will last well beyond the pilot and early phases of the initiative.

7) **The institution should consider equity, accessibility, and inclusion as key principles in CBL planning and delivery.** Access and inclusion are essential for learners to engage in CBL or any community of learning. In many cases, accessibility and personalized learning are, in fact, the core objectives of CBL initiatives for learners facing barriers to learning. These principles should be applied where digital technologies are used for learning, as the technologies themselves may pose accessibility challenges for learners. The case studies included in this report all illustrate these principles to some degree. For example, the Taylor chatbot at The Open University enables disabled students to disclose information about themselves to the institution, so that they can receive appropriate support. Through the process of developing Taylor, a multidisciplinary design and development team forged extensive communities of practice within the disabled community, contributing their needs and ideas to the development of the chatbot. Although inclusion was not initially a design consideration in the virtual co-ops, participants who self-identified as having ADHD and Autism reported that the modality of learning and engagement were well suited to their learning needs. Makerere University AI Health Lab project acknowledges that some healthcare practitioners in underserved communities need to receive capacity training to enable them to use innovative technologies for diagnostics.

8) **CBL projects should be designed and implemented using a suitable methodology and approach to ensure sustainability.** Different design approaches may be adopted for different types of projects and programmes. A useful one that can be applied in most CBL contexts is Adams et al. communities of practice lifecycle, illustrated below. The focus is on a clearly structured process to implement the project, from envisioning it to sustaining it, with equity, continuous improvement digital learning as foundational principles. The team at the University of New South Wales repeatedly referred to the human-centric design of their data analytics for learning initiative. This principle was evident in other case studies as well.

Figure 1 Communities of practice lifecycle[9]



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Annex 1: Case studies of innovative practice

AI-powered virtual work co-operatives: Athabasca University

Key impacts and lessons related to community-based learning

- Diverse and dynamic communities of engagement have evolved from the virtual work co-operatives initiative.
- AI-powered virtual co-operatives can provide richer and more meaningful workplace experiences than traditional on-site work placements.
- AI is leveraged to assist students in uncovering personal, cultural and business biases.
- Virtual co-operatives are particularly supportive as a modality for students who self-identify as being Autistic and/or having Attention Deficit and Hyperactivity Disorder (ADHD).
- Virtual co-operatives are a form of exploratory learning environment (ELE) that harnesses AI for optimal learning experiences.

Context

Athabasca University[10] is Canada's first open university and a leader in asynchronous and online distance education. Athabasca University has a diverse student population. The average age of undergraduate students enrolled in business programmes and degrees is 33, with 70 per cent of the students being first-in-family or first-generation to pursue higher education. Many students have full-time jobs and other commitments, such as being single parents, who attend classes late in the evening. Some students are in remote parts of Canada, including its north, and some are First Nations students living on Reserves. Many distance-learning students face limitations and barriers related to work placements because of their remote geographic location, family commitments and full-time work commitments.

Athabasca University has developed a programme that uses AI to deliver virtual work co-operative (co-op) experiences for students who face barriers participating in traditional work-integrated learning (WIL) and co-op[11] placements.

Programme objective

Athabasca University's Faculty of Business developed four AI-powered virtual work co-ops to address the challenges students might face in meeting WIL requirements. These co-ops offer students simulated workplace experiences designed to provide a meaningful, more enriching experience than those sometimes found in real-world work environments where students' work experiences may be limited to activities such as filing and making coffee, and there is little control over the scope of experience offered to them by the workplace.

Community-based and affective learning

The virtual co-ops nurture an alternative form of community within a virtual environment. The virtual spaces create opportunities for students to engage in affective learning, building emotional

[10] https://www.athabascau.ca/

[11] A co-operative is a form of work-integrated learning in which a student is placed in a workplace environment to apply the knowledge and skills they learn through an academic programme.

resilience and interpersonal skills. This approach aligns with the Indigenous concept of community, which Athabasca University emphasizes in other programmes designed for Indigenous students by Indigenous educators. Although not explicitly community-based in the geographic sense, AI virtual co-ops of Athabasca University build a virtual network of shared learning experiences, particularly among students from remote and underserved regions.

Programme design and features

Virtual co-ops operate as workplace simulations within several business contexts and cover different themes, such as financial services, construction and sustainability. These simulations are developed in collaboration with Ametros Learning [12], a specialized AI education vendor. The Athabasca University team and Ametros Learning co-create content and design scenarios, with the university retaining intellectual property (IP) rights over custom modules. Ametros manages the underlying AI technology. The structure of these virtual co-ops combines narrative-driven tasks, AI-guided character interactions, and problem-based learning to create an immersive environment. The existing technology requires students to type responses into the programme, which is accessed via the university Learning Management System (LMS).

Each co-op module includes multiple tasks for the student to perform, with three to four AI-led interactions per task, enabling students to refine their responses iteratively based on coaching from a virtual mentor. An AI 'mentor' is programmed into the current co-op design work using generative AI. The students engage with this virtual mentor as they solve problems and interact with the virtual work context, with the virtual mentor providing prompts, suggestions and support.

In the sustainability co-op, for instance, students evaluate vendors on ethical grounds and encounter the AI mentor who encourages them to consider sustainability from multiple perspectives. The system prompts students for further elaboration if their responses do not meet specific criteria, engaging them in multiple feedback cycles to support critical thinking and problem-solving. This AI-based feedback system pushes students to think beyond initial assumptions, fostering more profound learning outcomes. These adaptive learning interactions are paired with instructor oversight, allowing teaching assistants to monitor student progress and intervene when necessary. This is an important feature, as it emphasizes the need to have human oversight and judgement in the process. The virtual mentor is not the 'authority' in the learning process.

Machine learning refines interactions based on student responses. The initial versions of AI had limitations, such as difficulty in recognizing synonyms in student inputs. AI was not as capable as a human teacher in interpreting some student responses. The adaptability of AI has since improved, and newer generative AI models have enhanced their responsiveness.

The development team does a lot of background work and collaboration with organizations such as Ernst & Young Canada's Neurodiversity Centres of Excellence[13] to ensure that the information, data, and scripts on which AI mentors are trained are valid, reliable, accurate, and appropriately responsive to students.

One significant benefit of virtual co-ops is that specific workplace issues can be programmed into the co-op. In traditional WIL placements, there is no guarantee of the kind of experience students will encounter or whether they will get to apply the specific knowledge and skills they gain in their

[12] https://www.ametroslearning.com/
[13] https://www.ey.com/en_ca/insights/consulting/neurodiversity-centres-of-excellence-ey-canada

courses. There is little control (from the university side) over the extent to which students have a positive or negative experience. Each co-op focuses on specific roles and challenges within a workplace context, designed to build practical skills and encourage critical thinking. For example, students in the financial services co-op interact with an AI character named Charles, a deliberately challenging figure who embodies a stereotypical 'difficult boss'. Charles's interactions are intentionally uncomfortable, prompting students to navigate affective learning tasks that reflect real workplace dynamics, such as managing stress and responding to unethical requests from superiors. These tasks are designed to evoke emotional responses, allowing students to practise self-regulation, decision-making, and ethical judgment in a safe, controlled environment.

Another unique feature of Athabasca University's virtual co-ops is their application of just-in-time learning. Students receive educational content tailored to each scenario, which they must then apply immediately to the task at hand. This model of learning and doing aligns with the cognitive and affective needs of the student body at Athabasca, particularly benefiting students living with challenges such as ADHD and autism, who thrive in a structured, interactive format that minimizes cognitive overload. The simulation platform also follows global accessibility conventions to ensure more equitable access.

The virtual co-ops also address critical social issues through simulation design. In the financial services module, for example, students must choose between an Indigenous-owned vendor and a mainstream financial services provider. Typically they choose the non-Indigenous vendor despite its lesser suitability, revealing underlying biases that students later unpack in facilitated discussions. The experience thus enables students to uncover their own inherent biases.

By embedding AI-powered characters who embody diverse experiences, virtual co-ops at Athabasca University foster empathy and cultural competence, aligning with the university mission to support inclusivity. For instance, the construction services module includes a character facing gender discrimination, while the sustainability co-op addresses autism and neurodiversity. These modules are designed not only to simulate real-world scenarios but also to encourage students to think critically about equity, ethics, and sustainability in the workplace.

Challenges

The development and sustainability of the virtual co-op programme faced several technical and financial challenges. The programme was originally funded through external grants, and the university continues to rely on this funding model but acknowledges that it may not be sustainable in the long term. The Royal Bank of Canada has been a consistent sponsor. There are concerns about the ongoing costs of maintaining and upgrading the AI infrastructure. As technology evolves, the project team faces pressure to update simulations to ensure relevance and functionality, particularly as LLMs and new AI platforms replace earlier systems.

Student fees cover some of the subscription costs but not the development costs, complicating the programme's financial sustainability. While Athabasca University strives to keep costs low, there is an inherent tension between providing a high-quality learning experience and minimizing expenses. Reliance on user fees creates challenges, especially as the institution seeks to make its resources accessible to all students, including those from underserved communities.

Connectivity issues can pose challenges, particularly for rural and remote learners, who may have limited Internet access. While the simulations are designed to function asynchronously, students need to attend synchronous sessions outside of the co-op experience, which require stable Internet

connections, potentially excluding students from participation. Athabasca University is exploring alternative delivery methods to accommodate students who cannot reliably access synchronous sessions.

Evaluation and impacts

Multiple methods are used to evaluate the effectiveness of the co-ops. Student feedback is gathered through surveys and qualitative research, providing insights into the programme's impact on learning outcomes. One key area of focus is affective learning, as students frequently report personal growth in areas such as empathy, ethical judgment, and cultural awareness. Additional impacts of the co-op experiences and education include:

1) Strengthening leadership skills, teamwork, communication, innovation, critical thinking, and decision-making
2) Building lifelong interpersonal and business skills
3) Developing soft and hard management skills
4) Meeting employers' needs for work-ready graduates.

Graduates often return to Athabasca University seeking further guidance or professional references, indicating that the programme enhances learning outcomes and fosters enduring relationships with the university.

Scalability

Athabasca University is exploring ways to expand and scale the programme to reach a wider audience. The sustainability module, for example, has been redesigned to be easily adapted and used in various courses. The university has repurposed several modules of the virtual co-ops to provide learning experiences for Grade 10 and 11 students in an online programme provided by Athabasca University and SHAD Canada[14] .

Conclusion

Athabasca University's virtual co-ops are a model for inclusion and immersive learning for students who face barriers to WIL for various reasons. By embedding social, ethical, and cultural challenges into the simulations, Athabasca University not only prepares students for the workforce but also nurtures empathy, self-awareness, and cultural competence.

WeJump: Achieving equity and eradicating poverty through nurturing leadership and digital competencies in underserved youth: CHRIST (Deemed to be University)

Key impacts and lessons related to community-based learning:

- Training underserved youth from diverse communities in digital competencies prepares them for participation in the global workforce.
- Involving university student volunteers in training younger students in leadership skills, digital skills and inter-cultural communication is an effective model for mentoring and empowerment.

[14] SHAD Canada is a month-long, hands-on summer enrichment programme for grade 10 and 11 students. Its focus areas are STEAM education and entrepreneurship development. https://www.shad.ca/

- Digital competencies allow youth from underserved communities to demonstrate their skills through peer teaching and open workshops, developing their confidence and future economic participation competencies.
- CBL, which combines both online and offline collaboration, is a successful model for consolidating learning.

Context

CHRIST (Deemed to be University) was established as 'Christ College' in 1969 in Bangalore, India. In 2008, it was declared a Deemed to be University, as CHRIST University, under Section 3 of the University Grants Commission of India. It ranks among the top 100 universities in India in 2024 according to the National Institutional Ranking Framework (NIRF)[15] of the Ministry of Education. CHRIST University offers bachelor, master and doctoral programmes in humanities, social sciences, sciences, commerce, management, engineering, architecture, and law, serving around 37,000 diverse students from 60 countries. The institution focuses on the holistic development of students, with an emphasis on Christian values.

Two core values of CHRIST University are social responsibility and love of fellow beings. These values are represented in the university's CBL initiatives. One of these initiatives, WeJump.org[16], was established in Bengaluru in 2021. The mission of WeJump is to empower youth in underserved communities with digital competence, leadership skills, and social mindfulness. The initiative leverages digital tools and technologies to enhance students' educational experience and prepare them to become global leaders. Over time, WeJump has expanded its reach to multiple states in India and international collaborations with universities from India, South Korea, and Germany. It emphasizes leadership training, digital literacy, and cross-cultural collaboration, ensuring that students from diverse socioeconomic backgrounds can thrive. The initiative also distributes laptops to youth, creating equitable access to learning tools.

Objectives

WeJump has five high-level objectives to address specific educational and societal challenges: (1) Empowering youth with digital skills by equipping students from underserved backgrounds with essential digital skills. These skills include proficiency in office and multimedia tools, and basic programming, thereby improving their employability and social mobility. (2) Fostering changemaking leadership by training students to become Jump-Makers (JMs), empowering them to teach and lead their peers in digital learning environments. (3) Promoting global citizenship by encouraging mutual respect and cross-cultural collaboration through connecting Indian students with university volunteers and peers from different countries. (4) Reducing socioeconomic barriers by providing equitable access to digital education for all students, irrespective of their financial background. (5) Creating a sustainable global network by establishing a global network of students, educators, and professionals dedicated to lifelong learning, leadership development, and community engagement.

CBL model

In the context of WeJump, CBL refers to a collaborative, inclusive learning model where students from various backgrounds work together on common projects, share knowledge, and build leadership. The model transcends traditional classroom settings by integrating digital education,

[15] https://www.nirfindia.org/Rankings/2024/Ranking.html
[16] https://www.wejump.org/

leadership development, and social responsibility. It focuses on building intergenerational and interdisciplinary support networks that include not only students but also teachers, parents, university volunteers and professionals. These diverse groups work together to bridge social and economic divides, ensuring that everyone has the opportunity to learn, grow, and contribute meaningfully to their communities. The inclusion of youth in these collaborative learning environments helps to break down socioeconomic barriers. Through these shared experiences, students cultivate mutual respect and leadership, preparing them for future challenges in an interconnected world.

Design, modes of interaction and key technology components of the initiative

The WeJump initiative is built around three pillars: (1) Globally Connected, (2) Professionally Trained, and (3) Socially Engaged (G.P.S). Each of these pillars plays a crucial role in the comprehensive design of the initiative.

WeJump incorporates advanced digital tools and AI to facilitate personalized learning experiences and support skill-building in programming and multimedia. University volunteer students and instructors from CHRIST University and other global universities work with school-aged students who are admitted to the programme. Young students begin their digital learning journey using accessible platforms such as Scratch (a free block-based programming application for children)[17] and MIT App Inventor[18] to learn the fundamentals of programming. As they progress, they are introduced to Python and web programming, allowing them to create solutions with a global reach. Generative AI applications such as Open AI ChatGPT[19] and Dall-E[20] are used for interactive learning and creative content generation, enabling students to enhance their programming skills. Students learn multimedia content creation through tools like Canva[21] and ClipChamp[22], which integrate AI features for video editing and image enhancement. These tools empower students to produce high-quality digital content, encouraging creativity and skill diversification.

WeJump provides the resources needed to support large-scale, geographically dispersed learning. The initiative provides laptops with appropriate RAM, SSD, and CPU configurations to JMs so that they can participate in online learning. Google Classroom, a cloud-based LMS, is used to facilitate content delivery, track student progress, and support collaborative learning, making learning programmes location-independent. Online collaboration, workshops and virtual meetings are facilitated through platforms such as Google Drive, Zoom, and Google Meet.

Participants interact online and offline for the WeJump Academy for Youth. Its Weekly Online Digital Education (WODE) programme uses tools like Zoom and Google Classroom to facilitate interactive learning sessions. Students engage with their peers and instructors, participate in language exchanges, and collaborate on digital projects in real time. WeJump International Language classes also allow students to practice new international languages and strengthen their cross-cultural communication skills.

[17] https://scratch.mit.edu/
[18] https://appinventor.mit.edu/
[19] https://chatgpt.com/
[20] https://openai.com/index/dall-e-2/
[21] https://www.canva.com/
[22] https://clipchamp.com/en/

Three times per year, WeJump also organizes WeJump Open Workshops (WOWs). Students attend these in person and participate in hands-on activities. Additionally, JMs conduct weekly digital classes in their schools, enabling peer-led learning and reinforcing leadership skills within the community. Mentorship is another feature: Each JM is paired with a mentor from the university volunteer team or teacher community. Mentors provide continuous feedback and support, fostering a collaborative learning environment that encourages growth and improvement.

Funding

WeJump is a non-profit initiative that relies on institutional support, donations, and partnerships to fund its activities. Institutional support is provided by HEIs such as CHRIST University, Seoul Women's University, Women's Christian College and Chonnam National University, which provide funding, technology platforms and expertise to support the initiative's operations and growth. Donations and sponsorships from individuals and other organizations are used to purchase laptops, fund workshops, and cover operational expenses.

Impacts

WeJump evaluates its impact to ensure it meets its objectives through several methods that include student progress tracking by digital portfolio assessment (students maintain personal websites to showcase their projects); JM leadership evaluation conducted by peers and instructors; and pre- and post-assessments of workshops. Findings from these evaluations indicate that students are consistently improving their digital literacy and leadership capabilities through the WeJump initiative. The impact on their personal growth and community engagement has been significant, contributing to WeJump's reputation as a transformative programme that has successfully grown and scaled. It was ranked 39th among the most innovative university programmes by WURI[23] in 2023.[24]

Scalability and sustainability

WeJump has proven its scalability, by expanding its operations across multiple Indian states and establishing international collaborations with universities in South Korea and Germany and an NGO in the USA.

Conclusion

The WeJump initiative is a holistic CBL model that combines digital education, leadership development, and social responsibility. Through accessible digital tools and structured mentorship, it equips underserved youth with the skills they need to succeed in the global workforce and contribute to their communities. By fostering a sense of ownership and global citizenship among students, WeJump not only breaks down socioeconomic barriers but also promotes a sustainable, community-driven approach to education. As it expands globally, WeJump has the potential to create a generation of digitally competent, socially responsible leaders prepared for an interconnected world.

[2323] https://www.wuri.world/

[24] https://www.wuri.world/2023-global-top-100

Leveraging Digital Learning Technologies to Address Diverse Learner Needs and Evolving Educational Accessibility: Open University of Malaysia

Key impacts and lessons related to community-based learning

- Digital technologies used to deliver learning programmes enable remote and underserved communities to access higher education.
- Through digital platforms and partnerships with government agencies and non-governmental organizations, higher education opportunities are accessible to incarcerated individuals, senior adults, and members of traditionally underserved communities.
- Incorporating AI into online and distance learning allows for more personalized educational experiences for a wide range of learners with different demands.
- Conventional CBL activities may not inherently incorporate AI and digital technologies for engagement, yet these technologies enhance students' access to CBL opportunities inside their curricula and learning networks.
- The use of digital technologies in the realm of education fosters inclusion and significantly enriches community engagement in the learning process.

Context

Open University Malaysia[25] is an open, distance and digital education university with the motto 'university for all'. Established in 2001, it is Malaysia's first open and distance higher education institution. Open University Malaysia serves a diverse range of students from Asia, Europe and Africa, offering enrolment options through both the traditional route and the Accreditation of Prior Experiential Learning, which recognizes the significance of real-world experience. The profiles of students encompass working professionals, stay-at-home parents, school leavers, retirees, prisoners, and tribal learners residing in the remote areas of Borneo.

The university acknowledges that open and distance learning students have diverse learning needs. To improve learning experience for its diverse student population, Open University Malaysia has established a digital learning innovation initiative that leverages advanced digital technologies. The initiative arose in response to several educational and logistical challenges, such as limited access to digital resources, geographic isolation of students, and the need for an interactive online learning environment. The COVID-19 pandemic intensified the demand for online learning solutions. Open University Malaysia recognized the need to address these issues through digital innovation. The initiative is led by the Centre for Instructional Design and Technology (CiDT)[26], a multidisciplinary team comprising instructional designers, multimedia programmers, graphic designers, and educational experts. The CiDT is responsible for creating engaging, interactive, and accessible digital learning materials tailored to the needs of a wide range of students, including individuals in underserved communities, and learners with specific learning challenges. The project's primary focus is on leveraging AI-driven tools and advanced digital platforms to foster an inclusive, flexible, and engaging learning environment suited to the demands of modern education.

[25] https://www.oum.edu.my/
[26] https://cidt.oum.edu.my/

Objectives

Open University Malaysia's digital learning technologies initiative has six high-level objectives: (1) to enhance learner engagement by creating an engaging and interactive learning experience using digital technologies; (2) to improve learning outcomes by enhancing student learning; (3) to support flexible learning by using digital technologies to create a range of learning opportunities and experiences for students; (4) to foster collaboration and community by engaging learners and instructors using digital platforms; (5) to provide personalized learning experiences for students using data-driven insights; and (6) to stay current with technological advancements by exploring and adopting new technologies (for example, AI-generated videos and graphics used in learning materials and learning design).

CBL at Open University Malaysia

The respondents at Open University Malaysia define community-based learning as an approach that integrates academic study with active community engagement. The university promotes the importance of applying theoretical knowledge to real-world issues, which not only benefits students but also contributes to societal development. There are four key aspects to CBL at Open University Malaysia. The first is collaborative partnerships with local organizations such as the NGO *Sekretariat Malaysia Prihatin*, to deliver programmes such as Learning is Fun (LiF)[27]. This annual programme, which has been running for over a decade, aims to support community-based projects and includes activities that foster educational and social development. The second aspect is curriculum integration. CBL activities are embedded into various courses, allowing students to apply classroom knowledge to community projects, such as environmental clean-ups, educational outreach, and social justice initiatives. For instance, the Ethics and Corporate Social Responsibility module incorporates community-focused case studies, enabling students to develop practical skills in social responsibility. The third aspect is flexible and inclusive engagement. CBL initiatives are designed to be flexible, allowing students to participate at their own pace and convenience. Both online and offline options are available, making the programme accessible to students regardless of their geographic or socio-economic background. The fourth aspect is online projects. Open University Malaysia encourages students to participate in community-based projects and offers online engagement opportunities, such as virtual volunteering, online forums, and social media campaigns, to foster global awareness and community impact. Although traditional CBL initiatives do not necessarily harness advanced digital technologies for participation, Open University Malaysia students are able to use the open, distance and digital education modalities to interact with one another when planning and coordinating local community-based CBL initiatives.

The concepts of 'community' and 'community learning' also extend to the profile of students who access higher education through Open University Malaysia. The university serves students in geographic areas that traditionally face access barriers to higher education. One example is tribal learners in remote Borneo (Sabah and Sarawak) who are a traditionally underserved community but can pursue higher education programmes through Open University Malaysia, notably through mobile applications, as most people have smartphones. Open University Malaysia has also established partnership with the Malaysian Prison Department to offer tertiary education to inmates to equip them with knowledge and skills to pursue work and entrepreneurial opportunities upon their release from prison. These learners, sometimes with unique learning challenges such as isolation and lack of a broader learning community to engage with, benefit from the sense of community

[27] https://www.oum.edu.my/uniting-minds-inspiring-hearts/3/

fostered by online learning modalities designed to engage and motivate them as part of a virtual learning experience.

Digital learning design and features

The CiDT is responsible for developing interactive learning modules for 59 programmes ranging from diploma to PhD. These modules include quizzes, simulations, and scenarios to make learning more engaging and allow learners to apply their knowledge in real time. Incorporating multimedia resources including videos, podcasts, and infographics caters to different learning styles and ensures that the content is dynamic and visually appealing. Gamification is also included in learning design; game-like elements such as rewards are included to motivate learners to engage deeper with the learning material. The CiDT also uses data analytics to create personalized learning experiences to meet the individual needs of learners and enhance their motivation and success.

Digital content is designed to be mobile-friendly to allow learners to access materials easily and quickly, anywhere, which is essential in an ODL context. Mobile accessibility supports diverse learning styles and schedules, making education more inclusive and flexible. A mobile-friendly design empowers students to take control of their learning journeys, increasing their engagement and retention. By focusing on these strategies, the CiDT creates a rich and supportive learning environment that empowers students and enhances their educational journey.

The initiative is designed to be inclusive, by enabling learning and collaboration for learners who may have specific learning needs. Key features include: (1) Accessibility: Learning materials and digital tools incorporate accessibility features to accommodate learners with disabilities, such as audiobooks H5P.[28] (2) Flexible learning options: Learners can study at their own pace and in ways that suit their learning styles. (3) Personalized learning: Data-driven insights are used to personalize learning experiences, tailoring content and support to individual learner needs. (4) Inclusive collaboration: Digital platforms and tools enable learners from diverse backgrounds to connect, share ideas, and work together effectively. A range of support resources, including online tutorials, frequently asked questions (FAQs), and discussion forums, assist learners who may need additional help.

Technological components

The digital learning innovation initiative integrates a range of digital technologies to provide a holistic learning experience. Core components include:

- Digital learning platform: Open University Malaysia's robust online learning platform serves as the primary hub for accessing course materials, assessments, and interactive content. Accessible through multiple devices, it enables students to study flexibly and independently.
- Interactive content: The CiDT team creates multimedia content, such as videos, animations, quizzes, and simulations, designed to engage learners and cater to various learning styles. Gamification elements like rewards and badges are also incorporated to motivate students to interact with the material more fully.
- Personalized learning tools: Leveraging data analytics, the platform offers adaptive learning pathways and personalized content recommendations based on individual progress, strengths,

[28] HTML5 Package - a tool that helps users produce and run interactive context and video within a learning management system (LMS).

and areas for improvement. This feature supports student retention by providing targeted feedback.

- AI-powered tools: The platform includes AI-driven virtual tutors, chatbots, and intelligent assessment systems to offer students on-demand support and guidance, enhancing their learning experience.
- Collaborative tools: The platform includes discussion forums, virtual group workspaces, and real-time chat features, enabling learners to engage in peer discussions, collaborate on projects, and receive feedback from instructors.
- Mobile accessibility: The learning platform is mobile-friendly, allowing learners to access course materials, interact with instructors, and complete assignments on smartphones and tablets.

These components work together to create a comprehensive digital ecosystem that accommodates the unique needs of the student population at Open University Malaysia, fostering flexibility, accessibility, and engagement.

Challenges

Open University Malaysia faced challenges related to physical infrastructure and human resources. To overcome these, the university used cloud-based platforms, reducing reliance on physical space and enabling the efficient delivery of resources. Many students from remote or underserved areas had limited digital literacy or access to technology. Open University Malaysia addressed this by offering mobile-friendly content, support for low-bandwidth connectivity, and training on digital tools. Before adopting digital solutions, remote learners often experienced isolation and reduced peer interaction. Incorporating collaborative tools and interactive content improved engagement and fostered a virtual learning community. The initiative capitalizes on emerging opportunities in digital technology, such as AI and cloud computing, which allow for more personalized, scalable, and cost-effective educational models.

Impacts

The institution uses several strategies to measure the success and impact of its digital learning initiative. These include learner satisfaction surveys; learning outcomes assessments that track student performance; data analytics used to monitor user activity, such as login frequency, time spent on each module, and assessment completion rates, to evaluate engagement and identify areas for improvement; and focus groups and interviews to derive deeper insights into the initiative's impact and highlight opportunities for refinement. Overall, evaluation findings suggest that the initiative has successfully enhanced learner engagement, improved learning outcomes, and increased flexibility and accessibility. Additionally, students have shown higher participation rates in online discussions and greater satisfaction with the quality of feedback provided by instructors.

Scalability and sustainability

Open University Malaysia is committed to scaling its programmes both locally and internationally to reach more students. The project has a modular design, which makes it highly scalable. Cloud-based infrastructure enables the institution to accommodate a growing student population. Sustainability of the initiative is achieved through continuous improvement activities, investment in keeping hardware and software up-to-date, collaboration with technology providers and industry partners to share resources and best practices (fostering a sustainable digital ecosystem), as well as staff capacity building and continuous development.

Conclusion

The digital learning innovation effort at Open University Malaysia exhibits the optimization of digital technology and community-based learning within open, distance and digital education, cultivating a revolutionary learning environment. The advanced digital learning platform of Open University Malaysia efficiently provides accessible, engaging, and tailored educational experiences, aligned with the university's commitment to lifelong learning and community advancement.

Virtual field trips and humanitarian response training initiatives enabled by digital technologies: Stanford Accelerator for Learning

Key impacts and lessons

- Combined with research on neuroscience and learning, digital technologies such as AI and virtual simulations enable CBL across many themes and contexts.
- Interdisciplinary collaboration between different faculties and specialist fields enriches the design and creation of learning solutions and initiatives that bring learners together to solve community problems.
- Communities of learning are local, global and thematic.
- Virtual simulations provide a context for realistic learning about populations living in crisis, enabling site analysis and responsiveness to those populations.

Context

The Stanford Accelerator for Learning (hereafter referred to as Stanford Accelerator for Learning or 'the Accelerator' for brevity)[29], is housed at the Stanford Graduate School of Education.[30] The Accelerator is designed to advance educational research and innovation with the goal of ensuring that every learner thrives in an ever-changing world. By bringing together researchers, educators, innovators, policymakers, and community leaders, the Accelerator focuses on scaling solutions that address diverse educational needs across the lifespan, from early childhood to adult learning.

The Accelerator collaborates with communities by co-designing solutions to address local educational challenges and ensuring innovations are culturally responsive and equitable. It partners with schools, families, and organizations to bridge research and practice, providing training, resources, and funding to empower local decision-makers and foster sustainable impact. By prioritizing community voices, addressing systemic inequities, and supporting lifelong learning ecosystems, the Accelerator helps create lasting, meaningful changes in education.

An example of how the Accelerator works with communities is through its theme-based seed grant programme. These grants provide funding to researchers, scholars and practitioners who collaborate directly with schools, families, and local organizations to address pressing educational challenges.

One of those seed grants is called 'The People Who Help Other People Learn (PWHOPL)'.[31] It seeks to catalyse research and discoveries in service of adults such as community health workers (CHWs), tutors, early childhood education practitioners, coaches, mentors, classroom paraprofessionals,

[29] https://acceleratelearning.stanford.edu/about-us/
[30] https://ed.stanford.edu/
[31] https://acceleratelearning.stanford.edu/funding/people-who-help-other-people-learn-pwhopl/

attending physicians, and many others, who are involved in teaching but do not have formal teacher training. Projects supported by PWHOPL typically have a strong CBL focus.

Other initiatives that have been supported and incubated by the Accelerator are virtual field trips (VFTs) for students and virtual education and training in humanitarian response, such as training for students intending to support or work with refugees. The Accelerator combines research on learning with the latest digital technologies to enable CBL and enhanced learning opportunities in diverse contexts.

Objectives

The overall objective of the Stanford Accelerator for Learning is to facilitate interdisciplinary collaboration to address complex learning challenges. Each project undertaken with its support has specific objectives related to the community or learning problem it seeks to solve. The VFT and humanitarian response initiatives both sought to use advanced digital tools to bridge educational gaps, cultivate empathy, and build global learning communities.

CBL

The Accelerator has an evolving definition of 'community' reflected in its initiatives. Traditionally the notion of community was understood as geographically bound. However, the definition has broadened to include virtual and thematic communities, connecting learners from various disciplines, institutions, and regions. The Accelerator's interpretation of a community is dynamic, focusing on networks of learners united by shared goals and learning objectives rather than by location alone. For instance, a multi-layered community includes higher education students, K-12 educators, and field practitioners worldwide, participating in shared learning experiences facilitated by digital platforms. The Accelerator's 'accelerator studio' serves as a community of experts who contribute knowledge and resources to its projects. This studio provides a structured environment where participants work together, share insights, and receive support from specialists in various fields. The studio enables a sustainable, knowledge-sharing ecosystem that supports continuous project improvement by fostering collaboration among professionals, students, and educators.

VFT design and features

The VFT project[32] provides K-12 and college students with digital simulations of places they may not get to visit in person. The project's objective is to help students draw connections between their learning and the world around them, fostering critical thinking, problem-solving skills, and a sense of environmental and social responsibility. These immersive programs use 360-degree photographs and videos to create the experience of being at the location.[33] VFTs enable learners to interact and engage with locations so that they can connect with geographic features, people, climate or other phenomena related to that place. The virtual environment is very realistic and assists in making abstract concepts more tangible for learners. They can engage in learning groups on issues such as the effects of climate change in an area. The design of these virtual environments has the functionality for students to co-create them as they engage in experiential learning.

The humanitarian response initiative is a specific VFT project that enables students to learn about global health and humanitarian issues through virtual simulations of refugee camps. This initiative

[32] https://acceleratelearning.stanford.edu/initiative/digital-learning/virtual-field-trips/
[33] https://acceleratelearning.stanford.edu/initiative/digital-learning/virtual-field-trips/

has two key objectives: to raise awareness about global refugee crises and to equip students with analytical skills for public health and humanitarian work. It connects students from Stanford and international universities, including a partner institution in Lebanon, to explore digitally recreated Syrian refugee camps in Lebanon. Students gain insight into displaced communities' living conditions, challenges, and needs by interacting with the virtual refugee camp environments. They work collaboratively to conduct site analyses, using virtual tools to evaluate factors such as food security, health services, and safety within the camps. Virtual camp tours are crafted in detail, incorporating input from on-the-ground professionals and interviews with camp residents to ensure authenticity and accuracy. The realistic virtual experience supports students in developing empathy and fosters a sense of global citizenship. The international learning community of students from different universities transcends geographic barriers and supports cross-cultural learning and problem-solving.

Funding and sustainability

The Accelerator's initiatives are funded through a combination of federal research grants, foundation grants, sponsorships, and individual contributions. This diversified funding model currently enables projects to be sustained over time while exploring new avenues for growth.

To ensure technological sustainability, the Accelerator invests in scalable digital infrastructure, allowing projects to expand in scope without compromising quality. This approach is particularly important for initiatives like the humanitarian response project, where complex simulations require robust digital support.

Impacts

Projects supported by the Accelerator have had a positive impact on students, educators, and global communities. Through the VFTs, for instance, thousands of learners have had the opportunity to engage with complex social, environmental, and humanitarian issues in meaningful ways. Students participating in these projects have reported increased motivation, improved critical thinking, and a heightened sense of social responsibility. Educators report benefits from using new tools and teaching methods that enhance classroom engagement and make abstract concepts more accessible to students.

Conclusion

The Stanford Accelerator for Learning supports different forms of CBL by integrating digital technologies into projects that enable students to solve specific community, environmental and humanitarian problems through projects such as virtual simulations and global collaboration.

IDentif.AI platform innovates drug combination therapies and enables an extensive community of practice to address public healthcare challenges: National University of Singapore

Key impacts and lessons related to community-based learning

- Digital technologies and AI used in projects initiated during crises such as a global pandemic can potentially develop multidisciplinary communities of learning that previously operated independently.

- An AI-driven platform consolidates learning from different scientific disciplines and enables timely solutions to a problem that affects the entire society.

Context

The National University of Singapore is a national public research university in Singapore, established in 1980. It offers undergraduate and postgraduate degree programmes in medicine, the sciences, dentistry, engineering, computing, law, arts, social sciences, design and environment and business. In 2007, the Ministry of Education and the National Research Foundation established Research Centres of Excellence to promote research in Singapore universities. The National University of Singapore has four research Centres of Excellence that specialize in quantum technologies, cancer, mechanobiology, and functional intelligent materials.

When the COVID-19 pandemic broke out globally, the absence of targeted therapies led to a lack of knowledge about suitable drugs for treating patients infected with the virus. In response to this issue and to the pandemic, biomedical engineers and scientists at the National University of Singapore conceptualized and launched IDentif.AI – an AI-driven optimization platform that streamlines the identification of suitable drug combinations comprising repurposed therapies for COVID-19 patients. The platform leverages an AI-identified biological relationship to optimize drug pairings against infectious diseases, efficiently and timeously. The platform began as a drug therapy project in a crisis context, but a major impact that evolved from its implementation has been the enabling and strengthening of interdisciplinary scientific and healthcare research collaboration and learning, as well as facilitating an extensive community of practice with specialists from different disciplines working together to prepare for future pandemics and infectious disease outbreaks.

Programme objectives

When patients became infected with COVID-19, there was an urgent need for effective therapies to treat them. Given the time-sensitive circumstances, developing new drugs from scratch was infeasible. The IDentif.AI platform was developed to streamline the identification of appropriate drug combination therapies and reduce the time required to achieve this objective. Although the project did not initially aim to develop a community of collaboration and practice, this became a key feature of the initiative.

Programme design, technology and features

IDentif.AI is a digital medicine platform that interrogates drug interaction space using an AI-discovered quadratic relationships derived from biological responses to drug interventions. The platform relies on small datasets generated experimentally to pinpoint optimal drug combinations without any pre-existing information or big data. Unlike conventional drug discovery, which involves extensive screening for potential drug pairings, Identif.AI rapidly interrogates the drug interaction space within 2 weeks, significantly reducing testing time and resource requirements.

Once the prospectively obtained efficacy data for a small set of drug combinations is gathered, the platform uses AI-discovered relationships to correlate input drug combinations with their respective efficacy via a quadratic series, allowing researchers to identify the most promising pairs for further investigation. This platform has proven to be vital in rapidly identifying top-performing drug combinations, which are then experimentally validated to confirm their efficacy. In practice, this approach has shortened drug discovery timelines from years to mere weeks, which was crucial

during the early stages of the COVID-19 pandemic. Information, including the top-performing combinations derived from the platform, is made available for open access online to support pharmaceutical researchers and clinicians seeking for most suitable drug combination therapies for patients in other contexts.

The repurposing of drugs originally designed for other diseases, such as HIV and Ebola, is an efficient breakthrough that can be applied to other infectious diseases. For example, remdesivir, originally designed to treat Ebola, was quickly repurposed to treat COVID-19 patients. A traditional approach without the assistance of AI involves screening various drug combinations to identify effective pairings, which would typically involve testing up to 500,000 potential combinations – a prohibitively labour-intensive, time-consuming and costly task. IDentif.AI reduced this workload by limiting testing to less than 200 combinations, thus expediting the discovery process.

Project workflow

The project adopts a strong collaborative methodology involving active engagement with clinicians, infectious disease experts, AI specialists, and researchers. Each stakeholder group or individual contributes unique insights and expertise to ensure that the platform's drug recommendations are both effective and clinically relevant. The National University of Singapore team works closely with Singapore's National Centre for Infectious Diseases (NCID) and the National University Hospital to establish a preliminary list of drug candidates. This initial selection process considers both efficacy and clinical feasibility, ensuring that all drugs are suitable for practical use.

Once candidate drugs are identified, researchers perform laboratory testing in Biosafety Level 3 (BSL-3) facilities, as mandated by the World Health Organization (WHO) for handling SARS-CoV-2 samples. The research team partners with Singapore's DSO National Laboratories[34] and performs in vitro testing[35] to evaluate the antiviral properties of various drug combinations. IDentif.AI then analyses this data, identifying combinations that warrant further validation. This extensive network of partnerships is the key to the project's interdisciplinary and community-driven approach, with each institution and specialist stakeholder group providing critical resources and expertise. However, what has also emerged, is that specialists are learning from one another and, through collaboration, can understand the problem they are working on from multiple discipline perspectives, which is not always typical in their work. For example, biomedical engineers gain significant insights from clinicians working with patients, and scientists learn valuable information from working with engineers. Engineers use the holistic overview of each field of speciality in designing the technologies that enable the actionability of the platform. The human interaction aspect of the problem-solving and iteration process is paramount.

IDentif.AI impacts

The project has had both clinical and community impacts that have been so successful that the National University of Singapore team is developing the project for future pandemic preparedness.

IDentif.AI has facilitated a robust network of expertise within Singapore's research and healthcare communities. The model of community-based research ensures that each phase of drug development, from initial candidate selection to final validation, is informed by clinical insights and grounded in practical considerations. This collaborative structure has strengthened Singapore's

[34] Singapore's largest defence research and development (R&D) organization. https://www.dso.org.sg/about/
[35] In vitro testing means that samples are tested 'in glass' (such as test tubes) in a laboratory.

capacity to respond to future pandemics and public health crises by establishing a reliable and rapid response system for drug optimization.

Furthermore, IDentif.AI has set a new standard for drug development in pandemic contexts. By optimizing combinations of existing drugs rather than developing new ones from scratch, the platform provides a sustainable, cost-effective approach to managing infectious diseases. This methodology is particularly valuable in low-resource settings where access to novel therapeutics may be limited. The IDentif.AI framework can thus serve as a model for other regions, enabling healthcare providers worldwide to deploy rapid-response drug development strategies without the high costs associated with traditional drug development.

The scope of the platform has also been expanded to address Antimicrobial Resistance (AMR), a growing global health threat. AMR occurs when bacteria evolve resistance to existing antibiotics, rendering conventional treatments ineffective. This phenomenon has far-reaching implications, with projections suggesting that AMR could cause as many fatalities as cancer by 2050. Recognizing this threat, the IDentif.AI team has applied its workflow to discover effective drug combinations against bacterial infections, specifically targeting 'ESKAPE pathogens', a group of highly virulent bacteria designated by the WHO as priority pathogens.

The evolving and growing community of professional practice is collaborating on future pandemic preparedness and finding drug combination therapies for some of the most devastating infectious diseases that pose a risk to humankind.

Challenges and solutions

While IDentif.AI has achieved considerable success, the project has encountered several challenges. One of the primary obstacles is the regulatory environment surrounding drug approvals. Although IDentif.AI expedites the discovery of effective drug combinations, regulatory approvals for new therapies remain complex and time-consuming. During the pandemic, certain drugs received Emergency Use Authorization (EUA) from regulatory bodies like the U.S. Food and Drug Administration (FDA), allowing them to be deployed without the full range of clinical trials typically required. Drug combinations pinpointed by IDentif.AI may need to go through regulatory approvals before being deployed for infectious disease management. However, during the pandemic, EUA for multiple drug combinations highlights the adaptable regulatory frameworks that can accommodate accelerated discovery methods in crisis situations.

Another challenge lies in the platform's resource demands. IDentif.AI's requires access to laboratories that are designated for infectious diseases, especially for those that are highly infectious (e.g. COVID-19). To address this, the team is exploring partnerships with Singapore-based, regional, and international institutions to share best practices and resources, enabling broader access to IDentif.AI's capabilities. By fostering a global network of collaborators, the platform aims to overcome logistical barriers and extend its benefits to regions with limited technical infrastructure.

Future vision and scalability

IDentif.AI has the potential to be applied to a broad range of infectious diseases and public health challenges. Building on its success in Singapore, the platform is exploring potential partnerships with healthcare institutions in Southeast Asia to address regional health issues. IDentif.AI's modular

structure makes it well-suited for adaptation to various healthcare settings, allowing researchers to tailor its functionalities to specific diseases and resource constraints.

The platform's success in addressing AMR has prompted the team to consider new applications in chronic disease management. By leveraging IDentif.AI's predictive capabilities, the team envisions optimizing drug combinations for other disease indications to further personalized treatments. This expansion reflects the platform's versatility, as IDentif.AI can be adapted to tackle a broad spectrum of health challenges beyond infectious diseases.

Conclusion

The IDentif.AI platform at National University of Singapore exemplifies the transformative potential of AI in drug development, community-based healthcare and inter-disciplinary collaboration (as a form of CBL). Through interdisciplinary research, learning and collaboration and a focus on rapid-response drug optimization, IDentif.AI delivered timely solutions during the COVID-19 pandemic and laid the groundwork for future applications in infectious disease management and beyond. By fostering an expanding network of researchers, clinicians, and institutions, IDentif.AI demonstrates how community-driven AI initiatives can strengthen public health infrastructures and enhance global preparedness for future health crises.

iConsult Collaborative facilitates experiential learning and business community support: Syracuse University

Key impacts and lessons related to community-based learning

- The iConsult Collaborative[36] involves international and domestic students participating in digital consulting services to a diverse set of organizations, including start-up businesses, facilitating a community of professional learning and service.
- Real business consulting experience is experiential learning that provides students who may otherwise face barriers to work experience with opportunities to gain validated consulting experience.
- Student-led consulting in the technology field has had positive impacts on digital inclusion projects such as OurAbility[37] – in which AI was used to design ways to enable disabled people to apply for jobs.
- Project impact and communities of learning and practice extend beyond the projects completed by students – enabling an ecosystem of support for the start-up community and other businesses in the area.

Context

Syracuse University, located in New York (US), is a private research-focused university comprising 13 schools and colleges, offering a wide range of courses, degrees, certificates, and microcredentials that students can access online, part-time, and on-campus. The university attracts domestic and international students. Work experience and experiential learning are key components of business and professional courses at the College of Professional Studies. In traditional courses, experiential learning tends to be undertaken as part of a class and a course.

[36] https://professionalstudies.syracuse.edu/academics/iconsult-collaborative-at-syracuse-university/
[37] https://www.youtube.com/watch?v=Nm3MjK-6R7I

Work experience undertaken at businesses may offer variable opportunities for students, as businesses will assign tasks according to their own workflow priorities, with students having little control over the scope of work they will perform. A barrier faced by international students is that they struggle to gain US work experience to enable them to be deemed eligible for job applications in the country. Women also disproportionately face barriers to entry to professional jobs.

The iConsult Collaborative is an initiative of the College of Professional Studies (initially started at the School of Information Studies), led by Director Art Thomas. It provides opportunities for international and domestic students to provide digital consulting services to start-up businesses in the local community in areas such as marketing, web solutions and development, salesforce implementation, data warehouse design, business intelligence, data analytics and visualization, application development, management consulting, database solutions, and artificial intelligence. Since the consulting work is with real businesses, students are able to log the experience as authentic work on their resumés instead of experiential learning in an academic class.

Programme objectives

The iConsult Collaborative was established to give students real work consulting experience while supporting start-up businesses in the local community. Initially, the students provided digital services that start-ups may not have been able to afford in the initial stages of their business journey. As the initiative developed, the focus evolved to providing opportunities to international students, especially women, who face barriers to gaining real work experience in the USA. In addition, the initiative expanded its clientele to include all types of organizations, both for-profit and not-for-profit, large and small, local and distant, start-up and established. The initiative thus serves under-represented groups while providing opportunities for students to solve real business problems. Through these objectives, iConsult creates a pipeline for students to enter into professional roles and contributes to the development and growth of the business community.

Programme design and features

Client project work is organized according to a hierarchical team structure that matches student skills with client project requirements. The School of Professional Studies has a budget to pay an annual stipend to six graduate students/research assistants who serve as programme managers on client projects. They need to apply to be part of the programme and are appointed by the programme director. Most of the programme managers are currently women. Programme managers oversee several consulting projects, handling client interactions, project logistics, and team coordination. They are also responsible for appointing the next level of the project team–team members.

Team members are students who apply to the programme as volunteers. Their objective is to gain real work consulting experience. These students come from diverse backgrounds and have different skills. When a new project is commissioned, the programme manager consults the pool of applicants available for each project and selects volunteers with the best match of skills and potential to solve the client's problem and meet the project deliverables.

The programme takes an interdisciplinary approach: iConsult draws student volunteers from across the university, including the School of Information Studies, College of Engineering and Computer Science, and Whitman School of Management, to create interdisciplinary teams tailored to project requirements. This is a significant benefit of the programme because students are not limited to experiential learning that involves only their fellow students in one course or class.

Project workflow

The programme follows a structured workflow, from client engagement to project completion:

1) Client onboarding: Prospective clients contact the Director of iConsult for assistance with their digital or operational challenges. The Director holds an initial meeting with each client to assess their needs and determine if iConsult can provide the required expertise.
2) Project assignment: A programme manager is assigned based on their background and availability once a project is confirmed. The programme manager then meets the client and the Director to establish project goals, deliverables, and timelines.
3) Team assembly: Programme managers select team members from a pool of volunteer student applicants, considering their skills, experience, and fit with the project's requirements. Selected team members are introduced to the client, and a project charter is developed to guide the workflow. Multi-way non-disclosure agreements (NDAs) are signed by each team member, the university, and the client, protecting IP and ensuring confidentiality in all consulting projects. The IP developed during the project remains the property of the client.
4) Project execution and oversight: Programme managers coordinate team activities, oversee deliverables, and maintain regular communication with clients – digitally and in person, as required. The Director monitors all project communications, providing mentorship to programme managers as needed and intervening if issues arise.
5) Continuous feedback and adaptation: Throughout the project, the team gathers client feedback to ensure satisfaction and adaptation to any emerging needs. The Director and programme managers also provide guidance to students on professional etiquette, project management, and client communication.

Scalability and sustainability

The iConsult Collaborative was initially developed using grant funding from the Kauffman Foundation. However, decentralized management of the schools and colleges at the university means that each school has some autonomy over its operating budget. The programme Director has established a budget to pay a stipend to programme managers, of whom six can be hired at a time. Clients do not pay any fees for the projects undertaken for them, as this would contravene the ethics of experiential learning. However, clients who feel at any time that their work with iConsult has had a significant impact on their organization may choose to make a donation to the university, which can be used to support iConsult.

The workflow processes are well established. Although the programme itself does not currently use sophisticated digital technologies to engage students and clients, students are designing digital tools to enable more efficient communication and workflows across the projects, which may include AI and custom applications. There are no significant overhead costs to running the projects. Therefore, the concept is scalable, and other schools, such as the College of Engineering and Computer Science, have expressed interest in implementing the initiative in their own projects. The programme initially involved six students, but this has been easily scaled up to include more than 80 students. As the number of projects increases, the number of volunteer team members can increase accordingly, without significant challenge.

The project structure and workflow allow iConsult to operate efficiently and maintain a flexible, scalable model. The ability of the programme to expand with demand allows it to accommodate

more projects as its reputation grows, creating more opportunities for students and increased value for the local community.

Challenges and solutions

One challenge of the programme is sourcing quality projects that align with iConsult's educational goals for students. Some projects present unique and interesting problems for students to work on, while others are simpler. However, over time, iConsult has built a portfolio of reputable projects through word-of-mouth referrals from satisfied clients, which continues to grow. Another challenge is the diversity of student skills required for projects. Some projects require expertise beyond iConsult's typical pool of information studies and engineering students. The Director has addressed this by collaborating with other schools at the university to source specialized skills needed in some projects. Thus, a larger community of practice and engagement is facilitated through the iConsult Collaborative programme.

Programme impacts

The structured workflow and autonomy in delivering solutions to clients enable iConsult to maintain high standards of professionalism and client satisfaction while providing students with valuable work experience that is often more robust and more focused on developing and applying their professional skills than may be the case in traditional course-based experiential learning projects or other work-integrated-learning experiences. The programme's emphasis on client interaction and real-world project management prepares students for professional roles in consulting, project management, and technical fields of work.

Several layers of community and learning have developed through the iConsult Collaborative. International and local students who participate in the programme gain professional experience solving real business problems. They can list this experience on their resumés as real work experience, validated by the programme Director, instead of experiential learning. This has enabled students to provide evidence of their competencies when applying for jobs, enhancing their employability. Potential employers can also contact the Director for references. Students who participate in the initiative learn a range of 'soft skills' such as teamwork, negotiation, communication, problem-solving, conflict management, cultural competency, and interdisciplinary learning. The programme has become so popular that international students sometimes apply to be part of it before they even arrive at Syracuse to begin their studies. Students also benefit from mentoring and career development, which is integral to the initiative.

The programme empowers women's participation in technology-related work. By actively encouraging women to take on leadership roles, the programme addresses gender imbalances in technology management. iConsult helps women programme managers build confidence and industry-relevant skills.

Organizations of all types that have engaged with the collaborative have, in some cases, continued their relationships and contracts with the initiative, requesting further services and support with digital and business solutions. The project base grows steadily through word-of-mouth, with inquiries coming in from established businesses as well, including the City of Syracuse and an elder care facility. There is a growing community of businesses and enterprises that recognize the benefits of collaborating with students on these projects.

The programme's impact extends beyond individual students, as iConsult's projects often contribute to the local business community and provide solutions that benefit the Syracuse economy and ecosystem.

Future vision

Looking forward, iConsult aims to expand its interdisciplinary approach across other Syracuse departments. With interest from departments such as public policy and engineering, the programme Director envisions a scalable model that could provide experiential learning opportunities for students university-wide. This aligns with the commitment of Syracuse University to providing quality experiential learning and simultaneously supports the anticipated needs of a growing local economy.

Conclusion

The iConsult Collaborative at Syracuse University exemplifies how experiential learning can bridge academic and professional gaps for students, particularly those facing systemic employment barriers. Through hands-on consulting projects, iConsult provides students with practical skills, professional experience, and mentorship needed to succeed in the competitive job markets. As it continues to grow, iConsult serves as a model for universities to support non-traditional learners, create community impact, and foster diversity in technology management and consulting. By combining experiential learning with community engagement, iConsult offers a pathway for students' transition from academic life to successful professional careers.

'Taylor' virtual assistant (chatbot) facilitates accessibility for disabled students: The Open University

Key impacts and lessons related to community-based learning

- Collaboration between academic researchers and members of a disabled community enables co-creation of solutions to barriers to learning faced by the disabled community.
- A formal set of accessibility policies guides the development of technology initiatives that support inclusion, responsiveness and accessibility in learning.
- AI technologies incorporated into chatbot design enable the chatbot to have personalized conversations with users and offer them specific support according to their needs.

Context

The Open University[38], established in 1969, is an open and distance learning (ODL) university that provides a broad range of undergraduate and postgraduate programmes to diverse students from all over the world. Enrolments include a significant number of disabled students for whom distance education is the most accessible way to pursue higher education. The Institute of Educational Technology (IET)[39], founded in 1970, has a strong research focus related to digital technologies to support learning, teaching and assessment in distance education.

[38] https://www.open.ac.uk/
[39] https://iet.open.ac.uk/

The mission of The Open University is to make learning accessible to all. To achieve this, the university has an accessibility statement[40] that specifies strategies used to enable learning and support learners with accessibility needs. The Accessibility Hub[41] provides details of support available to disabled students and those who require specific types of support. As part of its Digital Governance Framework, The Open University has approved a Digital Accessibility standard available to all staff to ensure that they follow best practices in accessible digital learning design and delivery.

One accessibility initiative of the IET is the 'Taylor' chatbot[42] – a virtual assistant that functions as a Conversational User Interface (CUI) and guides disabled students to provide information about themselves to the university and to understand the support available to them. It supports CBL by enabling disabled students to access and engage within their learning and support communities, with support from the AI-driven Taylor. The chatbot model promotes inclusivity and is an example of how digital technologies and AI can be used for learning inclusion.

As a distance learning institution, The Open University's conceptions of community are often virtual and based on shared interests or challenges. Taylor was built through the ADMINS (Assistants for the Disclosure and Management of Information about Needs and Support[43]) project, inspired by the findings of an existing participatory research initiative with The Open University Disabled Students Group, a strong community that largely exists in online groups and forums with hundreds of members across the UK and beyond.

Objectives

The primary objective of the initiative is administrative – enabling students to share information about themselves and the barriers they face and have a good experience of their studies – using the CUI. The team was aware that students have different understandings and awareness of study and disability support, so there is sometimes a lot for them to understand and communicate before they can study effectively. A further aim, therefore, was for students to learn through the conversation in the same way they hopefully would in a conversation with a human advisor. The proposed solution was to build a virtual assistant to enable students with disabilities to provide information and access support via spoken or written dialogue, build a profile and provide support suggestions to students.

Project background and design

The Taylor chatbot was developed as a bespoke virtual assistant through extensive collaboration between staff and students. The research team prompted discussions with the Disabled Students Group to determine priority issues for the disabled community by inviting them to post in their online forums. A major theme identified was the barriers faced by disabled students in communicating about disabilities. Further work then involved learning together about these issues and the role that technologies could play in enabling members of the Disabled Students Group and the wider community of disabled students to learn about support and strategies that could make study equitable. There was a shared goal and learning within the community (e.g. sharing study tips and strategies that worked for them, learning about the possibilities of new technologies) as well as academic researchers learning about the experiences of disabled learners and requirements for the design of a system.

[40] https://about.open.ac.uk/accessibility-statement
[41] https://about.open.ac.uk/strategy-and-policies/policies-and-statements/website-accessibility-open-university
[42] https://iet.open.ac.uk/research/ou-launches-new-chatbot-for-students-to-disclose-disabilities-with-ease
[43] https://oro.open.ac.uk/85557/

The chatbot was trialled with students as they disclosed their disabilities. It was trained to provide personalized suggestions to students (a priority from the feedback received in the first trial). This was achieved by collecting suggestions from experienced disabled students about the tools, resources and support that had helped them succeed in their studies, and then using this as data to train Taylor to draw on to provide relevant advice.

A subsequent initiative, Digital Access Advisor, is broadening out the work to build partnerships and prompt discussions with interested parties around the world. It has also focused on the potential and concerns of generative AI to deliver new assistive technologies and support conversations around disability. The Open University team has led workshops and collected data from disabled students globally.

Technological infrastructure and components

Taylor was built primarily on Microsoft's Azure[44] technologies, which provided the necessary AI services for creating a seamless and intuitive user experience. The chatbot integrates multiple Azure AI components, including speech recognition, cognitive services, and chatbot frameworks, allowing for versatile communication options to meet students' diverse needs. As a web-based application, Taylor is accessible on both mobile and desktop devices, ensuring accessibility across different types of technology commonly used by The Open University students.

Over time, technologies used for Taylor need to evolve to incorporate new advancements in AI. While it was integrated with The Open University's Customer Relationship Management (CRM) system for managing student communications, Taylor required further development work to maintain it because of changes to the AI services available for running it. This has led to the exploration of alternative solutions. With the emergence of LLMs and retrieval-augmented generation (RAG) technologies, the development team are exploring more scalable options that could enhance Taylor's responsiveness and intelligence. These advanced AI models are expected to provide more sophisticated and context-aware responses. However, it is challenging to ensure that new systems are effective and sustainable as technology and user expectations evolve.

During conversations with Taylor, students receive individualized support suggestions based on the experiences and advice (collected through crowdsourcing) from other disabled students who have successfully navigated similar challenges. For example, if a student faces difficulty with time management, Taylor can suggest strategies contributed by other students with similar needs. This knowledge-sharing component adds significant value, allowing Taylor to function not only as a virtual assistant but as a bridge that connects students within the disabled community. The team has used the nQuire[45] platform more recently to gather suggestions from disabled students in the general population about barriers they face and strategies, tools and resources that they find useful.

By enabling students to discuss personal barriers privately, Taylor fosters a comfortable space where students feel supported rather than scrutinized. At the same time, the assistant's ability to draw on a knowledge base built through community contributions aligns with the principles of community-based learning, facilitating a supportive ecosystem where students can benefit from collective wisdom without compromising their privacy.

[44] https://azure.microsoft.com/en-us/
[45] https://nquire.org.uk/

Evaluation and impacts

The Open University has implemented several methods to evaluate Taylor's effectiveness and scalability. The first major trial of Taylor involved feedback surveys and analysis of conversation data, which indicated a strong preference for Taylor over traditional form-based methods of support. Most trial participants expressed a desire to use the assistant again. Findings from a second, longer trial period (publication under review) also show that an enhanced version of the system was well received and that a large majority would like to use it again.

Scalability

Trials have demonstrated that Taylor can accommodate a large student base with minimal manual oversight, which supports scalability. It was able to reach more than 500 students in its trial stages, demonstrating its potential as a model for broader adoption within The Open University and possibly other educational institutions. Insights gained from Taylor have also informed the development of other chatbot initiatives at The Open University, such as staff support systems designed to streamline responses to student inquiries.

The rapid evolution of AI technologies presents challenges and opportunities for the initiative. As new AI platforms emerge, Taylor needs to be updated to meet rising user expectations for such assistants, and to harness what is now possible. To address this challenge, the team has started prototyping a new system based on LLMs and RAG technologies, designed to retain Taylor's benefits while enhancing its capabilities.

Another strategy for sustaining Taylor involves partnerships and discussions with external stakeholders interested in AI-driven assistive technologies. This collaborative approach supports knowledge exchange, fostering a broader understanding of how AI can support disabled learners in diverse contexts. Through workshops and research collaborations, The Open University continues to expand the reach and impact of Taylor, notably its potential for enhanced digital accessibility and community-based learning.

The university's long-term goal is to create a learning ecosystem where community-based support transcends geographical and institutional boundaries, enabling students around the world to benefit from shared experiences and insights.

Conclusion

The Taylor initiative is an example of the transformative power of AI used in educational contexts. It promotes inclusivity and participation by disabled individuals within a learning community and provides personalized and responsive support.

WhatsApp-based ART microlearning initiative for rural healthcare workers: University of Cape Town PhD study (Briony Chisholm)

Key impacts and lessons related to community-based learning

- Digital technologies are used successfully to deliver microlearning to primary healthcare workers in remote areas.
- High cell phone penetration in remote or underserved populations enables mobile-friendly CBL and learning programme delivery.

- A ‘community’ is not always geographically connected; professionals working in isolation in remote contexts form a community of practice through shared experiences and shared knowledge. Communication technologies provide platforms that enable community collaboration and engagement.
- In underserved and under-resourced contexts, ‘low-tech’ solutions (such as WhatsApp messaging app) are more suitable than ‘high-tech’, data-hungry technologies or those requiring more sophisticated or expensive hardware devices.

Context

The University of Cape Town, located in Cape Town, South Africa, is a research-intensive university founded in 1829. It serves a diverse community of around 29,000 students from more than 100 countries globally and has been ranked first in the *Times Higher Education* Emerging Economies University Rankings.[46] The institution has six faculties – Commerce, Engineering & the Built Environment, Health Sciences, Humanities, Law and Science. There is a strong tradition of student participation in volunteer projects in local communities.

The Medicines Information Centre (MIC)[47] is based in the Division of Clinical Pharmacology at the university. The MIC established the National HIV and TB Healthcare Worker Hotline in 2008. Information pharmacists provide free, accurate and evidence-based advice to healthcare workers who care for patients with Human Immunodeficiency Virus (HIV) and tuberculosis (TB). Traditionally, ongoing HIV training for healthcare workers such as CHWs and nurses has been delivered at centralized locations, requiring healthcare workers to travel to those locations and be away from their clinics for that time. In rural and remote areas of South Africa, some government clinics are staffed by only one primary healthcare worker. These healthcare providers face several barriers to accessing training and development opportunities, one of which is that if they need to travel to a centralized area to access training on patient treatment or receive updated protocols on drug therapies, the clinic is left without staff, which negatively affects patients.

Briony Chisholm is an information pharmacist who works at the MIC. Part of her PhD study, ‘Testing WhatsApp-based Antiretroviral Therapy (ART) microlearning for South African primary care healthcare workers in remote eastern Cape clinics’ involved the use of the WhatsApp messaging application to deliver up-to-date ART training to healthcare workers in one of the most rural and underserved provinces of the country, while fostering a community of learning and practice among the participants who would otherwise not have had this opportunity.

Introduction

Through ongoing research and interaction with healthcare workers, pharmacists working on the National HIV and TB Healthcare Worker Hotline identified that there were gaps in CHWs and nurses’ knowledge of the national ART guidelines, which could negatively impact patients living with HIV and TB. This is understandable because there are regular updates to ART guidelines as new evidence emerges. Ongoing training of primary healthcare workers is challenging in South Africa because many clinics are in hard-to-reach rural areas, and healthcare workers in busy clinics typically do not have large blocks of free time for training. However, with 100 per cent cell phone penetration and 93

[46] https://www.timeshighereducation.com/
[47] https://mic.uct.ac.za/

per cent of adults using WhatsApp, this free, low-data-requirement platform was selected for delivering microlearning – short training sessions – to these nurses.

Programme objectives

The initiative's primary objective was to design a WhatsApp-based training intervention for nurses and CHWs in remote primary care clinics in the Eastern Cape province and determine its efficacy for knowledge transfer through pre- and post-intervention testing.

The initiative also had several secondary objectives:

- To determine knowledge retention through knowledge testing of nurses and CHWs three months post-intervention.
- To describe the acceptability of WhatsApp-based training for nurses and CHWs in primary care facilities, using online and/or face-to-face focus group discussions.
- To determine the feasibility of WhatsApp-based training for nurses and CHWs in primary care facilities through measuring participation.
- To explore and describe the changes in drug prescribing due to the training intervention through pre- and post-intervention folder reviews.
- To determine the effectiveness of WhatsApp -based training and monthly reminders in extending the reach of the Hotline by comparing the number/type of queries received from the study districts before, during and after the intervention.
- To describe the acceptability of the HIV Hotline as a source of mentorship for nurses and CHWs in remote primary care clinics in four districts in Eastern Cape, using online and/or face-to-face focus group discussions.

This set of objectives was informed by the need to create a sustainable, impactful, and resource-conscious training model that can be implemented widely in remote areas without significant infrastructure demands.

CBL

In the study's context, CBL applies to a community of healthcare workers based at remote primary healthcare facilities and their continuing professional development through in-service training. The initiative is not institutional but is linked to the MIC and hotline, which are based at the University of Cape Town. The PhD is Briony Chisholm's project, undertaken through the University of Cape Town, supervised by Prof. Catherine Orrell and Prof. Marc Blockman from the university.

Programme design and structure

Live virtual group training sessions were held at lunchtime, with participants joining the group during the allotted 10 to 15 minutes. Each session started with a case-based problem followed by one or two learning points and questions to encourage interaction by attendees. Participation was constructive. The trainer stayed with the group to answer questions, which generally continued for a while after the 'close' of the session. Participants said that they liked the interactive nature of the training and especially that the trainer was present and able to answer questions. Voice note summaries of the training sessions were provided, and this could be extended to voice note versions of all messages.

The WhatsApp Business app was used to deliver training, using text messages, voice note summaries and one or two images. The technology focus was on ensuring minimal mobile data requirements. The platform allowed for those who could not make it (for example, those busy with patients or unable to access the Internet at that time) to go through the lessons asynchronously later.

Used on a smartphone, WhatsApp also allows for some accessibility enablers for users with specific learning needs, such as larger text for those with vision difficulties and voice note versions of all text messages for people who need a more auditory version of information. The hotline served as an additional resource, offering CHWs access to expert support outside of the structured training sessions. This hotline provided on-demand guidance and answers to complex queries, reinforcing training content and promoting long-term knowledge retention.

Impacts

Because this initiative was part of a study, both quantitative and qualitative data were collected to measure all objectives and analysed. Data have been collected using multiple methods, to evaluate the four levels of the Gold Standard Kirkpatrick's Levels of Training Evaluation.

Quantitative data was reported descriptively, and inferential analysis was done using linear mixed-effects regression analysis, adjusted for clustering. Qualitative data was analysed and reported using proportions and thematic analysis.

Uptake was good, with almost 80 per cent of nurses agreeing to participate. There was no difference at baseline between knowledge of the control and intervention groups, and inferential analysis at three months post-intervention showed a clinically significant improvement in knowledge. Analysis of the questionnaires and focus groups showed a high degree of acceptance, with 99 per cent saying they enjoyed training and would participate if the initiative continued on a weekly basis throughout the year. Thematic analysis showed that overall sentiment was positive. Participants enjoyed the feeling of recognition, appreciation and empowerment that the training provided them – an expected effect that could have major positive impacts. Analysis of changes in patient care through folder reviews showed a significant increase in the correctness of patient care in the intervention group.

Challenges

The initiative faced several challenges. The first was technology infrastructure; for example, not all participants had reliable access to the Internet and sometimes experienced network connectivity issues during training. This was addressed through asynchronous availability of microlearning content following each session. Another challenge was language and terminology barriers. The technical nature of ART terminology sometimes needed to be simplified for easier understanding. A third challenge was message fatigue. This was addressed by keeping the sessions short and inviting feedback from participants on their preferences for communication.

Funding and scalability

This research project was funded through an educational grant from a pharmaceutical firm. Once the results have been published, the project team hopes to engage the National Department of Health and/or NGOs and/or private sector for funding and collaboration to roll it out to a larger group and to involve more trainers to maintain the interactive aspect of the model. There is potential to incorporate additional healthcare topics into the curriculum, thus broadening the initiative's impact within the healthcare sector.

Conclusion

The WhatsApp-based ART microlearning initiative demonstrates how mobile technology can be leveraged to overcome logistical challenges in rural healthcare education and CBL initiatives. By employing a low-cost, accessible platform, the initiative provides healthcare workers in remote areas with critical knowledge updates in HIV treatment, helping to bridge knowledge gaps and improve patient outcomes. The initial success of this programme shows the potential of digital microlearning as a scalable solution for professional development in resource-limited settings, reinforcing a commitment to community-based, continuous learning within the healthcare sector.

Use of data insights for student learning and support: University of New South Wales

Key impacts and lessons related to community-based learning

- Human-centred design should be the foundation of all projects using digital technologies to enhance learning.
- An iterative approach to development that enables the project to adapt to feedback yields constructive results and a sense of ownership from stakeholders.
- Ethics around the use of AI and digital technologies should be considered from inception right through the development of programmes and tools that incorporate AI, including data privacy.
- Personalized student support using AI and machine learning enables the right support to be provided to a student at the right time.
- AI has the potential to support equity and engagement within a learning community.

Context

The University of New South Wales has a diverse community of approximately 86,000 students. Around 30 per cent of enrolments are international students. The domestic student population is also diverse, including First Nations people. Adapting to university life and a new learning community can be challenging for students. The university offers hybrid learning modalities – students may attend classes virtually or in person. Some students may become at risk of dropping out or disengaging from their communities of learning for various reasons, including adapting to a new environment and coping with academic expectations while undergoing geographic, social and emotional adjustments. A comprehensive range of support is available to students, but students and staff are not always aware of this support, and in many cases, it is sought too late – when a student is about to drop out.

These challenges have been addressed by using AI and machine learning to develop an initiative that uses data analytics to support student engagement and support. This enables students to access the help they may need before they become at risk of dropping out of their courses. It is linked to CBL in the sense that students and educators can strengthen their participation and engagement in learning communities through targeted communication and collaboration. This use of AI is also referred to as learning analytics.

Project objectives

The overall objective of data analytics for student learning and support applications is proactive, early intervention, using data analytics to identify at-risk students and connecting them to

appropriate types of support before they disengage or drop out. This promotes equity in learning and increases students' likelihood of remaining engaged in the learning community and completing their programme of study. The initiative leverages AI and data analytics to provide real-time feedback and targeted support to students.

The initiative is further driven by several goals that serve the university's diverse student body. The first is to achieve equity, inclusivity and accessibility – all students, regardless of background or academic standing, have access to appropriate types of support through a standardized data framework that can be scaled across courses and faculties. A second goal is to enhance each student's agency in their learning journey. The application has the capability to provide 'nudges' to a student that are only visible to that student, if an issue with engagement has been identified by the application. Students have the agency to use the application at any time to access support services, confidentially. A third goal is supporting data-driven pedagogy or instruction: The initiative uses daily data about students' engagement to allow educators to tailor their teaching strategies to meet the needs of each cohort, thereby optimizing learning outcomes.

These goals create a responsive, comprehensive support system that promotes inclusivity and equity within the learning community.

Project design and features

The data analytics system and support platform is called the Academic Success Monitor, and is currently integrated into the learning management system, but there are plans to develop an application version that will be accessible to students and faculty staff on laptops, mobile phones or other devices. It may also be linked eventually to a short message service (SMS), which is more likely to reach an at-risk student than an email alert. Faculty members have access to an AI-driven chatbot that enables them to engage in a 'conversation' with the data and get recommendations for options, for example, if most of a student cohort appears to be disengaged from a unit of learning. Students also have their own AI chatbot to ask questions about their personal recommendations, ask for academic or wellbeing support, or to get help navigating the University of New South Wales processes.

The data-informed model has several core features, each of which is critical in supporting students and enabling staff to make informed teaching decisions.

- Human-centred design and ethical oversight: Strict attention is paid to privacy and data ethics to ensure responsible use of information in support of learning. Existing legislation and regulations have been consulted at each step of the development process, following a 'privacy by design' principle.
- Elimination of bias: Sensitive information, such as demographic data, is filtered out of the machine learning algorithm to prevent bias and maintain objectivity in student risk assessment.
- Data integration and analysis: The foundational element is a data lake that consolidates and integrates data from various university platforms into a central repository. This allows for comprehensive analysis and cross-referencing, providing insights into student engagement patterns across courses.
- Dynamic risk and success assessment: Machine learning algorithms enable the system to continually assess each student's risk of disengagement based on a range of historical performance data and behavioural indicators, such as frequency of login, completion of assignments, and interaction with course materials. Daily refreshed data enable

educators/instructors to monitor students' engagement levels and intervene as necessary. For example, students will receive a private message if it seems as though they are beginning to disengage, giving them agency and guidance to adjust their own path. Instructors receive notifications if the risk is deemed higher, such as with students who are not logging in regularly or who are falling behind in assignments. This allows them to reach out to those students with targeted advice or reminders, creating an environment where students feel consistently supported. Central support teams are notified if students are struggling in more than one class, as there may be larger issues present that they are best equipped to help with. This ongoing risk assessment is combined with success indicators to guide both students and support staff in identifying areas for improvement and intervention.

- Human-centric AI communication: The application uses generative AI technology to create personalized, empathetic outreach messages that encourage students to engage without feeling overwhelmed. These AI-generated messages draw from the University of New South Wales's co-designed language matrix, which captures the tone, syntax, and urgency required for different levels of student engagement at different points along their learning journey and engagement.
- Thorough quality control measures: The AI-generated messages sent to students are monitored through a strict and detailed quality control process. Human support staff monitor the automated messages continually to ensure that they are reliable as the system scales up.
- Human decision-making: A human is always involved at a significant decision point; AI never makes decisions on behalf of the students or support staff.
- Support infrastructure for students, faculty members, and support teams: The Academic Success Monitor offers three distinct variations of interface. The student version allows them to track their own engagement and receive personalized support recommendations. Faculty members also have access to a tailored interface that provides insights into both student engagement and course-level data, enabling them to make timely adjustments in instructional strategies. Central support teams are provided with a dashboard that enables them to receive risk alerts, see how students are performing across multiple classes in a term, identify which risk factors are most prevalent, track student engagement over time, and send custom messages to students.
- Iterative co-design process: The development of this initiative has involved, and continues to involve, extensive collaboration with students, academic staff, and support services staff. Regular feedback loops and pilot trials allow the team to refine the model continuously, ensuring that it remains aligned with user needs and evolving ethical considerations.
- Customized and personalized support at scale: Given the high volume of students, particularly in large, compulsory courses, data insights allow instructors to tailor support without extensive manual tracking.

Impacts

The initiative has improved student engagement and retention. As it is rolled out across the entire university in 2025, it aims to see reduced dropout rates and improved course completion. The capacity of the system to provide personalized support messages has been especially effective in motivating students to stay engaged in learning. The system enables individual student agency, and feedback has shown that granting students access to their own engagement data enhances their confidence and encourages them to take an active role in their learning. They can self-monitor and make adjustments as needed, fostering a sense of accountability for long-term academic success. Faculty members benefit from reduced cognitive load and have reported saving between one and

five hours per week managing their class, as the system automates much of the data analysis required to identify disengaged students. This allows instructors to focus on pedagogical tasks, such as adapting course materials and providing direct support to students who need it most.

Challenges and adaptations

Large-scale data integration has many complexities. Significant backend coordination was required with multiple stakeholders to create a unified data lake. The development team's initial focus was to develop a stable infrastructure to support ongoing analysis and cross-referencing among multiple platforms. Capacity building was another initial challenge. The system is designed to be user-friendly, but some faculty members needed additional training to effectively interpret data insights. The team addressed this by incorporating an AI-driven chat feature simplifying data interpretation, providing educators/instructors with actionable insights without requiring extensive data literacy.

Scalability

The initiative has proven to be highly scalable, and future expansion plans aim to further refine the Academic Success Monitor's capabilities and broaden its reach across all faculties at the University of New South Wales. The pilot and initial implementation phase have been extremely thorough and successful in several faculties. Ultimately, all students will have access to consistent levels of support. There are also plans in place to integrate additional support services such as mental health resources and language assistance, making the system a central hub for all student needs. In addition, the team is developing mobile-accessible features to enhance usability for students on various devices. This will allow students to receive timely notifications, access their engagement data, and interact with support services directly through their phones. Over three years, the university invested in the development of the project and it keeps investing in ongoing operational costs. Pricing models for AI are consistently decreasing, which supports sustainability.

Conclusion

The University of New South Wales's data insights for student learning and support initiative is a model for using data analytics in a human-centred, ethical way to support student engagement equitably by providing early, appropriate support to learners. AI-driven data analytics about student learning and engagement can also be a highly useful input into the monitoring and evaluation of course design and pedagogical strategies. The initiative shows that engagement in a learning community can be enhanced through advanced digital technologies, and equity for students from diverse backgrounds, with diverse challenges, can be achieved through human-centred design and ethical application of AI and machine learning. The concepts are transferable to any CBL context where the infrastructure exists for the use of these technologies. Personalization of support is valuable to any learner engaged in a community of practice or learning.

AI Health Lab – use of AI for diagnostics in low-resource healthcare settings, capacity building and community learning: Makerere University

Key impacts and lessons related to community-based learning

- AI and machine learning can be leveraged to design innovative diagnostic tools in resource-limited contexts.

- Multidisciplinary teams involved in the development of AI-driven healthcare tools develop into broader communities of professional practice that have no geographic limitations.
- AI-driven diagnostic tools can be harnessed to enhance the professional learning of healthcare practitioners who face barriers to traditional learning due to geography.

Context

Makerere University in Kampala is Uganda's oldest and largest higher education institution. It began as a technical school in 1922 and became an independent national university in 1970. It is also the longest-established university in East Africa. The university has nine colleges and one school and serves about 36,000 undergraduate students and 4,000 postgraduate students. The Department of Information Technology is one of four departments in the School of Computing and Informatics Technology. It collaborates on various projects to integrate IT solutions into diverse disciplines. The College of Health Sciences (MakCHS) was established in 1924 and offers research, health services, and medical, dental, nursing, public health and biomedical training. It comprises four schools and has key research partnerships and collaborations – Infectious Disease Research Collaboration, Makerere University-John Hopkins University Research Collaboration and the Makerere University Walter Reed Project.

Uganda faces many health challenges such as malaria and infectious diseases. The Department of Information Technology, in collaboration with the MakCHS, established the AI Health Lab to address the lack of specialists available in remote and low-resource public health facilities. Many of these facilities do not have microscopy technicians or specialists who can diagnose diseases from patient tissue and blood samples. The AI Health Lab, led by Dr Rose Nakasi, a computer scientist specialized in AI, harnesses artificial intelligence, machine learning, computer-aided design (CAD) and 3D printing to produce simple hardware to capture images of patient blood samples and diagnose diseases. Simultaneously, the use of these digital technologies fosters multidisciplinary collaboration and CBL in healthcare that can be replicated in any other resource-constrained area.

Programme objectives

The AI Health Lab was conceptualized as an innovative solution to fill gaps in healthcare services by leveraging AI and machine learning to improve disease diagnostics, particularly for malaria and TB, which are common in Uganda and East Africa. The project employs a multidisciplinary approach, integrating expertise from healthcare, AI, and ethics in order to design diagnostic tools tailored to the country's healthcare landscape. This initiative not only advances clinical diagnosis but also facilitates capacity building among local healthcare professionals by promoting on-site training through these cutting-edge digital tools.

Project design and features

The foundation of the AI Health Lab's efforts is the development of practical diagnostic tools that can be deployed in low-resource environments. The laboratory's signature project, Mak Ocular, combines AI with smartphone technology to create a cost-effective, accessible diagnostic solution. The Mak Ocular system comprises a 3D-printed adapter that allows a smartphone to connect to a microscope eyepiece, effectively transforming the phone into a diagnostic tool capable of analysing microscopic slides. Practitioners can use this tool to detect specific pathogens, such as malaria parasites, by analysing images with machine learning algorithms trained on thousands of samples. The project involves multiple stages of expertise, including contributions from hardware developers,

software engineers, and health professionals, ensuring that each component aligns with diagnostic requirements.

The development process begins with hardware design: CAD experts create the smartphone adapter that can be 3D-printed, making it compatible with standard microscopes commonly found in rural health centres. AI and machine learning specialists then develop algorithms that can recognize specific disease characteristics in microscopic images. To refine the accuracy of these algorithms, the laboratory collaborates with health practitioners who identify visual markers needed to diagnose different diseases, ensuring that the AI model can effectively distinguish between pathogens. This iterative development process allows the laboratory to create a reliable tool capable of improving diagnostic capabilities in low-resource settings.

Machine learning further enables the diagnostic technology. Practitioners in the field collect images of blood samples on microscope slides. AI models are then trained using large datasets of these images that capture the distinct characteristics of disease markers. For instance, in detecting malaria, the model learns to identify particular shapes, colours, and structures indicative of malaria parasites. These images are annotated by health experts, providing the model with the necessary knowledge to analyse new samples and deliver accurate diagnoses.

Once trained, the machine learning model can infer diagnoses from new images, facilitating quicker and more reliable results. Each stage of the development process includes rigorous validation by specialists, where diagnostic outputs generated by the AI are compared against expert assessments to ensure accuracy. Expert validation not only ensures diagnostic reliability but also addresses public concerns about AI in healthcare by affirming the role of human judgment in the final diagnostic decision-making process. The AI Health Lab views its system as a 'decision support' tool rather than a replacement for healthcare professionals. In this model, AI provides initial diagnostic suggestions, which practitioners can confirm or refine based on their clinical expertise. This approach emphasizes the importance of human oversight and helps mitigate potential mistrust of AI technologies in the medical community.

Ethical considerations are handled rigorously according to guidelines from the Uganda Ministry of Health (MoH), the WHO, and Institutional Review Boards. Before any diagnostic data is collected, the lab collaborates with Institutional Review Boards and carefully adheres to guidelines from the MoH. These ethical committees ensure that all AI applications comply with national and international standards for data protection, which is especially important in healthcare contexts involving sensitive patient information.

CBL, collaboration, and capacity building

The project work process involves a diverse group of stakeholders, including AI specialists, ethicists, clinicians, and community health representatives, each contributing to different stages of development. This multidisciplinary collaboration ensures that AI tools meet clinical standards and reflect the healthcare needs of Uganda's population.

A central component of the AI Health Lab's mission is to support professional development among health practitioners, especially those working in remote, resource-limited settings. Recognizing that many of these practitioners have limited exposure to advanced diagnostic tools, the lab conducts training programmes that introduce them to the new AI-based systems. This training is essential for fostering user confidence and ensuring the effective adoption of AI technology. Practitioners initially undergo training on how to operate digital tools and interpret AI-generated results, preparing them

to integrate these tools into their routine diagnostics. Training can be scaled because instead of each practitioner needing to peer into the microscope to look at a slide, several practitioners can study digital images of the sample at the same time.

This training component has broader implications for professional growth in the healthcare community. By engaging with AI tools, health workers gain hands-on experience with digital diagnostics, enhancing their skills in both clinical and technological aspects. Practitioners are also invited to provide feedback on the usability and effectiveness of the tools, allowing the laboratory to refine and adapt the technology based on real-world usage. This feedback loop is invaluable, as it not only improves the tools but also ensures that health workers feel a sense of ownership and competence in using new technologies.

Challenges and sustainability

The project faced several challenges while implementing AI diagnostics in Uganda's healthcare system. One challenge was initial resistance to unfamiliar technology, particularly in settings where traditional diagnostic methods were deeply ingrained. In these settings, even patients and the local population were wary of new technologies being used in their healthcare facilities. Integrating AI tools into standard healthcare practices required consistent engagement and training to ease practitioners' concerns. The lab's team conducted regular follow-ups and iterative training sessions, allowing practitioners to gradually become comfortable with the new technology. In some settings, the team was also obliged to meet with local community leaders and laypeople to explain the new technologies, allay fears about technologies, and gain their buy-in for these technologies to be used in their public healthcare services. In this sense, the project also serves a broader purpose of assisting the populations in remote, resource-poor and traditional communities to understand and accept the types of digital technologies that may become more common in their way of life in the future.

Another challenge was related to the usability of the technology itself. During initial trials, health workers expressed concerns about certain design aspects, particularly with the first generation of smartphone adapters. These early models proved cumbersome for some users, prompting the lab to make iterative adjustments based on practitioner feedback. Such modifications are crucial for ensuring that the technology is both accessible and user-friendly, ultimately improving its adoption rates.

In terms of funding, the lab relies primarily on short-term grants, which can limit the project's long-term sustainability. While pilot projects receive adequate funding, there is a need for a more consistent funding model to support ongoing development, scalability, and maintenance of the tools across the country. Scaling the AI Health Lab's work to more facilities remains a major goal, but it requires additional investment and strategic partnerships.

Project impacts

The AI Health Lab's work has the potential to transform healthcare delivery in Uganda by providing diagnostic support to underserved communities. By making diagnostic tools more accessible, the lab contributes to the early detection of diseases like malaria, TB and cervical cancer, potentially reducing mortality rates associated with these illnesses. In addition to benefiting Uganda, the lab's solutions could be scaled to address similar health challenges across the East African region, where healthcare systems often face comparable resource constraints.

Through its innovative work, AI Health Lab has also become involved in broader efforts to shape policy frameworks for AI in health.[48] Makerere University works closely with Uganda's MoH Digital Health Unit to contribute insights on the ethical and practical implications of AI diagnostics. These efforts align with Uganda's national objectives, including the Ministry of ICT's Fourth Industrial Revolution strategy[49], which promotes responsible adoption of AI technologies across various sectors. One area of opportunity outlined in the strategy document is transforming human capital development in Uganda – 'Broadening access to cost-effective, high-quality education and healthcare to improve school survival rates by 50% and increase average life expectancy by an additional 2 years'.

Looking forward, the AI Health Lab aims to expand its network of partnerships and secure sustainable funding sources to broaden the reach of its diagnostic tools. Dr Nakasi envisions collaborations with regional health authorities and international health organizations as essential steps in scaling the lab's work. Additionally, the lab is exploring ways to incorporate more advanced AI techniques, such as deep learning, to enhance diagnostic accuracy and broaden the range of detectable diseases.

Conclusion

Makerere University's AI Health Lab serves as a model for how AI can be applied in low-resource healthcare settings to improve diagnostic capabilities and facilitate on-site learning for health practitioners. The lab's multidisciplinary, ethically grounded approach exemplifies the potential of AI to address critical health challenges while respecting local contexts and regulatory requirements. As the lab continues to evolve, it is well-positioned to make a lasting impact on healthcare in Uganda and beyond, setting a standard for AI-driven solutions that are both innovative and ethically responsible.

AI and metaverse-based online teaching and community learning platform: Shanghai Open University

Key impacts and lessons related to community-based learning

- AI tools used in open and distance education can be harnessed to increase access to lifelong learning opportunities for people throughout their lives.
- Metaverse-based learning enables personalized learning and support, at scale, for learners in academic and non-academic learning and training programmes.

Context

Shanghai Open University[50] is an open and distance university sponsored by the Shanghai Municipal Government, with 40 campuses and teaching centres across Shanghai. It was initially established in 1960 as Shanghai TV University. The institution offers 51 Bachelor and Associate-Bachelor

[4848] The Ministry of Health has published a set of guidelines, but legislation for healthcare is still in process: Digital Health Enterprise Architecture, Standards and Knowledge Products. Available at: https://library.health.go.ug/sites/default/files/resources/digital-health-enterprise-architecture-standards-and-knowledge-products_62.pdf

[49] https://ict.go.ug/wp-content/uploads/2020/10/Executive-Summary-Ugandas-National-4IR-Strategy.pdf

[50] https://global.sou.edu.cn/

programmes and has around 100,000 students enrolled currently. In addition to academic programmes, the university provides large-scale, non-academic training and education to around five million people, online and offline. A key focus of the university's mission is lifelong learning, serving the needs of individuals, society and industry. Shanghai Open University also hosts the UNESCO chair on the UNESCO University Twinning and Networking (UNITWIN) programme and is a key partner to UNESCO IITE.

The university's AI and Metaverse-based Online Teaching and Community Learning Platform initiative aims to build a virtual learning community through an intelligent education platform, integrating AI and digital technologies, where students, teachers, and AI agents collaborate. Through this platform, students can engage in collaborative interaction in an immersive learning environment, achieving personalized and community-based learning goals.

Programme objectives

The main objective of the initiative is to build a series of demonstration applications in open education covering the full process of teaching, learning, assessment, training, and graduation, using technologies such as large language models, AI agents, and the metaverse. These applications provide teachers and students with full-process educational services and offer learners personalized, contextual, and intelligent learning spaces, overcoming the limitations of time and space in education to improve teaching experiences and efficiency. The initiative is applicable to various degree and non-degree education courses, particularly for working adults, remote education, and lifelong learners. Learners interact with teachers and AI agents through virtual communities to access personalized learning resources and support. The initiative also provides flexible learning approaches and support systems for learners with specific needs, such as elderly learners, with considerations made for aging-related challenges.

CBL at Shanghai Open University

Shanghai Open University views community-based learning as creating a multi-interactive learning environment through digital technologies and AI, where learners, teachers, and AI agents learn and collaborate together in a virtual community. This model emphasizes knowledge sharing, interactive learning, and enhancing student autonomy, making it particularly suitable for open education and lifelong learning scenarios.

Project design and features

The demand for practical training by adult learners and the limitations of traditional educational models, such as fixed learning times and locations, led to the exploration of new learning models at Shanghai Open University. The AI and metaverse-based online teaching and community learning platform offers flexible and convenient learning methods, providing diversified and personalized intelligent learning support services for both degree and non-degree education, effectively addressing issues such as contextual teaching, immersive training, and personalized learning.

The initiative design is guided by full-process teaching scenarios of 'teaching, learning, assessment, training, and graduation', including intelligent teaching design, AI-based teaching question-and-answer, intelligent learning assessments, and metaverse-based teaching and training. AI and metaverse technologies support the realization of these teaching scenarios. AI technologies, such as data analysis, intelligent recommendations, and automatic feedback, provide learners with precise learning paths and personalized content. Metaverse technology creates immersive learning

experiences, provides practical training scenarios, and promotes deep collaboration between teachers, students, and AI assistants.

Technological components and infrastructure

The technological infrastructure supporting this initiative includes online learning platforms, virtual reality, devices, AI computing engines, and learning management systems. Learners can access the platform through personal desktop or laptop computers, mobile phones and VR devices to enjoy a seamless learning experience.

The main tools used include AI-based learning management systems, metaverse virtual classrooms, and online collaboration tools. These tools feature intelligence, flexibility, and real-time feedback, allowing personalized recommendations based on learner's needs. The LLMs used are based on open-source tools, but most digital teaching tools were developed specifically for the university's educational needs, with a small portion customized from open-source platforms.

Learners interact in real time through the platform, discussing and collaborating using features like virtual classrooms, shared documents, and instant messaging. Teachers and AI assistants provide real-time feedback and guidance, and the process involves collaboration and enhancement among students, teachers, and AI assistants. Compared to traditional learning, this model significantly improves interactivity, immediacy, and collaboration, especially for geographically dispersed learners who can easily communicate and collaborate, leading to improved teaching quality.

Scalability and sustainability

The initiative is supported by funding from both the university and government, with a focus on digital online teaching. Given that the university's teaching model primarily emphasizes blended and online learning, the university has invested significantly in digital education tools and platforms to support this initiative. It is highly scalable and has already expanded to multiple open universities across China and schools in remote areas of western China supported by Shanghai Open University. The university plans to apply it to more disciplines and learning scenarios, and share insights through international conferences and case studies to bring value to other regions and educational institutions.

Sustainability will be ensured through ongoing technological updates, platform optimization, data accumulation, and social collaboration. Teacher training and feedback mechanisms will be strengthened, and the initiative will be integrated into the university's teaching plan, with AI being a central focus. This ensures continued investment and development, supported at the institutional level for iterative improvement.

Shanghai Open University believes that in the next five to ten years, AI-based community learning models will become mainstream in education. Therefore, the institution is investing in long-term development, actively creating new learning tools and platforms, focusing on the integration of teachers, students, and AI, enhancing teaching quality and convenience, and promoting sharing and collaboration of global educational resources to foster more intelligent, personalized, and collaborative community learning. Plans are also underway to integrate 5G metaverse technologies to create an immersive, borderless teaching environment, aiming to build an intelligent learning platform that supports lifelong learning, records learning processes, recognizes scenarios, senses environments, and connects communities. This platform will provide teachers with efficient

teaching tools and learners with 24/7 tutoring and support, thereby improving learning quality, stimulating student interest, promoting interaction, fostering autonomous learning and collaboration, and achieving deep integration of online and offline education.

Project impacts

The impact of the initiative is measured through learner engagement, improvements in learning outcomes, and the quality of feedback. Evaluations conducted among learners indicate that learner satisfaction and academic performance have significantly improved, particularly in terms of learning interaction and personalized support. AI interactions have also effectively increased online learning engagement and focus.

Conclusion

Shanghai Open University's AI and Metaverse-based Online Teaching and Community Learning Platform initiative demonstrates that lifelong learning for all can be achieved through harnessing the potential of AI and advanced digital technologies that allow learning to be accessible to anyone who wishes to access it, benefiting from personalized experiences facilitated through a metaverse.

Annex 2: Additional case studies of interest

University	Contact person	Name of project/programme
RMIT Australia	Jessica Nichols	GamifiED virtual reality (VR) and role playing in learning. https://www.rmit.edu.au/about/schools-colleges/college-of-business-and-law/research/cobl-research-groups/gamified
University College London	Louise Gebbett	Global Disability Innovation Hub (GDI). Assistive technologies. https://www.disabilityinnovation.com
Open University of Catalonia		eLearning Innovation Center. Ateneu courses and virtual campus
FEU Institute of Technology (Philippines)	Rossana T. Adao Manuel B. Garcia	EdiTH project Building technology-driven pedagogical tools. https://edith.feutech.edu.ph
Hamdan Bin Mohammed Smart University (HBMSU)	Hpreneurs@BHMSU.ac.ae	H-Preneurs platform – ecosystem to develop young entrepreneurs. https://hpreneurs.hbmsu.ac.ae
Indira Gandhi National Open University	Dr. O.P. Sharma	National Centre for Innovation in Distance Education

Annex 3: Glossary of learning and digital technologies

Term	Definition
Terms related to learning and community	
Affective learning	A process of acquiring knowledge, skills and attitudes through emotional engagement
Community engagement	Partnering with communities so they can lead the change process (UNICEF)[51]
Community-based learning	A group of people learning something together; a sub-component of experiential learning. A wide variety of instructional methods and programmes that educators use to connect what is being taught in schools to their surrounding communities, including local institutions, history, literature, cultural heritage, and natural environments.[52] More recently, community-based learning refers to learning that occurs within a community of learners (for example, online) who collaborate, solve problems and work on projects. (The concept 'community' is taking on a broader definition in the era of digital and virtual engagement and learning)
Community of inquiry	A group of individuals who collaboratively engage in purposeful critical discourse and reflection to construct personal meaning and confirm mutual understanding[53]
Distance education	Modes of education in which the student and the teacher are separated in time and space[54]; typically asynchronous
e-Learning community/digital learning community	A group of individuals, including one or more trainers/teachers, who are connected to one another via a digital medium (using a computer, smartphone or tablet, for example). This group of learners have a shared outlook and goals in terms of expanding their knowledge or learning new skills and abilities. Learning communities are built on dialogue and sharing[55]
Experiential learning	Learning by doing
Just-in-time learning	A form of learning that makes the right information available right when the learner needs it so they can react to changing situations in real time
Learning community	A group of students with shared learning goals who collaborate and connect with one another. Interactions are both practical and emotional. Learners of different or similar levels share knowledge and resources, as well as support, with emphasis on open, cohesive communication[56]

[51] https://www.sbcguidance.org/understand/community-engagement
[52] https://www.edglossary.org/community-based-learning/
[53] https://www.thecommunityofinquiry.org/coi
[54] https://unevoc.unesco.org/home/TVETipedia+Glossary/lang=en/show=term/term=Distance+education
[55] https://www.digiforma.com/en/definition/e-learning-community/
[56] https://www.thinkific.com/blog/what-is-a-learning-community/

Term	Definition
Lifelong learning	The concept of learning as a process that continues throughout life to address an individual's learning needs[57]
Project-based learning (PBL)	A student-centred teaching method that encourages learning through engaging, real-world, curriculum-related questions or challenges
Service e-learning/digital service learning	An integrative pedagogy that engages learners through technology in civic inquiry, service, reflection, and action[58]
Service learning	An approach to education that combines learning objectives with community service to provide a context for students to apply their learning while meeting a social need
Terms related to digital technologies and learning	
Advanced digital technologies	Artificial Intelligence (AI), the Internet of Things (IoT), blockchain technology, big data, data analytics, Augmented Reality (AR), Virtual reality (VR), cloud computing, quantum computing, autonomous systems, wearable technology
AI (Artificial Intelligence)	Technology enabling computers and machines to simulate human learning, comprehension, problem solving, decision making, creativity and autonomy[59]
AI agent	A system or program capable of performing tasks autonomously on behalf of a user or another system by designing its workflow and utilizing available tools[60]
Augmented reality	An enhanced version of reality created by the use of technology to overlay digital information on an image of something being viewed through a device (such as a smartphone camera)[61]
Chatbot	A computer programme that simulates human conversation with an end user[62]
Digital e-learning	A set of technology-mediated methods that can be applied to support student learning and can include elements of assessment, tutoring, and instruction[63]
Digital technologies	The use of digital systems, tools, and devices that process, store, and transmit data in electronic form. It encompasses a wide range of technologies, including computers, smartphones, software applications, the Internet, and emerging technologies such as artificial intelligence, machine learning, and blockchain[64]
Edtech – educational technologies	A systematic way of designing, carrying out and evaluating the total process of learning and teaching in terms of specific objectives and

[57] https://learningportal.iiep.unesco.org/en/glossary/lifelong-learning
[58] Waldner, L. S., McGorry, S. Y., & Widener, C. (2012). E-service-learning: The evolution of service-learning to engage a growing online student population. Journal of Higher Education Outreach and Engagement, 16(2), 123-151 [In https://www.researchgate.net/publication/329120108_Service-learning_and_digital_technologies]
[59] https://www.ibm.com/topics/artificial-intelligence
[60] https://www.ibm.com/think/topics/ai-agents
[61] https://www.merriam-webster.com/dictionary/augmented%20reality
[62] https://www.ibm.com/think/topics/chatbots
[63] https://link.springer.com/referenceworkentry/10.1007/978-1-4419-1428-6_431#:~:text=Definition,assessment%2C%20tutoring%2C%20and%20instruction
[64] https://www.igi-global.com/dictionary/digital-technology/7723#google_vignette

Term	Definition
	employing a combination of human and technical resources to bring about more effective instruction[65]
Exploratory learning environment (ELE)	AI-supported tools in which learners are encouraged to actively construct their own knowledge by exploring and manipulating elements of the learning environment. Typically, these systems use AI to provide feedback to support what otherwise can be a challenging approach to learning[66]
Generative AI	Deep-learning models that can generate high-quality text, images, and other content based on the data they were trained on[67]
Hybrid learning (also known as blended learning)	Any combination of in-person and remote learning[68]
Large Language Model (LLM)	A deep learning algorithm that can perform a range of natural language processing (NLP) tasks based on being trained in large volumes of data
Learning analytics	Measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs[69]
Machine deep learning	A subset of machine learning that uses multilayered neural networks, called deep neural networks, that more closely simulate the complex decision-making power of the human brain[70]. Since deep learning does not require human intervention, it enables machine learning at a tremendous scale. It is well suited to natural language processing (NLP), computer vision, and other tasks that involve fast, accurate identification of complex patterns and relationships in large amounts of data.
Machine learning	A branch of artificial intelligence (AI) and computer science that focuses on using data and algorithms to enable AI to imitate the way that humans learn, gradually improving its accuracy[71]
Metaverse	3D-enabled digital space that allows people to have lifelike experiences online using tools such as augmented reality, virtual reality, and advanced internet and semiconductor technologies
MOOC (Massive Open Online Course)	A course of study that is made available over the Internet and can be followed by a large number of people who do not typically engage with each other
Natural language processing (NLP)	The use of AI to automatically interpret texts, including semantic analysis (as used in translation), and generate texts[72]

[65] https://unevoc.unesco.org/home/TVETipedia+Glossary/lang=en/show=term/term=Educational+technology
[66] https://unevoc.unesco.org/home/TVETipedia+Glossary/lang=en/show=term/term=Exploratory+learning+environments
[67] https://research.ibm.com/blog/what-is-generative-AI
[68] https://blogs.worldbank.org/en/education/what-hybrid-learning-how-can-countries-get-it-right
[69] Society for Learning Analytics and Research. https://www.solaresearch.org/about/what-is-learning-analytics/
[70] https://www.ibm.com/topics/artificial-intelligence
[71] https://www.ibm.com/topics/machine-learning
[72] UNESCO. 2021. AI and education Guidance for policy-makers.
https://unesdoc.unesco.org/ark:/48223/pf0000376709?locale=en

Term	Definition
Online learning	Instruction that is delivered electronically through various multimedia and Internet platforms and applications[73]; may be individualized or community-based, synchronous or asynchronous.
Retrieval-augmented generation (RAG)	An AI framework that combines the strengths of traditional information retrieval systems (such as search and databases) with the capabilities of generative LLMs[74]
Technology-enhanced learning (TEL)	Learning that uses mobile technologies to enable individuals to seamlessly move between physical, digital, and communicative spaces for educational purposes[75]
Virtual learning	An artificial environment experienced through sensory stimuli (such as sights and sounds) provided by a computer and in which one's actions partly determine what happens in the environment[76]
Virtual learning environment (VLE) (or virtual classroom)	A platform used in education to give access to educational content online. This can be via computers or mobile devices (tablets or phones or even games consoles). Most VLEs are set up by a specific educational institution, such as a school, college, or university[77]

[73] https://www.sciencedirect.com/topics/psychology/online-learning#:~:text=Online%20learning%20refers%20to%20instruction,%2C%20and%20Internet%2Dbased%20learning
[74] https://cloud.google.com/use-cases/retrieval-augmented-generation
[75] https://www.sciencedirect.com/topics/computer-science/technology-enhanced-learning
[76] https://www.merriam-webster.com/dictionary/virtual%20reality
[77] https://unevoc.unesco.org/home/TVETipedia+Glossary/lang=en/show=term/term=Virtual+learning+environment

Annex 4: Questionnaire template for case studies

Background

The project aims to find and present evidence from open and traditional universities of emerging and good practices in using advanced digital technologies and Artificial Intelligence to enable community-based learning. Neil Butcher & Associates has been commissioned to produce an analytical report that includes case studies of universities using AI and digital technologies to facilitate community-based learning.

Your institution's experience in using AI/digital technologies to support and enable community-based learning would be a valuable input into this report.

Questions

1) Please provide a brief title and description of the initiative, and the department/unit that implements it.
2) The project is about 'community-based learning'. Explain your understanding of this term in the context of your institution/department and its learners and programmes.
3) What are the primary or high-level objectives of your initiative?
4) Describe the context for your initiative – for example, the learning programme/s, learner profiles, and intended learning outcomes. Does the initiative enable learning and collaboration for learners who may have specific learning needs?
5) What specific challenges or opportunities led to the development of this initiative? Does it aim to solve specific problems or limitations that existed before?
6) Describe the overall design of the initiative. What are its core components? How do they integrate AI and advanced digital technologies?
7) Describe the technological infrastructure that enables the initiative. This could include access to technologies and devices by learners, as well as platforms and ICT required for it to work seamlessly.
8) Describe the digital tools and technologies used in the initiative. What are their features? Why were they selected? Have specific criteria been used to select them? (It would be useful to see the criteria if they exist.) Were they developed as bespoke tools for your institution, or were existing or open-source tools used or adapted for the initiative?
9) Describe the modes of interaction in this initiative. How do students and learning community members interact within the learning process and with each other, using digital tools? How are communication, collaboration and feedback facilitated through the technology? How are these different from before the technologies were adopted?
10) How is the initiative and its development funded/resourced? If there have been any challenges with resourcing the initiative, please describe them and how these challenges are addressed (if at all).
11) Describe how the impact of the initiative is measured/evaluated. How do you know that it meets its objectives? Has it been evaluated? If so, what were the findings?

12) How scalable is the initiative? What steps have you taken or are planning to take to expand its reach, if any?

13) How is the long-term sustainability of the initiative ensured? Are there any specific strategies the institution is employing to maintain its effectiveness over time?

14) How do you envision this initiative (or other initiatives to support learning through advanced digital technologies) evolving over the next five to ten years? Is your institution actively developing other tools or initiatives to enable community-based learning?

15) Do you have any other insights or information you would like to share about the initiative?