

**AR-supported Teaching** 

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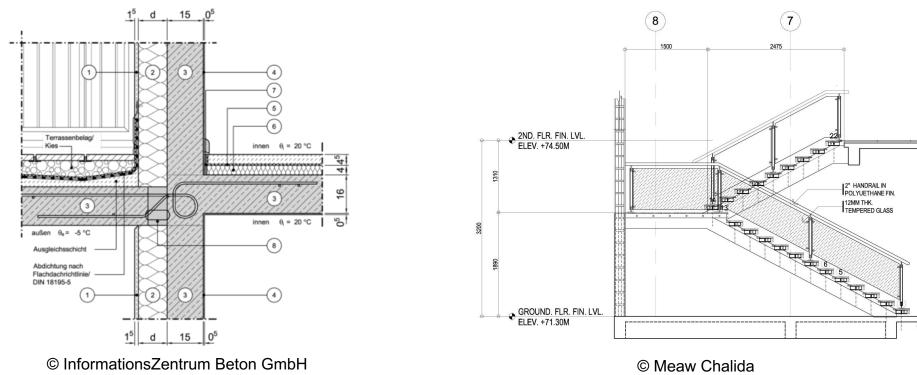
12.10.2022

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## Status quo

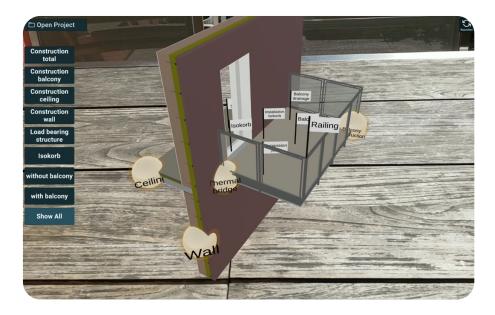
Teaching uses mainly two-dimensional material, problems are three-dimensional





## Status quo

- Teaching uses mainly two-dimensional material, problems are three-dimensional
- ► Augmented Reality can help students to immerse in teaching scenes







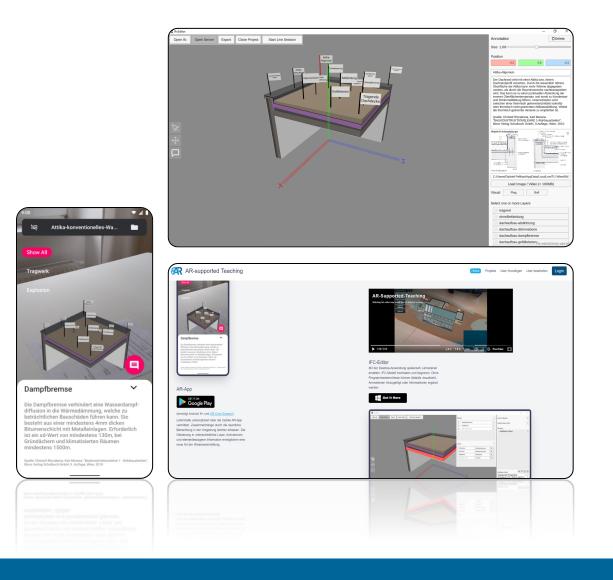
## Status quo

- Teaching uses mainly two-dimensional material, problems are three-dimensional
- ► Augmented Reality can help students to immerse in teaching scenes
- Current AR software solutions
  - closed eco-system
  - often require programming skills



# **AR-supported Teaching**

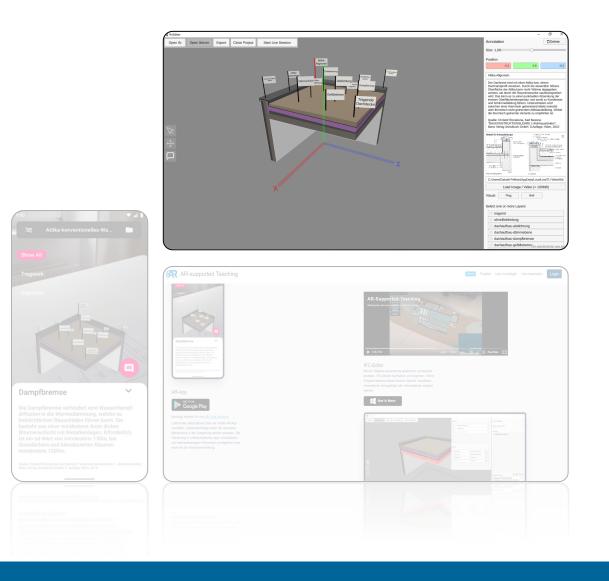
- AR platform for teachers and students
- uses IFC
- three applications





# **AR editor**

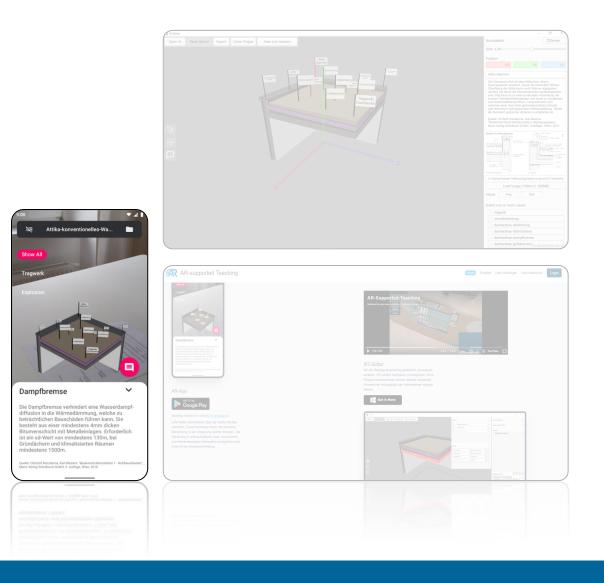
- imports multiple IFC files
- enables the addition of didactic elements like:
  - animations
  - annotations
  - buttons and layers





# **AR viewer**

- for android devices
- view the scenes created in the AR editor
- live session to AR editor and other AR viewers (chat, voice, live pointer)



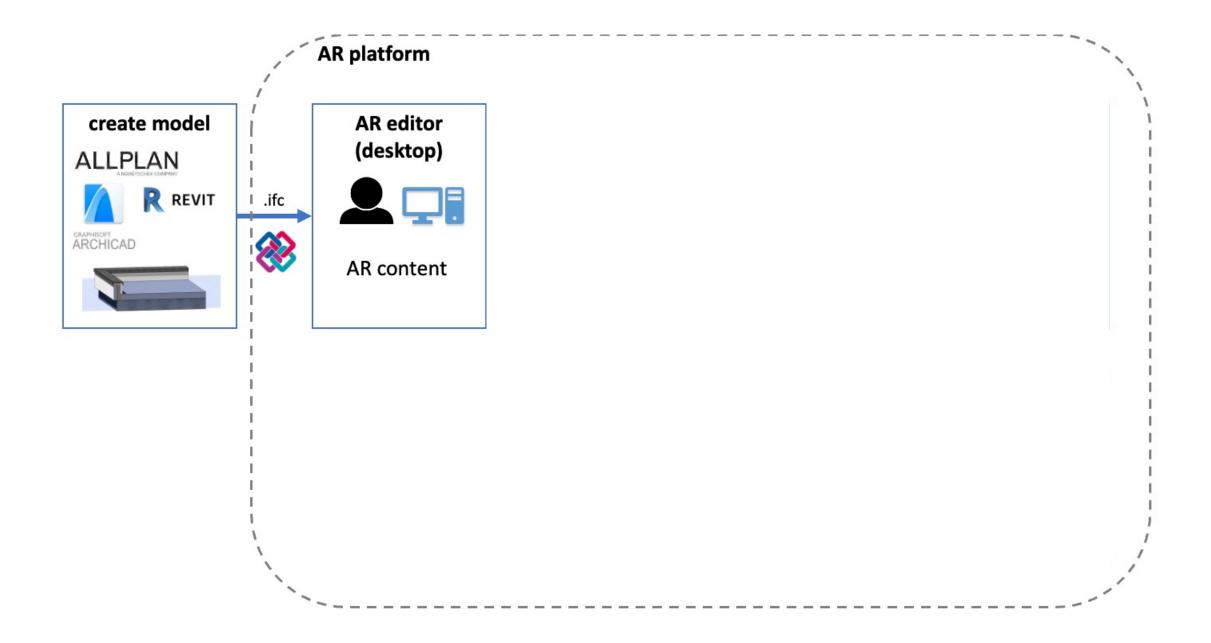


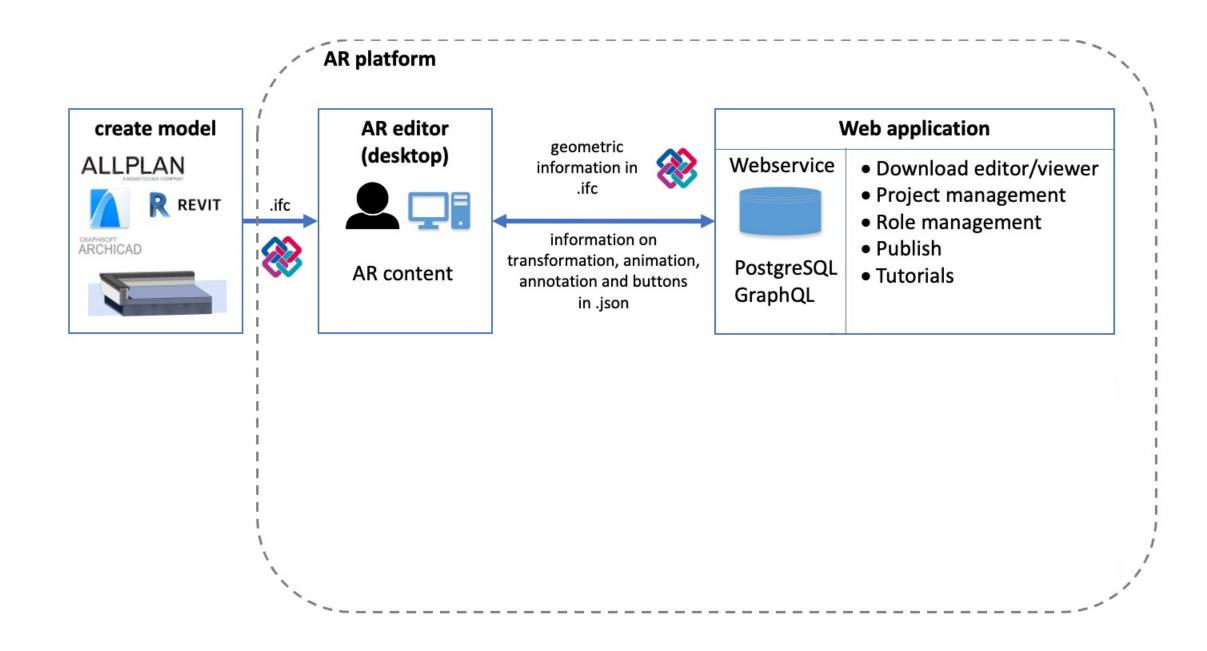
## Website

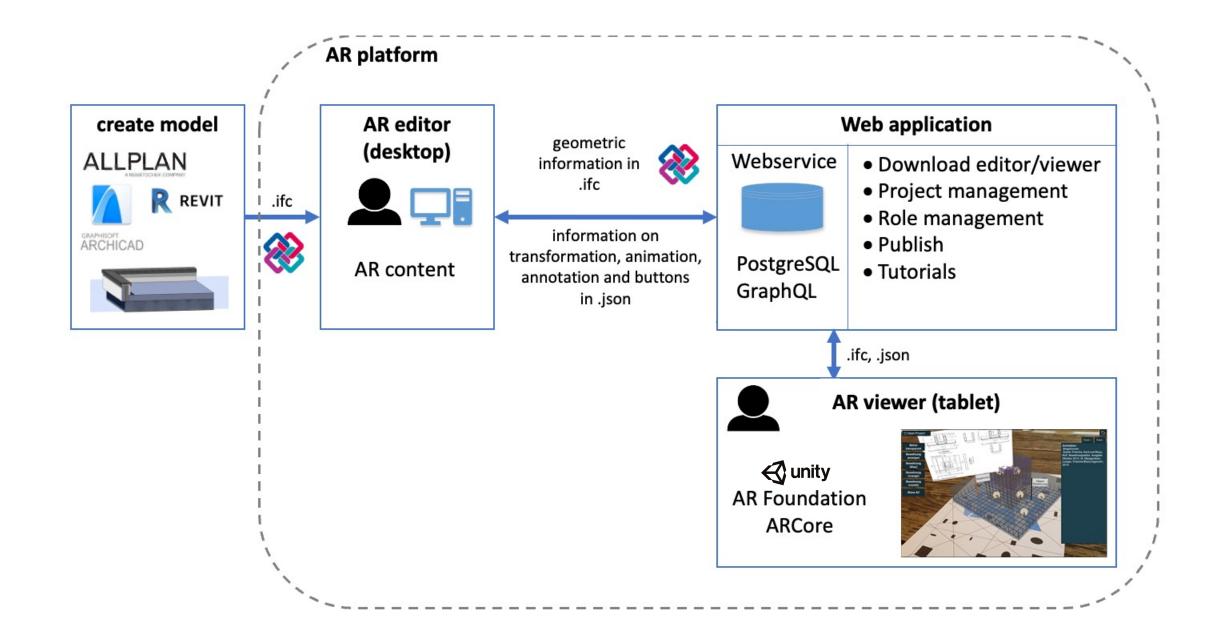
- link between AR editor and AR viewer
- group management
- project management
- teaching scene overview

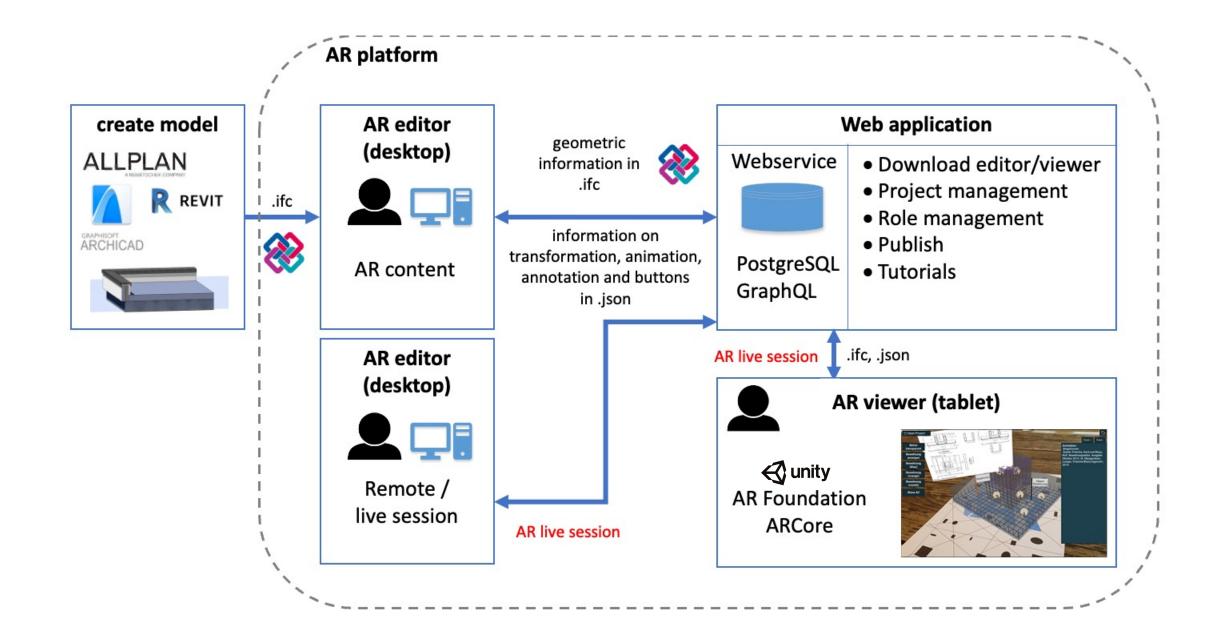














Half-timbered construction Frame construction Transom construction Skeleton construction Wooden truss ceiling Isokorb/balcony insulation Climbing formwork Concrete bracket reinforcement Reference: • Schöck Bauteile Ges (...) Reference: Fritsche, Gerd und Blasy, Rolf (...) with visible support structure unguided; hanging freely from the crane S2 V2 U.I.I.IIIIIII Sleeve foundation Concrete pillar Reference: Fritsche, Gerd und Blasy, Rolf (...) Foundation plate Free-body principle Reference: Fritsche, Gerd und Blasy, Rolf (...) pen Project pen Project pen Project OSB-Platte xplosion Show All ndlauf xplosion Show All xplosion Show All STB Lau/plate 25 cm



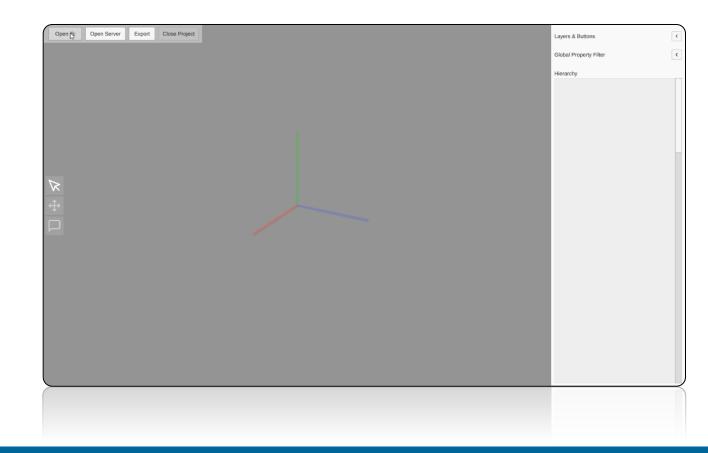
# **Key openBIM Information**

- IFC as import option  $\rightarrow$  software-independent environment
- Teaching scenes are stored as IFC files  $\rightarrow$  long-lasting support
- Students learn how to work with openBIM and AR
- Multipurpose of openBIM



## **Key Outcomes – AR editor**

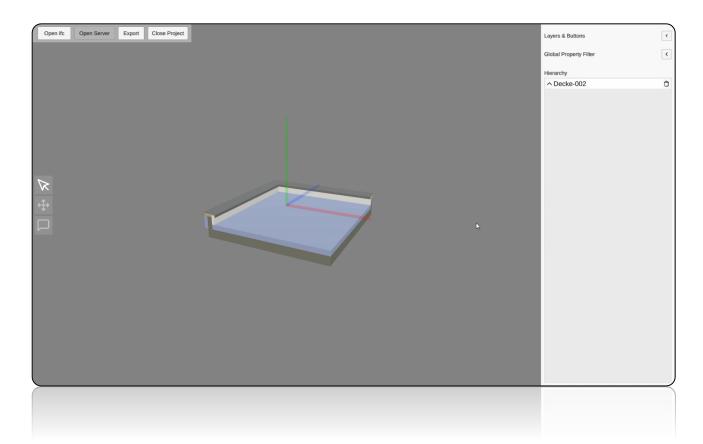
#### IFC data





# **Key Outcomes – AR editor**

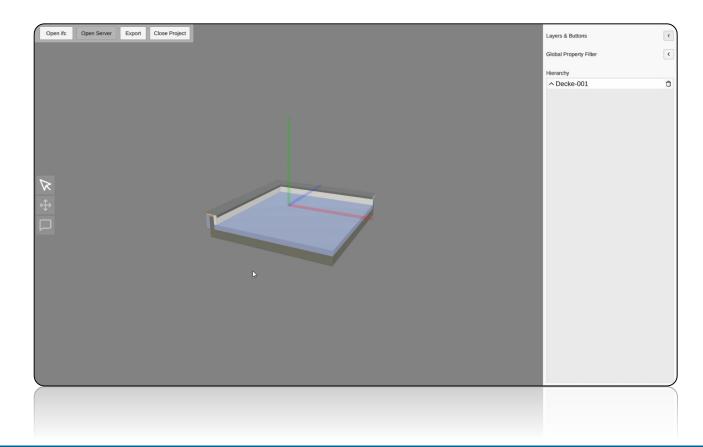
- IFC data
- Buttons and Layers





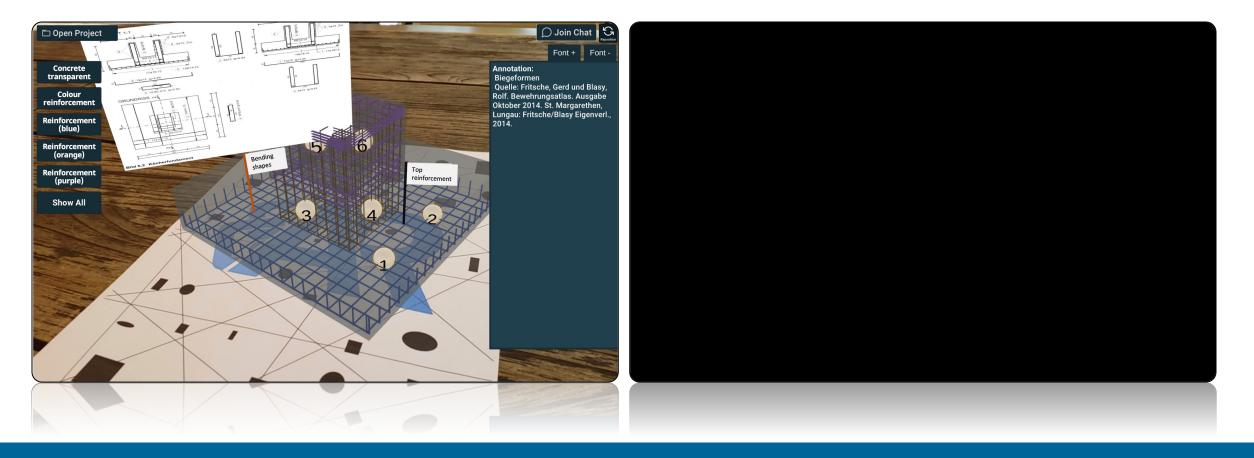
# **Key Outcomes – AR editor**

- IFC data
- Buttons and Layers
- Annotations



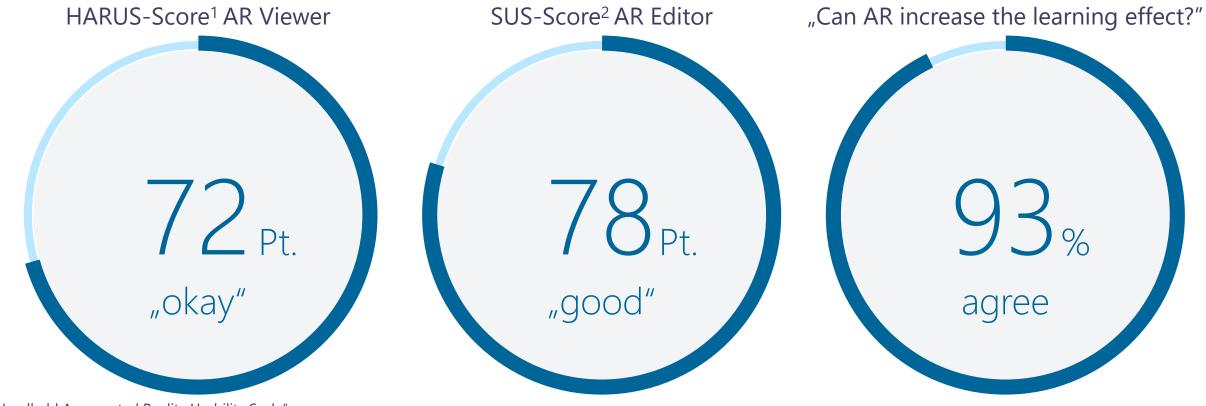


### **Key Outcomes – AR viewer**





# **Key Outcomes – Evaluation**



<sup>1</sup> "Handheld Augmented Reality Usability Scale" <sup>2</sup> "System Usability Scale"



## **Key Outcomes – Publication**

MDPI



Augmented Reality in AEC Education: A Case Study

Harald Urban, Gabriel Pelikan and Christian Schranz \*()

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Abstract. Augmented Reality (AIR) is a Construction 40 technology that is seen as a site-extension of Building Information Modeling (BM). In addition to the practical apper visitin he design and construction processes AR can be used to support teaching through visualizations and interaction. This incide presents area AP platform (all of "AP-augmented Teaching", applicable for both Architecture, Engineering and Construction (AEC) education and as a Construction 40 beehnology. The aim of the project is to increase the annuout of AP. Auroported Teaching the or education and a interaction students to the productive use of AR. During in development, special attention was paid to the needs of the AEC industry. Users can englop BB models to create AE. Scense beform addition, animations and annotations without requiring programming skills. The AR platform enables interaction with mente experts and its herdror also sustified or distance learning. In a plicit study, use cases were defined and students toteed the subality of the applications. The results were positive and additionate that AE a future in education, especially if enough AEC AR content and practical use cases are available. The latter action corrests the application of AR in AEC practice.

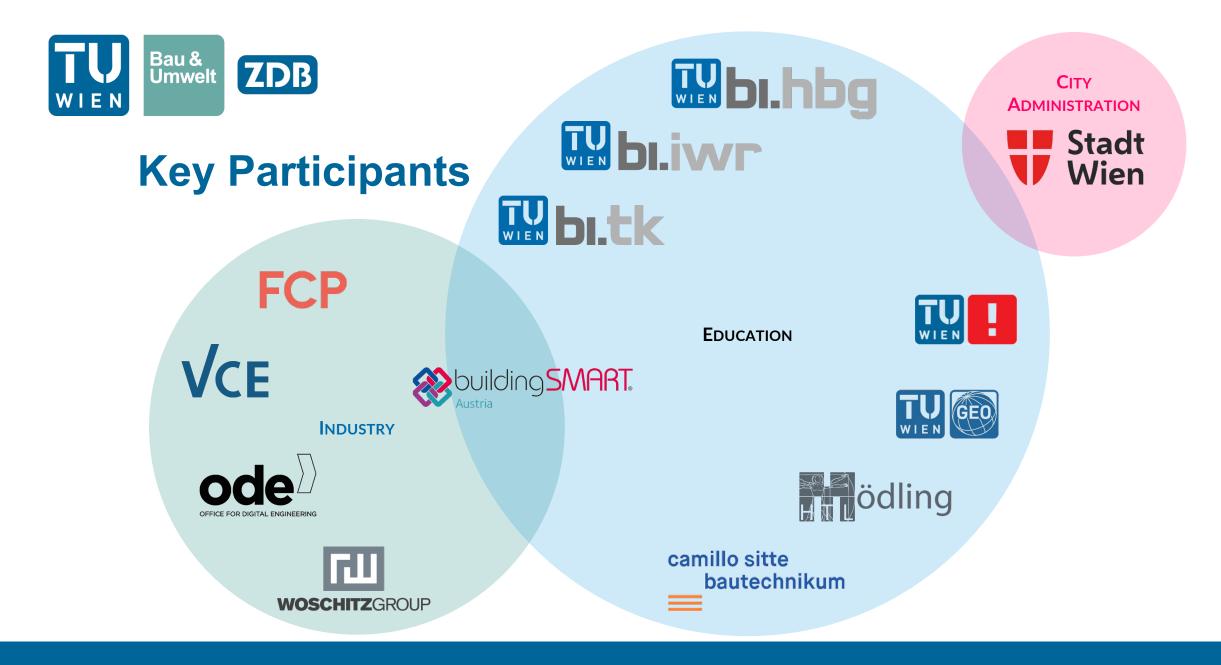
Keywords: augmented reality; education; Construction 4.0; BIM; software

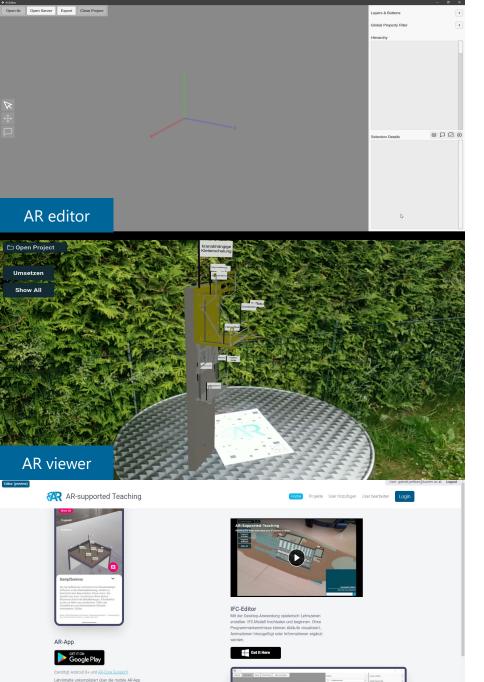
Citation: Urban. H.: Pelikan. G.:	
Station: Urban, H.; Pelikan, G.; schranz, C. Auemented Reality in	
	1. Introduction
EC Education: A Case Study.	The digital transformation of the construction industry is progressing at an ever-increasing
uildings 2022, 12, 391. https:// loi.org/10.3390/buildings12040391	pace, with the development significantly driven by the use of Building Information Modelling (BIM), a construction analogue to the information age. BIM enables a central administration
cademic Editors: Agnieszka Leśniak	of digital geometric and alphanumeric information [1,2] that correlates with the real environ
nd Krzysztof Zima	ment. This development is accompanied by further new technologies for the construction
Received: 31 December 2021 Accepted: 17 March 2022 Published: 22 March 2022	indistry emerging due to the unprecedented amount of available information. A part from BM systems size gargement radius [10, 48], virtual radius [10, 8], redsci and [30, 19], redsci and [30, 19], redsci and [30, 19]. The set of the throughout the industry, establishing the term Construction 40 [5]. To seet on Industry 40 [5]. Construction 40 (5), Size and Constructive 40 [5]. Construction 40 (5), Size and Constructive 40 [5]. Construction 40 (5), Size and Constructive 40 [5]. Constructive 40 (5), Size and Con
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his article is an open access article istributed under the terms and	1.1. AR in the AEC Industry
antibuted under the senter and onditions of the Creative Commons Attribution (CC BY) license (https:// zeativecommons.org/licenses/by/ 10/).	AR extends the real environment by an additional virtual content [16]. This can be achieved either with portable devices (mAR; mobile augmented reality) or with the help of head mounted displays (HMD). In contrast to VR, visual or auditory elements are projected

Augmented Reality in AEC Education: A Case Study

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TECHNISCHE BLIDDER UNIVERSITÄT WEN ZOB

Website

# R-suppopterd Belastering



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