

SUTD campusX

Learning ANYWHERE using Cyber-Physical Learning Technology for Future Learning

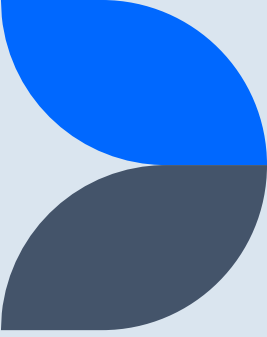
Professor Kin-Leong PEY

Associate Provost

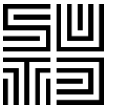
Office of Digital Learning



Education Transformations/Disruptions



- ❑ COVID-19 → remote Learning (Zoom, Teams)
- ❑ Digitisation → sharing and collaborative learning
 - real-time team-based activities: sharepoint, sharescreen, digital annotations, etc
 - learning analytics
- ❑ Generative AI tools → LLMs/ChatGPT
 - academic integrity
 - AI literacy
 - fundamental knowledge
 - higher order learning & assessments/critical thinking skills
- ❑ Skills-based learning → lifelong tertiary learning
 - self-directed learning
 - personalized learning
- ❑ Learn & Work → seamless learning
 - work-study pathways (educational and career goals)



Cyber student



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Physical student



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Cyber-physical learning

Learning **same** materials

Not equal to hybrid learning



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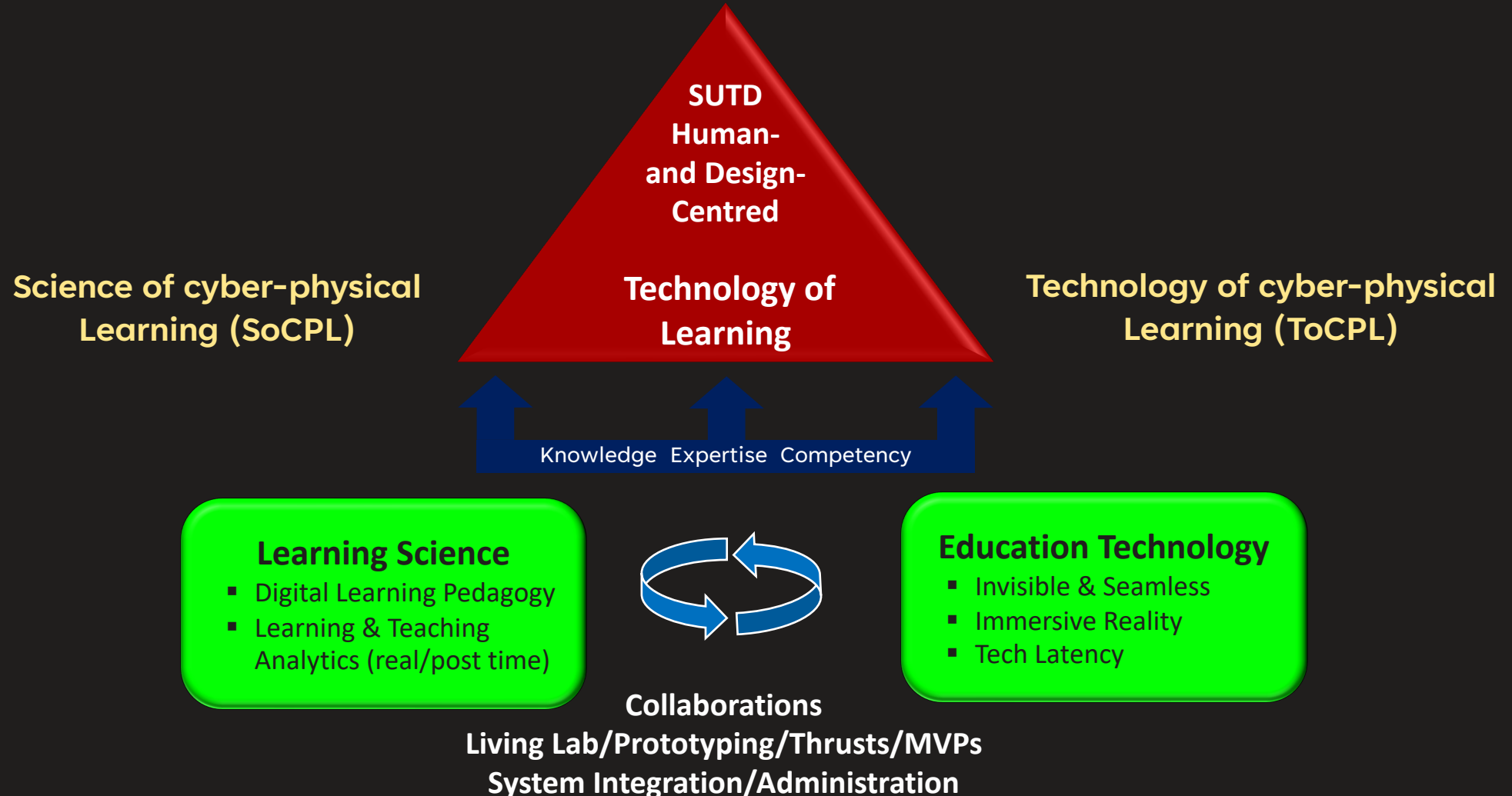
A person wearing a VR headset is shown from the chest up. Their right hand is raised in a gesture, with a glowing blue sphere and concentric circles around the index finger. The background is a soft-focus cityscape at night. Overlaid on the scene is a network diagram consisting of white lines connecting various nodes, some of which are glowing blue. The overall color palette is dominated by blues and purples, with some warm yellow and orange tones from the city lights and the person's skin.

campusX vision

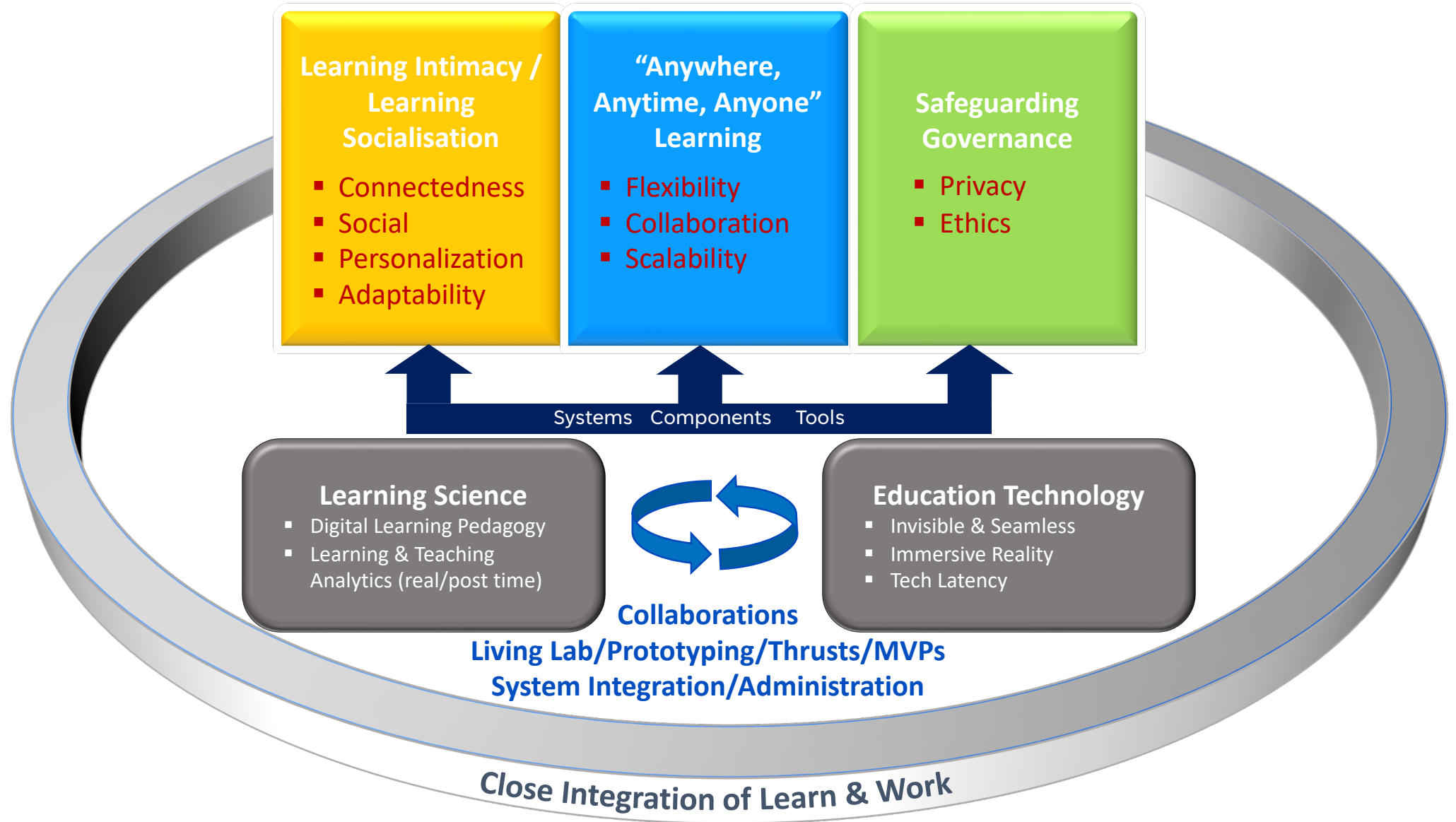
To pioneer a fun, safe, and inclusive educational experience at SUTD, where lifelong tertiary learners can leverage innovative cyber-physical techno-pedagogies to personalize their learning journeys and achieve optimal learning outcomes.

Human-Centric Technology of Learning

Ethics of cyber-physical Learning (EoCPL)



campusX – Seamless Cyber-Physical Learning Environment



campusX Philosophy

The central thinking behind campusX is that **cyber-physical learning**, when powered by **educational technology**, is an intimate, interactive, and impactful **learning pathway** that will drive educational innovations to **improve** learning outcomes, **grow** skills and knowledge, and **sustain** personalized lifelong tertiary learning in a fun, safe, and inclusive way.



campusX roadmap

Horizon NOW

(1-2 years – FY22-FY23)

Address the pain points of SUTD's learning pedagogy via

6 MVPs, UROP & campusX builder & set-up partnership with external parties

Horizon NEXT

(Next 2-3 years – FY23-FY25)

*Development of **6 campusX intellectual thrusts** to address the grand challenges and support pilot runs of MVPs (e.g. real-time intervention via Learning analytics, telerobot-human interaction, immersive realities learning, metaverse with gamification etc.) and scaling up of courses*

Horizon BEYOND

(4 years and beyond – FY26- FY29)

Progressively scaling up of campusX MVPs and pedagogies to freshman, sophomore, junior and senior curriculum, PG and CET. Explore more futuristic learning - NFT/blockchain metaverse for personalized leaning like skills training.

campusX key thrusts



G1 Learning Intimacy / Learning Socialisation

- Connectedness
- Social
- Personalization
- Adaptability

G2 "Anywhere, Anytime, Anyone" Learning

- Flexibility
- Collaboration
- Scalability

G3 Safeguarding Governance

- Privacy
- Ethics

People-Centric Learning & Design (PCLD)

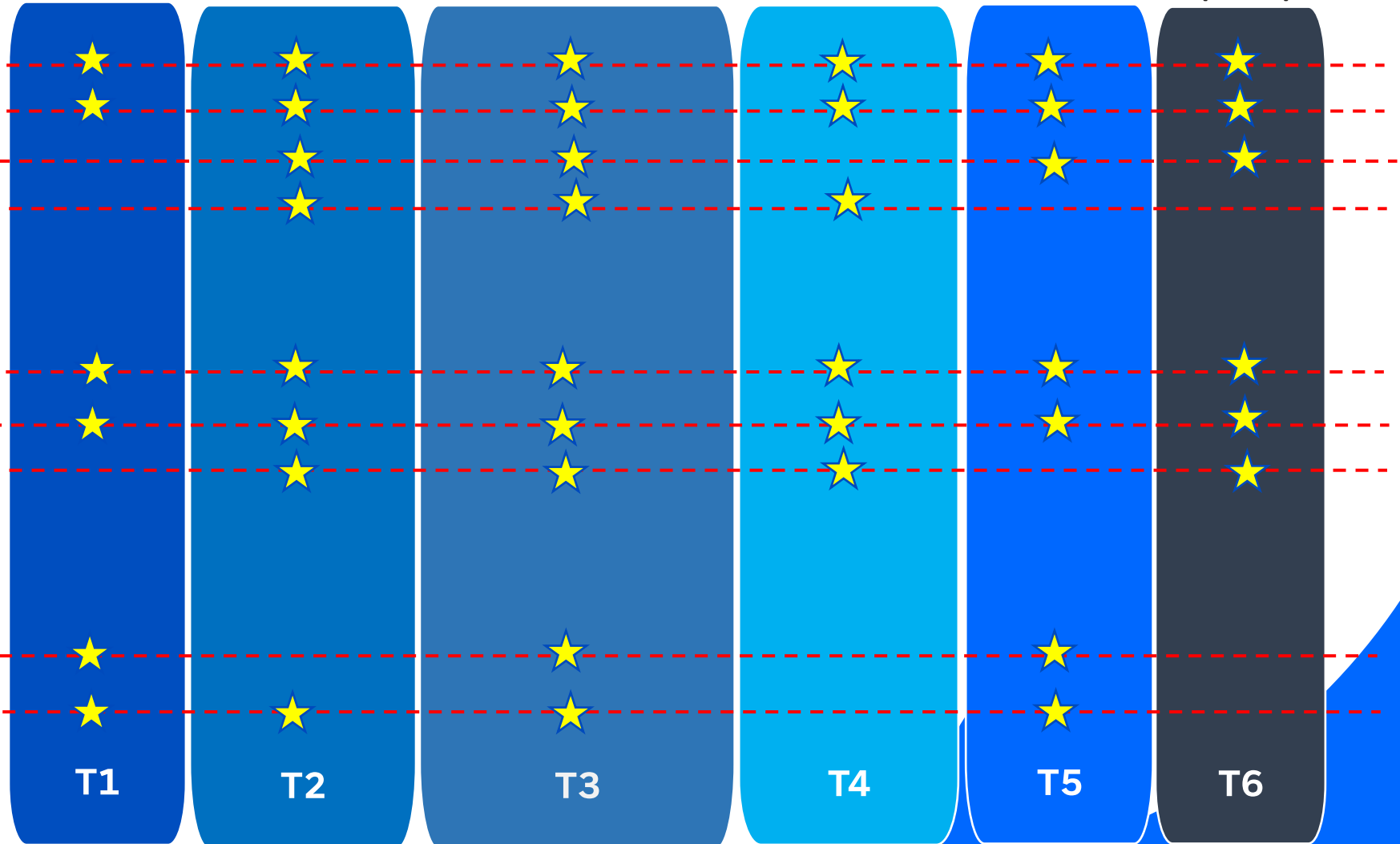
Immersive Realities Learning (IRL)

Metaverse & Blockchain for Learning (MBFL)

Socially Interactive Edu Robotics (SIER)

Advanced Learning Analytics (ALA)

Enhanced Learning Through Innovative Technology (ELITE)



MVP P2P (Proof-of-concept to Practice)

- ❑ MVP1 (completed)
 - Cyber-Physical Learning Telepresence System
 - First prototype has been developed and demonstrated during NTEL22 and visit of Minister of Education to SUTD during Nov 2022
 - Further improved versions being developed
- ❑ MVP2 (near completion)
 - Learning Progress System with Learning Analytics
 - Project has started and in development phase (1 Jan 2023 to 31 Oct 2023)
- ❑ MVP3 (ongoing)
 - 3D scanning, smart digital repository, and NFT for student portfolio
 - Improve design learning
- ❑ MVP4 (near completion)
 - Understanding Large Language Model for Education
 - To understand how students interact/use chatGPT and identify teaching practices (prompt engineering) to guide students
- ❑ MVP5 (ongoing)
 - Future campusX classroom involving wider consultations with students/pillars/clusters
 - Engaging users via design workshops and dialogues
- ❑ MVP6 (launching soon)
 - Personalized and Adaptive Learning
 - SUTDVerse for immersive interactive learning
 - Engaging users via design workshops and dialogues



Telepresence Robot Learning System

**A gamified telepresence robot
platform to help students and
instructors learn and interact
better in cyber-physical learning**

Improved Learner Experience



Remote students can see the physical classroom, interact and collaborate with their friends using the robots

Increasing classroom engagement and social intimacy of hybrid classroom

Improved Instructor User Experience



Better engagement

Telepresence Robot

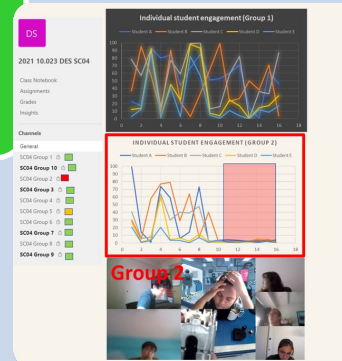
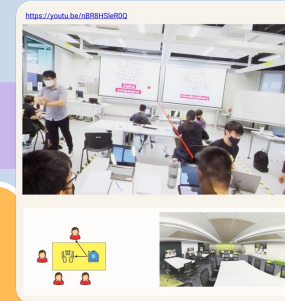
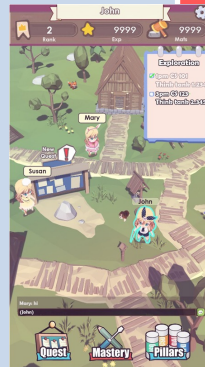
Virtual Reality

CampusX MVP

Gamification

Analytics

Gamification/Metaverse Game to better engage student discussions and teamwork



Learning analytics to better engage students in sub-group discussions

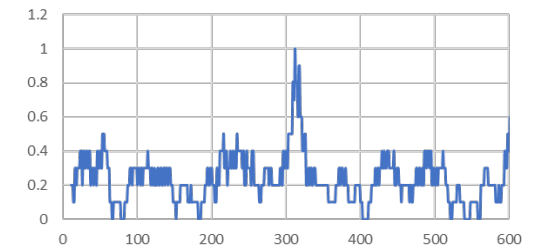
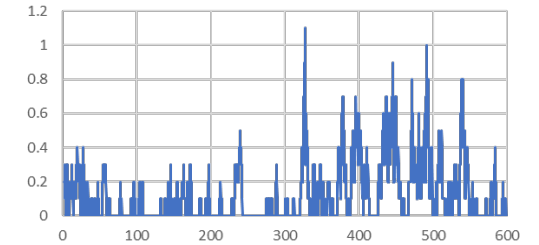
campusX MVP

A gamified telepresence robot platform to help *students and instructors* learn and interact better in cyber-physical learning.

Cyber-Physical Telepresence Learning System



- Telepresence robot, learning analytics, facial and eye sensors, VR/AR, and gamification tools
- Integrated, seamless, and interactive learning experience for users both cyber & physical students
- Enable physical representations of the remote cyber students in a face-to-face class
 - All students are able to learn and collaborate together in an effective and socially connected manner



- Learning analytics and sensors also provide instructors
 - With real-time dashboard understanding of the learning responses of students
 - Instructors can personalise and optimise learning for both cyber and physical students.

Improved version of TLS

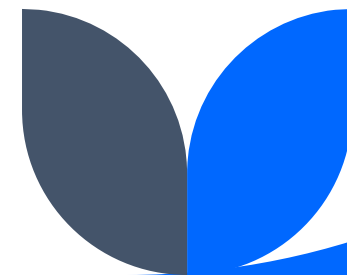


Key features of TLS

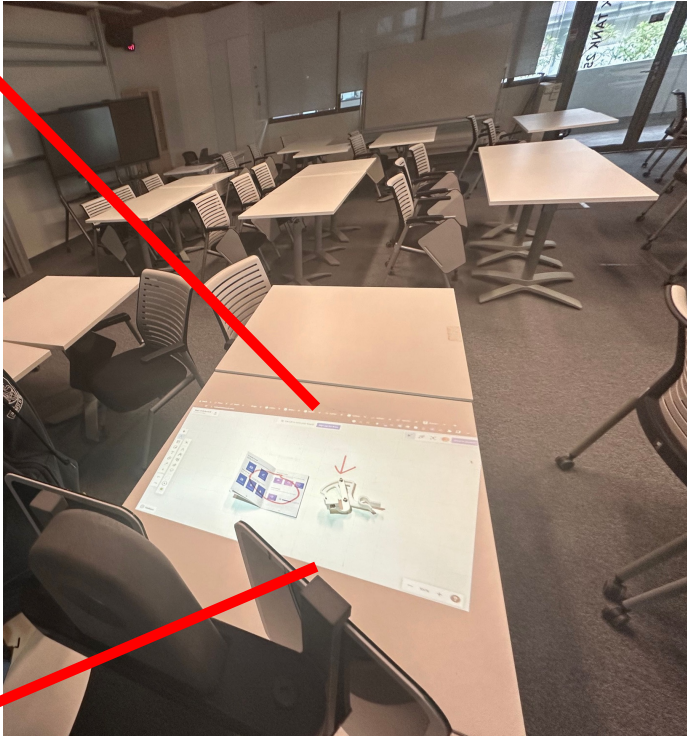
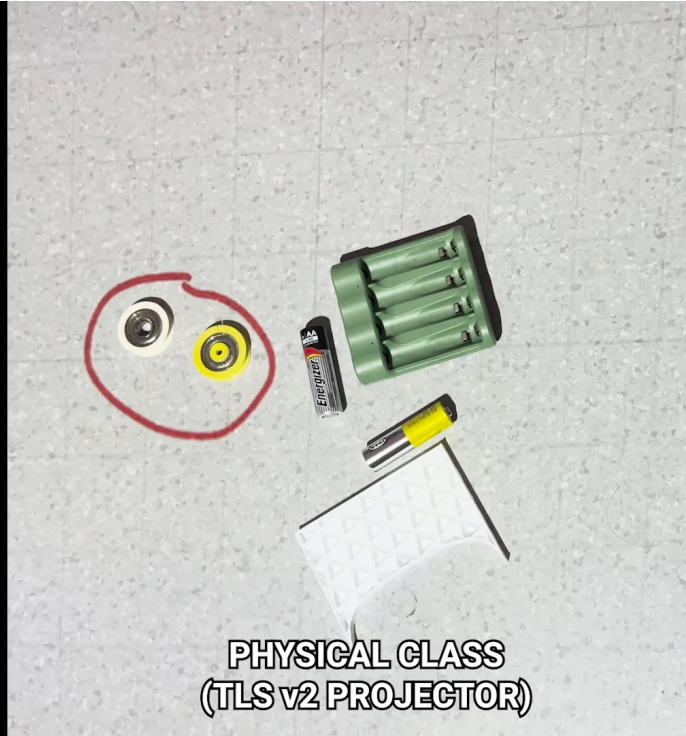
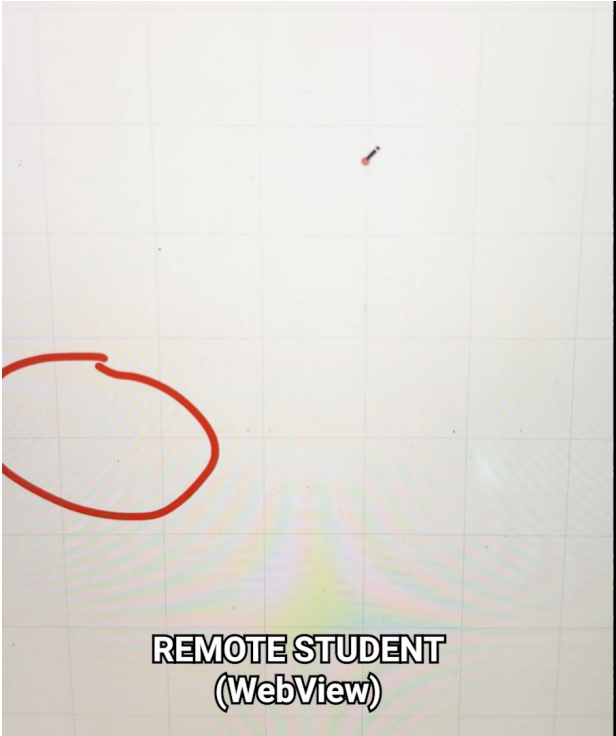
- Web based access and VR based access
- 360° view with flexible motion
- Pointers, Indicators and Virtual projection
- Integration of Audio fencing feature
- Suitable for both content based discussion and hand-on activity



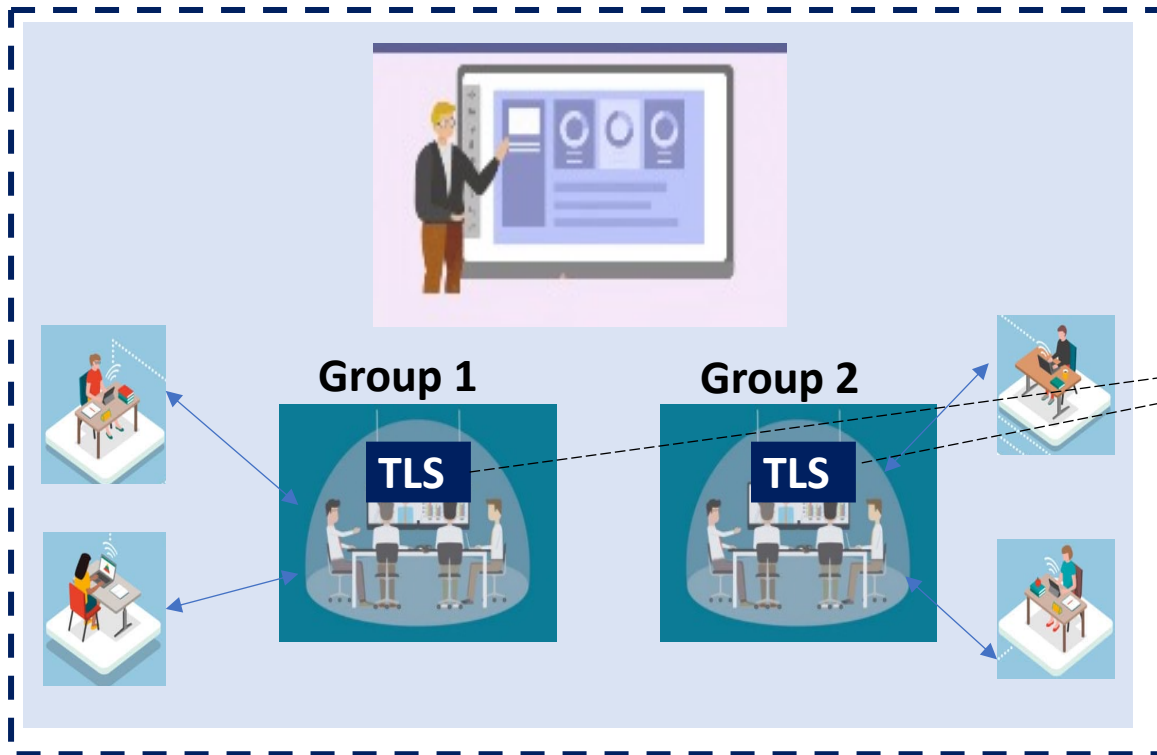
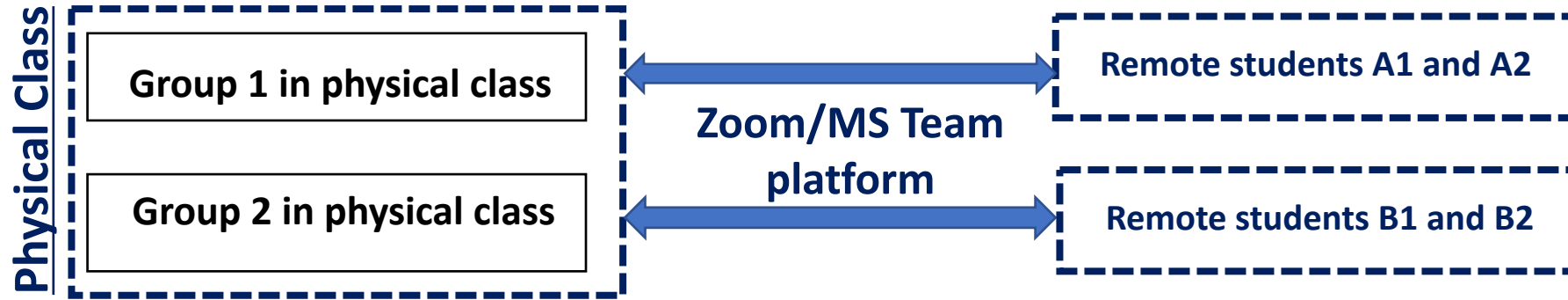
Improved version of TLS



Improved version of TLS

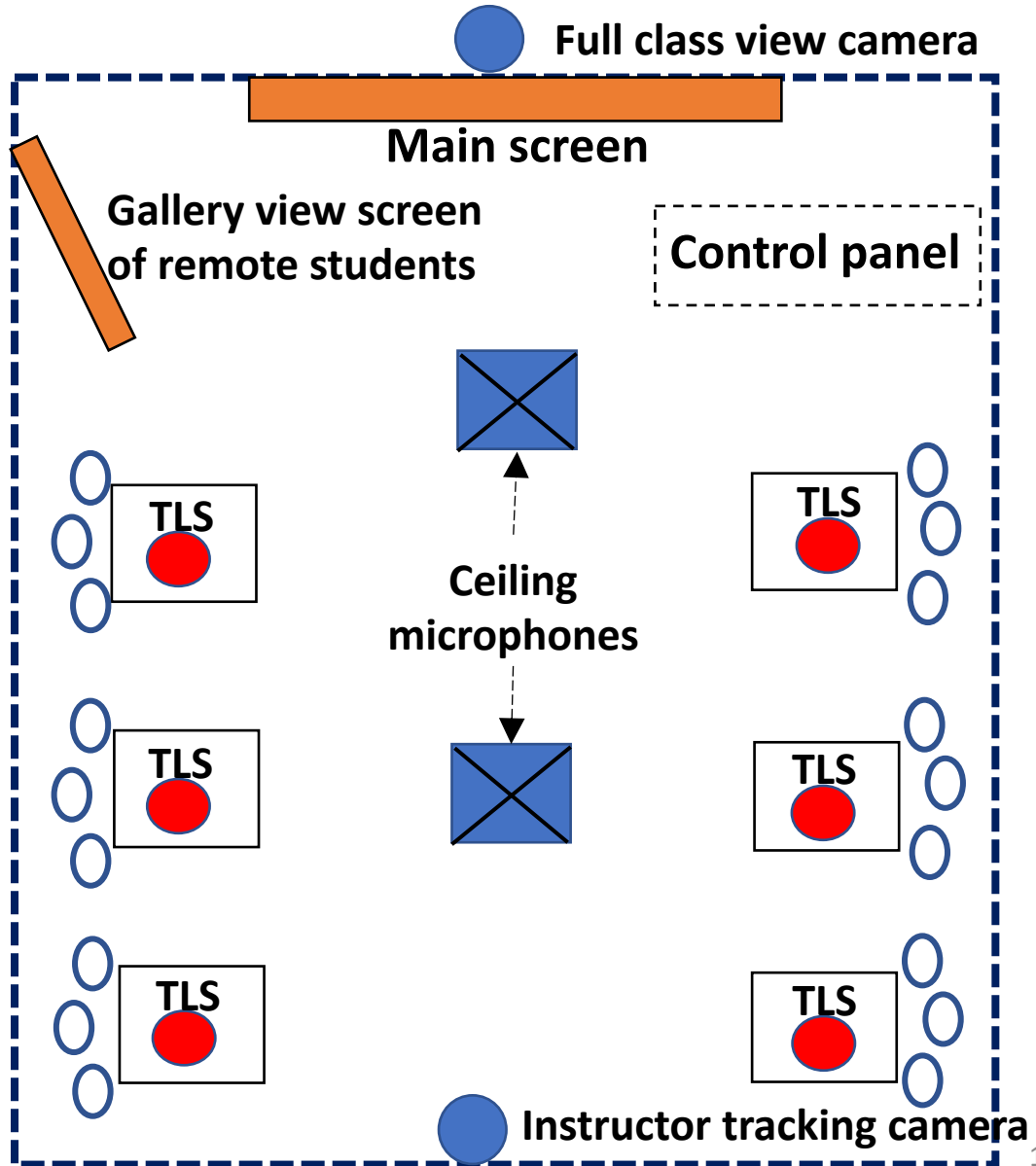


Cyber-Physical Group Activity



Telepresence Learning System (TLS)

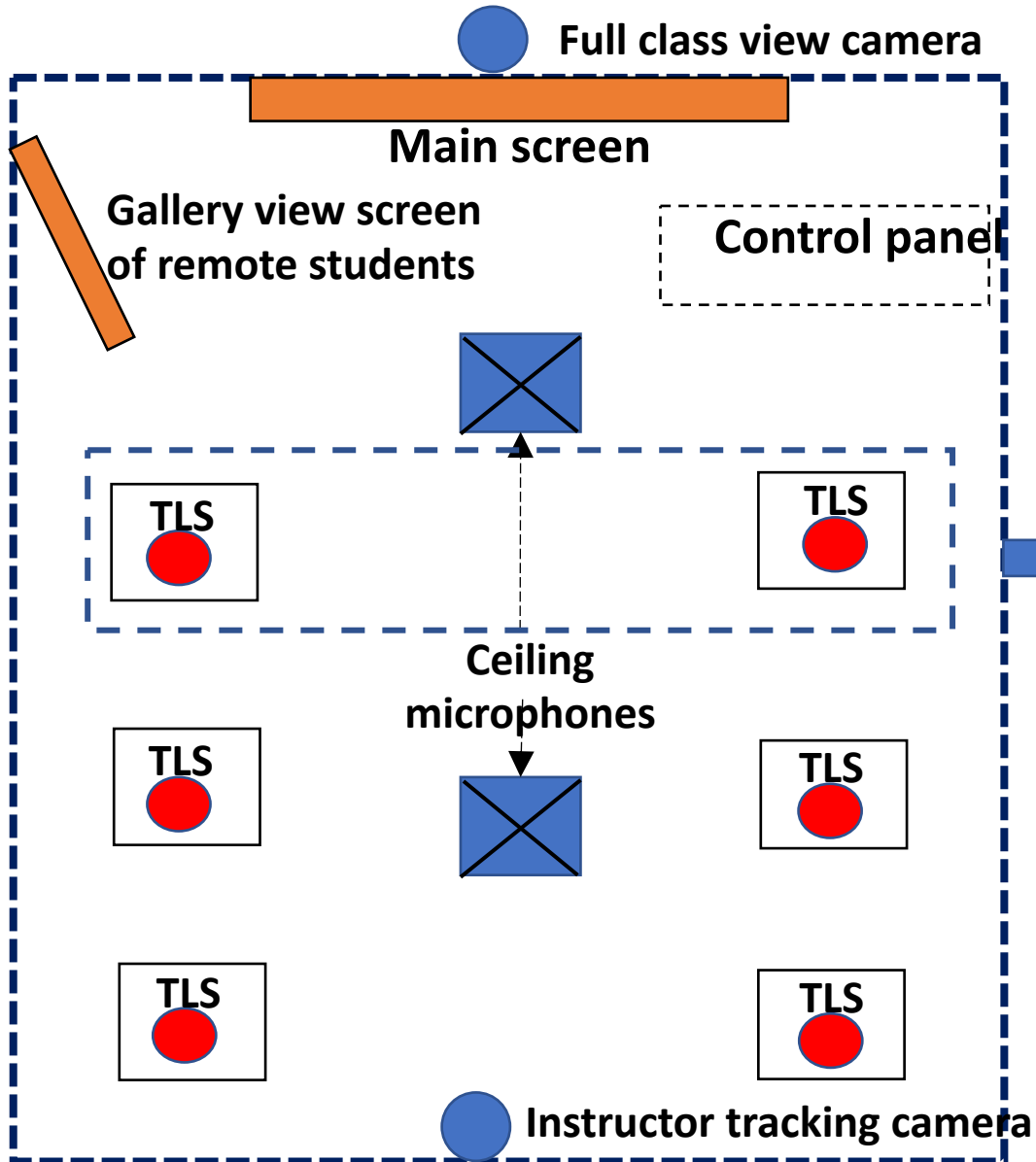
Proposed cyber-physical classroom



Key features

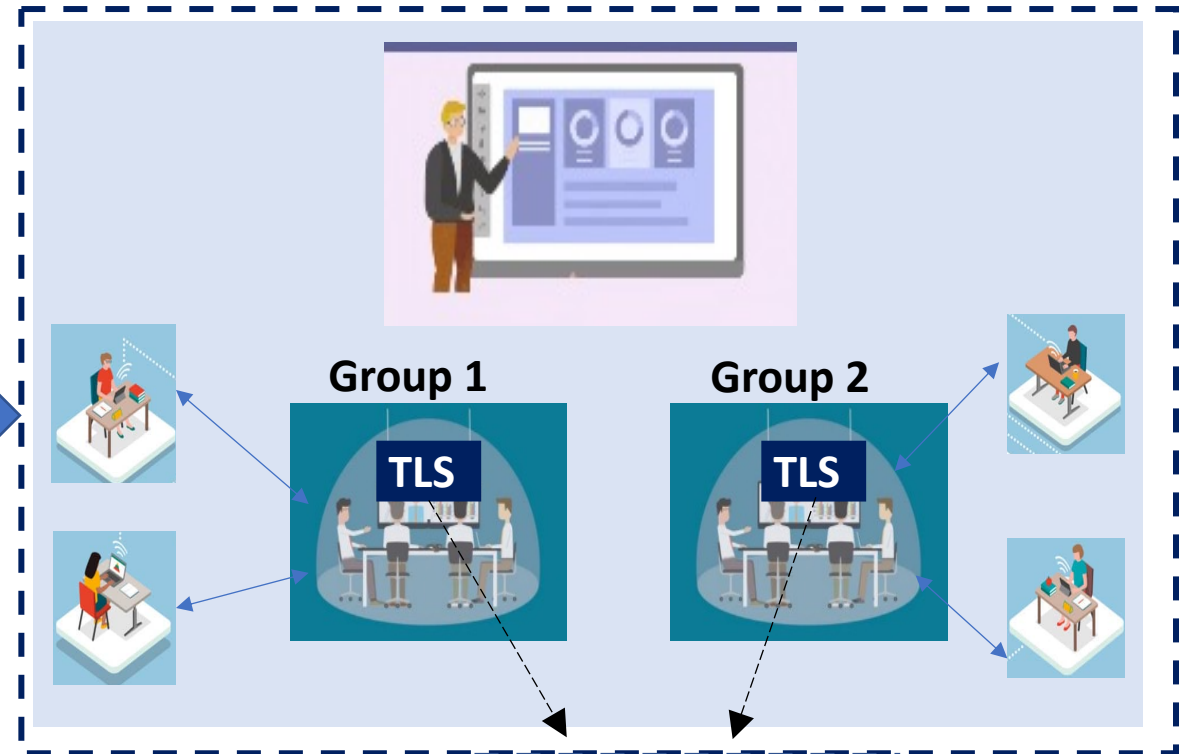
1. Each group consists of TLS for team-based activity and remote cyber students joining the team through TLS.
2. 1 x Main instructor screen (at least 80") for content display
3. 1 x Gallery view side-screen (around 65") for instructor to see cyber learners
4. Cyber learners to:
 - view instructor through class camera
 - Zoom audio feed from ceiling microphone
 - during cyber-physical team-based learning, both personal laptops and TLS are to be used
5. **Audio fencing** feature is required and to be improved in TLS.
6. **Both group activity and teaching/lecturing**
 - **Design-, critics-, content- and programming-based lessons**

Proposed cyber-physical classroom



Key features

- Both group activity and teaching/lecturing



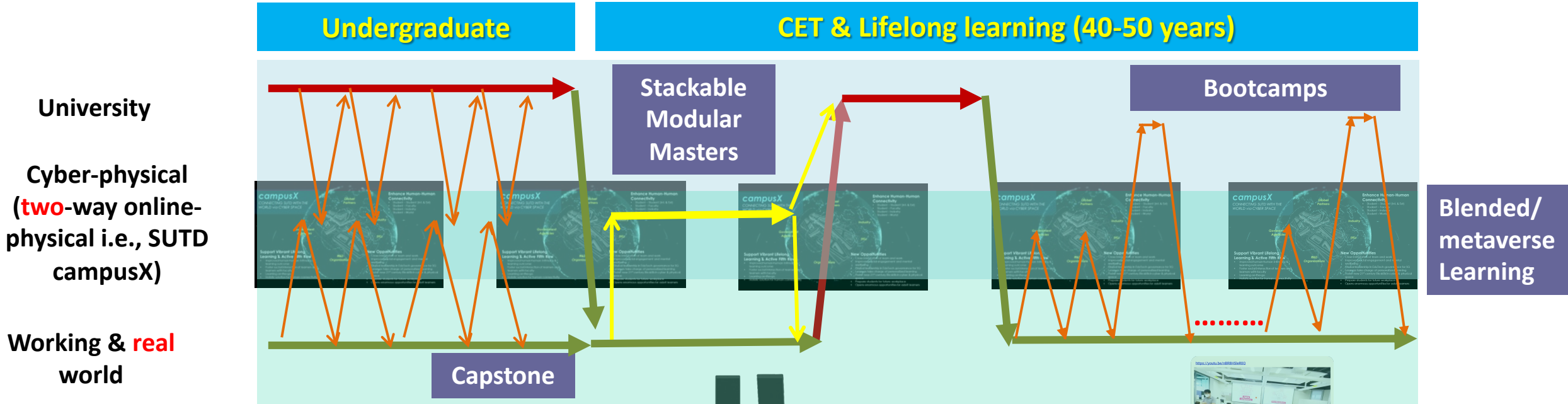
Telepresence Learning System (TLS)



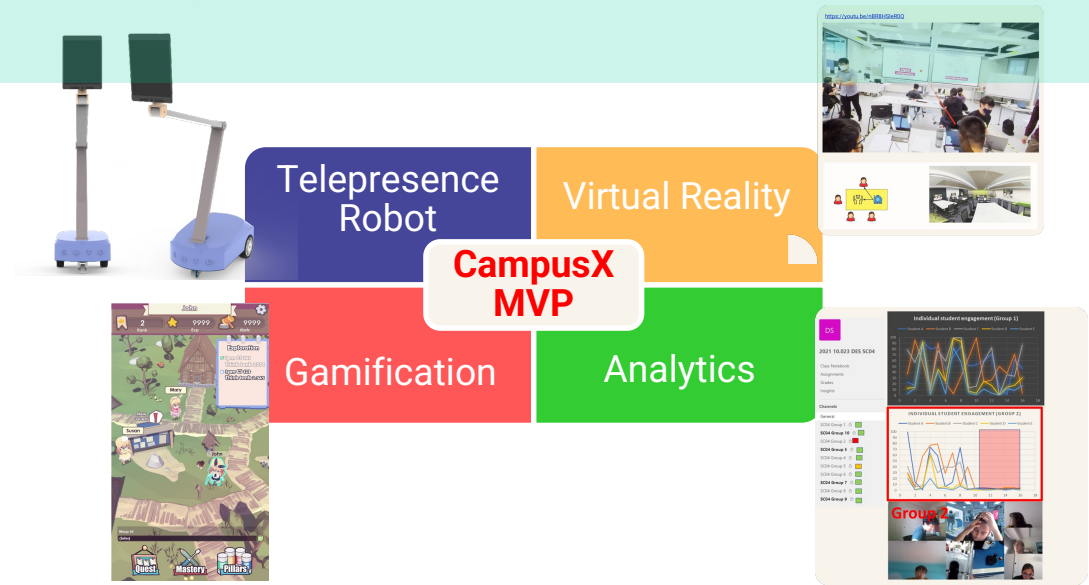
Immersive and Integrative Cyber-Physical Learning Environment

- New CPL environment stimulates more interest on learning with immersive and inclusive learning environment.
- Overall class environment would enhance class intimacy and engagement.
- TLS
 - convenient for remote students to interact with fellow students and teacher during the group activity.
 - suitable for both content-based discussion and hands-on activity providing flexibility in the motion near the hands-on activity area with different views and virtual projection.

Pedagogy Innovation & Lifelong Learning – Frontier Uni in cyber-physical learning



Flexible and modular curricula coupled with **cyber-physical learning** platform to allow learning across multiple avenues for **50+ years of continuous education** after high school.

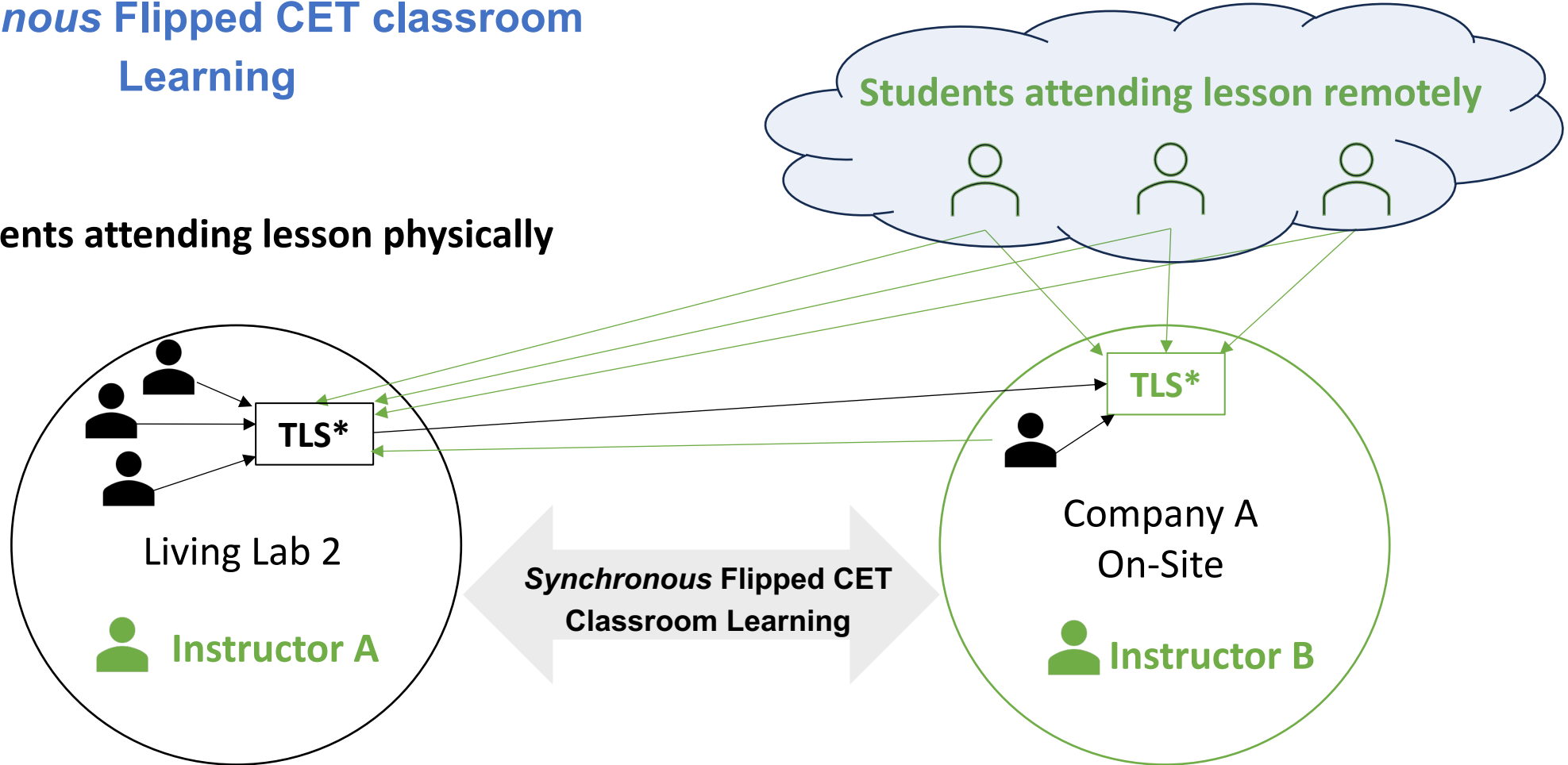


Modified from Sanjay Sarma (MIT), Speech at SUTD Academy launch

SSG-IAL-SUTD campusX Living Lab

Synchronous Flipped CET classroom Learning

Students attending lesson physically



* Telepresence Learning System (TLS)

campusX

CONNECTING SUTD WITH THE
WORLD via CYBER SPACE

**Local &
Global
Partners**

**Enhance Human-Human
Connectivity**

- Student – Student
- Student – Faculty
- Student - Industry
- Student - World

**Government
Agencies**

**SUTD campusX
addressing the future
of PET & CET education**

Industry

Academia

**Support Vibrant Lifelong
Learning & Active Fifth Row**

- Improved human-human intimacy & learning outcome
- Foster social interaction of learners and learners with faculty
- Learning on-the-go
- Holistic solution for human connectivity

**R&D
Organisations**

New Opportunities

- Close integration of learn and work
- Improved social engagement and mental wellbeing
- Leadership in cyber-physical governance
- Learners take charge of personalized learning
- Foster new 21st century life skills in cyber & physical space
- Prepare students for future workplace
- Opens opportunities for adult learners

International Cyber-Physical Learning Alliance



Tecnológico de Monterrey
Mexico

Zhejiang University
China

SUTD
Singapore

Core Founding Members

Aalto University

Zhejiang University

Hong Kong University of Science and Technology

Co-lead - Tecnológico de Monterrey (Tec)

Co-lead - Singapore University of Technology and Design (SUTD)

Associate Member - NEOM U, Saudi Arabia

International Cyber-Physical Learning Alliance (CPLA) Launch at Tec in Jan'24



The poster features a central image of a human hand holding a prosthetic hand. The background is a dark, textured brown. At the top left is the IFE CONFERENCE logo. The main title is 'Cyber-Physical Learning Alliance Summit 2024'. Below the title are logos for the Institute for the Future of Education (Tec), Living Lab & Data Hub, SUTD (Singapore University of Technology and Design), and campus. On the right side, there is a call for contributions and a list of important dates. At the bottom right is a QR code.

IFE CONFERENCE

Cyber-Physical Learning Alliance Summit 2024

Institute for the Future of Education
Tecnológico de Monterrey

Living Lab & Data Hub

SUTD SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

campus

We are calling for contributions relevant to the Cyber-Physical Learning in the areas of Artificial Intelligence, Hackathons, Education Models, Learning Analytics, Applications and Ethics. The contributions could be Innovation Paper, Research Paper, or Discussion Panels.

Important dates to note:

- Extended abstract submission deadline: September 1st, 2023, at 23:00 hrs (GMT-6)
- Submitted abstracts evaluation: September 4th to September 29th, 2023
- Notification of acceptance: October 2nd, 2023
- Full presentation submission deadline: November 30th, 2023, at 23:00 hrs (GMT-6)

Scan QR Code for Cyber-Physical Learning Alliance Summit 2024

Aalto University, Finland
Zhejiang University, China
Hong Kong University of Science and Technology, SAR, China
Tecnológico de Monterrey (Tec), Mexico
Singapore University of Technology and Design, Singapore

SG Cyber-Physical Learning Alliance Partners

To be launched on 29 Nov 2023



Nanyang Academy of Fine Arts (NAFA)

Ngee Ann Polytechnic (NP)

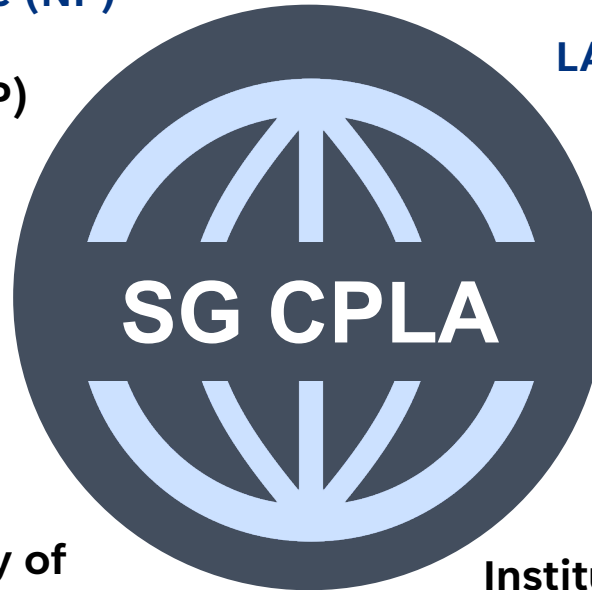
Singapore Polytechnic (SP)

Temasek Polytechnic (TP)

Singapore Institute of Technology (SIT)

**Singapore University of
Social Sciences (SUSS)**

**Singapore University of
Technology and Design (SUTD)**



LASALLE College of the Arts (LASALLE)

**Building and Construction Authority
Academy (BCAA)**

Civil Service College (CSC)

Singapore Institute of Management (SIM)

**Singapore Institute of
Manufacturing Technology (SIMTech)**

Institute of Adult Learning (IAL)

Ministry of Education (MOE)

SG CPLA Partners

“

Digital is setting the stage for immense innovation. In a world of “work from anywhere,” people also want to **“learn from anywhere.”** New education platforms are rising to meet this demand.

Bryan Garvey

You can access your learning “account” online and complete course modules or entire degree programs from the best providers, anywhere in the world, at your own pace. **The learning journey becomes hybrid, taking the best that online and in-person modes can offer, and flexing to your individual needs.**

Prof. Soumitra Dutta

You have to think, **what can you be distinctive at?** If you have an online offering, it is almost infinitely scalable, but the customer will also be free to choose the best provider. So, **you have to offer something really good and distinctive.**

Prof. Adam Tickell

”

campusX for meeting SUTD 2030

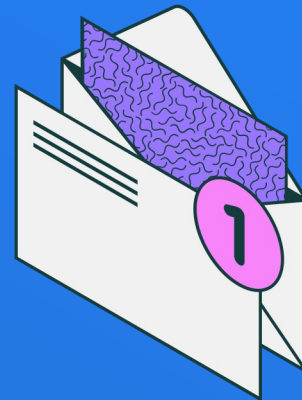
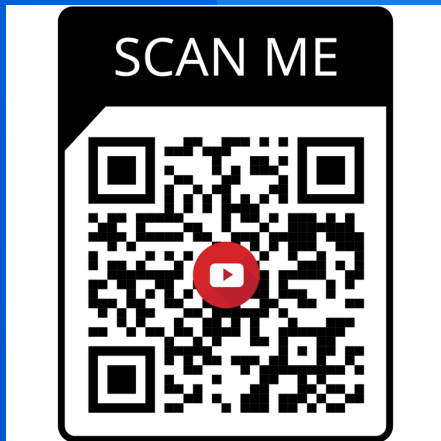
*Learn and Work framework is
timely and critically important*

*It is not whether we should do it
instead it is a must*

*campusX has distinctive features for
data-driven personalized learning*

Thank You

To find out more



campusX@sutd.edu.sg

