

# XR in Education

# The Papers

- Using immersive technologies to enhance the student learning experience
- Analyzing augmented reality (AR) and virtual reality (VR) recent development in education
- Advancing Education Through Extended Reality and Internet of Everything Enabled Metaverses: Applications, Challenges, and Open Issues

# Extended Reality

- XR: umbrella term that encompasses AR, MR and VR Technologies
- AR: enhances/modifies reality by overlaying virtual content onto it
- VR: replaces the real world with a computer-generated one
- MR: integrates elements of both the real and virtual worlds, enables interaction

# Using immersive technologies to enhance the student learning experience (2024)

- Evaluate undergraduate students perceptions about immersive technologies in education
- Focus on remote educational delivery due to COVID
- Can enhance the learning experience
- Can increase engagement

# The Study

- Methodology: embedded individual case study
- Self-administered web-based questionnaire
- 83 participants
- 55% had not used immersive technologies in their studies
- 27% to small or some extent
- 16% to a great extent

# Findings

- Participants see potential to provide supplementary support to the learning process
- Computing-related subjects innately seem to be more suitable
- Men find Chemical Engineering, Chemistry and Mechanical Engineering more suitable than women
- Top preference seemed to be for MR
- Least preference was for VR and AR
- Participants still prefer traditional face-to-face classes

# Findings: Drawbacks

- Cost of equipment
- Health issues
- Why they were being asked to use the technology
- Almost half agreed: using immersive technologies in their classes would make them feel anxious

# Discussion

- Aligns with other papers:
- Benefits: immersive learning, better visualization, increased engagement
- Drawbacks: cost, health issues (e.g., motion sickness)
- Interesting point: Preference for face-to-face classes over immersive technologies



# Critic

- Small, single-institution participant group: limiting generalizability of findings
- 55% lacked experience with immersive technologies: reducing reliability of answers
- Comprehensive study

# Analyzing augmented reality and virtual reality recent development in education (2023)

- H1: VR and AR researches in education have increased dramatically in the past ten years
- H2: VR and AR adoption in education have exponential growth during the outbreak of COVID
- H3: VR and AR have enhanced communication and students-educators interaction
- H4: Mobile applications and platforms are dominating
- H5: Adopting of VR and AR in education have been significant during COVID
- H6: Recent researches on VR and AR in education include trends related to market and businesses for future jobs

# The Study

- Systematic literature review of articles from 2011 to 2022
- Scopus database
- 1536 articles used for further analysis

# Proof H1 & H2

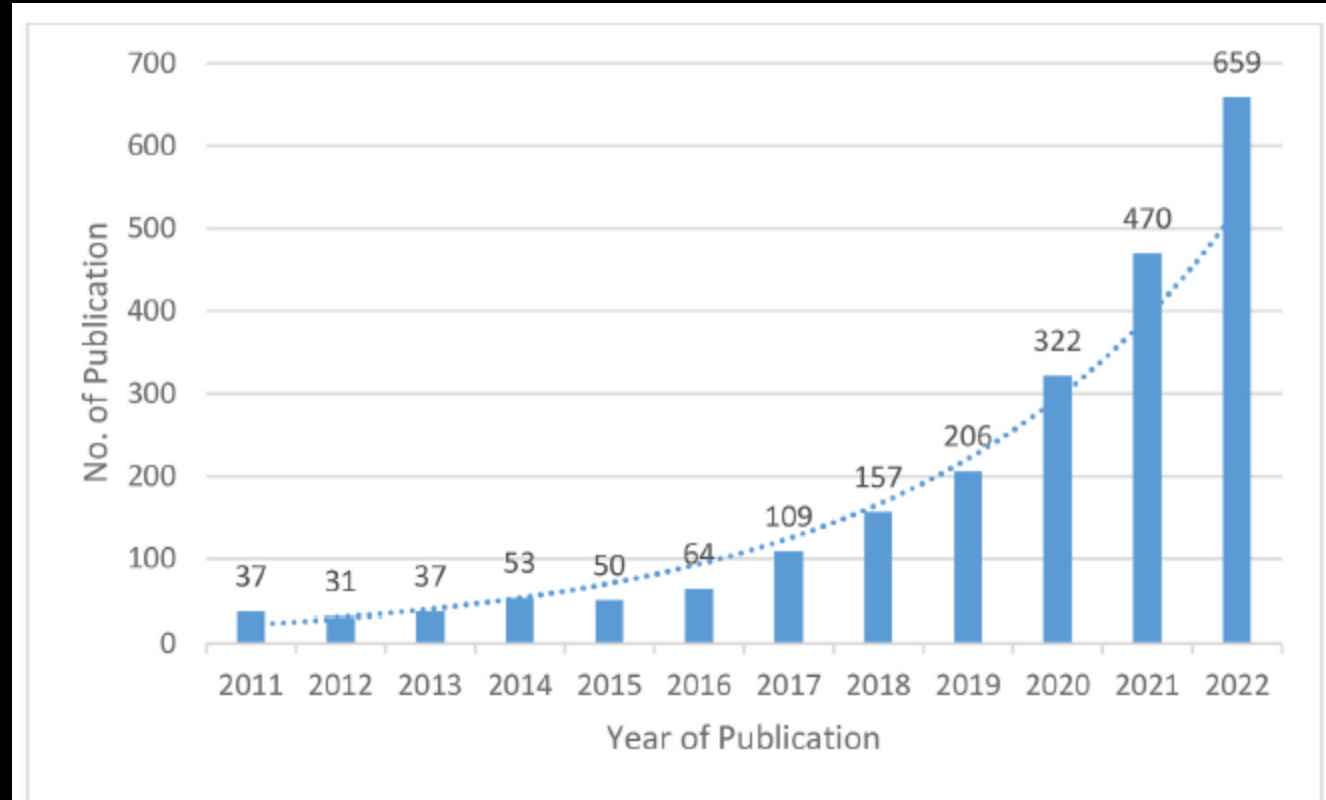


Fig. 1. Distribution of VR and AR throughout year of publication.

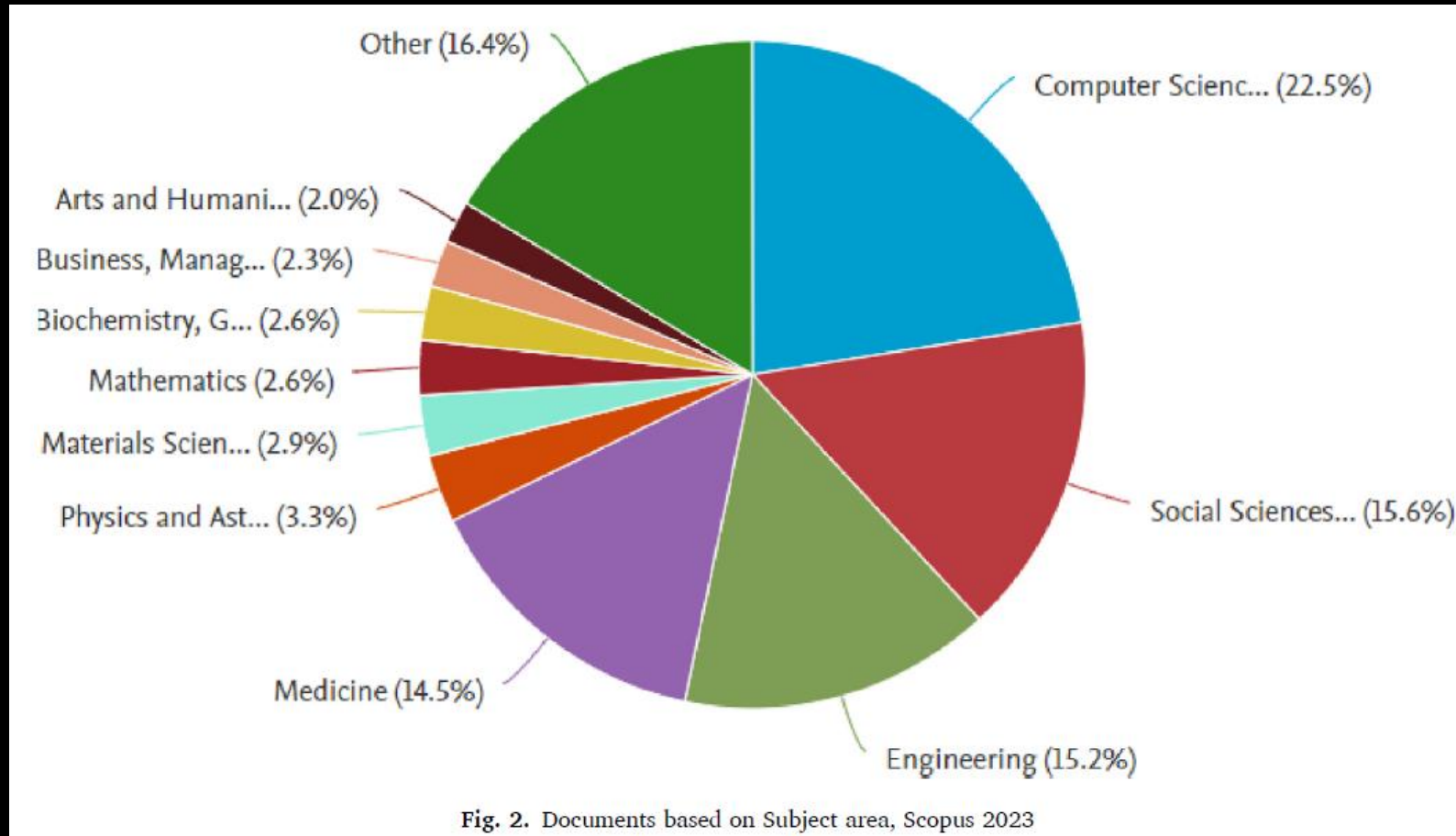
# Proof H3

- 527 articles include both AR & VR in education
- 84 documents were selected
- Uploaded to WordStat for further analysis
- Keyword analysis, word frequency: highlight the role of AR and VR in learning
- Topic analysis: shows a strong correlation between students, teachers, and AR/VR

# Proof H4 & Rejection of H5

- Mobile education was among the top 10 keyword distribution
- 11<sup>th</sup> in topic analysis
- 8<sup>th</sup> among word frequency
- => Proofs H4
- Results reveal no evidence for H5
- => Reject H5

# Proof H6:



# Critic

- No new empirical data
- Comprehensive review



# Advancing Education Through Extended Reality and Internet of Everything Enabled Metaverses: Applications, Challenges, and Open Issues (2024)

- XR and IoE-powered Metaverses can deliver highly immersive, interactive, and tailored educational experiences
- Enhance learning outcomes

# What is the Metaverse?

- Shared virtual environment
- Persistent
- Users to interact via immersive technologies with both the environment and other users

# What is the Internet of Everything (IoE)

- IoT: network of physical objects, that are connected to the internet
- IoE: is based on IoT, data, people, and processes

# The Study

- Systematic literature review
- 4 databases
- Primary articles in English
- No restriction on publication date
- 182 selected articles

# Findings

- Enabling personalized learning experiences
- Providing real-time feedback
- Creating immersive environments
- Mobile technology enables, advanced services in XR environments
- => Supports education with immersive XR apps
- => Utilizes affordable VR/AR devices
- Enables education from anywhere in the world

# Findings: Obstacles

- High cost of implementation
- Insufficient infrastructure
- Incompatible XR and IoT devices
- Data privacy, security

# Critic

- No new empirical data
- Overall thorough overview

# Summary

- XR is useful in education
- But there are drawbacks



Thanks for your attention 😊