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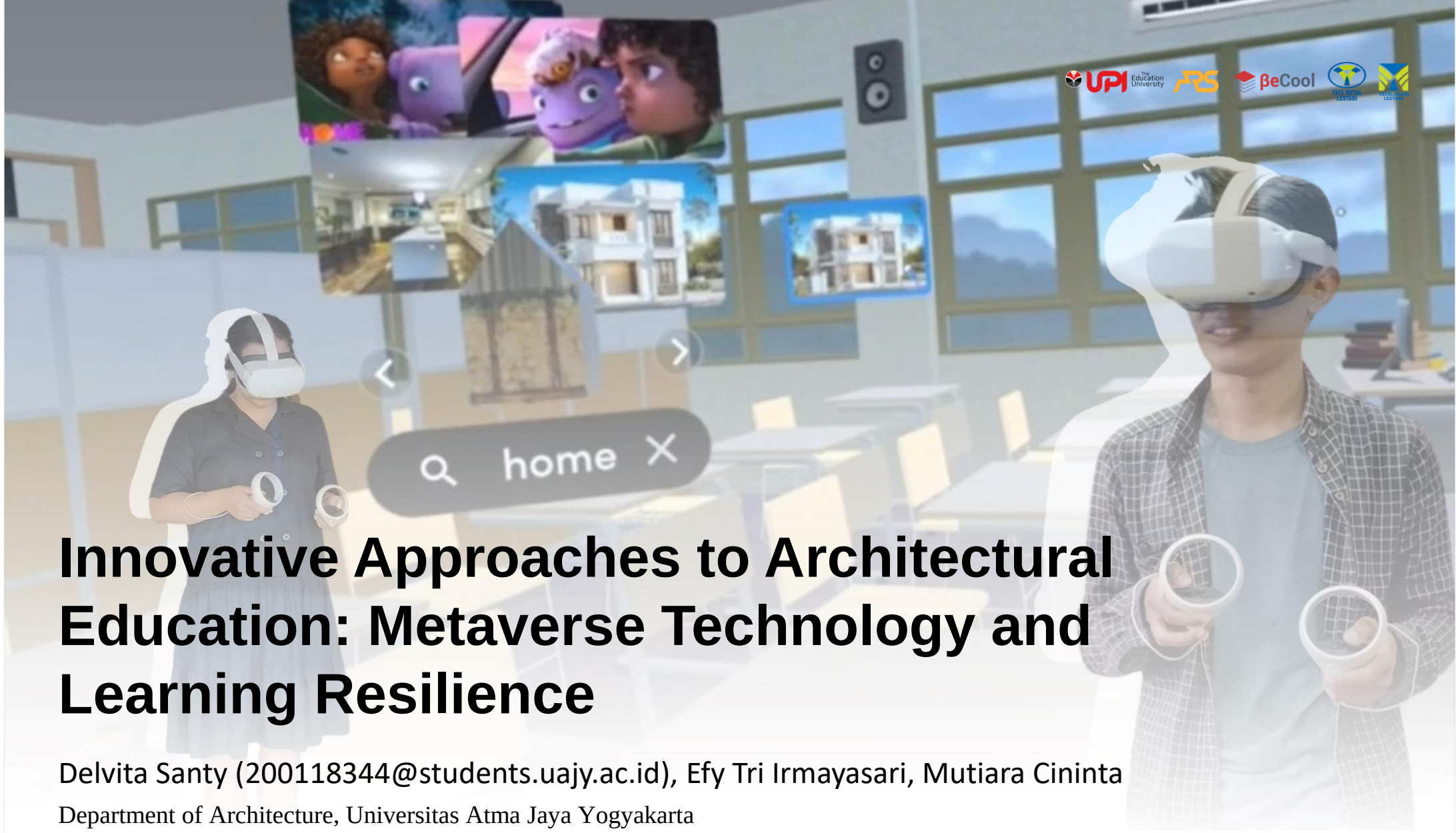

Innovative Approaches to Architectural Education: Metaverse Technology and Learning Resilience

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sbcc 2024

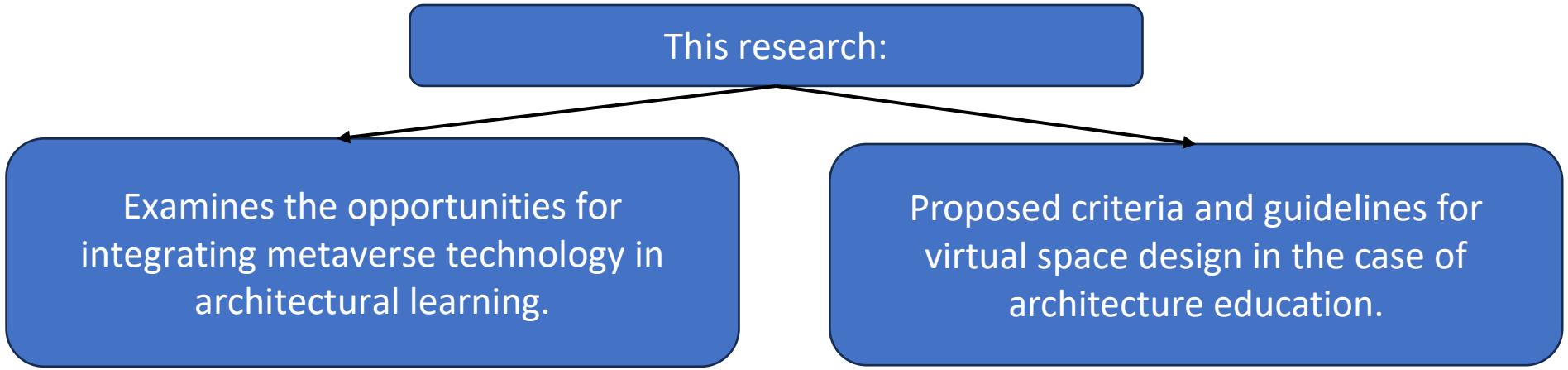
International Symposium and Workshop
on Sustainable Buildings, Cities, and Communities
"Building Low Carbon Future: Decarbonizing with Impact"

Introduction

- The emergence of COVID-19 caused unprecedented changes to the education system, namely the transition from offline learning to online learning. Implementing learning with an online system during the COVID-19 pandemic has experienced several challenges and was considered ineffective [1][2][3].
- Architecture schools, once centers of social activity, during the pandemic are becoming physically inaccessible, leading to a lack of social interaction.
- Digital pedagogy had a significant psychological impact in terms of reduced interest, decreased self-confidence, symptoms of depression, and health implications such as difficulty sleeping among architecture students [4].

Introduction

- On the one hand, Metaverse and Virtual Reality (VR) technology offers promising solutions to enhance online learning experiences, particularly in architecture education, by fostering increased student engagement, understanding, and overall learning optimization [5][6][7][8].
- Besides that, VR technology is better and more effective when compared to the usual learning process through books or videos [9].



Method

Mixed method research:

- Quantitative : UEQ
- Qualitative : Structured Interview
- Respondents: 5 experts/lecturers and 20 architecture students
- Primary data : VR experiment
- Secondary data: Literature review

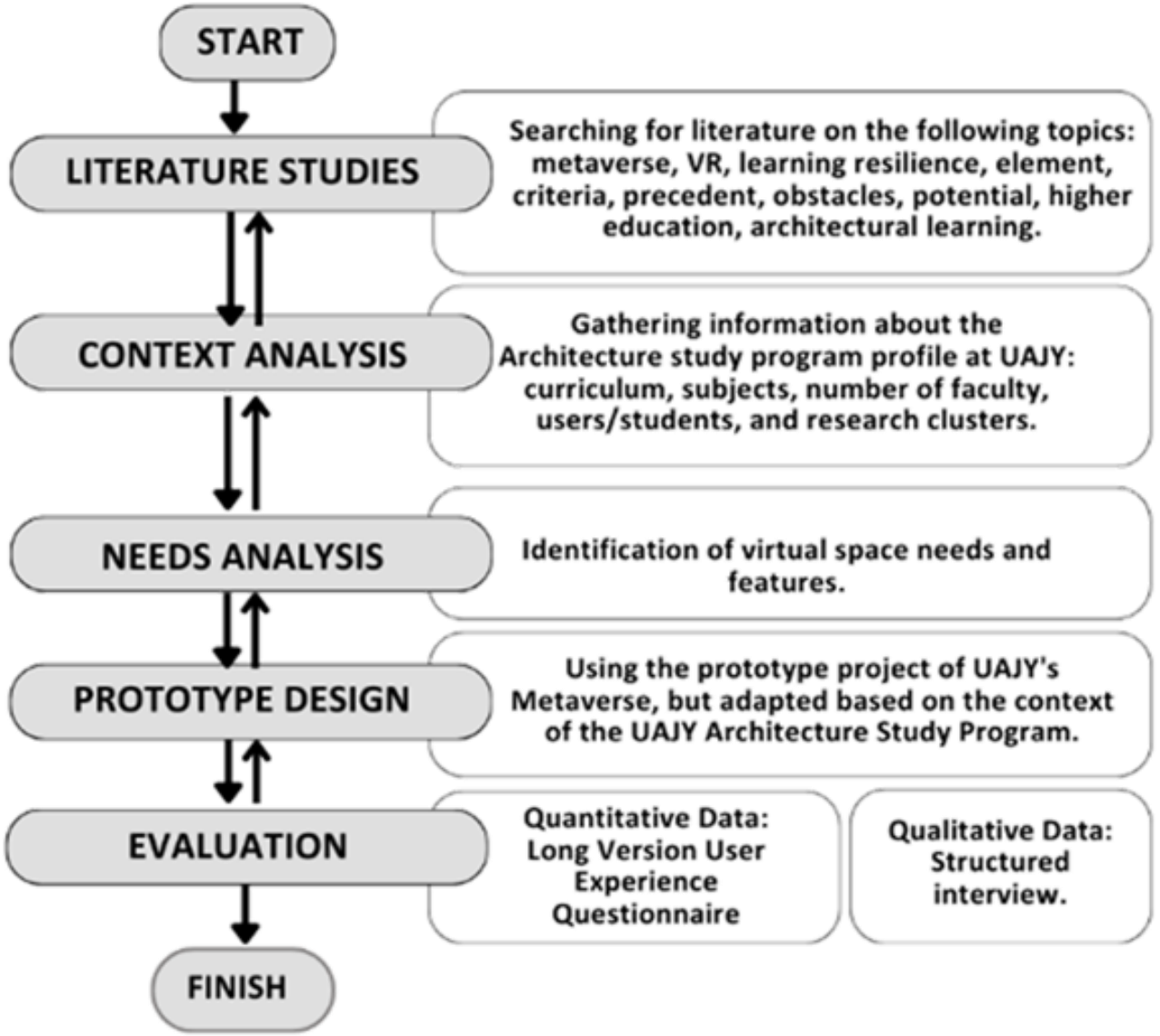


Figure 1. Research flow for developing virtual space design for architectural campuses

Method

The initial prototype shows the two types of classes that are needed in response to the curriculum: studio-based (discussion room model) and theory-based (typical classroom model).

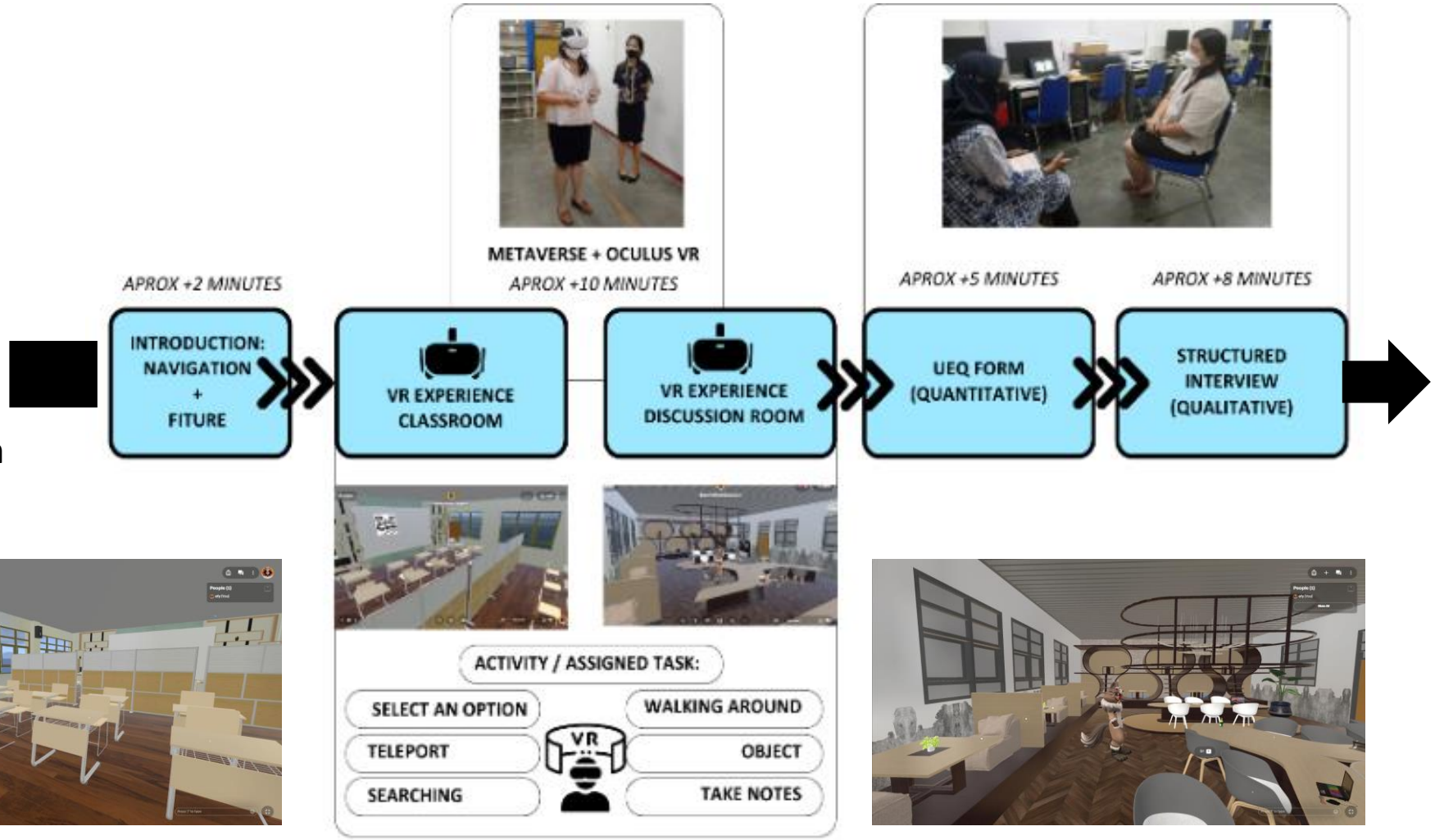


Figure 2. Metaverse Prototype Evaluation Procedure

Result and Discussion

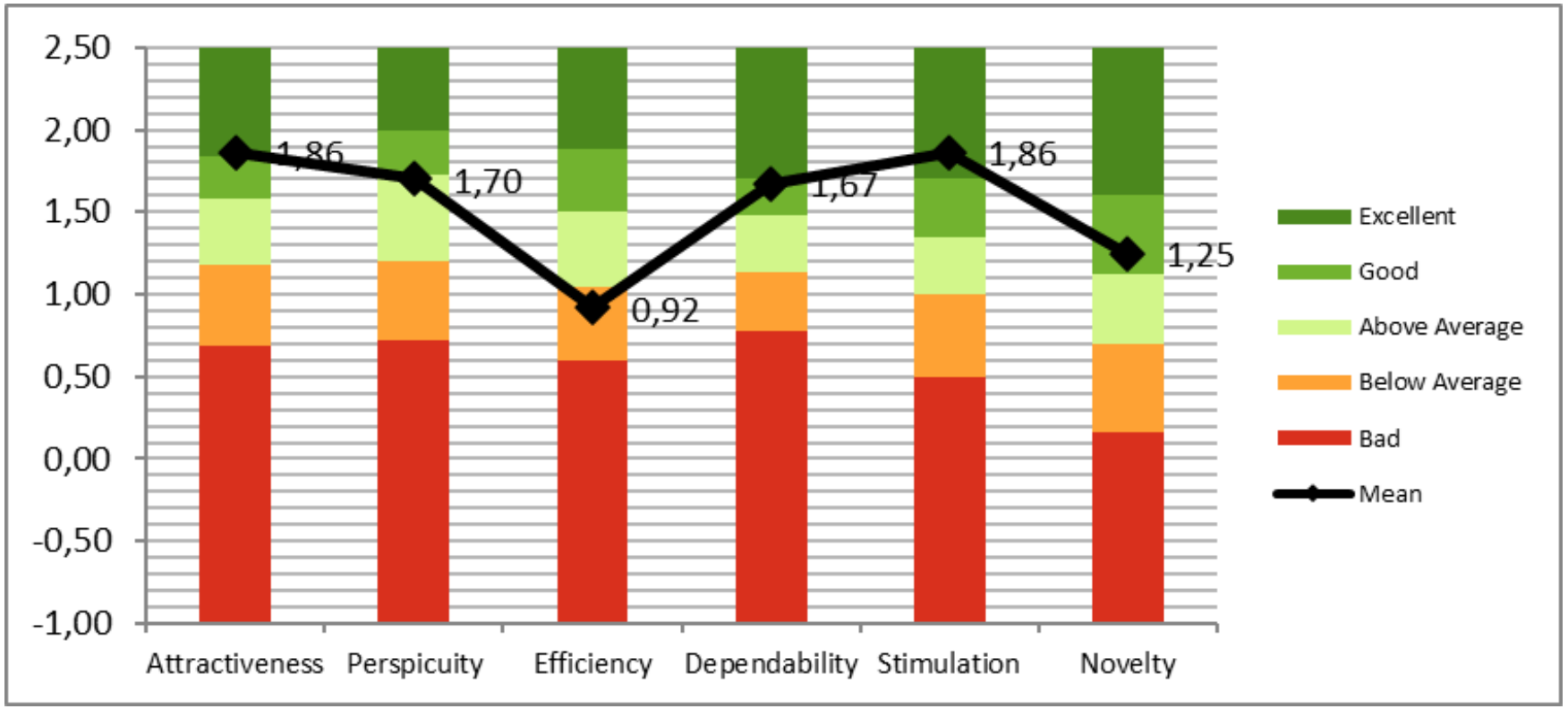


Figure 4. Combined UEQ Metaverse Prototype Evaluation Results

- Metaverse technology has potential as an effective means of teaching spatial experiences and three-dimensional modelling not facilitated by non-immersive online media such as Zoom and Teams calls

Lobby

Function	A start landing
Criteria	Accommodate minimum 30% of the total number of students.
User	Students and Lecturers
Guideline	Open space without furniture.

Collaboration Space

Function	Virtual collaboration space fosters teamwork, idea exchange, and productivity.
Criteria	Shared tables and chairs.
User	Students and Lecturers
Guideline	Space that can be transferred to VR, private desk, and chairs (glass cubicle room for 1 lecturer and 2 students).

Exhibition Space

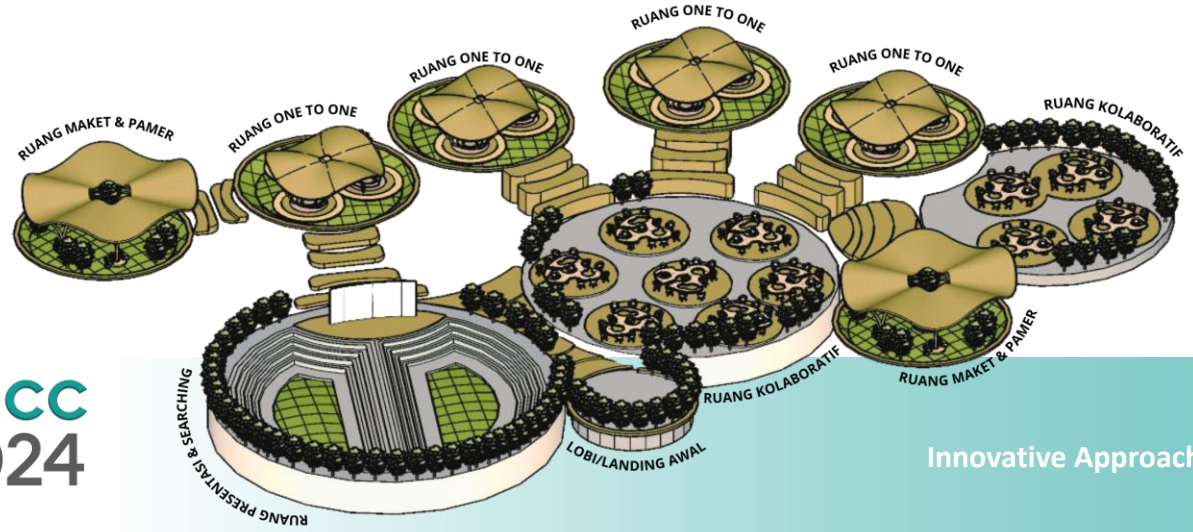
	Material Gallery	Artwork Archive	Gallery Archive	Stage Studio Award
Function	Pavilion space with material displays grouped according to courses.	Space area with storage for the collection of artworks.	Space area with storage for material collections.	Area for studio awards presentation ceremony.
Criteria	Clear organization, interactivity, flexibility, and aesthetic appeal for optimal learning experiences	Efficient storage, accessibility, categorized, and labeled	Efficient storage, categorized and labeled materials, accessible	Optimal lighting, seating, stage setup, and aesthetics for a memorable and professional studio
User	Students and Lecturers	Lecturers	Lecturers	All users (entire school community)
Guideline	There is a space designated as an exhibition venue to showcase the results of student model works that will be exhibited	There is a space designated to exhibit posters and explanations of student works that will be showcased	There is storage space provided for storing student models or project works	There is an open space designated for showcasing the overall works of the students

Classroom

	Sketch Room and Exhibition Space	Searching and Presentation Room	Art Gallery
Function	Facilitate creative ideation and showcase	Supports information retrieval and effective communication	Pavilion Space with an estimated 2 pavilions for the studio course within one semester, showcasing 11 selected studio works.
Criteria		Shared seating and presentation board.	Accommodate minimum 30% of all users (entire school community)
User	Students and Lecturers	Students and Lecturers	Students and Lecturers
Guideline	Space facilitating note placement in the metaverse, displaying simple meetings and fostering collaborative note-sharing experiences	One room accommodating 12 people multiplied by 12 classes, and a layout for a communal space.	

Personal Discussion Room (One to one)

Function	As a personal discussion space between students and lecturers.
Criteria	Consultation desk, chairs, can be connected spatially and separated in terms of access.
User	Students and Lecturers
Guideline	Space that can be transferred to VR, private desk, and chairs (glass cubicle room for 1 lecturer and 2 students).



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Conclusion

- Metaverse and Virtual Reality (VR) integration in architectural education offers more engaging, stimulating, and creative learning.
- Beyond physical limitations, its strengths include the possibility of accommodating a more imaginative environment and space-efficient digital 3D archiving. This aspects may ensure a resilient architectural learning approach.
- The suggested model consists of two main zones: classroom area and exhibition space. Some architectural guidelines, such as service rooms and utility areas, may no longer be relevant in virtual architectural design. However, some space programming, anthropometry, and ergonomics considerations are still pertinent to implement.

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