



Learning +
歡迎來到我們的

空間設計工作坊
Metaverse
Design Brief



Co-design Ideal Digital Learning Space

Health Professional Teachers and Students

By leveraging metaverse technologies, this workshop aims to prototype a set of four learning spaces within health professional programs:

1. interactive study center
2. gamified learning
3. community outreach
4. interest-based learning

For teachers and students to co-design innovative learning environments, with the design goals of:

- integrate technology and innovation,
- inspire and facilitate active learning and teaching methods,
- foster interaction and collaboration in class, and
- enhance engagement and the learning experience for students.



PROJECT TEAM

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Perhaps we can never truly stand in the shoes of others, but through sharing the little stories you encounter and discover multiple welcoming perspectives, face up to your own thinking patterns, and plant the seeds of community co-creation.

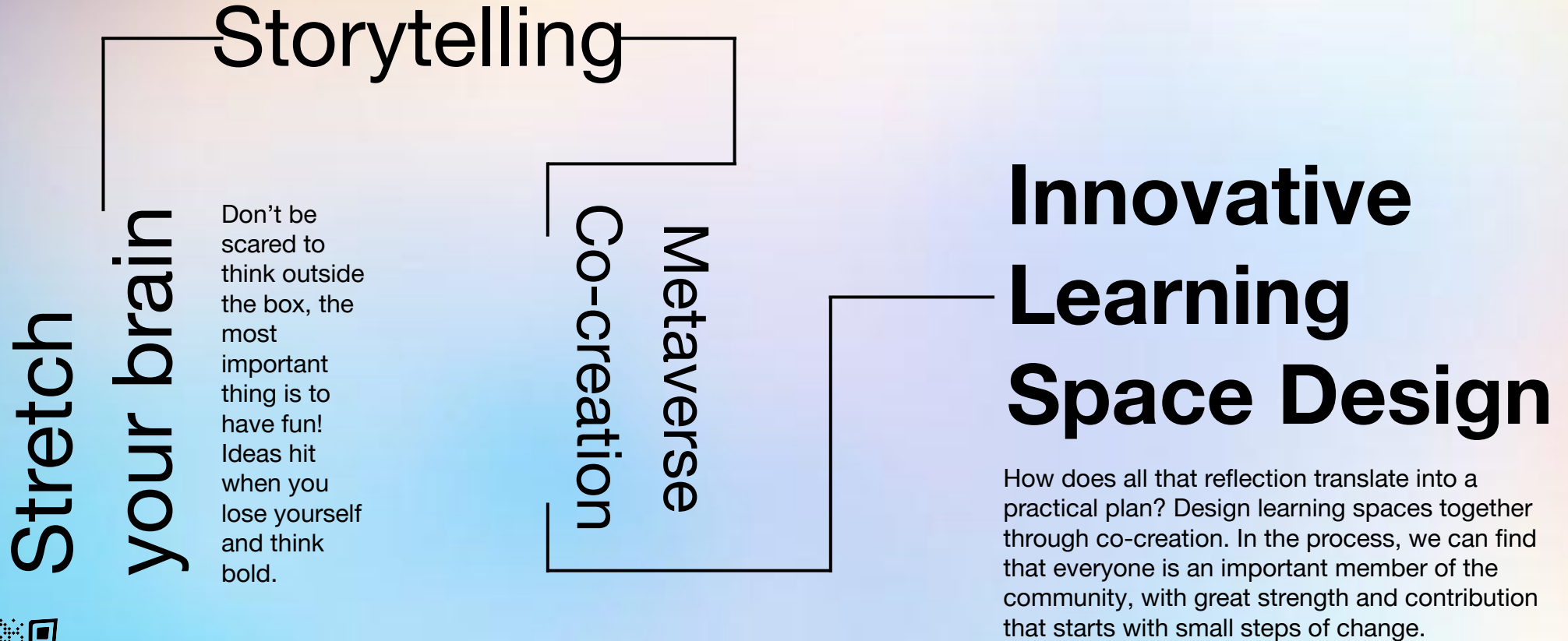


Table of contents

- 01 Problem Definition
- 02 Ideas, Ideas, Ideas
- 03 Design Precedents
- 04 Kit-of-Parts
- 05 Co-creation
Workflow



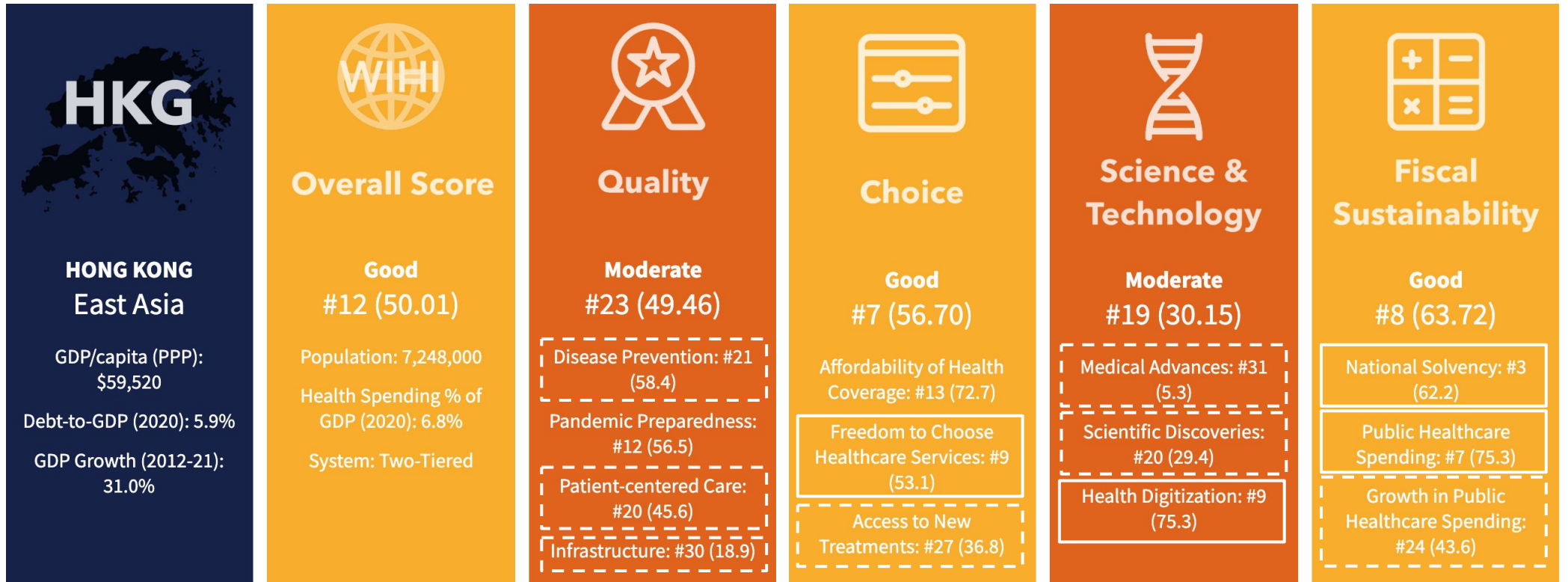
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PROBLEM DEFINITION

Our targeted problem space stands at the intersection of a need to innovate and tackle increasing pressures of the Medical Industry, adapting to challenges of digital transformation, and enhancing students' learning motivation



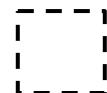
Hong Kong: #12 in the 2022 World Index of Healthcare Innovation.



- FREOPP. (2023). Hong Kong: #12 in the 2022 World Index of Healthcare Innovation.



WORLD'S TOP



SPACE TO IMPROVE

PROBLEM STATEMENT

Based questionnaires and interviews with students and teachers in biomedical engineering, biomedical sciences, Chinese Medicine, Food & Nutritional Sciences and medicine programmes, it has been observed that the main obstacles in current health professional education include, but are not limited to:

- Large class size and limited specimen impeded hands-on and practical learning progress
- Long and unilateral lecture format hindered students engagement, causing low attendance
- Lack of holistic education and soft skills training to prepare students for real-world challenges
- The need for more personalised learning, catering to the diverse needs of students

By reflecting on how educational activities take place in physical spaces, this project hopes to contribute to advancing medical education with more human-centric designs.



39%

of Hong Kong students reported “very engaged” in lessons. The results also indicate that Hong Kong students were less likely to be engaged in reading lessons compared to other regions, ranking 56th out of 57.



53%

of Hong Kong students exhibit symptoms of anxiety, 35% are suspected of being depressed and less than 20% have an ideal parent-child relationship



90%

of teachers reported an increase in perceived stress levels compared to 5 years ago



- PIRLS (2021). Thriving through the reading pandemic, Hong Kong students attain the top three ranking in the world for four consecutive PIRLS cycles
- 浸信會 (2022)「中學生抑鬱焦慮狀況調查 2022」 Access: <https://www.bokss.org.hk/>
- Chong, Y.L. (2006). Occupational health problems for teachers from primary and secondary schools in Hong Kong (Doctoral dissertation, City University of Hong Kong).

RESEARCH METHODS

A mixed-methods approach is utilised, incorporating both quantitative and qualitative research methodologies.

PART I

Quantitative study on students' perceptions

Questionnaire

PART II

Qualitative study on teaching and learning challenges

Semi-structured Interview

PART III

Participatory research on teaching plan and learning space design

Co-creation Workshops

PART I STUDENT *SURVEY*

In the survey, we aim to address the students' perceptions of using remote conferencing video in the past and accepting the future digital learning space / virtual learning environment (VLE) with high-quality interior designs.

In the qualitative study under the approval of the Chinese University of Hong Kong (CUHK), Science-related subjects of the freshmen or Year 2 students in the CUHK were recruited who all were experienced in using video conferencing and naive in using VLE to join the electron survey volunteered in the first-semester term of 2023-24.

According to the literature reviews, the 29 questions were developed for the 5-point Likert scale in the survey based on items in validated questionnaire documentation.

The 4 factors were categorised by the perceptions of

- (1) past experiences of using remote video conferencing,
- (2) expectations of adopting the key characteristics,
- (3) perspective teaching and learning activities, and
- (4) forecasting of the interior design of the furniture layout.

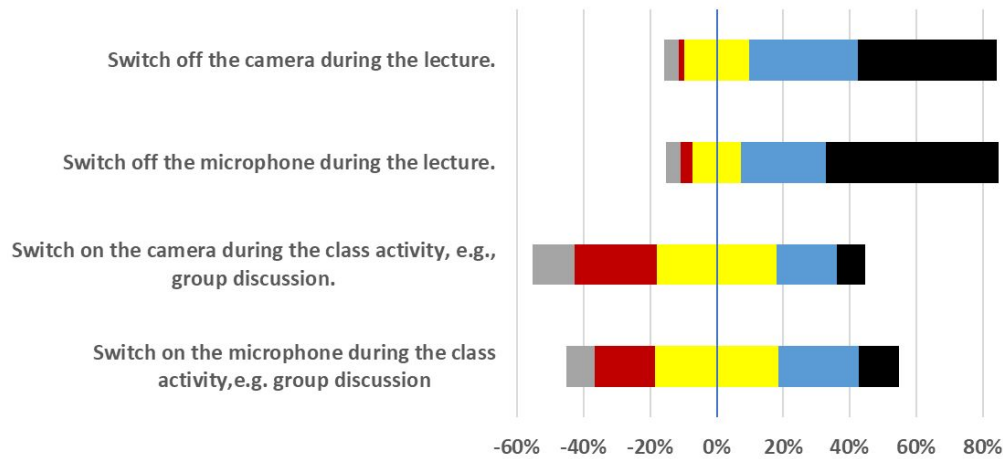
The data responses of 170 students were collected and analyzed. The Cronbach alpha is 0.869, confirming the reliability of the questionnaire and its internal consistency.



ZOOM ENGAGEMENT

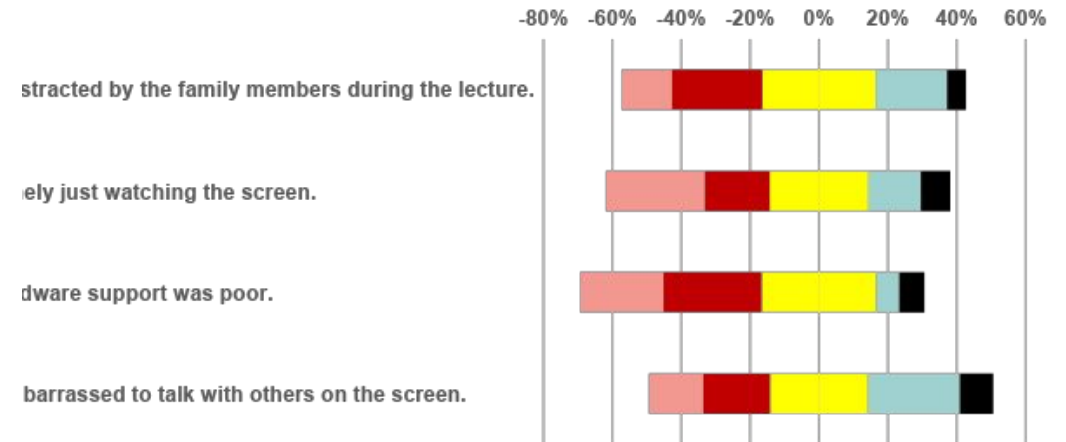
Have you joined the DLS of remote video conferencing, e.g., Zoom
Microsoft Team, with the following actions?

■ Never ■ Rarely ■ Sometime ■ Often ■ Always



What are your perceptions of using remote video
conferencing, e.g., Zoom or Microsoft Team listed as follows:

■ Sometime ■ Rarely ■ Never ■ Rarely ■ Sometime ■ Often ■ Always

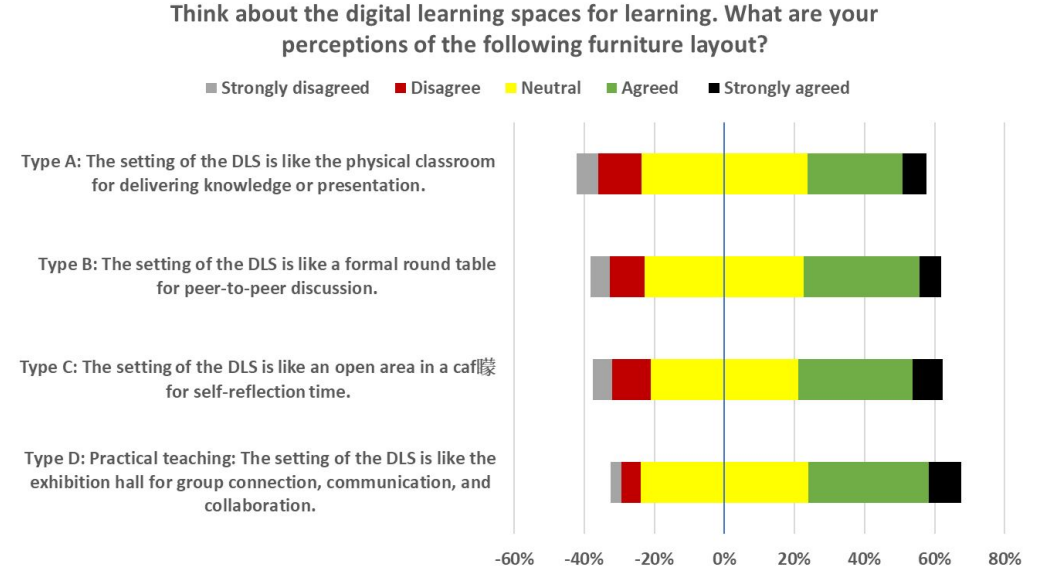
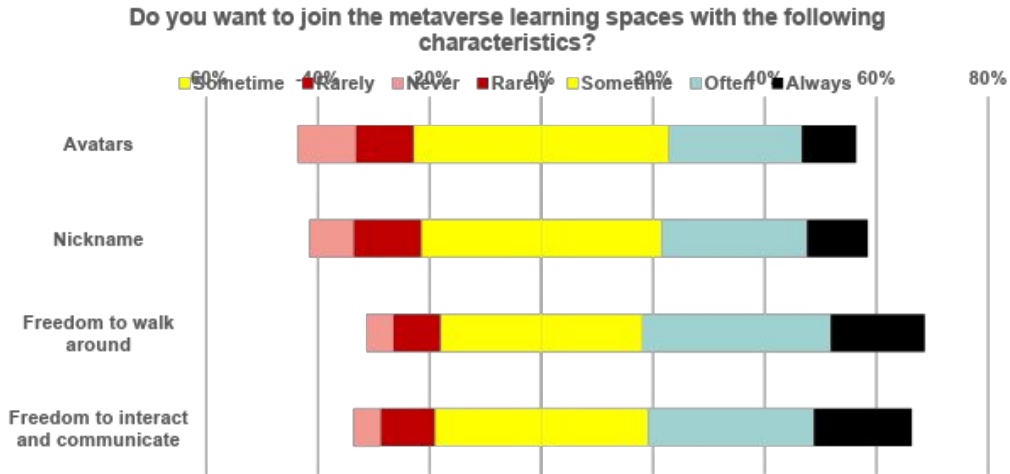


Reflections & Discussions:

- Students tend to switch of their cameras and often feel embarrassed to talk.
- However, it is important to consider if students only disengaged on zoom, or generally disengaged in class.
- Is an off camera the same as sitting in the back row, and what is the significance of switching on the camera?
- Were they embarrassed to talk on screen, or embarrassed to talk in public? Why?



(DIGITAL) LEARNING SPACE



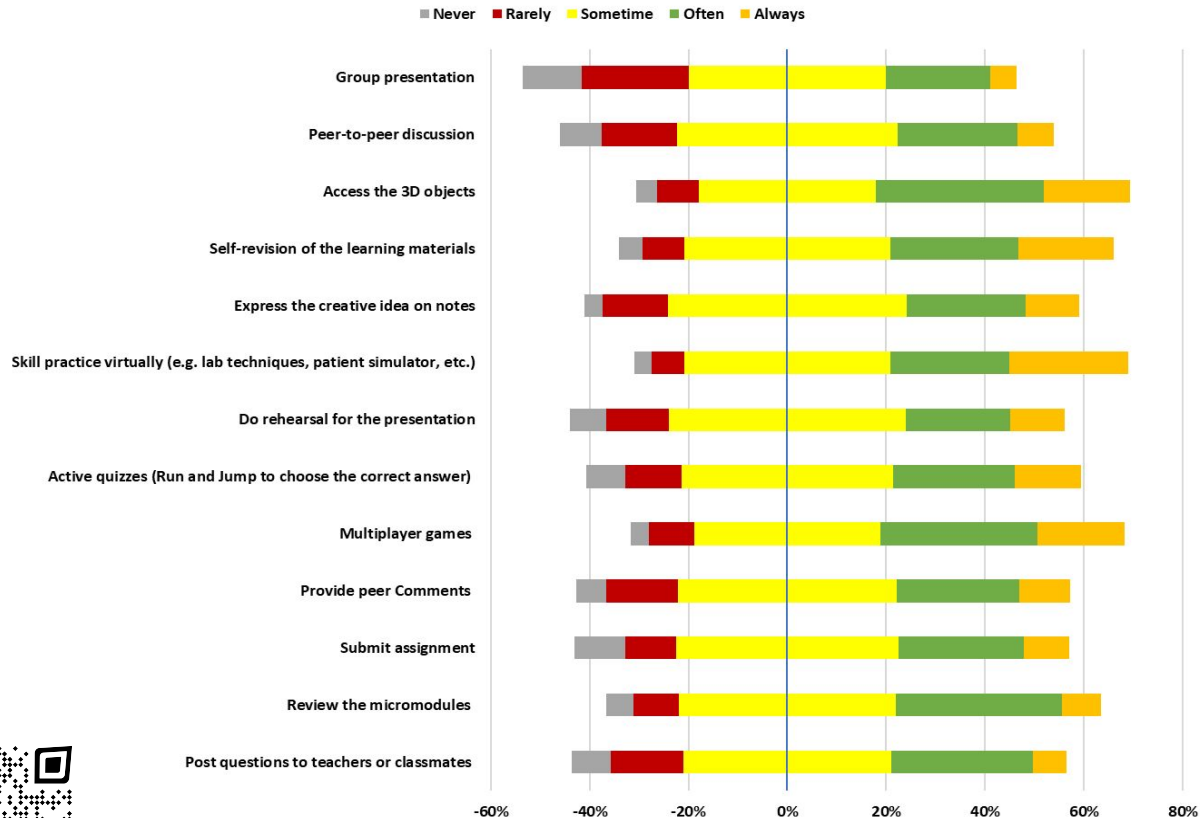
Reflections & Discussions:

- In digital learning space, students wish to have the freedom to walk around. But why is there a need to wander?
- Also, students wish to interact and communicate and have a digital learning space like an exhibition hall for groups connections. What does that tell us about their learning need and willingness to engage?
- The results in all four room types came very close, even in the ratio of responses, does it mean all of the rooms are equally desired or a lack of preference? Were they informed of the implications of their decisions?



DIGITAL LEARNING ACTIVITIES

Do you want to join the metaverse learning spaces with the following learning activities after class of the virtual study?



Reflections & Discussions:

- According to previous results, students wish to have group connections and interactions in digital learning spaces, however, results here shows that they do not wish to have group presentations.
- Were they discouraged to conduct group work or presentations?
- Do students dislike group presentations solely in the Metaverse, or is this sentiment prevalent in general?
- Are group work and presentation a significant part of the learning journey? What are the gains for students?



PART II STAKE- HOLDER *INTERVIEW*

In the pre-interview survey, the **majority of respondents expressed the belief that students are actively engaged in class.**

However, during the interviews, concerns were raised about **a lack of student participation, particularly in responding to questions and class discussions.**

Similarly, when asked about the use of active learning techniques, one participant **rated it a perfect 10.** Nevertheless, the interviews revealed an overwhelming expression of **dissatisfaction with the teaching methods, indicating a lack of engagement.**

While most participants indicated that applying **active learning to classes is not overly challenging, the reality is that these methods are rarely put into practice.**



There is **uncertainty regarding participants' comprehension and understanding of what are active learning methods**. When being asked if they have used such methods in class, some responded that they would have casual conversations with students at the beginning of class as a form of practice.

While most acknowledged **being raised in a diverse and expansive learning environment**, the interviews revealed a prevalent sentiment of being brought up with **traditional or spoon-feeding methods**.

Encouragingly, all participants unanimously agreed that **interventions can be made when students lack motivation**, demonstrating a **collective willingness to change the current status quo**.

While most participants believe that teachers innovate their teaching methods annually, there is **a divergence of opinions regarding the effectiveness of the current teaching approaches**, with over half advocating for necessary changes.

All respondents acknowledged that **the design of learning spaces is crucial for high-quality education**. However, this aspect was **scarcely being actively raised** during conversations.

Also, **alternative design possibilities were rarely mentioned**.



The majority of participants **had not previously experienced metaverse**, yet almost all expressed a **willingness to incorporate them** into their teaching or learning practices.

Furthermore, most participants **perceive the impact of the metaverse on the quality of education as positive**. However, they unanimously agree that **implementing** the metaverse in educational institutions **poses significant challenges**.

In the survey, most participants recognized the **potential utility of the metaverse** in courses such as **in anatomy**, for **visualizing human body** parts, functions and structures.

Additionally, some believed that the **metaverse could be beneficial for soft skills-oriented courses**, such as social outreach, general education, and poster presentations.



PERSPECTIVES I – metaverse in teaching



Lecturer A

I am interested in adopting AI games, like metaverse in my teaching, I think it will make learning more enjoyable and perhaps students can explore the human body virtually... but actually I am not sure about the difference between AI or metaverse yet.

With the large class sizes, it is impossible to interact, metaverse or not. I have like 200 students in one class.

The lecture time is limited, so I don't have time to ask questions to each of them. There is also a lot of teaching content to go through. And, they don't respond, just waiting for me to give answers

They can't seem to focus on this extra activity, some of them just sit and look at me. Maybe they think it's boring or a waste of their time, or they just want to passively receive the answers from me, or that I should concentrate on delivering the lecture, but not to interact with me.

I haven't asked why they did not participate, it is embarrassing, they might think I am forcing them to enjoy activities they don't like. They might think I didn't prepare well for the lecture, instead, used the time to play activities with them, so I didn't ask.

I feel this way because they didn't participate, some of them fall asleep, or took a rest and ignore me. Some of them just walked passed me and went out of the lecture hall, maybe they went to the toilet and thought to come back after the activity ends.

I tried using some of the school's metaverse resources. During the lecture break, I gave students a QR code to scan and join the meta world, where they can move around and answer questions.



Lecturer B



PERSPECTIVES II – learning engagement



Student A

The **education culture is more unidirectional**, students tend not to share what they think. **Classes can go on consecutively for 3-4 hours**, often overrun and cutting into lunch breaks.

The teachers go through the slides very fast, and they pack a lot of content on one page, and spend 2 minutes on each page. **It is quite exhausting for students to complete so much content in a short time and stay focused.**

We will have to go through the contents again by ourselves so as to understand. I think that's why **most of us would rather study by ourselves than attending lectures.**



Lecturer D

Nowadays, I find that students don't want to read texts, only a few of them will go to the library, they asked me if it is enough **to just study your powerpoint for exam.**

Students are very smart, they know which professor made the exam questions, so **they only attend those lessons to get tips on exams.** We can improve the facilities but not the learning attitude

What they like here is a set of slides, 60-100 pages, **teachers need to do all the homework and compile the textbooks into something ready made for the exam.** The dependency on lecture slide is huge. You don't even have to buy a textbook and the library resources used by the students, I don't think its too much.

It is different when I was a **student**, the professors just give some key points in class and we have to go to the library afterwards to study by ourselves. **We have to work hard by ourselves.**



Lecturer C



PERSPECTIVES III – aspirations & motivations



Student B

I watched a lot of video online on healthcare, disabled people, prosthetics are expensive for a lot of them, so I wonder if we can make it cheaper, pay a low premium, **I want to help people. It gave me motivation to overcome my SEN.**

I set up a new student body for **public healthcare**. In Hong Kong, initiatives often go to public housing to promote, but actually, those groups are already connected to the system. But **we need to target those who are segregated from these services**. So I organise activities, paying visits to homeless, or elderly in the holiday. **Students are quite actively engaged even with their busy schedule. They want to know.**



Student C

I want to provide medical services that are **patient-centered**, or make designs that are user-friendly and affordable. But we **don't have chance to get to know local communities, or understand their real need**. We have to be considerate because our profession impacts a lot of life. We **should take account for people and their feedback**.

Medicine is not just about the scientific part, it's more about communication. Not only the patient, the clinic, or hospital, but the community. Being a healthcare provider should also cope with the whole social systems in the healthcare system. We should also communicate with all potential patients.

I used to be in a uniform group, air cadet, that **sparked my interests in community engagement**

The ones who go to hospital already know they need treatment, but there are actually a group of people who need medical advice they just don't know it or how to. It would be a **great idea to have early exposure and a very good opportunity for me, with friends and teacher support to organise activities together**. We are applying as an NGO.

We haven't learnt a lot about this. Well, **we have ethics class, but the curriculum is more about academic knowledge**, not to bother on these kind of professional qualities.



PERSPECTIVES IV – potentials

Self-motivated learning...
With good education, students have to have an incentive to learn.
Exploring different aspects of the same curriculum. In biomedical engineering, we can incorporate **what students are interested in, like cyberpunk or sci-fi.**

Like Minecraft learning, but not just VR, like Khan Academy, just an online platform, but its a digital learning space where you watch videos and questions pop up, I really like it. **Like an interactive video game way of learning.**

But not like after a 2-hour lecture, and then **give us 10-mins break but ask us to play game.** Maybe it could help us relax, but people will have to stay and play, I feel like it could be hard.

I remember one class, we played a quiz game, and **the teacher just gift some simple prize, just a candy.** I didn't know some of my classmates were like, **so competitive, when playing games, it was really interesting to learn that about them** and it was really fun to collab and play. **I still remember all the answers to that class.** But other classes, it is difficult to remember.

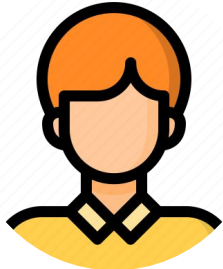
Interact with the environment and interact with others, **just so much more fun than just sitting in the classroom, teachers talking all day long, no offense**

Students **participate when they have friends in the room,** or when they feel **confident.** So I think this is how a **sense of belonging** helps in studying.

Maybe like cahoot, a **partnership or like a league,** quizzes, brings the fun in learning out.

I know this sounds like a long shot, but i love **the practical uses it could bring.** In the future, we can see **new ways to medical engineering products** like insulin pump, its kinda cool.

Nowadays, study can change, like **simulation of patients, procedures,** questions to ask depending on patient's response, and **you get immediate answer from the computer,** it's not like we used to, flipping books. But now, its possible.



Student D



Lecturer E



Student E

New ways of teaching, new ways of learning

Yale Medicine Magazine, 2016 - Autumn

As the century-old model of medical education shows its age, the School of Medicine rebuilds its curriculum.

Two years of science, two years on the wards: That familiar structure of the American medical curriculum took shape over a century ago. But it's showing its age.

Access:

<https://medicine.yale.edu/news/yale-medicine-magazine/article/new-ways-of-teaching-new-ways-of-learning/>



Medicine is changing faster than that structure can keep up. So at Yale, the medical school's legacy curriculum is now no more.

In a process that started in 2008, hundreds of faculty, students, and alumni dismantled the old and built a brand-new curriculum.

"The way we practice medicine has changed drastically. People's expectations of doctors are changing, too," says Richard Belitsky.

"We took a fresh look at everything we're teaching, which included how we were teaching it."

Belitsky called the rebuild process a "steep uphill climb".

A vista that has changed dramatically since 1910, when the two-and-two curricular structure appeared in Flexner's critical report on then-shoddy American standards of medical education.

The report transformed those standards, which have remained high to this day.

Arguably, medical practice is no longer the same straightforward exercise in scientific diagnosis and treatment that it was even 30 years ago.

Physicians must now think of the whole patient, her culture and socioeconomic setting, the medical system, and societal dynamics that lead to disparities.

- Disease prevention is gaining great importance.
- Electronic medical records and the bottom line haunt practice;
- genomics offers unheard-of insights;
- simulation technology and digital devices change the learning process.
- Teamwork is supplanting the old doc-on-top hierarchy.

There's only so much of this you can tack on to a traditional curriculum. So Yale's starts fresh.

A break with the past

Rather than the traditional year of basic science followed by a year of clinical science, the new curriculum weaves them together.

Now first- and second-years take eight integrated courses over a year and a half. Each course are broad and deep on thematic studies like “cell energy,” “plasticity and disease,” and “the reproductive years and middle age.”

The last course, for instance, includes elements of embryology, pathology, cell biology, epidemiology, and pathophysiology of both the female and male urogenital systems.

New subject matter is also appearing, including information on aging. It also includes longer courses in professional responsibility and scientific inquiry as well as clinical experience: students see patients in “pre-clerkships” throughout the first 18 months of school.

They’ll now take an earlier jump to the wards in January of the second year.

Earlier clinical experiences offer several advantages, Belitsky says, including motivating students, offering context for what they’re learning, and providing a longitudinal view of care.

The clerkships themselves have changed. Rather than one- or two-month rotations, students now enter 12-week clerkships that combine specialties with similar approaches to the patient, like internal medicine and neurology.

According to Michael L. Schwartz, attendings in one specialty are now taking the initiative to point out connections to the other: *“There’s a change in the culture of the clerkship to think about this as a shared enterprise,”*

Students also come together as a class for “shared precedes,” short courses that kick off each clerkship period and cover topics like informed consent and patient safety.

Regularly reuniting as a class during the clinical years is a novel approach, as students previously went their own ways as clerkships began.

Yale not alone in a rebuilt curriculum.

“In the past, there may have been important aspects of communication with patients that were taught in the psychiatry clerkship that students should be aware of and practicing in all clerkships. We’ve cherry-picked those things that we think are useful for all the clerkships and put them into these common precedes.”

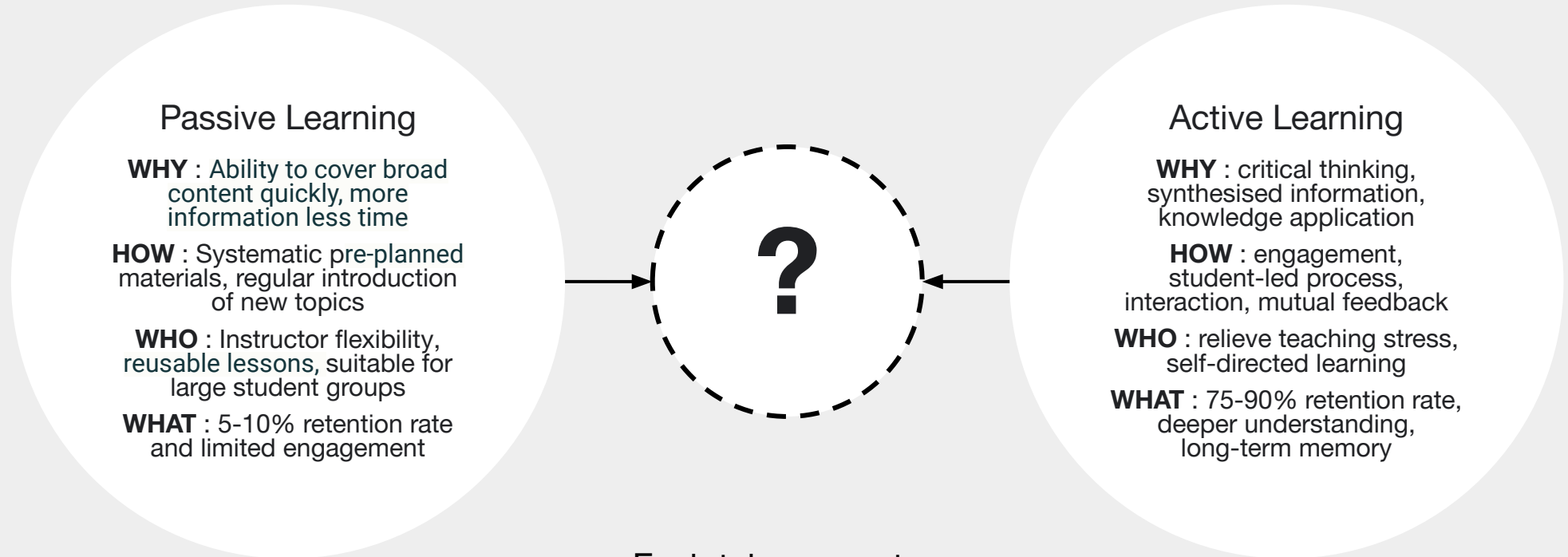
Students wrap up rotations in December of the third year. That leaves an unprecedented 17 months of time for research and thesis writing, electives and subinternships, and the boards.

Under the old curriculum, time for these activities had been shrinking. The new schedule may allow more students to graduate in four years.

The new curriculum also focuses on teaching. Faculty development is a priority, as are new, more transparent standards for faculty and students to offer each other feedback.

Those instructors take it in good spirits. There’s a sense of new energy at the school as the curriculum rolls out and as faculty and students try on new ways to teach and to learn together.





Each takes one step forward. Is there a third model that is compatible with both?





80-minute Biology discussion on “prokaryotic gene regulation”

Goal for student learning: To identify the structure and regulation mechanism of the lac operon and trp operon by using a role-play activity.

1. In-class quiz on previous three lectures (5 min).

2. Review and role-play set-up (20 min).

2.1 Review the *structure* of the lac and trp operon (7 min). Draw the structure on the board for reference and review the biological process and regulation of lac operon.

2.2 Ask the students to come to the board *in pairs* to complete the figure with important component molecules (5 min).

- If the students can successfully draw the pathway, ask another student to talk through the pathway again.
- If the students have difficulty drawing the pathway, the other students or the GSI could help them to figure out the pathway.

2.3 Review the trp operon mechanism (8 min).

- Ask students to work in groups of 3-4 people each for 5 min to talk through how this operon is being regulated while referring to the structure on the board. (Instructions: discuss how the trp operon responds to environment with/without tryptophan, what proteins are involved, and how they interact with each other).
- To debrief, ask someone to talk through the trp operon mechanism (3 min).

3. Check for Understanding: Play the “Lac Operon” role-play (45 min).

3.1 Introduce the lac operon and trp operon role-play activity and explain the process (5 min). Assign the roles of different molecules to volunteer students who will be the “actors,” while all the other students will be the “directors” of the play.

3.2 Role-play (15 min): The “actors” play the dynamic regulation of the lac operon, and the “directors” judge whether they play a functional lac operon or not. Change the environmental conditions, play the responses of the lac operon again (10 min). If time permits, repeat for the trp operon. (5min)

3.3 Group Discussion (10 min):

As a large group, discuss the following questions:

- What are the ways to improve the play by better representing the regulation of the pathway?
- How would one exhibit specific versus non-specific interactions?
- What other responses will be stimulated under other conditions, such as mutations?

3.4 Students discuss remaining exercise questions in small groups (15 min).

- Sample exercise question: *What do you think would happen in each of the following?*
 - An E.coli missing a functional lacZ gene.
 - An E.coli missing a functional lacI gene.
 - An E.coli in which the repressor molecule no longer can bind lactose.

4. Summarize the discussion and any remaining questions (10 min).

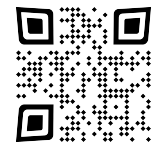
Submitted by Yaxuan Yang, Molecular, Cellular & Developmental Biology as a sample lesson from Bio 172 (under the direction of Dr. Kenneth Cadigan)

Sample Curriculum

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
	CLINICAL: PRACTICE OF MEDICINE			EARLY CLINICAL	INTERMEDIATE CLINICAL	ADVANCED CLINICAL
Clinical Experiences	Understand roles	Collaborate with clinical team			Increased responsibility	Co-lead teams
	Patient in context	Community assets and needs/public health		Targeted health education	Teach junior students	
	Understanding social and cultural situation / actual conditions					
Communication and Collaboration	Gather thorough comprehensive	Thorough and focused history			Thorough, focused – complex patients	
	Understand patient perspective	Patient education skills	Complex communication with patients and family		Teach these skills	
	Empathy				Giving bad news	
Clinical Skills	Vital signs	Basic physical exam		Increasing accuracy	Increasing efficiency	Able to teach exam
	Basic procedures (first aid, immunizations)			In-patient procedures	Able to teach procedures	
The Developing Professional (professionalism)	Fundamental professional attributes		Cases from clinical experience		Advocacy	
	Self-care	Work-life balance			Increasing autonomy	
Clinical reasoning	Apply basic sciences/physiology to history and physical exam			Basic diagnostic/therapeutic plan		
	Basic differential dx common symptoms			Increasing sophistication in diagnosis and management		
Student-as-teacher	Self-directed learning	Defining and researching clinical questions		In-depth learning/teaching		Co-lead clinical team
	Peer teaching/learning	Near-peer teaching (history/PE)		Near-peer teaching ethics, professionalism, clinical reasoning		
	REPORTER			INTERPRETER	MANAGER	EDUCATOR

Application of the RIME (reporter, investigator, manager, and educator) model to curriculum reform. PE, physical examination.

- Tran, T. D., Vu, P. M., Pham, H. T., Au, L. N., Do, H. P., Doan, H. T., ... & Vu, N. V. (2022). Transforming medical education to strengthen the health professional training in Viet Nam: A case study. *The Lancet Regional Health–Western Pacific*, 27.

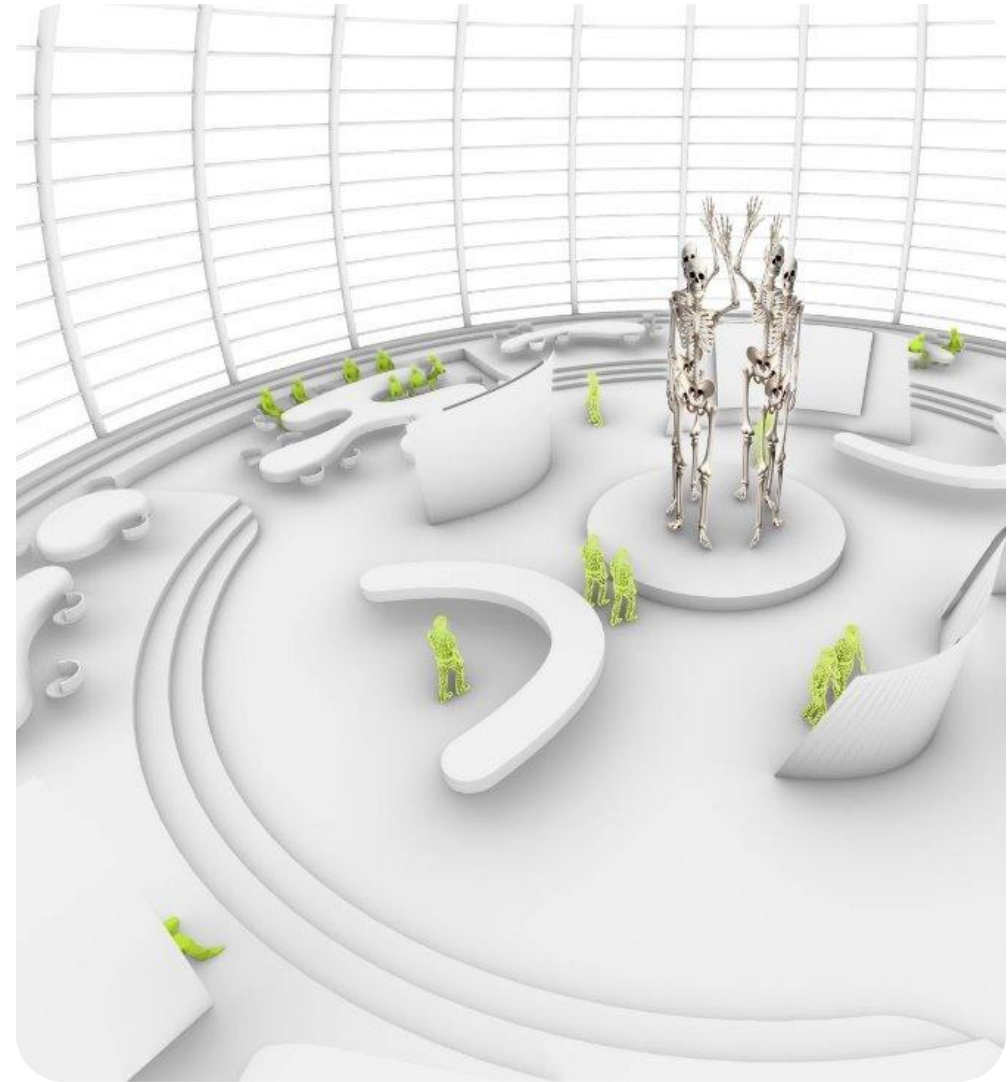


From the worldwide movements in health-science education reform, it can be understood that the teaching and learning **challenges at our medical school is not unique**, but there is **a wider need for change over the century-old curriculum and pedagogical methods**. Especially given the rapidly changing socio-economic landscapes and urban challenges.



Metaverse for a Hybrid & Interactive Learning Environment

- Metaverse describes a three-dimensional and immersive virtual world that enables social and economic interactions among users, regardless of their physical location.
- In the rapidly evolving world of digital technologies, the concept of a "metaverse" has emerged as a promising tool for gamified learning, including training for health professionals.
- Metaverse may possess distinct qualities from other tools commonly used in educational settings—namely, "Interactivity, Corporeality, and Permanence"
- In such an “unreal”, virtual space, our project proposes a preliminary study to address the question: “Can the metaverse offer pedagogical innovation for hybrid learning experiences, providing students with enriching and engaging professionalism in knowledge and skill competency?”



Sense of Belonging

A sense of belonging is a psychological construct that reflects acceptance and value within a group or community.

Its states and traits can fluctuate based on interactions and experiences.

- **Universal human need:** It is a crucial aspect of human connection, influencing identity, emotional well-being, and engagement in different social, educational, or professional settings.
- **Learning Approach:** When students feel that they matter and are integrated into their learning environment on campus, they are more likely to engage actively, perform well academically, and experience overall satisfaction with their educational journey.

Reflections & discussions:

- How does the collaborative work of students and teachers impact the acceptance of the relationship between architectural creativity design in the innovative digital learning environment and a sense of belonging?
- Through a sense of belonging, how do students and teachers, as key stakeholders, envision the sustainability of innovative digital learning environments for future pedagogical strategies, including the teaching format, gamified involvement, community outreach and social interaction in tertiary education?
- By emphasizing the sense of belonging, are the participants willing to adapt their creative design to real circumstances, conditions, and contexts in future higher education environments?

