



# Augmenting hospitality education

Exploring the development process of low-technology, immersive educational content

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...and an  
amazing team of  
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# Practical motivation

- Established design principle for hospitality education: **embedding the learning process** in real life professional contexts (Oskam et al., 2018)
  - Covid-19 pandemic: imposing **remote learning** options
  - Consequence: **student engagement** dropped; social isolation had negative impact on students' well-being; etc.
- How to **revitalize student engagement** in the context of distance learning?



# Academic motivation

- **mobile learning** has been subject to vibrant debates (e.g., Smith & Walters, 2012)
  - calls for **mixed-method, cross-institutional** research on immersive technologies in hospitality education to understand **technological advancements** (Mejia, 2020)
- How can immersive technologies enhance mobile learning of hospitality students?



# From Motivation to RQ

	Practical	Academic
Motivation	How to revitalize student engagement in the context of distance learning?	How can immersive technologies enhance mobile learning of hospitality students?
RQ	How does student feedback inform the prototype development of low-technology mobile immersive content to enhance hospitality education?	



# Augmented Reality

- AR (Augmented Reality) **overlays digital information** in real-time (e.g., images, videos, or 3D models) onto the user's view of the real world
- Based on the notion of 'local presence', AR enhances (i.e., augments) the user's perception of the real world
- AR **complements reality** by bringing digital layers into real environments, making them easier to combine with learning (Chung & Hsiao, 2019)



# Virtual Reality

- “Virtual reality is an artificial, virtual, and viewer-centered experience in which the user [student] is enclosed in an **all-encompassing 3D space**” (Rauschnabel et al., 2022)
- Goal: create a sense of **presence in the digital world**
- Educational tasks through virtual reality technology **positively impacts student interest**, motivation, and enjoyment Cardenas-Sainz et al., (2022)



But how to design  
new immersive  
learning content?





# Methodology

- in-depth **exploratory** research design
- purposeful case: capture **iterative development of immersive content** within the context of hospitality education (Yin, 2012)
- **design-based process** for developing immersive content (Reeves, 2006)





# Initial solutions (prototypes)

#	Immersive content	Classification of immersive technology (Rauschnabel et al., 2022)	Student's learning situation	Technology platform
1	360-degree images with embedded video	VR	Accessing contextual learning in hospitality outlets (e.g., reception, kitchen) together with instructional videos on standard operating procedures	WarpVR
2	Holographic avatar	AR	Accessing information on e.g., food recipes, history of food/beverages, food/beverage preparation training	Fectar
3	In-camera view of 3D-modelled objects	AR	Comparing multiple options of hospitality-related object configurations (e.g., hotel beds in 3-star vs. 4-star vs. 5-star properties)	Fectar
4	360-degree video with branched storytelling	VR	Interacting with a stakeholder in a hospitality setting (e.g., difficult customer during a service encounter)	WarpVR



# Holographic avatar





# 360 degree images with embedded video





# In camera view of 3d modelled content





# 360 degree video with branched storytelling





# Testing: 18 In-depth focus groups

	Test 1 (09/22 – 11/22)		Refinement of prototypes	Test 2 (01/23-03/23)	
Focus groups	HH1	3*		HTH1	12
	HH2	1*		HTH2	11
	HH3	2*		HTH3	11
	HTH1	16		HTH4	12
	HTH2	8		HTH5	12
	HTH3	13		UIB1	7
	HTH4	14		UIB2	7
	UIB1	11		UIB3	8
	UIB2	12			
	UIB3	11			
		91 pages			70 pages





# Coding Scheme: Testing Cycle 1

Themes	Description	Example Quotation
Learning Effectiveness	Engagement, interactive nature, immersion & perspective, safe practice, application	<i>Just having maybe having <b>more interactiveness</b> with the actual blender... maybe you can click on everything</i>
Physical Implications	Concentration Health	<i>The kitchen was well made. If technology was from today, and I would not <b>get motion sickness</b>, it would be nice to use.</i>
Didactics	Teaching	<i>I would actually be against using this as a core part of the course. In the current state <b>it's too buggy</b>... it doesn't allow for a controlled situation ...eventually it's just going to cause you problems where one student can't do it...<b>what do we do in terms of grading?</b></i>
Tech Advice software	Scope, malfunction, technical performance, user interface, user friendliness, value-add, quality	<i>I didn't feel it was user friendly. It was obscure...I just did not like the app. <b>It took me a long time to get the hotel room visible</b> and it didn't trigger immediately.</i>
Tech Advice hardware	Quality, bring your own device	<i>So I guess <b>quality was a bit of a shame</b>...that you could not look over the desk to see how the carrots were sliced.</i>
Use Cases	Commercial, education	<i><b>Instead of showing the students a video of how to say no in situations, you could give them multiple options to choose from with VR</b></i>



## Prototype Findings

## Refinements Test 1

### Outlets: 360 video

Background noise was distracting  
The video was too close to me, I do not see the environment  
Make it interactive so you can actually do the steps to use the dishwasher  
Choose interesting machines not the dishwasher

Sound edited  
2D video was positioned towards back  
Hotspots, buttons and direction arrows added  
  
New videos added for mixer, hotspots added and video-editing

### Holographic avatar

Could not get a close-up of his hands, we want a closer view so we can see what hes doing.  
If it's a 2D guy on a screen its not useful, it would be great to be able to zoom in... from different angles in 3D

New holograms created on kitchen uniform  
2D youtube video on how to julienne carrots with close-up of hands  
3D model of cutting board with julienned carrots  
3D model of hand

### AR Hotelroom

•Want to walk around the room

Labels added  
360 images of bedroom categories added to accompany 3D models  
Newer 3D model assets for beds added

### Branched Storytelling

•Intro was too long  
•If you connect VR with gamification it could go somewhere  
  
•I get motion sickness very quickly, a bit laggy, – it went to the homescreen all of a sudden (could be a problem with phone used)

Intro video trimmed  
  
Coach feedback video created indicating a lower score being provided if wrong answer is given  
Addressed with provider



# Coding Scheme: Testing Cycle 2

Themes	Description	Example Quotation
Learning Effectiveness	Engagement, interactive nature, immersion & perspective	<i>These prototypes could benefit from combining with other devices and allowing for <b>interaction among multiple users</b>. This would enhance the overall experience and create more opportunities for collaboration and engagement.</i>
Physical Implications	Concentration Health	<i>it gave me quite a <b>headache</b></i>
Didactics	Teaching & learning	<i>this technology would be used in a <b>complementary manner</b> and would not replace physical classes entirely</i>
Tech Advice software	Scope, malfunction, technical performance, user interface, user friendliness	<i>I ...accidentally looked like right and <b>accidentally started playing the video</b> (that was next to me). And then he was talking the video was blaring, I couldn't turn off the video</i>
Tech Advice hardware	Quality, bring your own device	<i>I would say headphones. Okay, because <b>it was very difficult to listen with</b>. Everyone in the room</i>
Use Cases	Commercial, education	<i>Especially for studying for your oral exams. Yes, it's hard to practice with them fellow students if maybe they're much better or they're worse in the language and then <b>you can practice with your own level</b></i>



## Prototype Findings

## Refinements Test 2

### Outlets

- Blender video no benefit, rather have a person explain it to you in 360

No changes due to decision to stop continuous refining of prototypes while keeping staff workload in mind

#### **Future changes:**

Reshoot video and have an actor speak to learner within the 360 video rather than showing a 2D video within 360 environment

### Holographic avatar

- Want a close-up of fingers, want to see from the top
- 2D offers no added value in VR
  - Difficult to listen with 2D video of chef and youtube video playing concurrently
  - The carrots & the food – I did not understand that

No changes due to decision to stop continuous refining of prototypes.

#### **Future changes:**

Remove 3D model of hand and either animate or take different 360 video recordings from different perspectives  
Remove 2D video on how to julienne carrots  
Remove Lidar scan of carrots

### AR Hotelroom

- Some categories not working
- Not to scale, measurements were off i.e. 6m wall is not realistic
- Feels cheap, a bit messy

Modification of textures, improving quality. Scaling adjustment, adapting measurements as realistically as possible. However, the measurement in the prototype is for reference only, as it varies depending on the angle of phone usage.

Light optimizer to improve performance on different devices.

As the 360 room does not match the AR 3D models, we proceeded to remove the 360 content and increase the quality of the 3D models.

### Branched Storytelling

- Google cardboard hasn't changed in 7 years, same problems
- Video quality low, couldn't see guest's facial expression
- Difficult user experience
- Got a headache when I had to read the text

No changes due to decision to stop continuous refining of prototypes

#### **Future changes:**

Use Pico Neo / Oculus Quest 2 headsets / desktop player  
Reshoot 360 videos using a higher quality 360 camera

Clearer introduction on how to use WarpVR app and cardboard/headset  
Inform users of zoom function

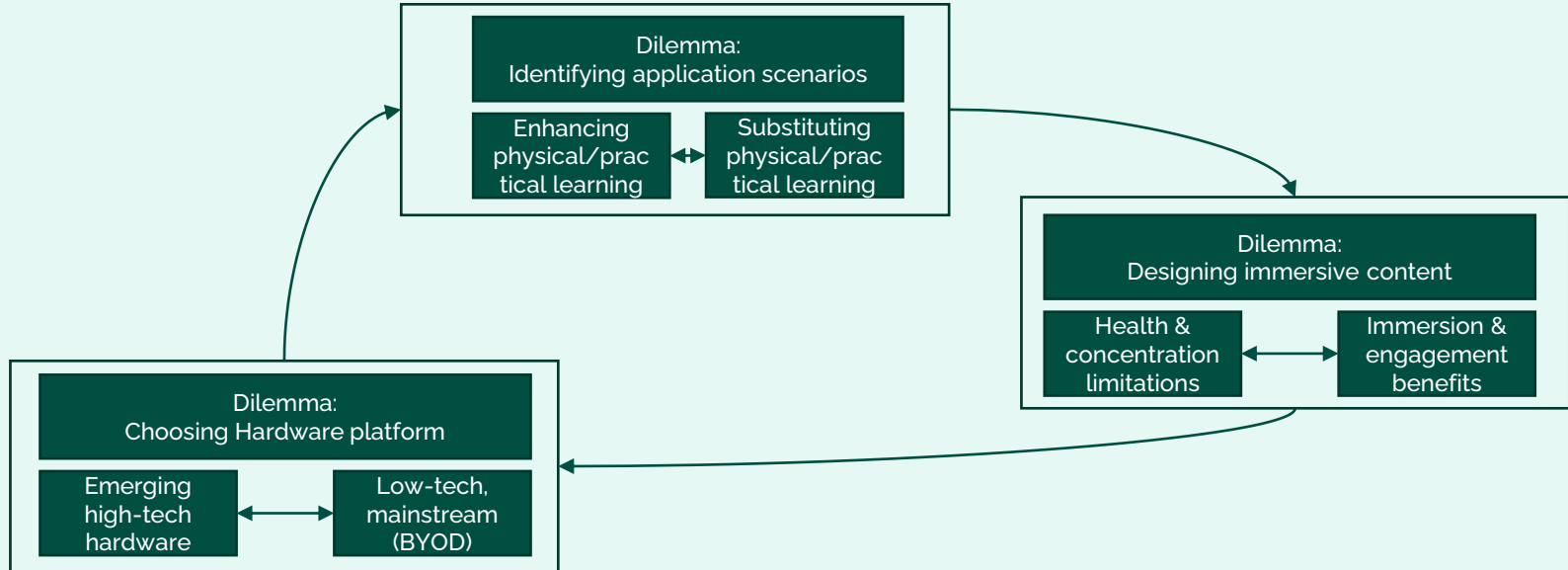


## Some additional findings:

- Interactivity is an important feature to allow learning by doing
- Don't use 2D video in 3D environments, laptop is preferred for viewing in 2D
- Expectations in 3D environments are to view objects in 3D from different angles and perspectives
- Gamification elements to increase engagement can make VR/AR work
- Students learnt in 360 video experience by observing the consequences of their choices
- AR/VR can be used as a complementary tool in education rather than standalone
- Video quality of 360 experiences needs improvement
- Quality of user experience for AR platform needs improvement
- Health issues such as headache, motion sickness and eye strain



# Towards design principles for immersive content





# Theoretical anchoring

## Educational theory:

- Experiential learning
- Situated learning
- Social learning theory
- Social constructivist learning
- Problem-based learning
- Maker education

**Training & Development theory:** ADDIE model, Kirkpatrick evaluation

**Technology framework:** Technology Acceptance Model

## Research frameworks:

- Design-based research
- Design-thinking
- Value-proposition design
- Participatory action research / co-creation



# Could you help?

- Case study vs. (?) design-based research process
- Presentation of findings
  - Coding scheme per testing cycle
  - Coding scheme aggregated per testing cycle
- Theoretical anchoring





# HOTELSCHOOL THE HAGUE

*Hospitality Business School*