Pedagogy Research Innovation

順德聯誼總會鄭裕彤中學
Shun Tak Fraternal Association Cheng Yu Tung Secondary School

Integrating Metaverse into Science Education with PST Framework

2024

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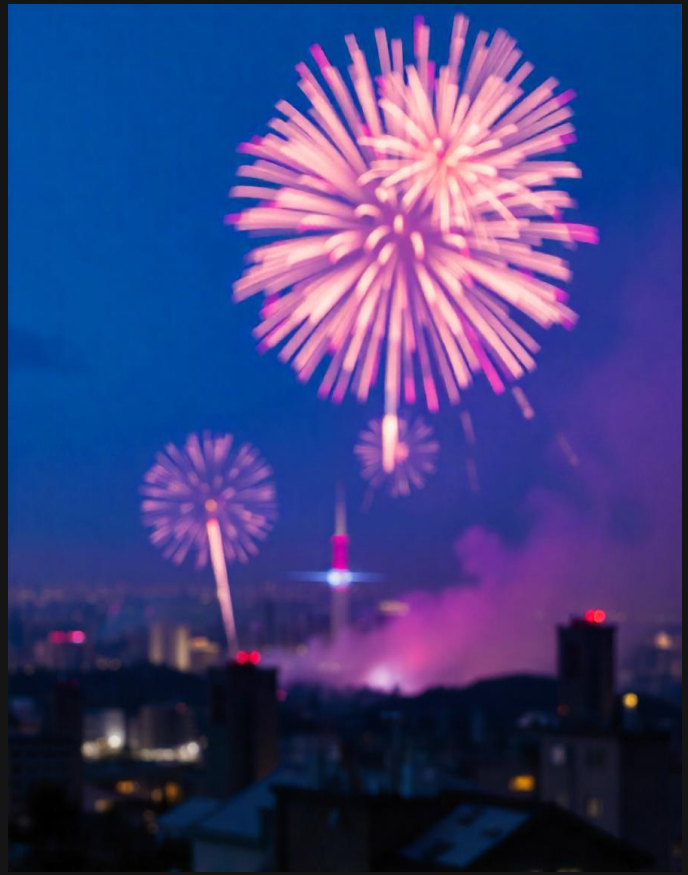
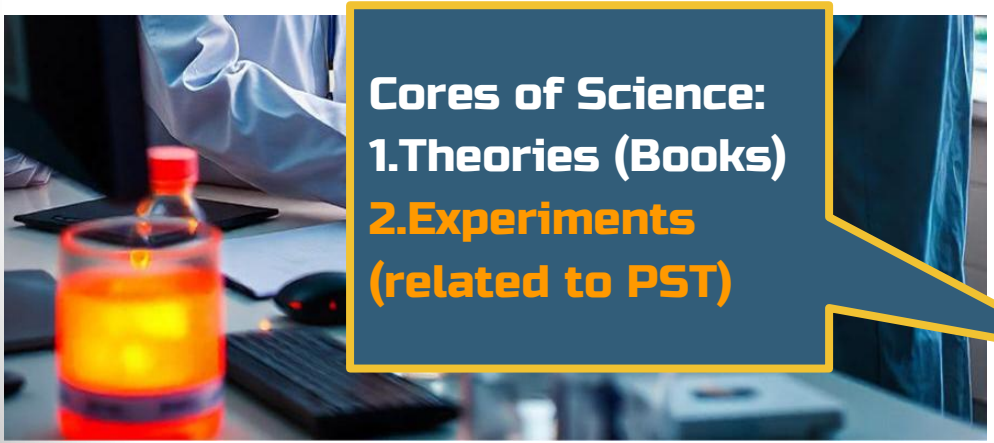


The metaverse in education is pointless if it's just for show and not for learning.

Scientific experiments in Science Education

Scientific experiments are designed to **discover reproducible natural phenomena** at the level of scientific inquiry. Various theoretical explanations have been proposed based on **hypothetical assumptions and speculations** about a particular repeatable phenomenon (Chang, 2011).



Cores of Science:
1.Theories (Books)
2.Experiments (related to PST)

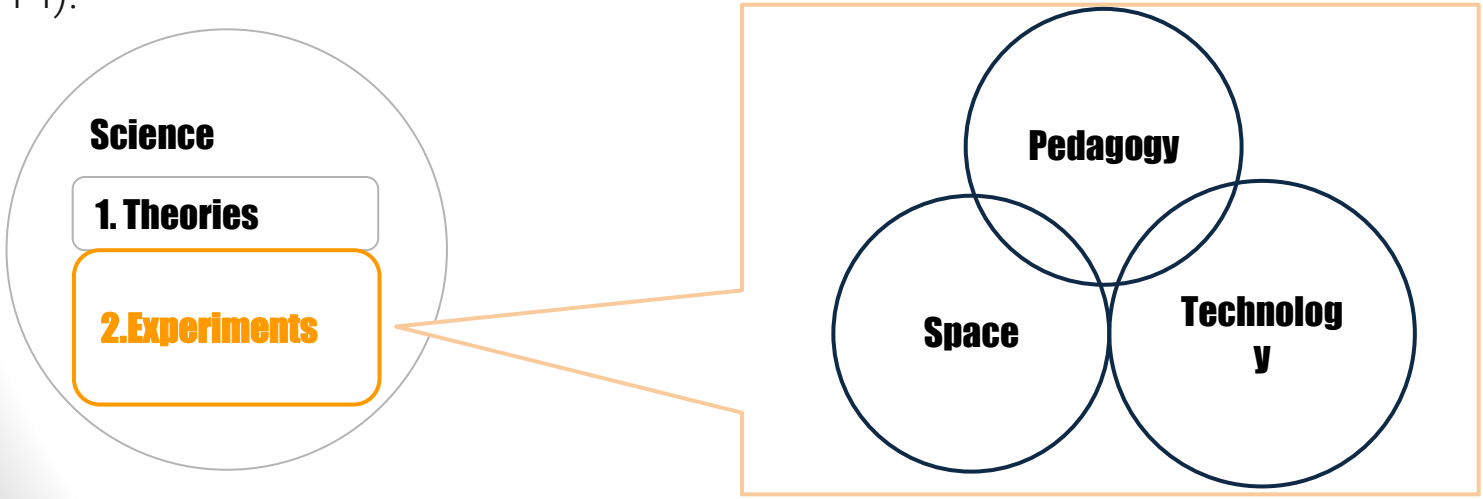
Science Education:
Teaching students to do...

Science

1. finding patterns in nature
2. explain (theories and experiments)

Science Education & The PST Framework

In science education, students need to learn more than just scientific theories but also master the logic and methods of scientific verification. However, experiential learning does place a **greater demand on the environment in which it occurs** (Kluge, 2014).



PST Framework with Metaverse

Pedagogy

Leveraging innovative teaching methodologies that leverage the unique capabilities of the Metaverse.

Space

Creating immersive（*virtual ）environments that enhance the learning experience and support specific educational objectives.

Technology

Seamlessly **incorporating cutting-edge technologies**, such as virtual reality and artificial intelligence, to power the Metaverse-based learning experience.

The impact of Metaverse on Pedagogy

Immersive Learning Experience

1. Goes beyond just reading books and watching videos
2. Students can experience things, not just learn about them
3. Learning through doing, not just seeing
4. Uses more senses to help remember better

(Cho, Hong & Kim, 2022)

Self-directed Interactive Learning Experience

1. More freedom in how to learn
2. Students in control of their learning
3. System adapts to each student instead of other way around

(Sghaier, Elfakki & Alotaibi, 2022)

The impact of Metaverse on Space

Virtual Reality Capabilities

1. Beyond physical world limitations
2. Scene-to-scene transitions
3. Field trip augmentation

(Dreamson & Park, 2023; SONG et al., 2022)

Environmental Simulation

1. Theory visualization
2. Safe experimentation
3. Repeated practice opportunities

(Hamilton, 2022)

Learning Accessibility

1. Time-zone independent
2. Location-flexible learning
3. Continuous education support

(Lo & Tsai, 2022)

The impact of Metaverse on Technology

AI-Enhanced Learning

1. Adaptive to individual styles
2. 24/7 virtual teacher support
3. Personalized guidance
4. Emotional engagement enhancement

(Elgohary & Al-Dossary, 2022)

Gamification

1. Instant feedback system
2. Increased student motivation
3. Competitive collaboration
4. Skill development focus

(Turan, Avinc, Kara & Goktas, 2016)

Advantages & Disadvantages

Pros & Cons

Cost Benefits

Virtual labs eliminate expensive equipment and space requirements

Laboratory skill deficiency

Students lack hands-on experience with real equipment

AI Integration

Automated analysis and personalized guidance enhance learning efficiency

Safety awareness gaps

Virtual environments may create unsafe habits in real laboratories

(Tsai, Ho, & Nisar, 2021; Zawacki-Richter, Marín, Bond & Gouverneur, 2019; Matsuo et al., 2011; Krishnan, 2022)

Further Development

01 AI-Powered Support

Intelligent systems adapt to each student's learning style and provide instant help

02 Virtual Learning Enhancement

Digital tools create interactive experiences that make complex concepts easier to understand

03 Intelligent Tutoring

Available anytime, virtual tutors analyze student performance and provide targeted guidance

04 Digital Integration

Seamless access across devices with automatic content updates based on learning data

My Humble Conclusion:

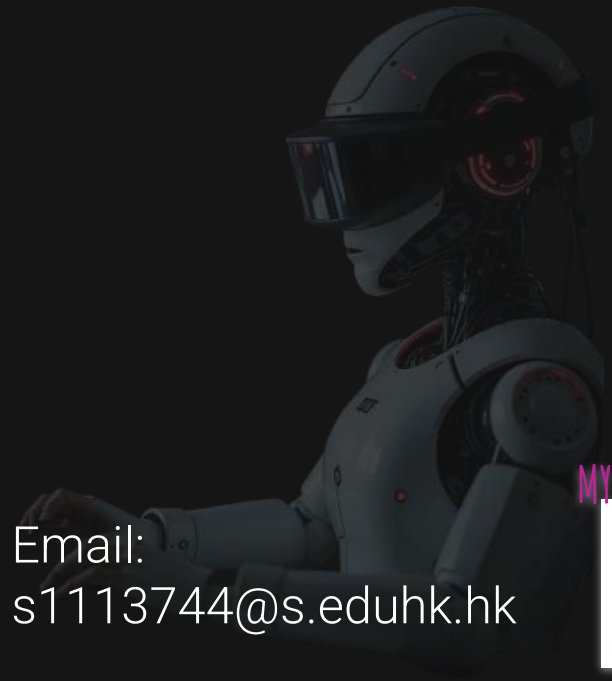
The Metaverse Will Be A Portal Where Science Will Transcend Into Reality.

Pedagogy Research Innovation

Thank you for coming!

My Research Interests:

- STEM Education
- Metacognition
- AI & Automation
- Robotics



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