How Schools Learning Environment Can Transform Digitally and Smartly for Better Learning Outcomes

30 Nov 2023

Trung Nguyen
Founder, Pythaverse

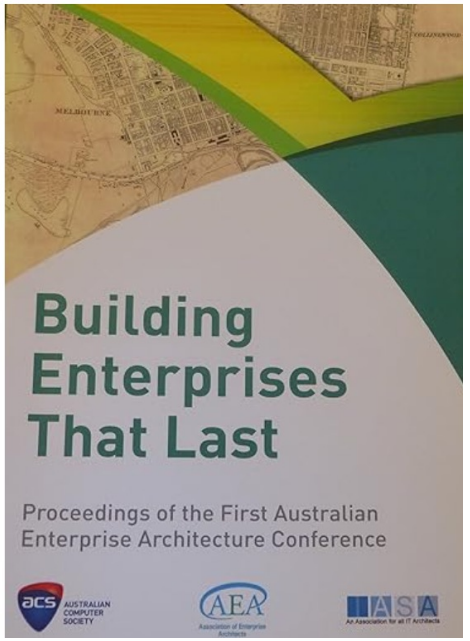
Agenda

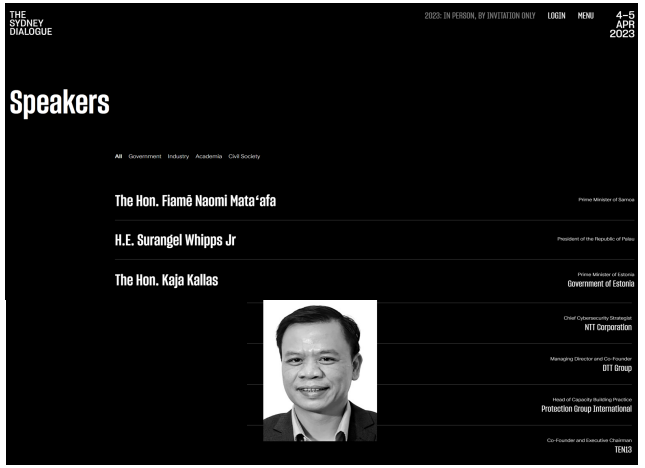
1. Technology disruption and schools' transformation
2. Making right decision for School Digital Transformation
3. Digital Transform Learning Smartly for Better Learning Outcomes
4. Pythaverse: an effective solution
5. Take-aways

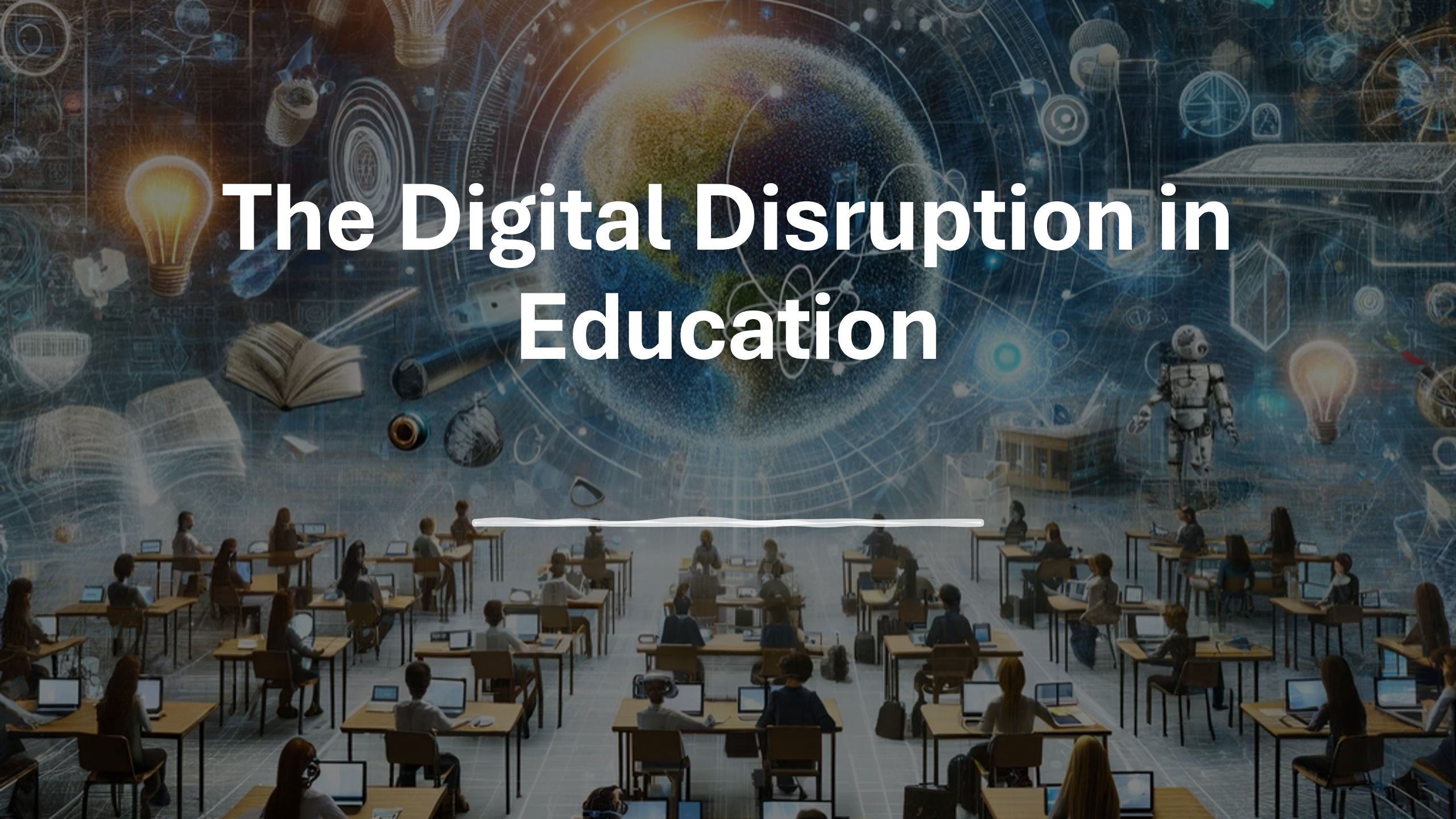
pythaverse
My Digital Twin

About me

- **A good STEM student:** IMO silver medalist in Mathematics 1995, Honor in Computer Science, Best International Alumni, University of technology, Sydney, Certified Carnegie Mellon Instructor…
- **25 years in IT industry:** Working globally in USA, EU, ASIA; Top 10 companies in Vietnam; Taskforce member in Asia Pacific Data Analytics Skills standards; Chairman of Stevie award for new technologies; Certified Enterprise Architecture; International leader dialogue on technology like Sydney Dialogue, Worldbank, OECD …
- **Successfully transform different organizations:** Vietnam eGovernment; Top 4 Bank in Vietnam; Vietnam iKnowledge Platform; Data-analytics for Covid fighting in Vietnam…
- **Represent private sectors in Vietnamese Industry 4.0 policy taskforce:** Editorial board of Vietnam Digital Economy report; Vietnam masterplan on Industry 4.0 …
- **Working in Education since 2003:** Leading ICT skills training institute in Vietnam; Masterplan for Vietnam National University in Hanoi, Initiate STEM Education in Vietnam since 2011
- **Still good to work in:** Digital transformation; Digital learning; AI & Big Data; Enterprise Architecture & Master planning; Instructional design
- **Still believe:** the best work I can do is helping the next generation to be better than me

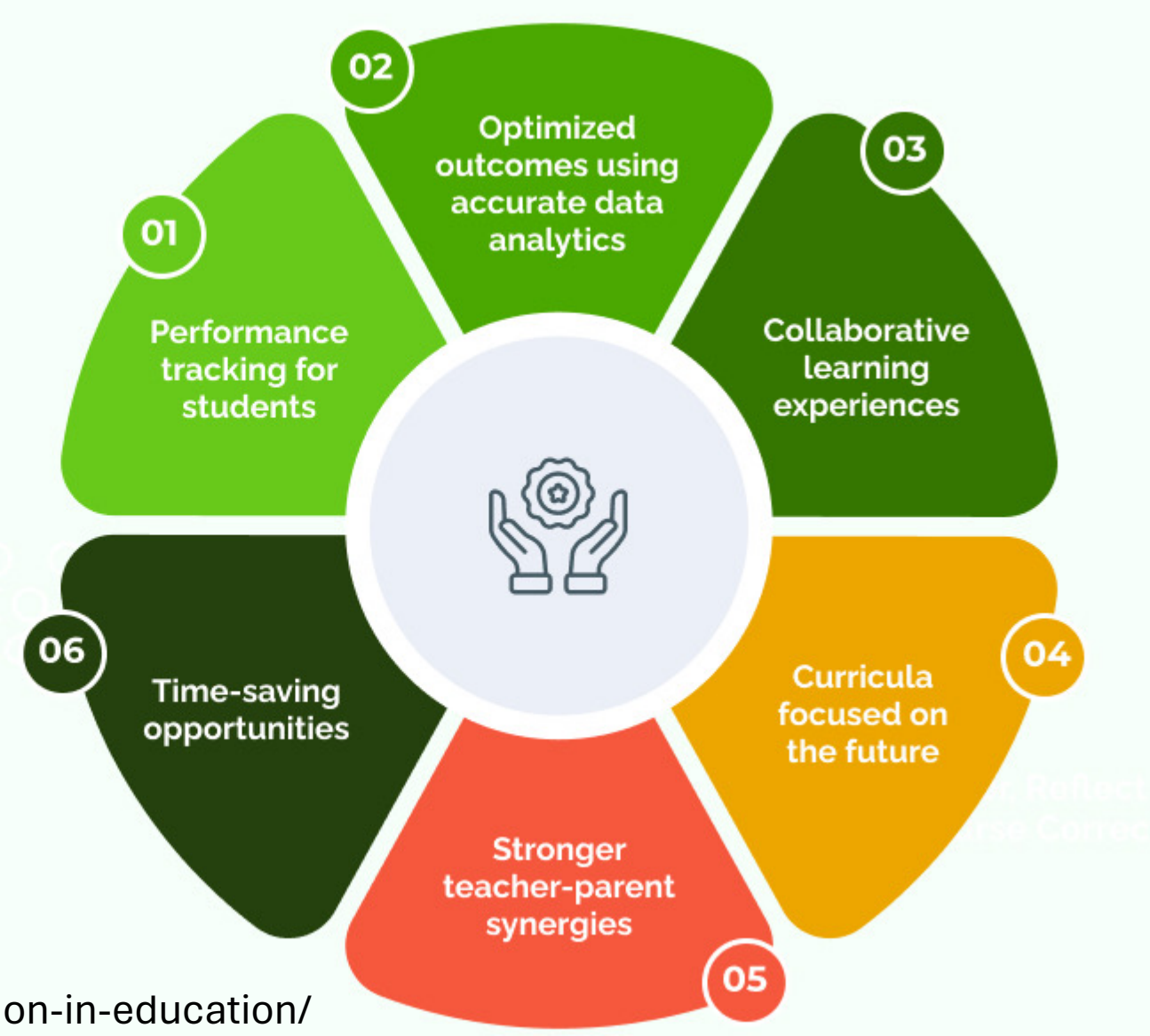





The Digital Disruption in Education

Technology can bring many good things to us

- Inefficient ICT infrastructure and poorly resourced digital learning systems caused countries' most significant disruptions to education and learning losses during the COVID-19 pandemic.
- Up to **one-third of students worldwide** could not access learning for over a year due to school closures.



https://www.digital-adoption.com/digital-transformation-in-education/

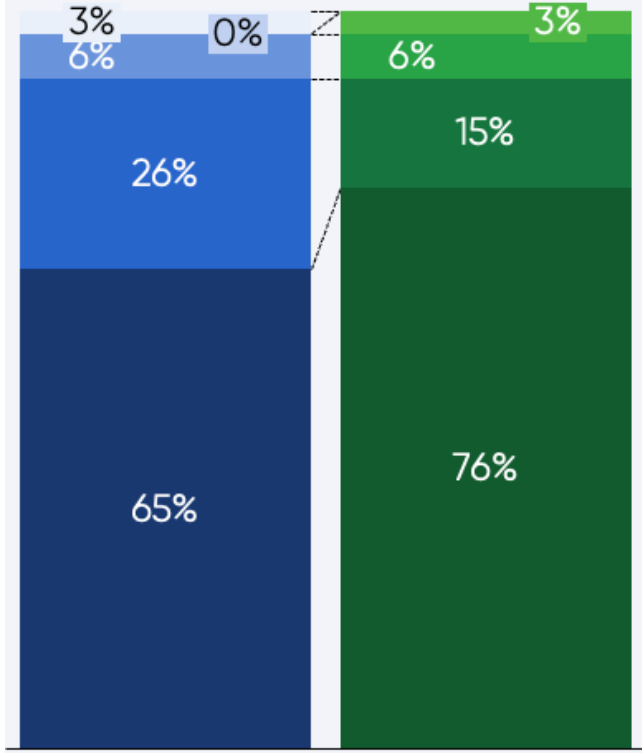
But … technology has introduced many new challenges to us

We enter even more disruptive technology era with AI, Quantum …

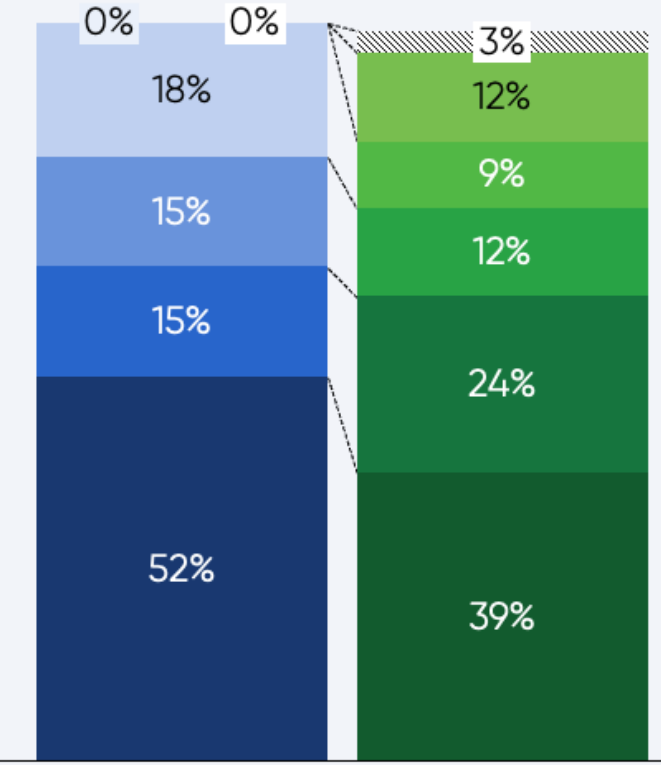
My digital twin!

Two thirds of schools see the integration of digital as critical to the future of K12 education

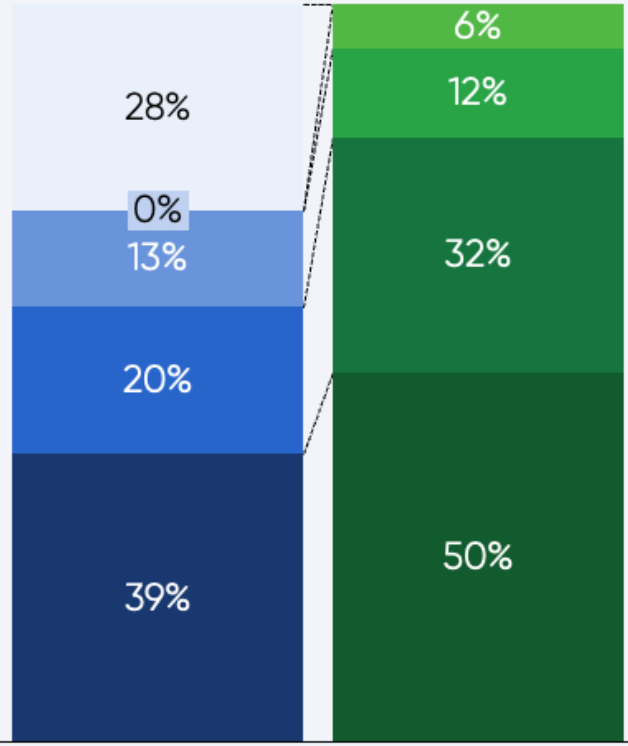
How important is the **integration of digital technology** to the future of K12 education on a scale of 0 to 5?

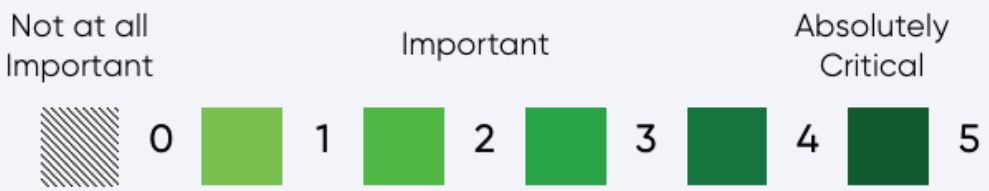


How important is **offering online learning** to the future of K12 education on a scale of 0 to 5?



How important is **developing hybrid learning models** to the future of K12 education on a scale of 0 to 5?





HolonIQ

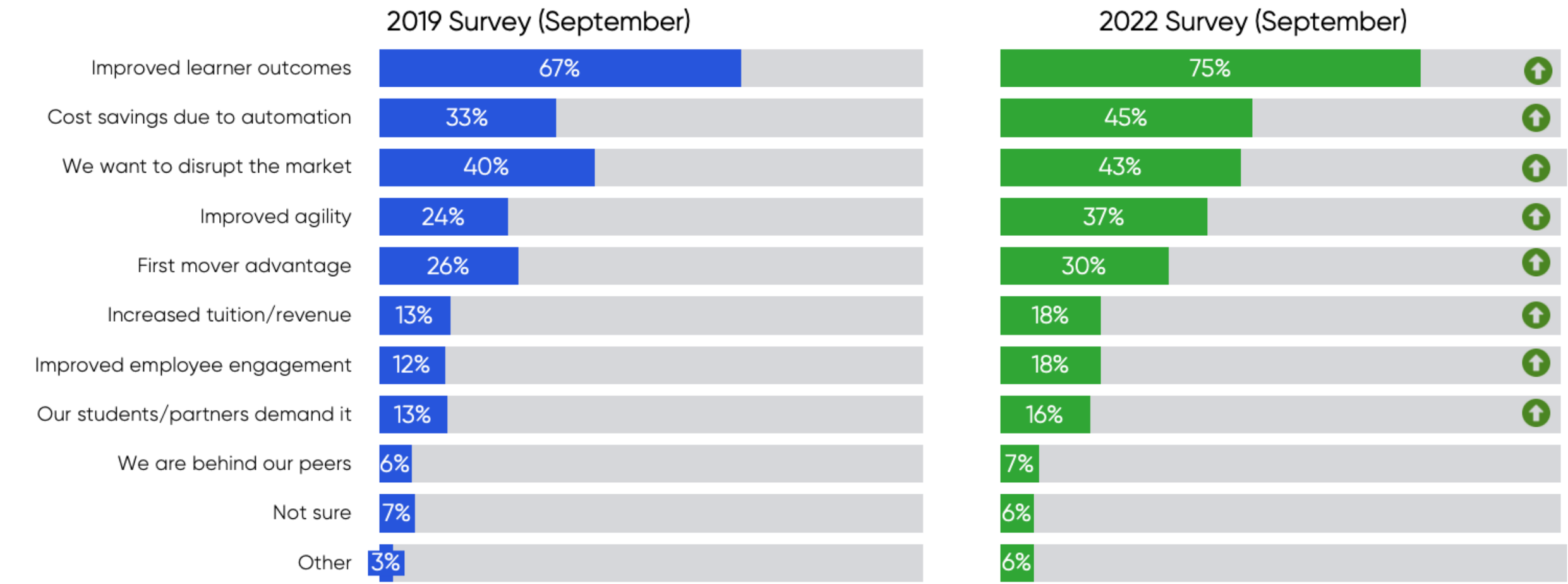
Source: HolonIQ, January 2023, Global K12 Network Survey

While digital transformation is a must

Doing it right is mostly important

Improved learner outcomes remain the top reason for adopting AI, followed by cost savings, disruption, agility and first mover advantage.

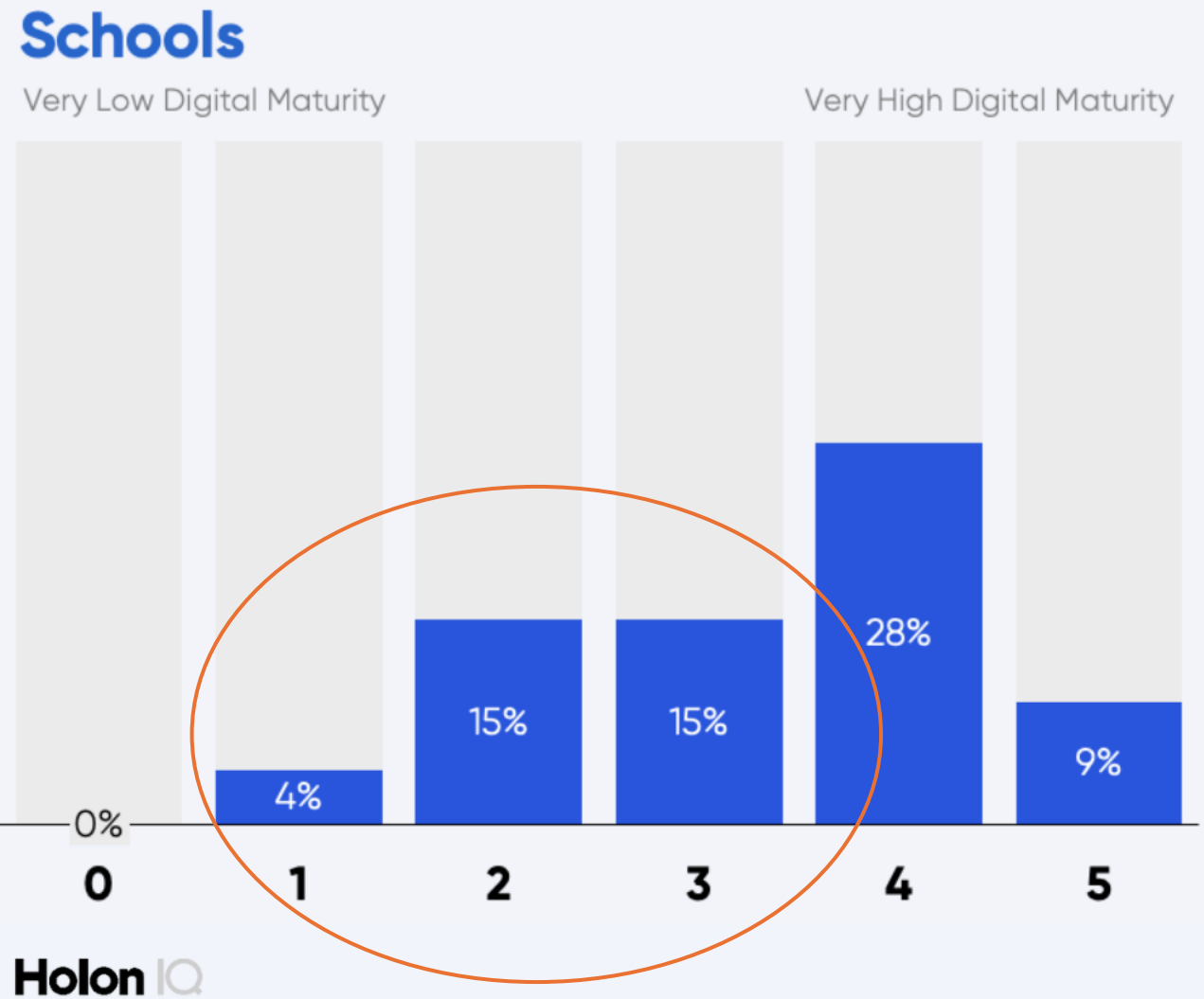
What were the reasons for adopting AI?



Source: HolonIQ, February 2023. n = 464 across both 2019 Aug-Sep Survey and 2022 Aug-Sep Survey

Just over one third of schools self-assess as having high levels of digital maturity (4 or 5). Room to grow as K12 builds digital capability.

How would you rate the overall digital maturity of your institution on a scale of 0 to 5?



> Our schools are not equipped for hybrid learning (enough working devices, internet access), and learning is back to frontal learning even after COVID
>
> ~ Product Manager, Department of Education, Israel

> Our school has to train staff to generate the skills to move towards an integrated digital curriculum
>
> ~ Librarian, International School

Source: HolonIQ, January 2023, Global K12 Network Survey

Technology in education: a case study on the Philippines

Internet Access	72.2% of junior high schools have internet access (DepEd, 2022)	
	67.3% of senior high schools have internet access (DepEd, 2022)	
Device Availability	Ratio of computers to learners:	1:19 in elementary schools
		1:9 in junior high schools
		1:3 in senior high schools (DepEd, 2022)
Use of Online Learning Platforms	90% of teachers surveyed used DepEd Commons in the past semester (USAID, 2022)	
Key Challenges	Only 1.8% of 47,421 public schools have free public Wi-Fi (Philippine News Agency, 2022)	
	1,635 schools still lack electricity access, affecting 380,529 students (Cabico, 2022)	
	Lack of devices and reliable connectivity for all students	

Technology in Philippine Education: A Complex Integration

Technology integration in the Philippines faces challenges due to pre-existing educational issues.

Goal: Utilize technology to provide effective educational solutions and improve quality of life.

Hurdles include high costs and the need for substantial investment in ICT.

Well-planned legislation is crucial for building a robust ICT infrastructure.

Current gaps in infrastructure are being bridged by non-governmental initiatives.

These initiatives provide valuable insights for government agencies to enhance EdTech adoption.

Key players essential for successful EdTech integration:

- Legislators and government officials
- Development organizations and NGOs
- Local government units
- Department of Education (DepEd)
- EdTech

Collaboration among stakeholders is key to enabling successful use of EdTech.

UNESCO: Technology in Education: A tool on whose terms? – 2023 report

Digital technology has drastically changed education, yet its transformative impact remains a topic of debate.

Usage of digital tools in education is inconsistent, influenced by:

- Local community resources.
- Teacher readiness and attitude.
- Educational levels.
- National economic status.

Advanced countries see more classroom integration of technology compared to less developed regions.

Mixed evidence on educational tech impact; costs likely underestimated.

Disadvantaged communities often lack access to educational technology benefits.

Calling for decisions about technology in education to prioritize **learner needs**

#TechOnOurTerms campaign

Promotes tech regulation in education to serve learner needs, focusing on:

- Appropriateness.
- Equitability.
- Evidence-based implementation.
- Sustainable practices.

Policy makers advised to:

- Evaluate tech's fit for their context and learning objectives.
- Consider marginalized groups in tech adoption.
- Demand evidence of tech's educational impact.
- Understand comprehensive costs.
- Ensure alignment with sustainable development visions.

Emphasizes a balanced approach to digital learning, advocating for:

- Coexistence with and without technology.
- Prioritizing human interaction in learning over digital tools.
- Viewing technology as a complement, not a replacement, for traditional teaching methods.

SHORT SUMMARY

Can technology solve the most important challenges in education?

The adoption of digital technology has resulted in many changes in education and learning, yet it is debatable whether technology has transformed education as many claim. The application of digital technology varies by community and socioeconomic level, by teacher willingness and preparedness, by education level and by country income. Except in the most technologically advanced countries, computers and devices are not used in classrooms on a large scale. Moreover, evidence is mixed on its impact. The short- and long-term costs of using digital technology appear to be significantly underestimated. The most disadvantaged are typically denied the opportunity to benefit.

In asking 'A tool on whose terms?', the Report shows that regulations for technology set outside of the education sector will not necessarily address education's needs. It is released along with a #TechOnOurTerms campaign, calling for decisions about technology in education to prioritize learner needs after assessment of whether its application would be appropriate, equitable, evidence-based and sustainable.

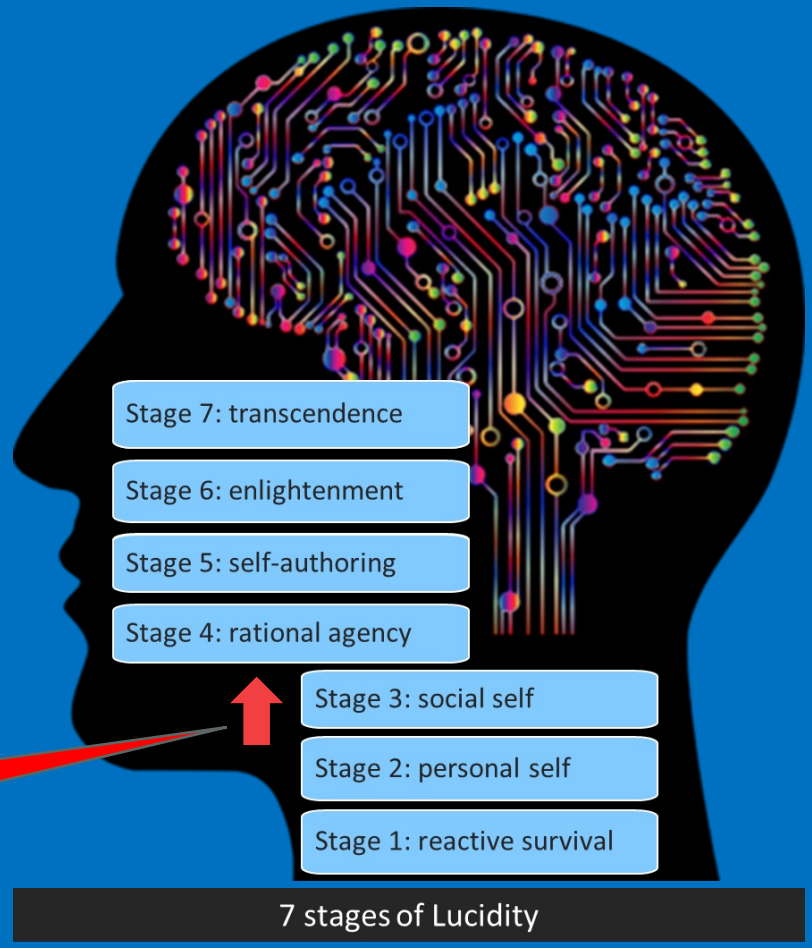
It would cost **USD 1 billion per day** to maintain connectivity for education in poor countries

It provides a compass for policy makers to use when making these decisions. Those in decision-making positions are asked to look down at where they are, to see if technology is appropriate for their context, and learning needs. They are asked to look back at those left behind, to make sure they are focusing on the marginalized. They are reminded to look up at whether they have evidence on impact and enough information on the full cost needed to make informed decisions. And, finally they are asked to look forwards, to make sure their plans fit their vision for sustainable development.

Digital Transform Learning Smartly for Better Learning Outcomes

The coming problem to our students

1. **Students are consuming and not creating**
   - Less interest & competent at STEM
   - Less Social Collaborative
   - Less Creative
2. **Traditional learning not engaging students**
3. **Current Learning tools and contents do not fit**



We need learning environment aims to help students move from Stage 3 to Stage 4,5

Pythaverse Digital Twin and Co-Creation learning framework with Global Competencies, STREAM and AI

Goals

- Learner's Outcome (Goal 1): Engage and Enhance students' learning outcomes
- Future Skills (Goal 2): Prepare students for the future
- Empower Creators (Goal 3):Foster the development of a new generation of creators

Content

GLOBAL COMPETENCIES

- **Responsible Citizen Competencies:** Promote Human values in Technology Era
- **Digital Twin & STEM Competencies:** Foundational and future technology readiness
- **Co-Creation Competencies:** Driving machine and AI for creativity

STREAM & AI

Approach

- **Engage:** Engage Early and Make It Easy
- **Learn:** Immersive Learning and Learning by Doing
- **Resolve:** New Assessment Framework and Global Issues Driven Tournaments
- **Grow:** Open Up Digital Resources for real world applications

Technology

Artificial Intelligence (AI): PTutor	Internet of Things (IoT), Robotics: Leanbot	Digital Twin Technology: Plearn, Plab, PSim	Metaverse and Virtual Reality (VR): PSim, Phub, PVR	Collaboration Tools: PTour, PSchool	Content Creation and Management: PStudio	Cloud Computing: PCloud, PLearn, PGit, PNote, PCode
•AI Tutor •Personalized Learning and Teaching •Automated Content Generation	•Interactive Learning Environments for IoT, Robotics •Real-World Data Integration	•Virtual Replication •Simulations and Modeling	•Immersive Learning Spaces •Experiential Learning	•Interactive Classrooms •Inter-class, Inter-school collaborative platform •Community Building	•User-friendly Interfaces •Modular and Customizable Content	•Accessibility and Scalability •Data Storage and Analysis

Competencies – driven contents

Responsible Citizen Competencies, Promote Human values in Technology Era

- **Ethics - Human values:**
  - Digital Citizenship
  - Intellectual property
  - Sustainability
- **Creative and Critical Thinking:**
  - Innovation and Design Thinking
  - Systems Thinking
- **Soft Skills:**
  - Adaptability and Flexibility
  - Collaboration
  - Communication
  - Critical Thinking
- **Collaboration and Teamwork:**
  - Interpersonal Skills
  - Conflict Resolution
- **Lifelong Learning Mindset:**
  - Curiosity and Inquisitiveness
  - Self-directed Learning
- **Global and Cultural Awareness:**
  - Cultural Competency
  - Global Mindset
- **Leadership and Social Influence:**
  - Leadership
  - Social Influence

Digital Twin STEM Competencies:

Foundational and future technology readiness

- **Technical Proficiency:**
  - Applied Mathematics and Science
  - Engineering Design
  - System Integration
- **Foundational Technological Literacy:**
  - Computational Thinking
  - Digital Literacy
  - Data Literacy
- **Core Technological Skills:**
  - Coding and Programming
  - Data Analysis
  - Cybersecurity Fundamentals
- **Analytical Skills:**
  - Problem-Solving
  - Critical Thinking
  - Data Analysis
  - Analytical Reasoning
  - Abstract Reasonings.
- **. Practical and Technical Skills:**
  - Technical Tools Proficiency
  - Project Management
  - Quality Assurance
- **Research Skills:**
  - Scientific Inquiry
  - Experimental Design
- **Emerging Technologies:**
  - Artificial Intelligence and Machine Learning
  - Internet of Things (IoT)
  - Robotics
  - Blockchain
  - Quantum computing

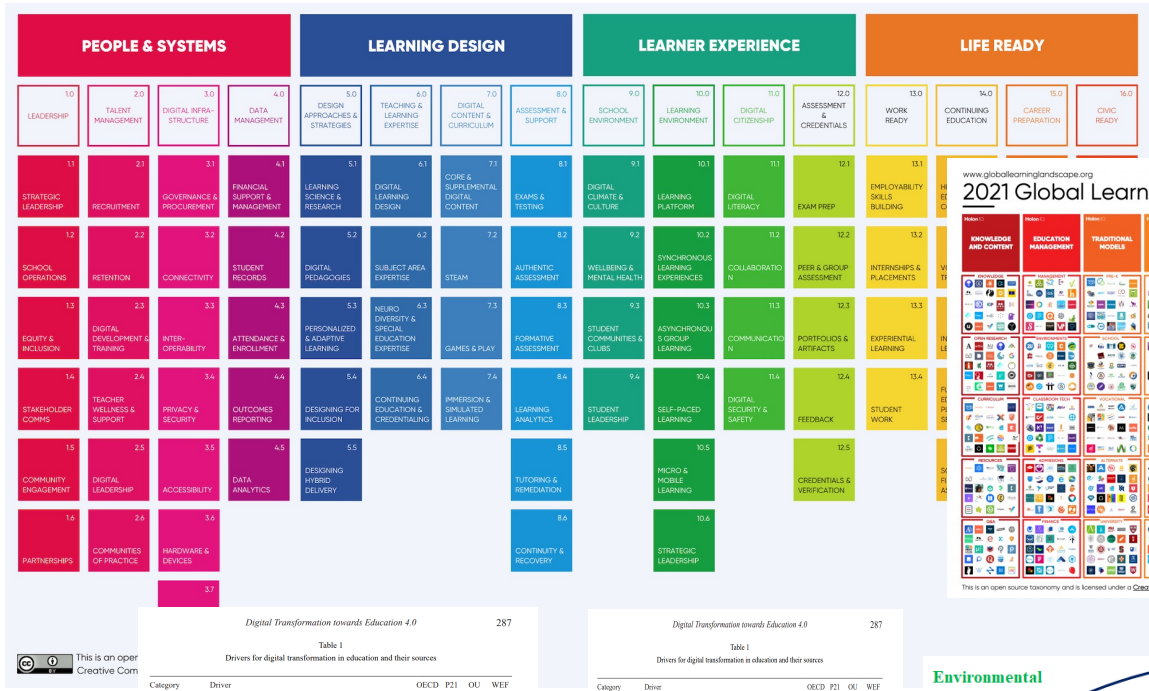
Co-Creation Competencies:

Driving machine and AI for creativity

- **Design Thinking:**
  - Complex problem solving
  - User-centered design
- **AI driving:**
  - Prompt Engineering:
  - Innovative Application
  - Understanding AI Algorithms
- **Interdisciplinary Knowledge:**
  - Cross-disciplinary Skills
- **Emotional Intelligence:**
  - Empathy (For others and for yourself)
  - Emotional Regulation
- **Ethical Judgment and Complexity Handling:**
  - Ethical Reasoning
  - Managing Complexity
- **Rational agency:**
  - Self-confidence, self-efficacy, self-actualization, self-reflection.
- **Resilience and Resolve:**
  - Resilience
  - Resolve

The problem with School digital transformation framework out there

1. Too complicated
2. Vendors-driven
3. Technology-driven
4. Too much on administration too little on learning
5. Mimic Enterprise digital transformation framework and not suitable for Schools
6. Require impossible school resources to deploy
7. Too expensive



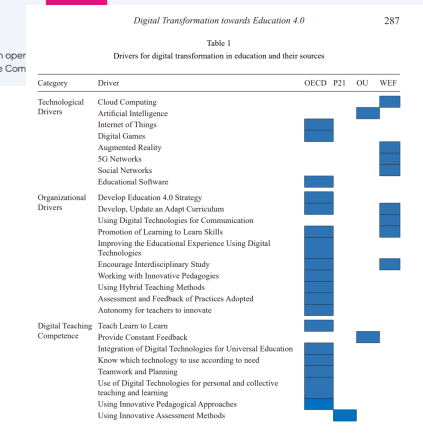

Digital Transformation towards Education 4.0 287

Table 1
Drivers for digital transformation in education and their sources

Category	Driver	OECD	P21	OU	WEF
Technological Drivers	Cloud Computing				
	Artificial Intelligence				
	Internet of Things				
	Digital Games				
	Augmented Reality				
	5G Networks				
	Social Networks				
	Educational Software				
Organizational Drivers	Develop Education 4.0 Strategy				
	Develop, Update an Adapt Curriculum				
	Using Digital Technologies for Communication				
	Promotion of Learning to Learn Skills				
	Improving the Educational Experience Using Digital Technologies				
	Encourage Interdisciplinary Study				
	Working with Innovative Pedagogies				
	Using Hybrid Teaching Methods				
	Assessment and Feedback of Practices Adopted				
	Autonomy for teachers to innovate				
Digital Teaching Competence	Teach Learn to Learn				
	Provide Constant Feedback				
	Integration of Digital Technologies for Universal Education				
	Know which technology to use according to need				
	Teamwork and Planning				
	Use of Digital Technologies for personal and collective teaching and learning				
	Using Innovative Pedagogical Approaches				
	Using Innovative Assessment Methods				

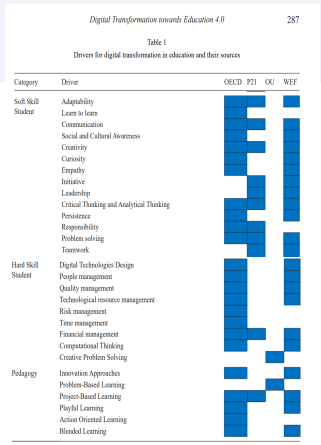
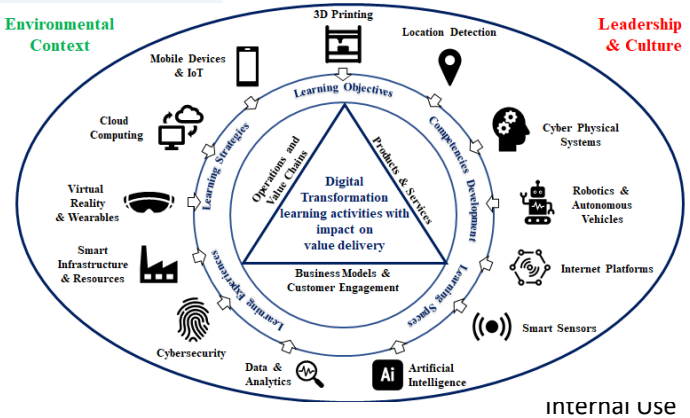

Digital Transformation towards Education 4.0 287

Table 1
Drivers for digital transformation in education and their sources

Category	Driver	OECD	P21	OU	WEF
Soft Skill Student	Adaptability				
	Learn to learn				
	Communication				
	Social and Cultural Awareness				
	Creativity				
	Curiosity				
	Empathy				
	Initiative				
	Leadership				
	Critical Thinking and Analytical Thinking				
	Persistence				
	Responsibility				
	Problem solving				
	Teamwork				
Hard Skill Student	Digital Technologies Design				
	People management				
	Quality management				
	Technological resource management				
	Risk management				
	Time management				
	Financial management				
	Computational Thinking				
	Creative Problem Solving				
Pedagogy	Innovation Approaches				
	Problem-Based Learning				
	Project-Based Learning				
	Playful Learning				
	Action Oriented Learning				
	Blended Learning				



School digital transformation pillars

Teacher:

Valuable time for a valuable works

Culture:

From compliance to also data driven governance

Technology usage:

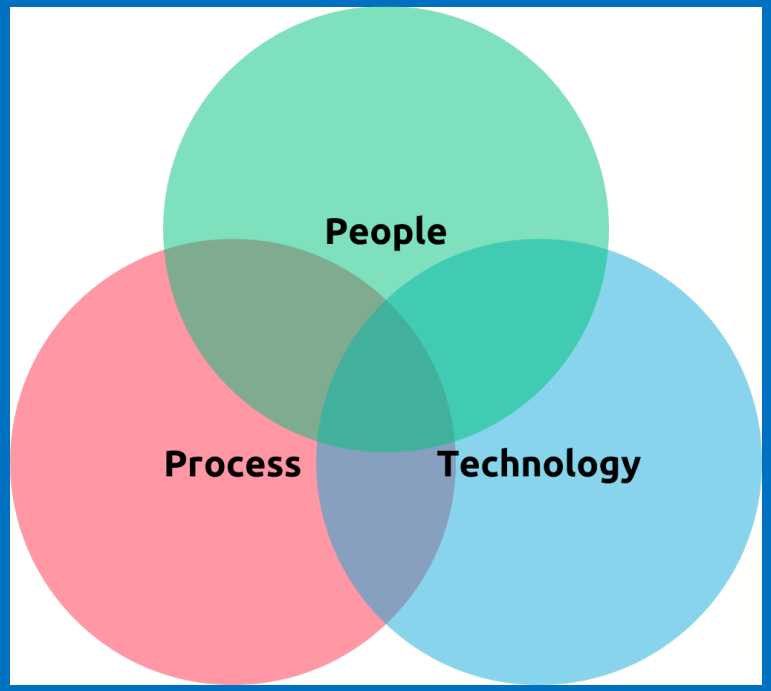
Learners outcome-driven

Leadership:

Strong and innovative – Most important factor

People – Technology – Process

- The old way:
  - People → Process → Technology → People



The new way:

People →Technology→ Process → People

- Leadership envision Technology-empowered operation
- People co-create with technology via Data-driven culture to improve Process
- Technology redefine new virtual-physical (digital twin) process
- Process to be more users-centric and empower users to be better

Pythaverse **A**gile **T**ransformation for **H**igher learning outcomes PATH

Why (Drivers):

Identify the internal and external factors motivating the adoption of transformation project

Who (Use Case/ Business Case):

Determine the stakeholders who will benefit, such as students, teachers, and administrators.

Where (Digital Maturity Level):

Assess the current state of your organization's readiness for digital transformation.

What (Process Area):

Choose the specific area for transformation: Core processes like teaching and learning, or supporting processes like administration.

When (Implementation Plan):

Develop a timeline focusing on engaging champions and early adopters within the organization.

How (Execution Strategy):

- Employ proper project management practices, assemble the right team starting with a champion, and collaborate with trusted partners for implementation.

Team

Data

Framework details

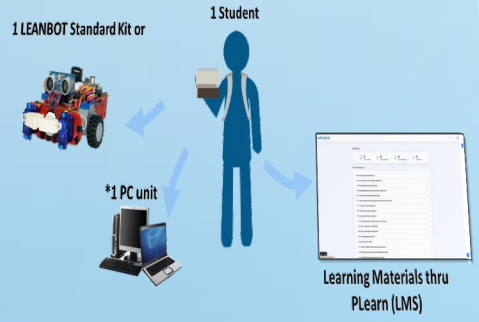
Layers	Description	Steps to Do	Best Practices	Examples
Why (Drivers)	Establish the motivation for digital transformation to improve learning outcomes.	Identify key goals and challenges.	Start with a clear vision, involve stakeholders.	Schools adopting tech to improve engagement.
Who (Use Case)	Stakeholders like students, teachers, and administrators who will benefit.	Define target users and their needs.	Tailor solutions to stakeholder needs.	Teachers using analytics to personalize learning.
Where (Maturity Level)	Assess current digital readiness.	Conduct an initial assessment of digital capabilities.	Use a standardized assessment tool.	Schools evaluating their existing digital infrastructure to see what applications can be implemented, what need extra infrastructure investment
What (Process Area)	Select core or supporting processes for transformation.	Pick key areas that will have the most impact.	Focus on areas with quick wins to demonstrate value.	Updating teaching methods to include digital resources.
When (Plan)	Develop a timeline and strategy.	Set short-term and long-term milestones.	Get buy-in from early adopters to build momentum.	Implementing a pilot program with a select group of teachers.
How (Execution)	Outline the approach to manage the transformation.	Establish a project management office, identify a champion, select a trusted partner.	Regularly review progress, adapt as needed.	School forming a digital transformation team led by a tech-savvy teacher.

Pythaverse: an effective solution

Goal 1: Enhance Students' engagement and learning outcomes

Inclusive and Accessible Learning

Goal 2: Prepare students for the future readiness



Affordable Future-Ready Education

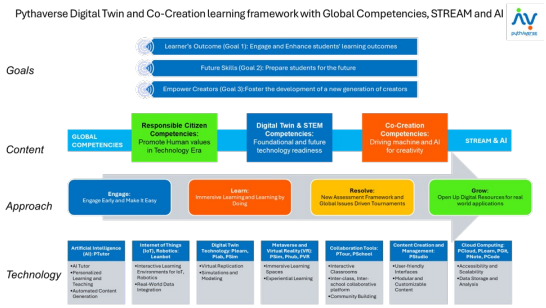
Goal 3: Empower Students as Creators

Standards-Aligned, Cutting-Edge Ecosystem

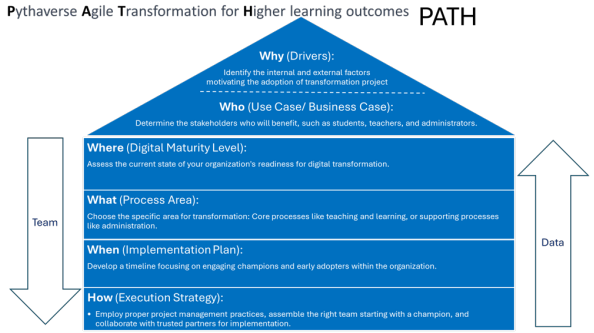
pythiverse

My Digital Twin

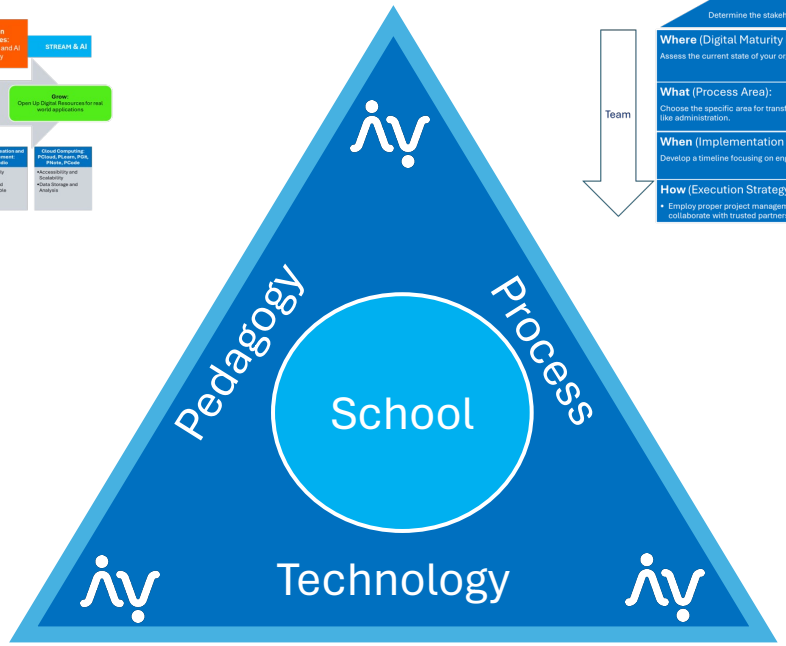
Pythaverse comprehensive solution for digital learning



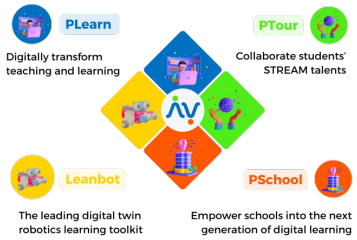
CO-CREATE



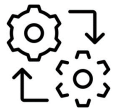
PATH



DIGITAL TWIN PLATFORM

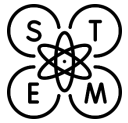


Why Pythaverse Stands Out



Digital Twin Technology

- Unique digital twin STEM robotics toolkit, 1 student 1 robot learning anytime anywhere.
- Immersive 3D metaverse simulating real world application.
- Real-time data for virtual scenarios



Global & STEM Competencies

- Curriculum aligned with global standards
- SDG centered
- Learning by doing STEM

AI-Powered Learning Metaverse

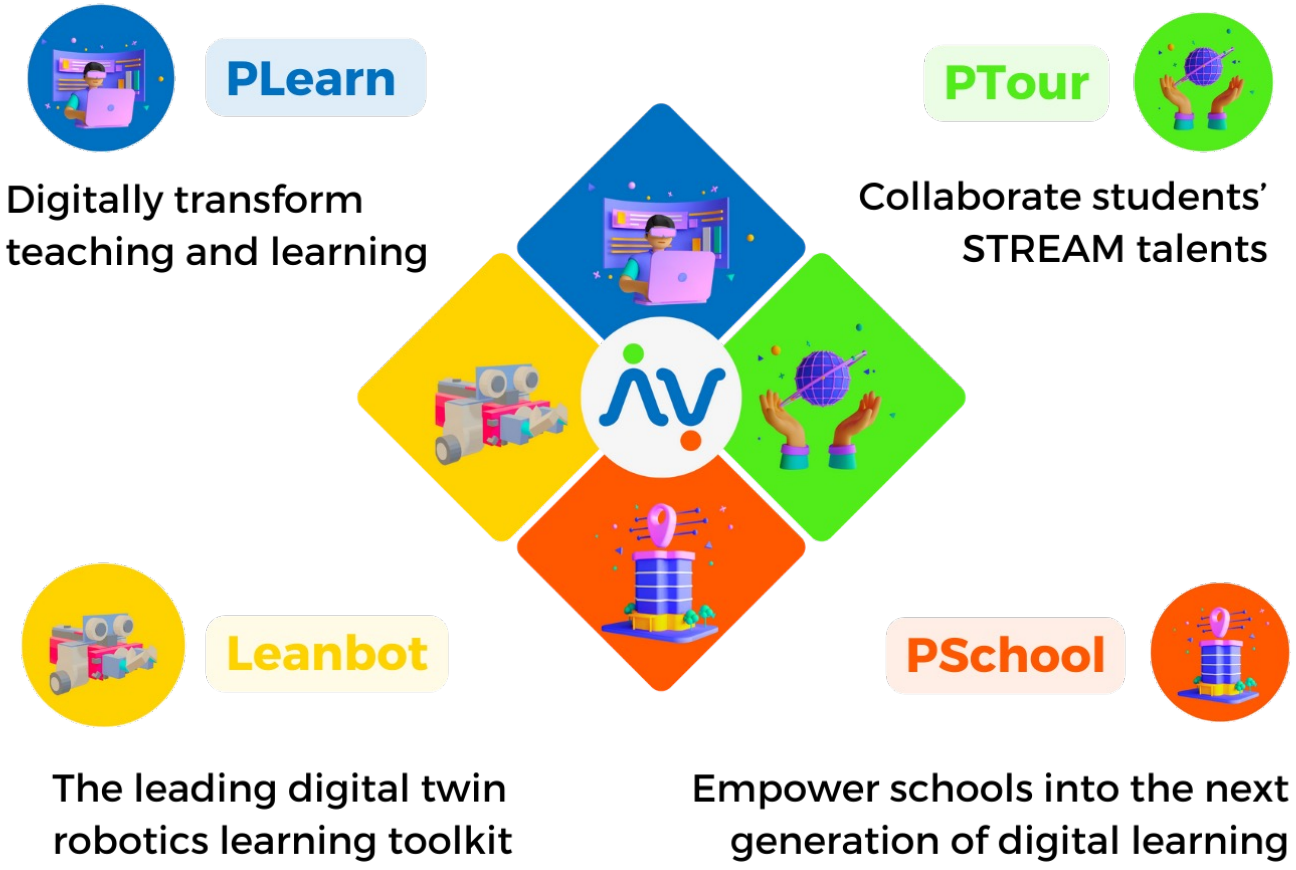
- Smart engagement
- Personalized tutoring
- Ethical compliance
- Managed education Metaverse

Comprehensive Ecosystem

- From toolkit, content to management, we cover it all
- Hundreds of courses and learning activities
- Partner created contents

A revolutionary approach to modern education.

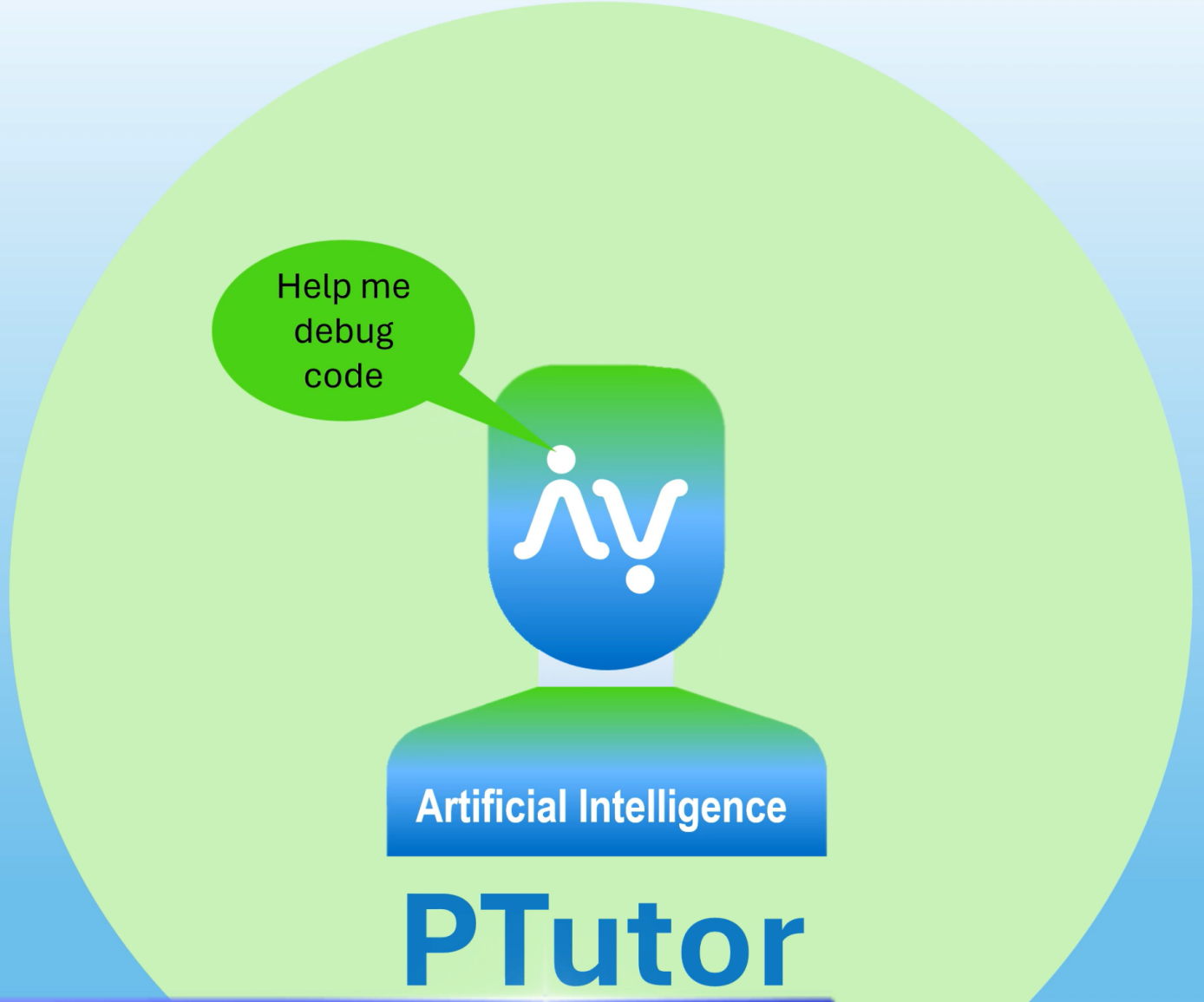
Pythaverse: The Future of Cyber-Physical Learning



A Comprehensive Ecosystem for Modern Education


AI, IoT, Robotics, and the
Metaverse


Robot ID:leminhhoa
VS
Robot ID:trangnguyend
Digital tv
importan
the next-
STEM le



PTutor

Revolutionizing the way students learn coding and digital creation

Case study of schools in the Philippines

St. Paul College Pasig SWRP case study

1. 39% agree the course improve their technology and digital skill in the future job, 43% voted moderate level
2. 42% believe that the course will improve problem solving and critical thinking skills, 41% voted moderate level
3. 17% think that after the course, students themselves will be more confident in approaching robotics and AI at good level, 48% at moderate level
4. 28% believe after the course, they have high motivation to study technology course in the future, 42% have moderated motivation

Leanbot class

Report

FOR St. PAUL COLLEGE PASIG

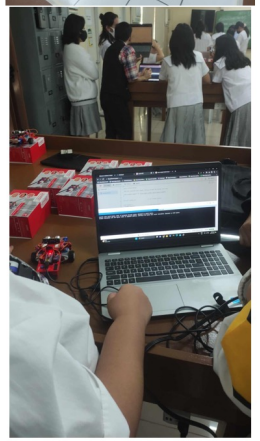
SWRP 11 COURSE IMPLEMENTATION AND CASE STUDY ANALYSIS

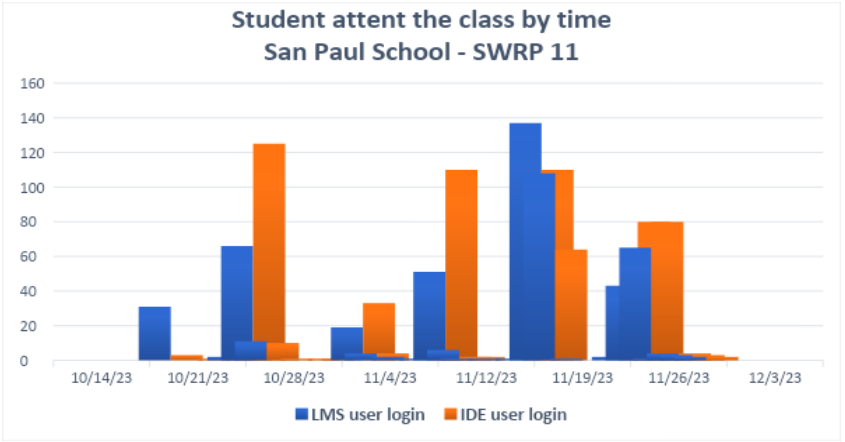
By Pythaverse Content Team, November 29, 2023

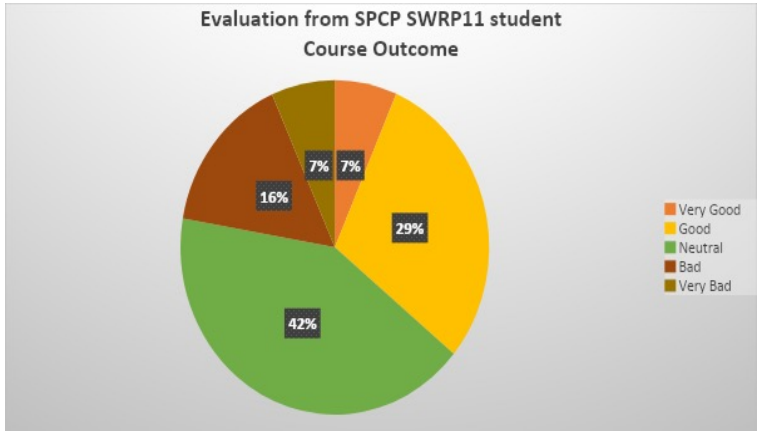
New Robotics learning environment enable data-driven transformation of classroom for **learners' outcome**

Classroom Implementation

Robot to Student Ratio	2:4
Laptop to Student Ratio	2:4
Teacher to Student Ratio	1:35 / 2:60-80
Full-time Robotics Teachers	2
Backup Teachers	2
Internet Connectivity	*Slow*







Agile deployment → Data-driven monitoring → Outcomes-driven

SAN BEDA College Alabang SWRP case study

- **52%** agree the course improve their technology and digital skill in their future jobs.
- **51%** believe that the course will improve problem solving and critical thinking skills.
- **81%** think that after the course, students themselves will be more confident in approaching robotics and AI.
- **85%** believe after the course, they have high motivation to study technology course in the future.

SAN BEDA COLLEGE ALABANG
SWRP 9 & SWRP 11 COURSE IMPLEMENTATION AND CASE STUDY ANALYSIS

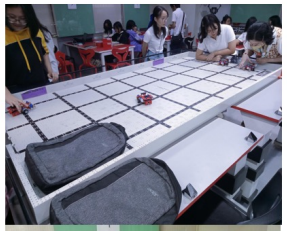
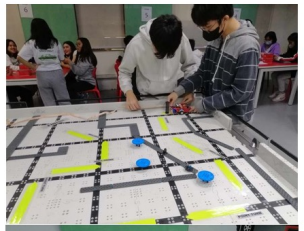
By Pythaverse Content Team, November 29, 2023

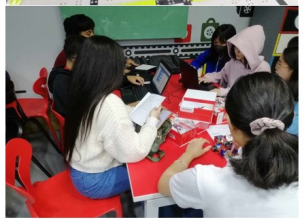
Pythaverse PTE Ltd Highl

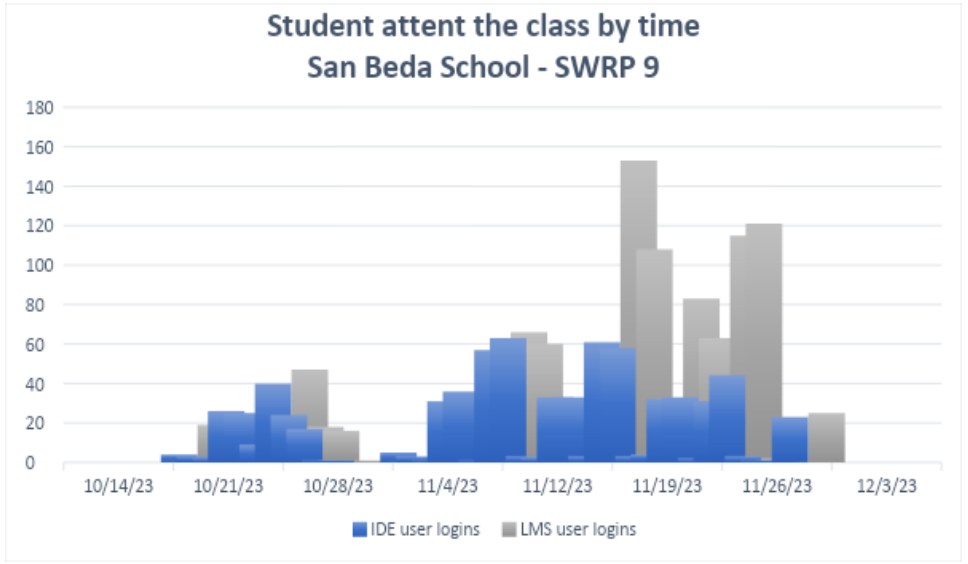
New Robotics learning environment enable data-driven transformation of classroom for **learners' outcome**

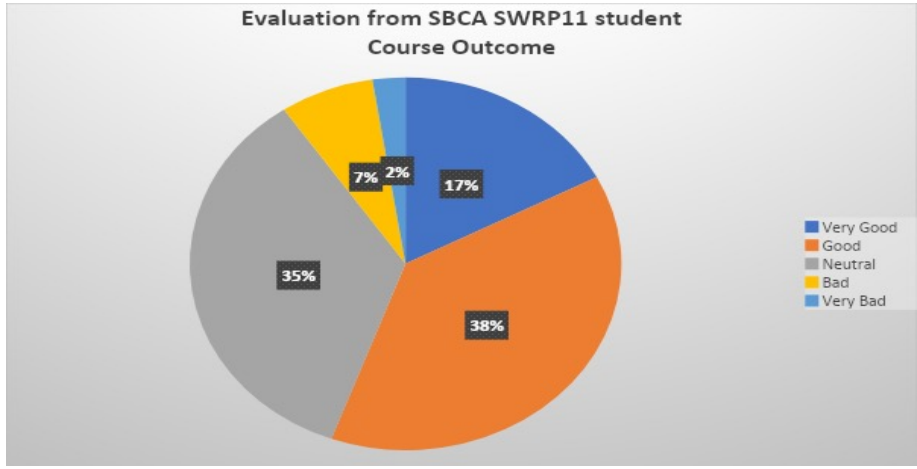

Classroom Implementation

Robot to Student Ratio	2:4
Laptop to Student Ratio	2:4
Teacher to Student Ratio	1:40
Full-time Robotics Teachers	3
Backup Teachers	9
Internet Connectivity	*Slow*







Agile deployment → Data-driven monitoring → Outcomes-driven

Lesson learned: Leadership – Teacher's willingness – Agile deployment – Outcome driven

People:

Digital transformation via learning by doing method and data-driven approach; learner-first content

Decisive leader

Willing Teachers

Technology:

Digital Twin & AI platform, bring the future into classroom now

Transform the classroom

Resolve technical difficulties

Process:

Learning framework for Responsible Citizen, Digital Twin technologies and Co-creation competencies

Clear learning goals

Appropriate outcomes selection

Take-aways

1. Learner’s outcome is (the most) important driver for digital transformation
2. Use PATH to jump start the digital transformation
3. Leadership – Teacher's willingness – Agile deployment – Outcome driven
4. DATA, DATA, DATA DRIVEN

A right partner can bring affordable cutting edge learning technologies to your classroom, successfully deliver desired learner outcomes

pythaverse
My Digital Twin

pythaverse
My Digital Twin

VISION: Pythaverse is the leading in cyber physical learning platform that is open, accessible, learner first design to realize Global & STEM competences success for students across the world by enabling them as the next-gen technology-empowered creators

Core competencies:

1. **Global competence, STEM** driven learning content
2. **SDG centered, accessible**, **learner first** product design
3. **Open, digital twin** enabled platform
4. Leading **S.E.A., US and Global education** partner network
5. **Agile**, **responsible, learning** organization culture

PYTHAVERSE = an area of activity and interest of persuading
PYTHAVERSE = To educate about believing in something through reasoning or argument.