



Warum gab es Mumien?

Im Alten Ägypten bestimmte die Religion nicht nur das Leben, sondern auch den Tod. Das Ziel war, ein ewiges Leben zu erreichen und die Götter zu führen. Voraussetzung dafür war ein guter Tod. Das normale Volk trocknete die Körper der Toten in Sand. Die Pharaonen hingegen wurden in Kisten aus Gold und Silber einwickeln. Die Erhaltung...



Invited Symposium (SIG 7)

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

Josef Buchner
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23.08.2024



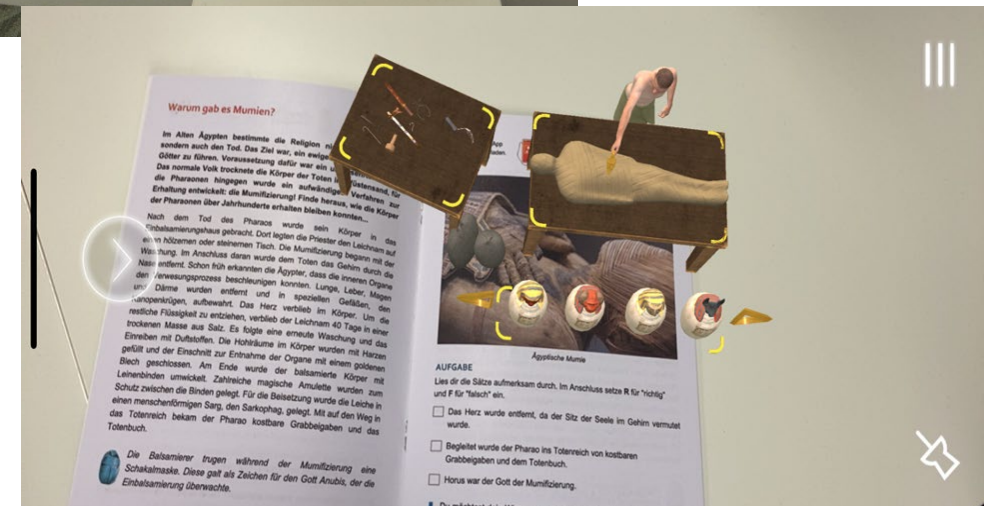
What is AR?

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



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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

How and when to use AR in the classroom?

Potentials

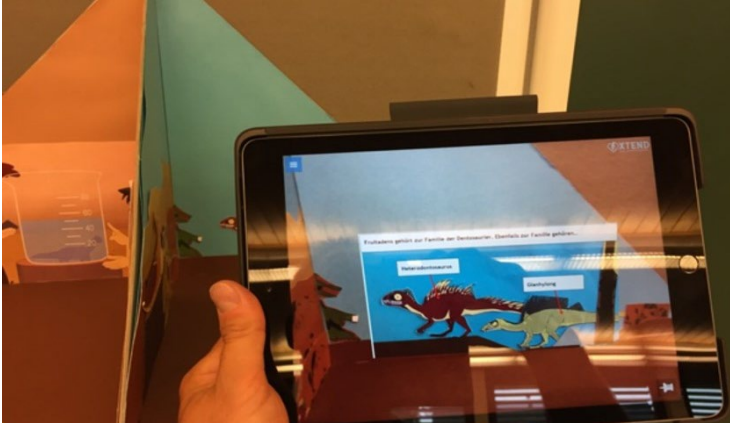


Effective and engaging instruction

Challenges

Examples

AR + learning strategies

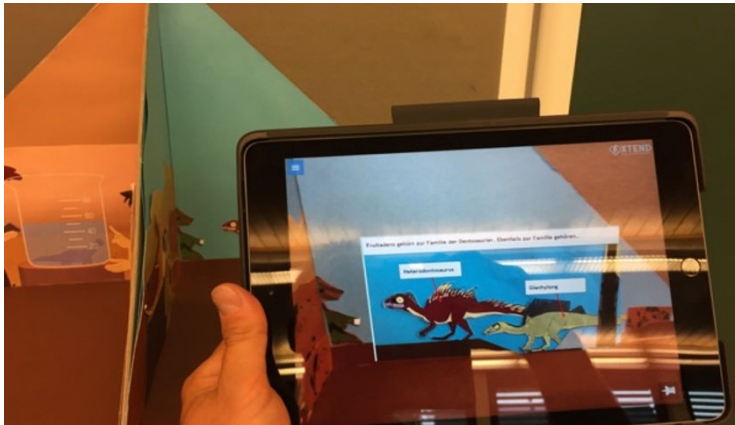


Potential: Visualization
Challenge: Hedonism

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

Examples

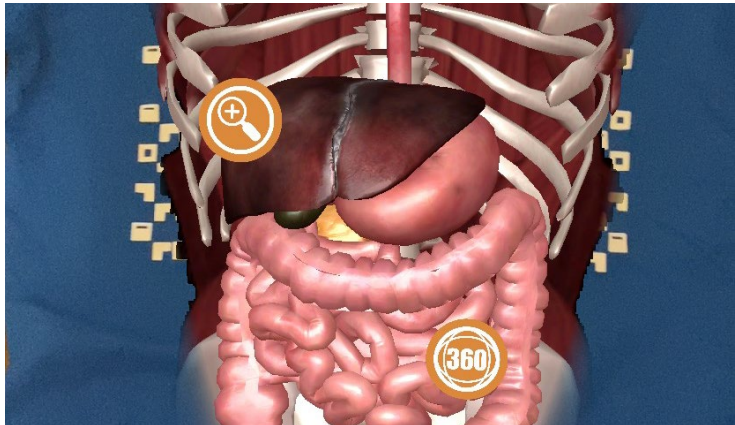
AR + learning strategies



Potential: Visualization
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Interactive AR lessons

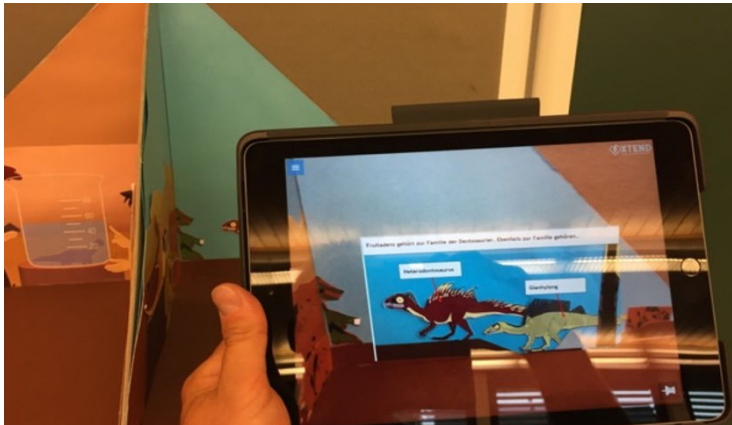


Potential: Dimensionality,
Visualization
Challenge: Hedonism, ICT
skills

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

Examples

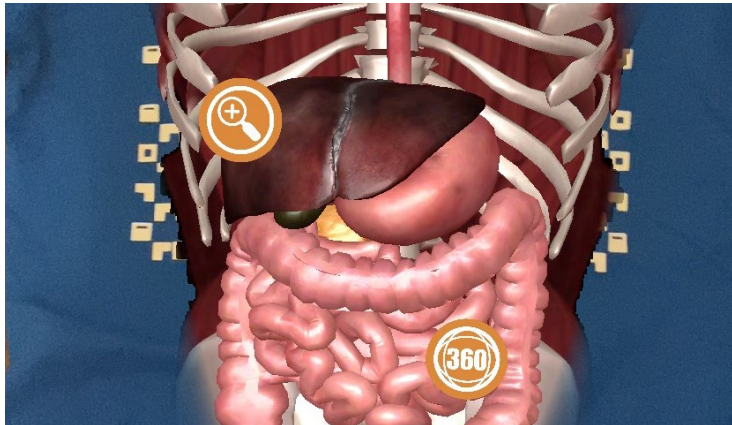
AR + learning strategies



Potential: Visualization
Challenge: Hedonism

Buchner, 2022; Moser & Lewalter, 2024;
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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 &
Weißböck, 2019; Ho et al., 2011

Future research directions 1/4

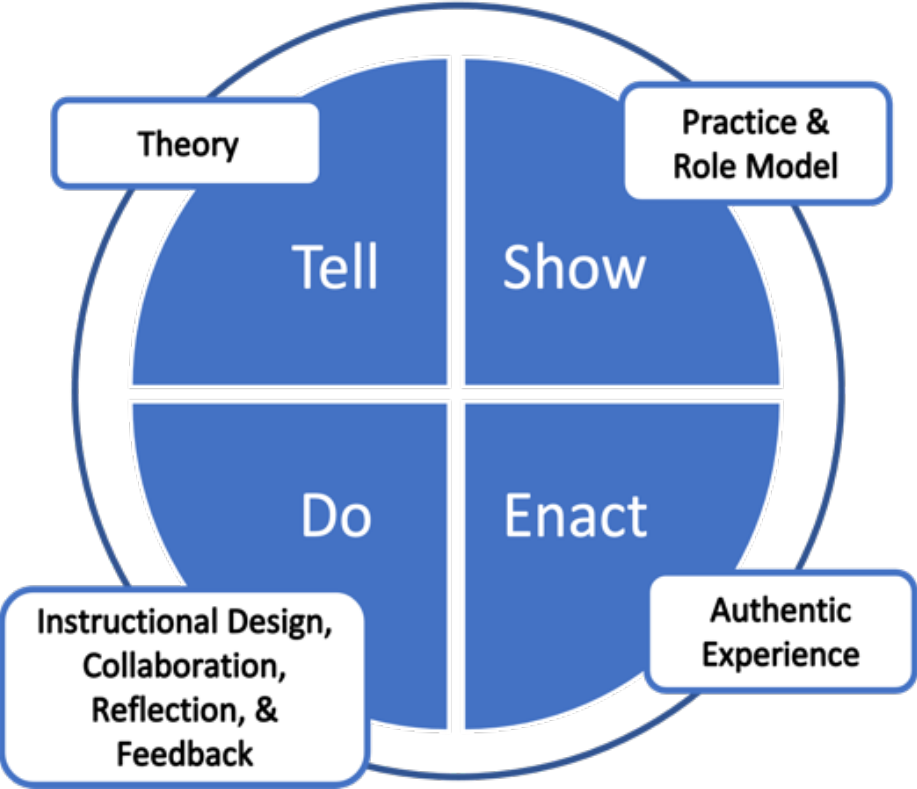
Teacher Education

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

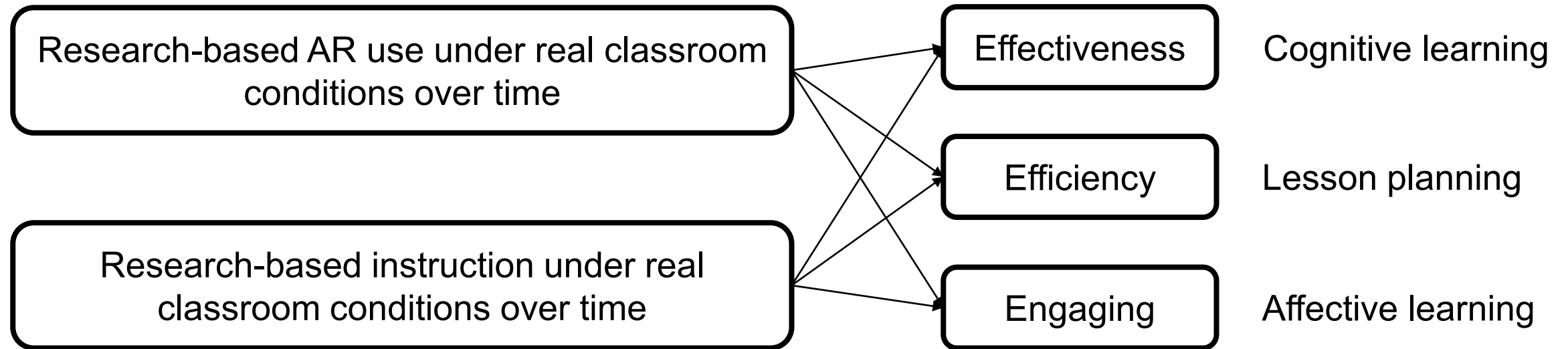
Digital game-based learning (DGBL) has great potential to facilitate learning, especially in terms of motivation. Previous research has shown that narratives and feedback in DGBL environments can have positive impacts on learning outcome. Augmented reality (AR) provides a unique gaming environment that 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 2x2 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



Theory-based

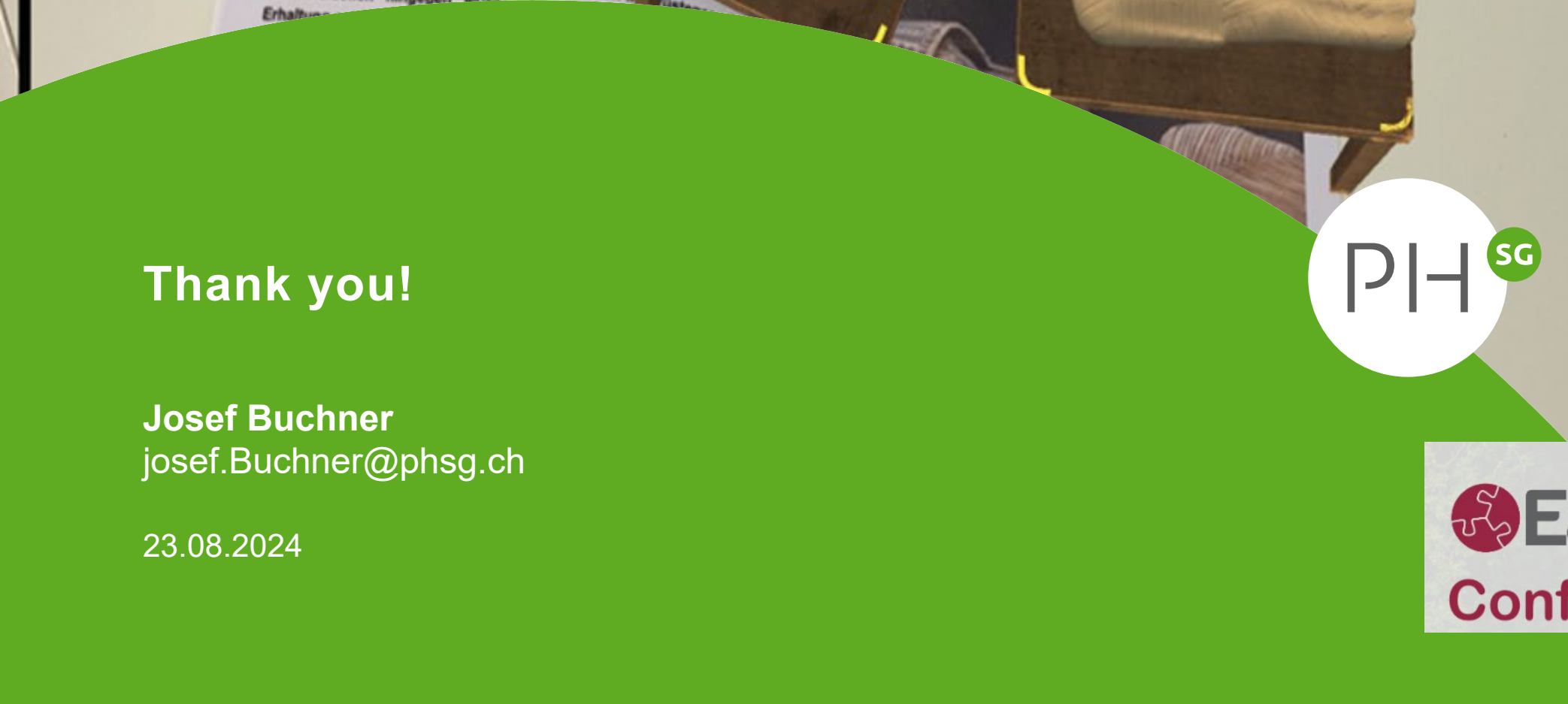
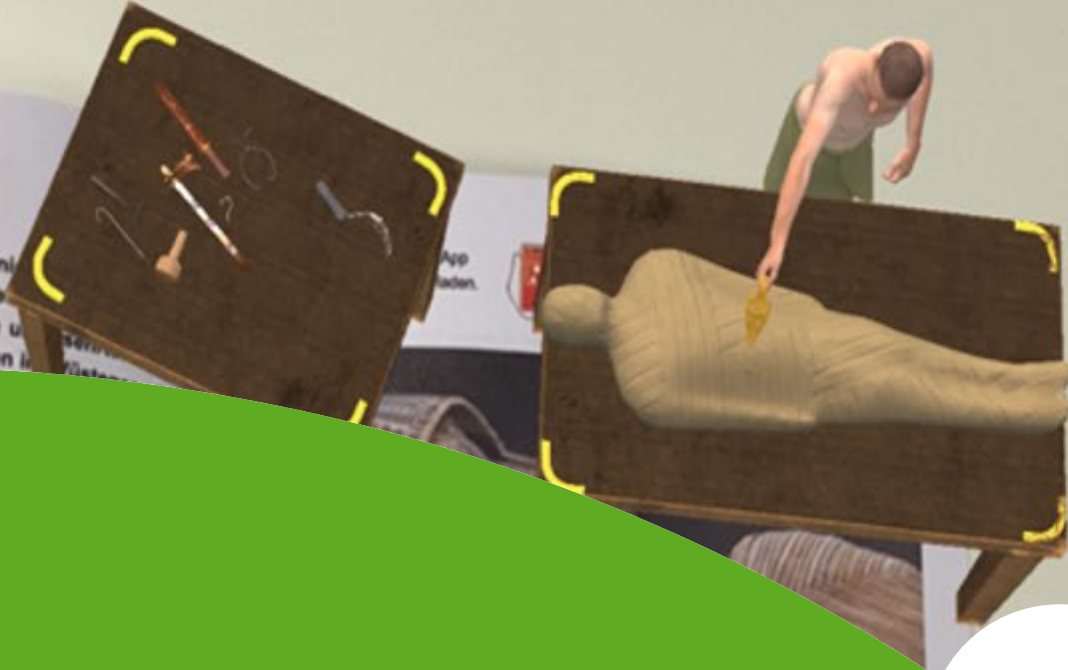
Framework for AR
learning and
instruction

Practice-inspired



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Thank you!

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