

# Three Perspectives on Embodied Learning in Virtual Reality: Opportunities for Interaction Design

Julia Chatain<sup>1,2</sup>, Manu Kapur<sup>2</sup>, Robert W. Sumner<sup>1</sup>

<sup>1</sup>Game Technology Center, ETH Zurich; <sup>2</sup>Professorship for Learning Sciences and Higher Education

## 1 Introduction

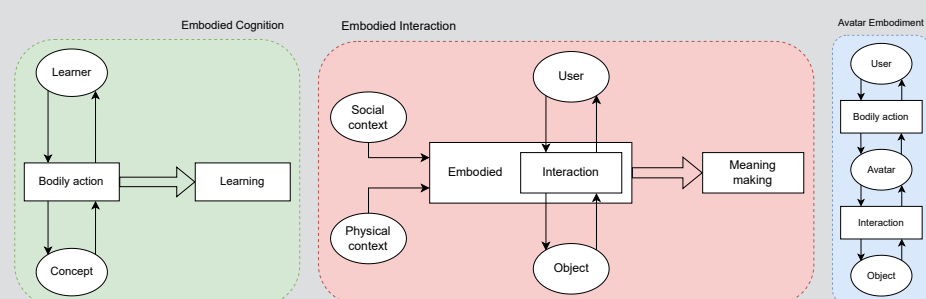
The term “embodiment” is used in many fields, with various meanings and implications. In our work, we focus on three meanings of embodiment tied to embodied learning in Virtual Reality: embodied cognition, embodied interaction, and avatar embodiment.

## 2 Three meanings of embodiment

**Embodied Cognition**<sup>1</sup>. Our bodies play an important role in learning: We perform spontaneous gestures when learning, and, we learn from directed bodily actions

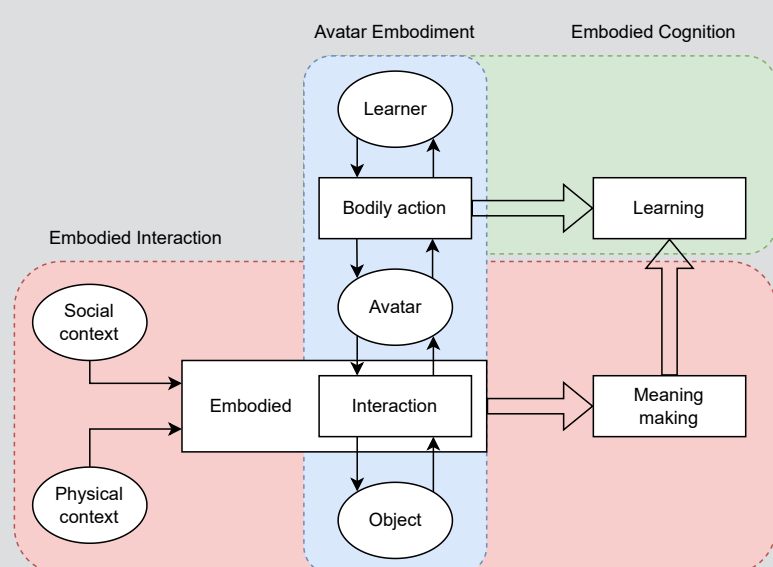
**Embodied Interaction**<sup>2</sup>. Interaction meaning is grounded in and informed by its social and physical context.

**Avatar Embodiment**<sup>3</sup>. In VR, interaction happens through a digital avatar. The sense of avatar embodiment refers to the perception of the digital avatar as one’s own body.



Representation of: embodied cognition, embodied interaction, and avatar embodiment. The relation  $A \rightarrow B$  means that A inform B, while  $A \Rightarrow B$  means that A induces B. All arrows are conditional, and may not happen.

## 3 Landscape of Embodied Learning in VR



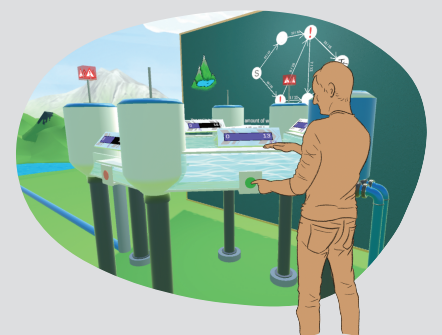
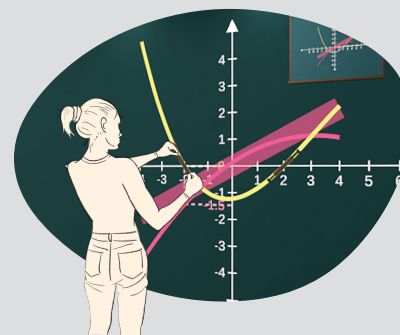
These perspectives present commonalities but also differences. They are not interchangeable and should be considered within an interdisciplinary framework. We present several examples.

## 4 Two pathways to learning

(1) Bodily actions  $\Rightarrow$  Learning

(2) Interaction  $\Rightarrow$  Meaning making  $\Rightarrow$  Learning

The meaning highlighted by (1) the bodily actions and by (2) the interaction are not necessarily the same. Discrepancies may result in poorer learning outcomes.

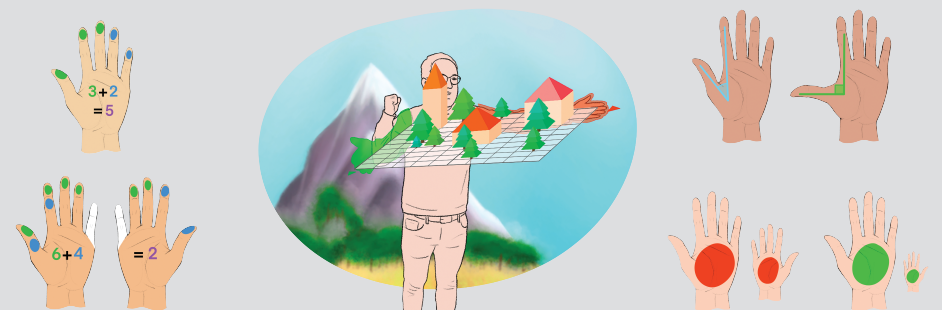


In “Grasping derivatives”<sup>4</sup>, we explore how to design embodied interaction to support learning. In “Grounding graph theory”<sup>5</sup>, we explore how to design the context of the interaction to support learning.

## 5 Semantic avatars

(3) Avatar  $\Rightarrow$  Bodily actions  $\Rightarrow$  Learning

Semantic avatars = digital avatars designed to highlight a specific meaning, explored through bodily actions.



## 6 Conclusion

- Consider the meaning highlighted by the interaction and its context and how it relates to the meaning being learned.
- Consider desirable difficulties in interaction to support deeper sense-making of bodily actions.
- Consider breaking avatar-body morphological similarity to design semantic avatars.

## References

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