Invited Symposium (SIG 7)

Learning with technologies in the classroom: **Augmented Reality (AR)**

Josef Buchner
Institute of Digital and Computer Science Education
St.Gallen University of Teacher Education, Switzerland

23.08.2024

Earli SIG 6&7 Conference

What is AR?

- Representation of real and virtual opjects simultaneously in a real environment.
- Interactions run in real time.
- Alignment of real and virtual objects to each other.

Azuma et al., 2001; Rauschnabel et al., 2022

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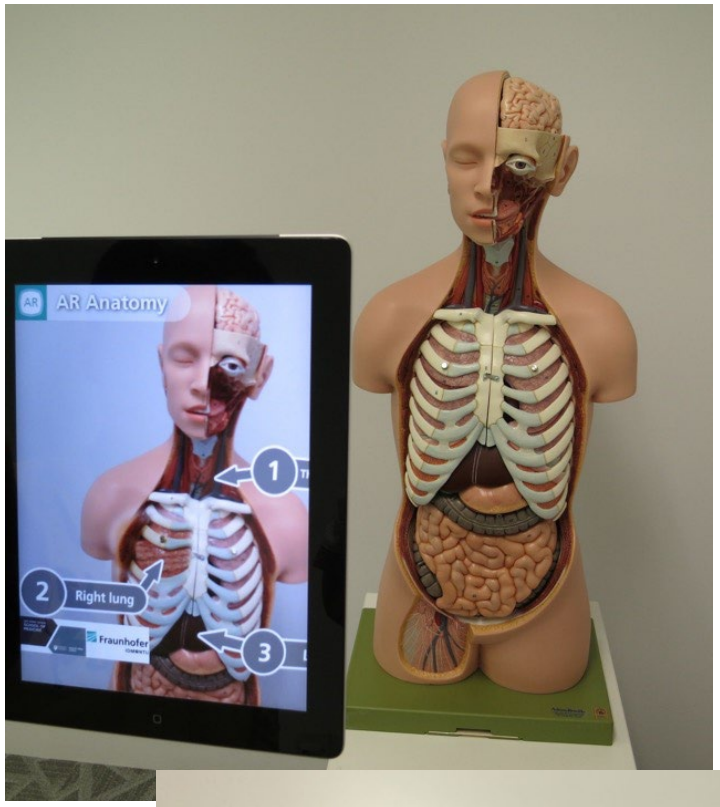

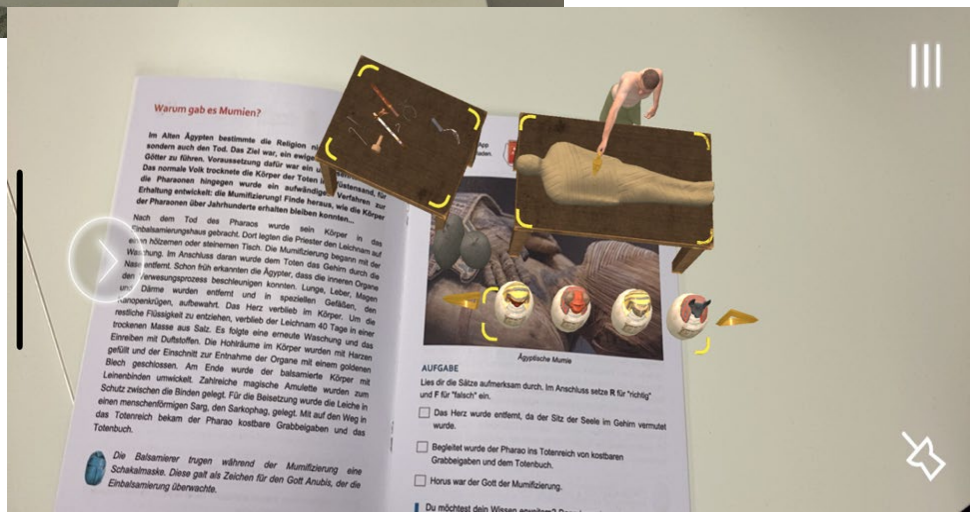

Azuma et al., 2001; Rauschnabel et al., 2022

AR for learning and instruction

AR for learning and instruction

Potentials

- Visualize the invisible
  (Bakri et al., 2019; Yoon et al., 2017)
- Interactivity: Modifying, examining, changing both virtual and real objects
  (Krüger et al., 2019)
- Just-in-time information and feedback
  (Alrashidi et al., 2017; Loup-Escande et al., 2017)
- Real-time guidance
  (Altmeyer et al., 2020; Thees et al., 2020)
- Multimedia Learning / Dimensionality
  (Buchner, Buntins et al., 2022; Krüger & Bodemer, 2022)
- Affective learning
  (Deibl et al., 2021; Sahin & Yilmaz, 2020)

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Challenges

- Usability issues
  (Akçayır et al., 2016)
- ICT skills
  (Akçayır & Akçayır, 2017)
- Problems with the application(s)
  (Akçayır & Akçayır, 2017)
- Hedonistic effect
  (Zumbach et al., 2022)
- Teacher competencies
  (Alalwan et al., 2020; Buchner, Krüger et al., 2022)
- Educational AR applications
  (da Silva et al., 2018)
- Cognitive load
  (Buchner, Buntins et al., 2022)

How and when to use AR in the classroom?

Potentials

Challenges

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Potentials

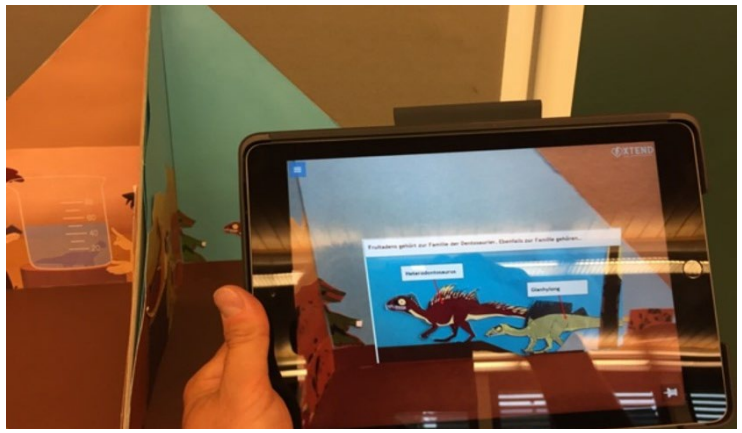
Challenges

Effective and engaging instruction

(Buchner & Kerres, 2023)

Examples

AR + learning strategies



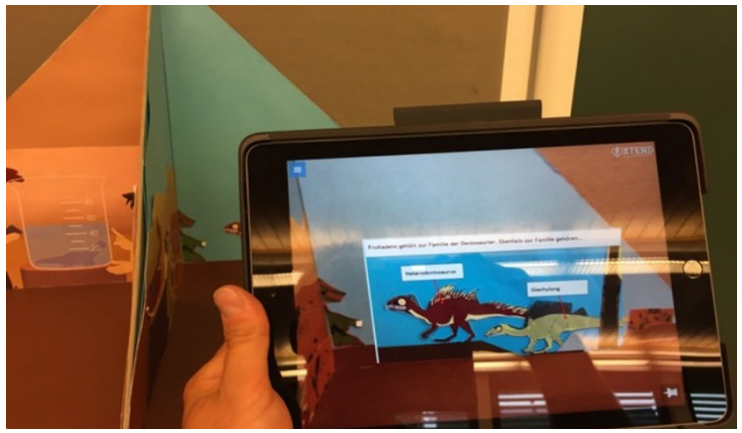
Potential: Visualization

Challenge: Hedonism

Buchner, 2022; Moser & Lewalter, 2024; Wu et al., 2018

Examples

AR + learning strategies



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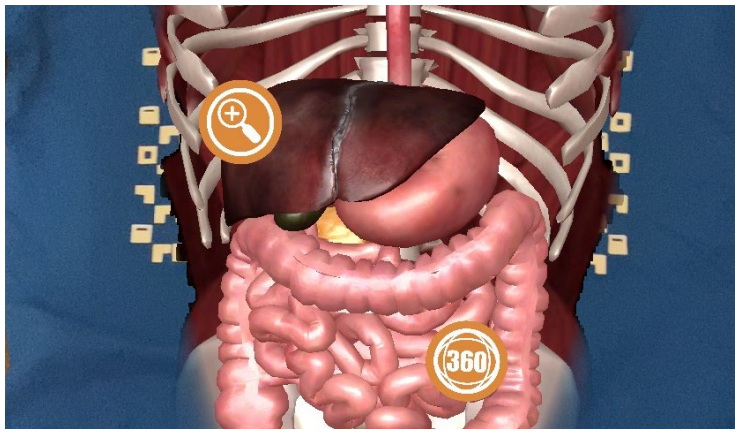
Interactive AR lessons



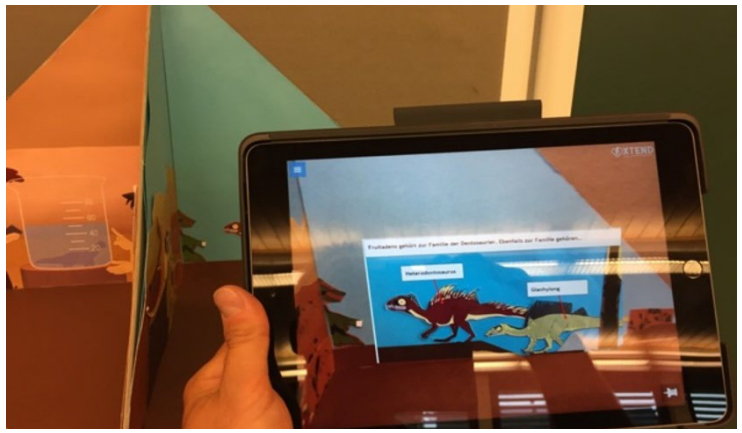
Potential: Dimensionality, Visualization

Challenge: Hedonism, ICT skills

Chi & Wylie, 2014; Buchner et al., 2021, in preparation

Examples

AR + learning strategies



Potential: Visualization

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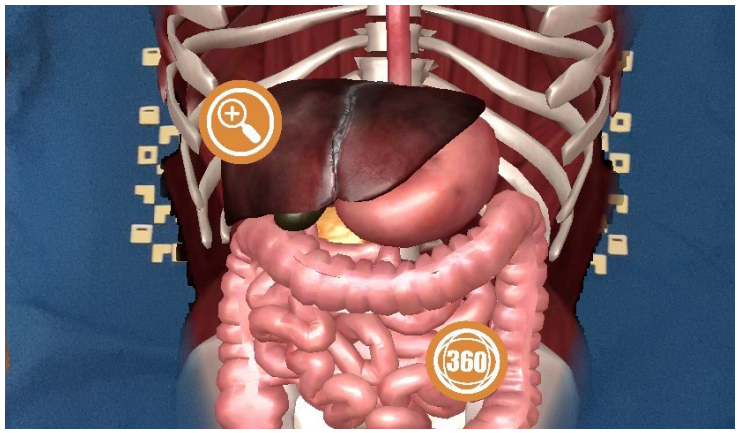
Buchner, 2022; Moser & Lewalter, 2024; Wu et al., 2018

Interactive AR lessons



Potential: Dimensionality, Visualization

Challenge: Hedonism, ICT skills

Chi & Wylie, 2014; Buchner et al., 2021, in preparation

Students as AR designer

Potential: Learning about technology, Motivation

Challenge: Guidance

Buchner & Kerres, 2021; Buchner & Weißenböck, 2019; Ho et al., 2011

Future research directions 1/4

Teacher Education

AR + learning strategies

Interactive AR lessons

Students as AR designer

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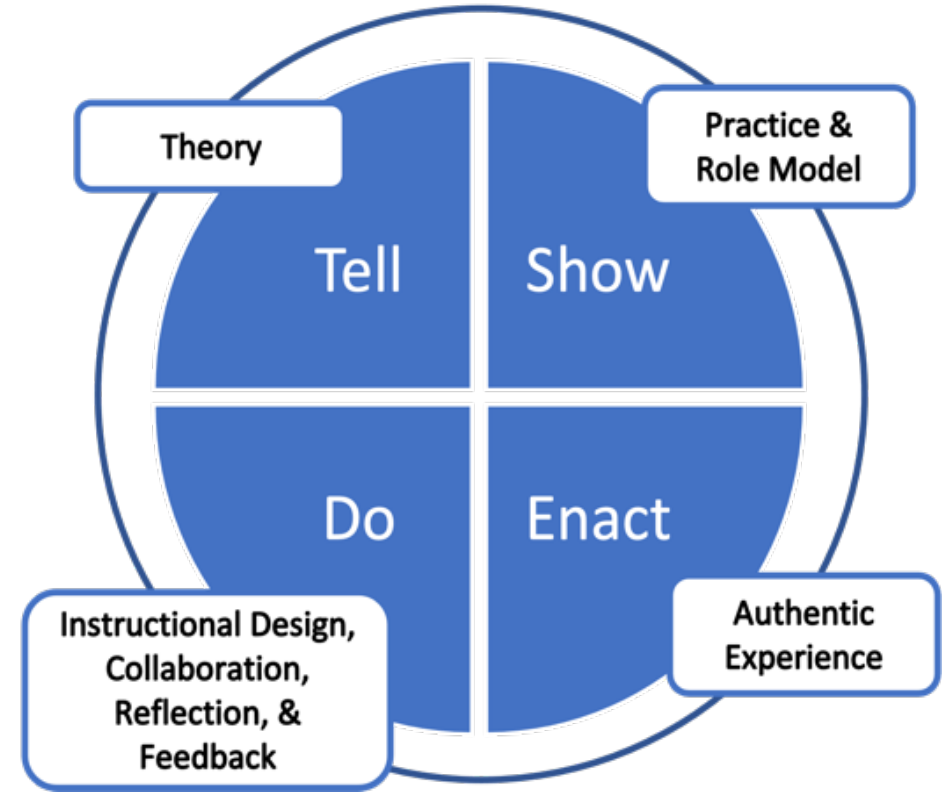


Buchner & Hofmann, 2022

Future research directions 2/4

How, when, AND for whom

The Interplay of Narrative and Feedback in Educational AR Games

Julia Flottmann, Kevin Palzer, Daniel Bodemer

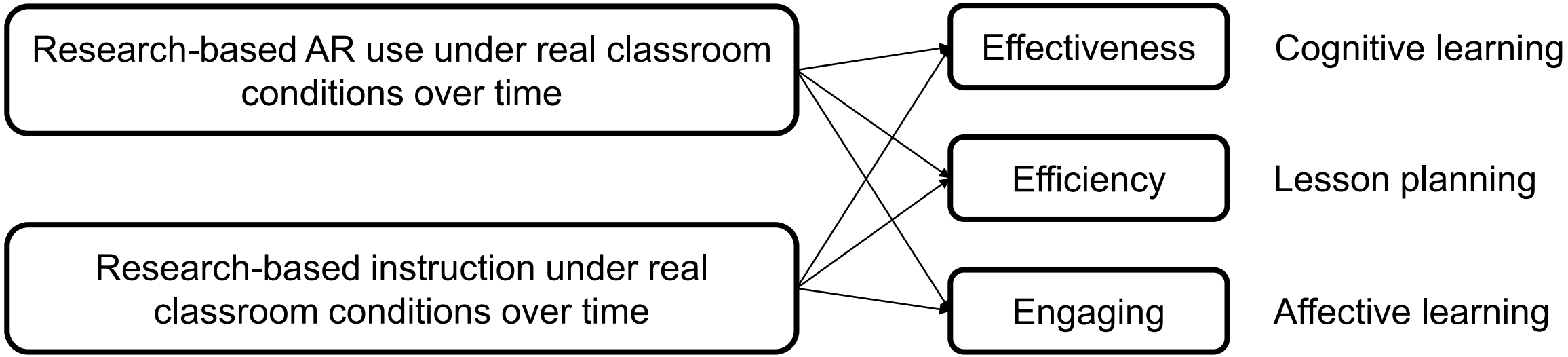
Digital game-based learning (DGBL) has great potential to facilitate learning, especially in terms of motivation. Previous research has shown that narratives and feedback in DGBL environments can have positive impacts on learning outcome. Augmented reality (AR) provides a unique gaming environment that integrates virtual elements with the physical world, showing promise for enhancing learning processes and outcomes. However, it is unclear how narratives and feedback may interact with each other in AR learning games. This laboratory study (N = 123) investigates the influence of narrative and feedback on learning in AR games and their potential interaction effects. Using a 2×2 factorial design, participants played an AR learning game with or without a narrative and received process-oriented feedback (PF) with detailed information, or outcome-oriented feedback (OF) with only information about the correctness of the learner's answer. The game included two levels addressing topics in pedology in which players must solve problems in a laboratory setting. Results revealed significant interactions between narrative and feedback on motivation-related variables, indicating that PF led to higher scores compared to OF only in the AR game without a narrative. Additionally, PF was found to significantly enhance immersion experience, flow experience, and transfer learning outcomes. However, the expected positive impact of narrative presence on learning outcomes was not supported, possibly because participants tended not to be aware of the narrative while playing . These findings suggest the importance of carefully considering the interplay between narrative and feedback in instructional design, particularly regarding motivation and learning outcomes.

Unveiling the Human Learner Behind the AR Glasses: A Systematic Review and Future Directions in Personalized Education

Zoya Kozlova, Sarah Hofer, LMU

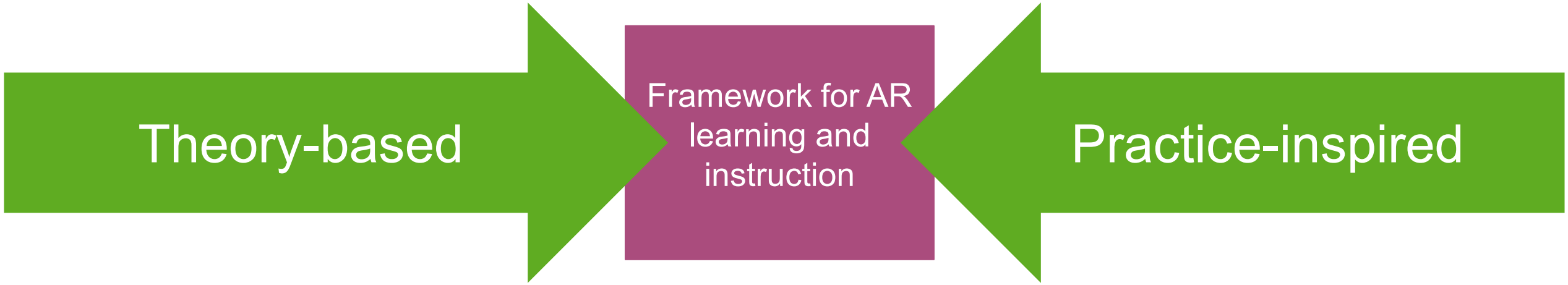
Future research directions 3/4

Longitudinal research studies



(Buchner & Mulders, in preparation)

Future research directions 4/4



Thank you!

Josef Buchner
josef.Buchner@phsg.ch

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