



EFFECTS OF VR ON STUDENT LEARNING: A SCOPING REVIEW

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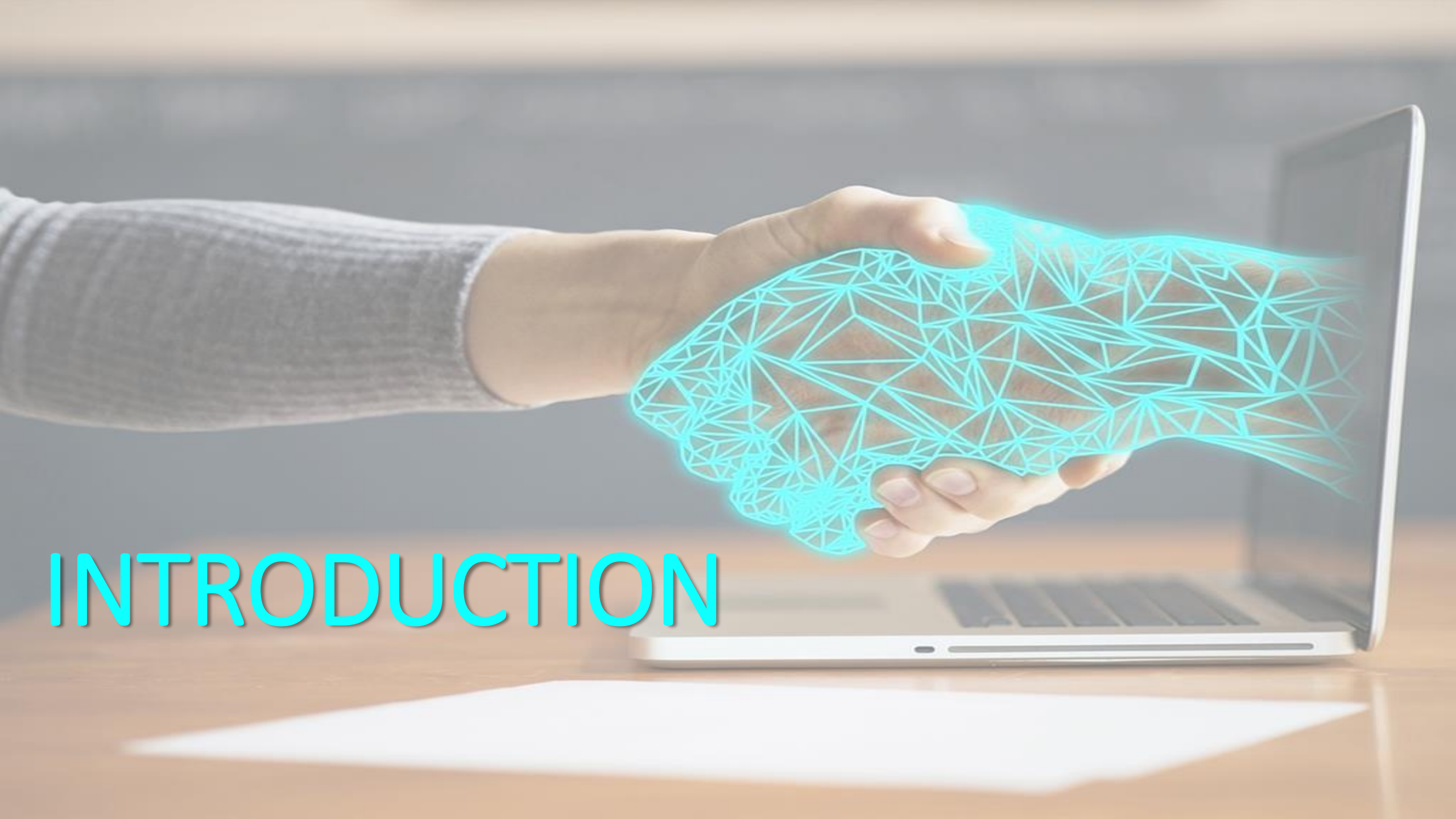
AUTHOR INTRODUCTION

Anila Das

- Faculty in Computer Science
- Currently pursuing Ph.D. in Learning Technologies at the University of North Texas
- Research Interest
 - Virtual Reality
 - Augmented Reality
 - Mixed Reality
 - Augmenting the learning experience for K-12 education through immersive learning
 - Curriculum areas of focus: History and Aerospace

Janetta Boone

- Instructional Technologist at NASA Johnson Space Center.
- Currently pursuing Ph.D. in Learning Technologies at the University of North Texas
- Research Interest
 - Innovative training methods and strategies for near-future deep space exploration.
 - Niching an intersection at the corner of anticipatory training and immediate-need training to accommodate the lag in ground-to-space communication time.
 - Related topics are adult remote workplace learning, UX/LXD, high-stakes AR situational awareness training, pre-simulation technology, and interactive training elements to promote self-pacing efficacy.



INTRODUCTION

▼ K-12 and VR

VR integration allows for:

- Enhanced visual learning
- Improved student retention
- Increased student involvement
- Interactive learning
- Greater comprehension
- Increased competency
- Constructing new learning and understanding
- Making the connection from the classroom to the real-world



Benefits

Significant benefits for student learning in the VR landscape include

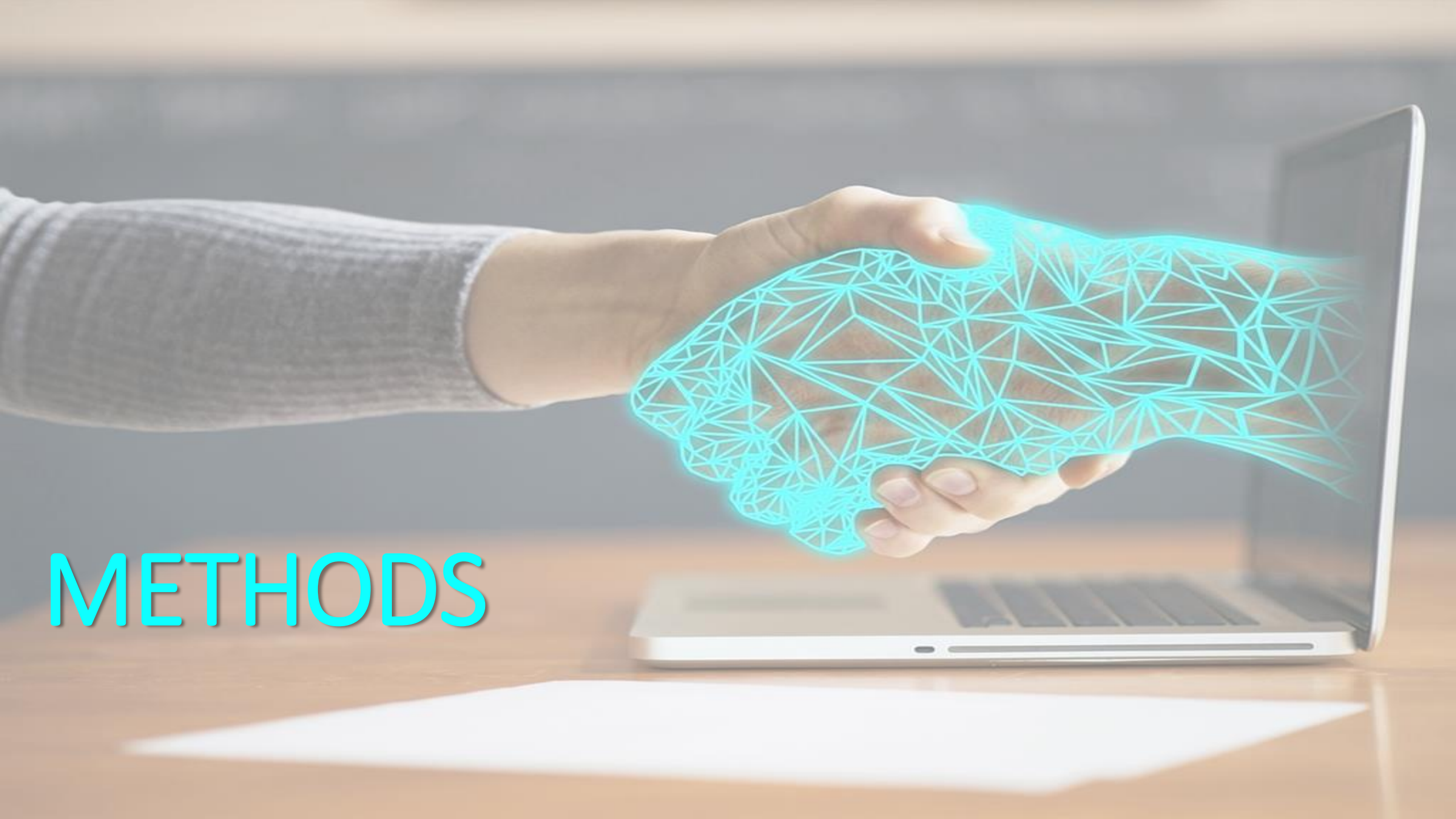
- Improved motivation
- Retention of student learning
- High level of interactivity and collaboration for interpersonal development
- Promotion of active and experiential learning
- Leveraged exposure to practical skills to deal with real-world



Purpose

Review of literature

- Correlated with virtual reality's impact on student engagement and retention within the elementary classroom.
- Results from previous studies were gathered and synthesized identifying trends within the last decade.



METHODS



Framework

Arksey and O'Malley's (2005) five-stage framework is utilized for the purpose of this scoping review.

The five stages consist of:

1. Identifying research questions
2. Identifying relevant studies
3. Study selection
4. Charting the data
5. Collating, summarizing, and reporting the results



Identifying the Initial Questions

1. What is the impact of VR integration in the educational system and classroom?
2. What is the impact on student retention with the integration of VR?
3. Does the integration of VR improve student engagement?

"VR courses break through the limitations of time and space, extends the scope of teaching materials" (Liou & Chang, 2018, p. 140).

▼ Identifying Relevant Studies

The leading search concepts were:

1. Virtual reality
2. Elementary education
3. Immersive technology

"Over 90% of students approved of using 3D immersive VR to enhance learning, stating it to be good and innovative" (Maheshwari & Maheshwari, 2020, p. 9).

▼ KEY SEARCH TERMS

Boolean operators were incorporated to combine and expand the literature search options. Boolean operators such as OR and AND allowed the authors to combine search terms and broaden the results.

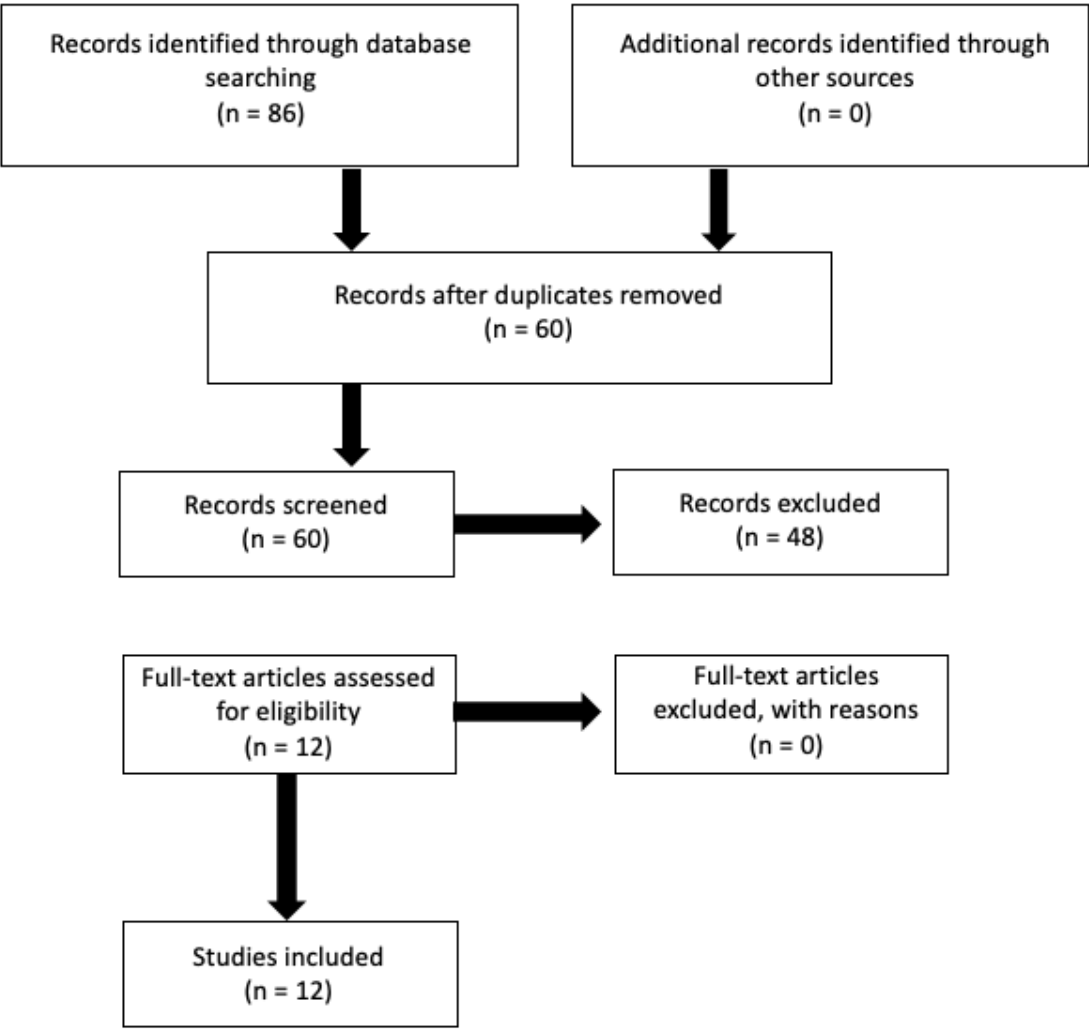
Databases	Google Scholar ERIC IEEE Xplore
Search Terms	"virtual reality" "elementary education" "immersive technology"

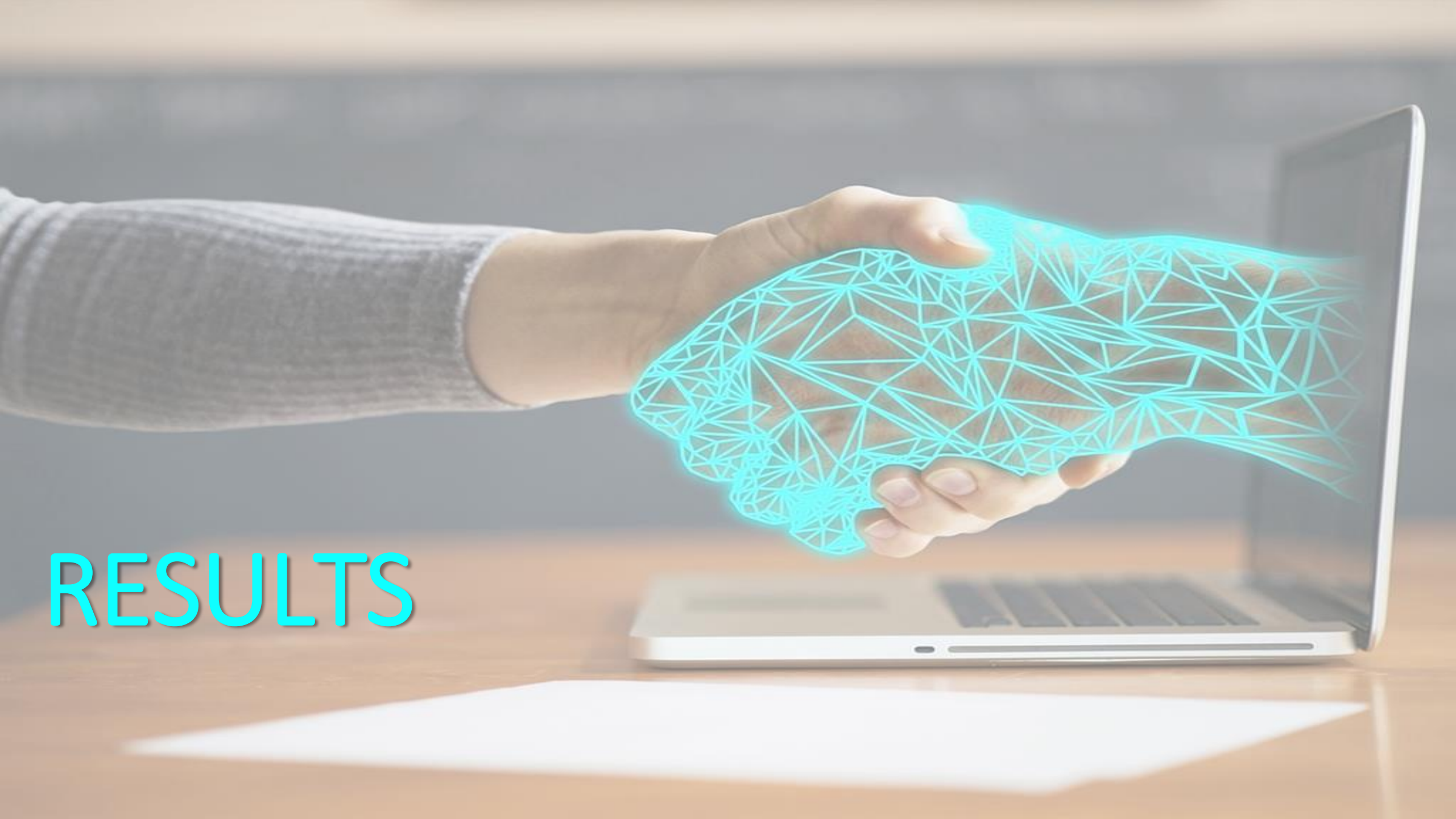
Identification

Screening

Eligibility

Included





RESULTS



Central Focus

- Identify critical aspects of integrating virtual reality applications within the K-12 classroom.
- Influencing
 - Effectiveness of learning
 - Brain stimulation
 - Retention

"Students appreciated learning Physics using more graphical and animated approach as it would assist them in understanding the topics better" (Sulaiman et al., 2020, p. 5).



Discoveries

- Incorporating virtual environments allows for a more immersive experience.
- Stimulating the brain to better absorb and retain information.
- VR allows teachers a new modality to disseminate knowledge in ways never imagined before.
- Knowledge gap between learning and experiencing is decreased with the immersive virtual reality experience.

"Digital simulations are generally effective because they allow students to experience phenomena that are impossible or infeasible to visit otherwise, they are dynamic and interactive, and they scaffold and assess user learning" (Radu, 2012, pg. 314).



Discoveries

Theme	Citation
VR makes the impossible possible	Radu, 2012, pg. 314
Deeper learning	Sulaiman et al., 2020, p. 5
Positive student perspective	Maheshwari & Maheshwari, 2020, p. 9
Extended modality of teaching material	Liou & Chang, 2018, p. 140
Actively engaged	Radu, 2012, pg. 314

▼ Virtuality Offers

Through virtuality reality

- Offers students the affordance of a real-world experience
- Allows various perspectives
- Allows students to think outside the box
- Wholly immersive experience
- Allowing the brain to make the connection between learning and the real world

"This encourages students to engage with the content actively and is likely a factor to improved learning" (Radu, 2012, pg. 314).



Outdated Learning

- Traditional learning is swiftly becoming outdated
 - New generation of gamers find traditional learning difficult
- Learning for the new generation requires teaching to be
 - Immersive
 - Hands-on
 - Appealing



Complex Subjects

Virtual Learning Environment (VLE)

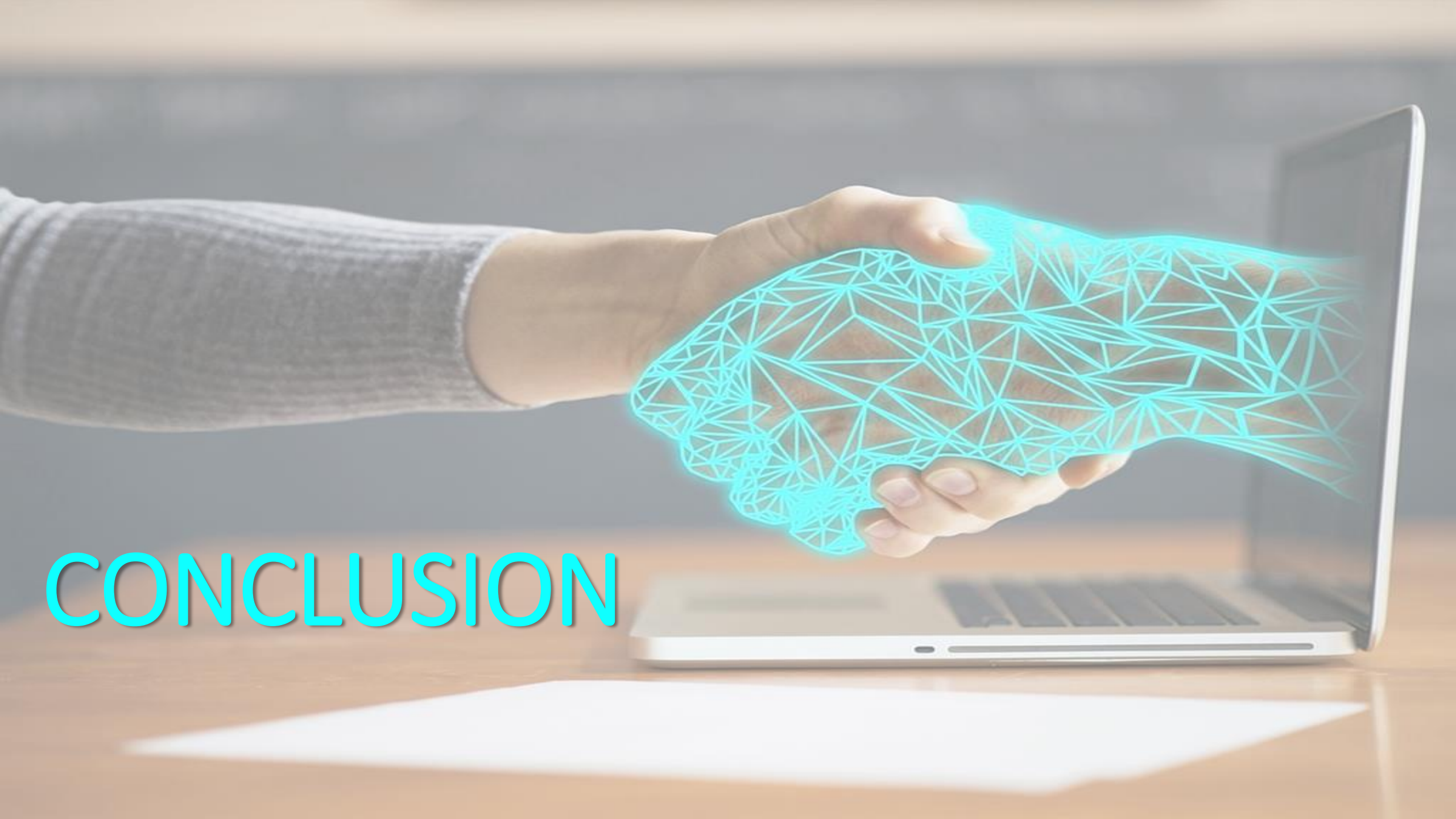
- Physics
- Science
- Biology
- Math
- Chemistry
- Motivate students
- Stimulate learners' understanding



Situated Learning

- Students immersed in specific environment/situation
- Learning happens as learner maneuvers through the environment/situation
- Not feasible for all learners

"Using the situated learning environment created by VR, learners are allowed to operate the objects with their own hands, to observe and to experience carefully" (Liou & Chang, 2018, pg. 1).



CONCLUSION



VR Impacts

- Enhance student learning
- Create an environment to stimulate the mind for better retention
- Students are given control of their learning environment
- Implicitly places learning in the hands of the student
- Fully immersive experience



VR Affects

- Effusively engaged with little distraction
- Envision ideas more clearly
- Reflect on learning and experience
- Prompt's knowledge acquisition
- Allows for exploration
- Takes learning from the classroom and bringing knowledge into the real world



IMPLICATIONS FOR
PRACTICE AND
FUTURE RESEARCH



Future Research

- Learn how the integration of VR can enhance students learning outcomes.
- The results demonstrate that VR is a technology that can positively influence students' learning achievements and motivation to learn.

“Studies have shown that immersion in a digital environment can enhance education in at least three ways: by allowing multiple perspectives, situated learning, and transfer” (Dede, 2009).

A hand is shown holding a glowing blue wireframe sphere, which is superimposed over a laptop screen. The background is a blurred image of a laptop and a desk.

To request a bibliography of the articles analyzed in this study, contact:

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