

# Fostering Intercultural Competencies in Initial Teacher Education: Implementation of Educational Design Prototypes Using a Social Virtual Reality Environment

Kristina Förster  
Chair of School Pedagogy  
University of Wuerzburg, Germany  
kristina.foerster@uni-wuerzburg.de

Rebecca Hein  
Chair of Human-Computer Interaction  
University of Wuerzburg, Germany  
rebecca.hein@uni-wuerzburg.de

Silke Grafe  
Chair of School Pedagogy  
University of Wuerzburg, Germany  
silke.grafe@uni-wuerzburg.de

Marc Erich Latoschik  
Chair of Human-Computer Interaction  
University of Wuerzburg, Germany  
marc.latoschik@uni-wuerzburg.de

Carolin Wienrich  
Human Technology Systems  
University of Wuerzburg, Germany  
carolin.wienrich@uni-wuerzburg.de

Copyright by AACE. Reprinted from the with permission of AACE (<http://www.aace.org>).

**Abstract:** The combination of globalization and digitalization emphasizes the importance of media-related and intercultural competencies of teacher educators and preservice teachers. This article reports on the initial prototypical implementation of a pedagogical concept to foster such competencies of preservice teachers. The proposed pedagogical concept utilizes a social virtual reality (VR) framework since related work on the characteristics of VR has indicated that this medium is particularly well suited for intercultural professional development processes. The development is integrated into a larger design-based research approach that develops a theory-guided and empirically grounded professional development concept for teacher educators with a special focus on teacher educator technology competencies (TETC8). TETCs provide a suitable competence framework capable of aligning requirements for both media-related and intercultural competencies. In an exploratory study with student teachers, we designed, implemented, and evaluated a pedagogical concept. Reflection reports were qualitatively analyzed to gain insights into factors that facilitate or hinder the implementation of the immersive learning scenario as well as into the participants' evaluation of their learning experience. The results show that our proposed pedagogical concept is particularly suitable for promoting the experience of social presence, agency, and empathy in the group.

## Introduction

Against the backdrop of globalization and digitalization of various areas of life, many initiatives in research and policy emphasize the importance of the development of media-related and intercultural competences in educational contexts. Ideally, both competencies should be fostered in a combined and integrated approach (Förster & Grafe 2021; Müller-Hartmann 2005). From both perspectives, the educational context needs teachers who prepare their students for contemporary and future demands. The covid-19 pandemic has underlined the need for all teachers to be able to adapt their teaching to digital formats (Foulger et al. 2020). Furthermore, transnational media pedagogical approaches, which also focus on intercultural competence development, have gained importance since the beginning of the pandemic (Jager et al. 2021). However, research has shown that teacher educators themselves often do not have the media-related and intercultural skills to support them in educating their students (Tondeur et al. 2016; Cushner & Mahon 2009).

Immersive learning settings in virtual reality (VR) could address this issue. They present promising potential for the development of intercultural and media-related educational competences of teacher educators through the specific characteristics of this medium (Shin 2018). Immersive features such as visual representation and interactivity lead to a perception of embodiment or agency. These mappings can generate emotional responses, such as empathy (Wienrich et al. 2021). We summarize these mapping of immersive features and the corresponding perceptions as characteristics of VR. Immersive experiences are highly related to increased empathy (Barbot & Kaufmann 2020).

From both a theoretical point of view (i.e., regarding the differentiation and operationalization of competence requirements for this stakeholder group) and practical training scenarios, the field is still largely unexplored. For this reason, we choose a design-based research approach that allows us to closely observe the interplay between design and application through a cyclical iterative approach and to investigate not only presumed or intended but also unexpected effects (Tulodziecki, Herzig, & Grafe 2014). The overall goal of our research project is to develop a professional development program for teacher educators that addresses media-related competencies in an intercultural perspective based on the Teacher Educator Technology Competencies (TETCs; Foulger et al. 2017) using social VR. This paper focuses on an early phase in the development process, namely the stage between an initial beta test with a convenience sample consisting of 14 preservice teachers and the first tryout under fully realistic field conditions with teacher educators.

The goal of this exploratory study is to identify factors that facilitate or hinder the successful incorporation of VR in the context of intercultural oriented initial teacher education. Furthermore, the objective is to learn about preservice teachers' perceptions and evaluations of their learning experiences with VR to facilitate the design of a pilot addressing teacher educators.

## Literature Review

### Intercultural Competence

A widely cited source that underlines the complexity of competency modeling in the multidisciplinary intercultural research field is a systematic literature review by Spitzberg and Chagnon (2009), which lists a total of 300 sub-concepts and competency expressions. In broad parts of the research community, this assessment of the status quo is subject to consensus (Arasaratnam-Smith 2017; Leenen 2019; Rathje 2007). Likewise, the definition of intercultural competence as the "ability to communicate effectively and appropriately in intercultural situations based on one's intercultural knowledge, skills, and attitudes," according to Deardorff, which was the result of a Delphi study with researchers (2006), has been widely adopted. However, it has not been generally clarified to date whether intercultural competence is a generic or context-specific construct (Leenen 2019).

We base our research project on the argument by Leenen, who considers it neither possible nor useful to define intercultural competencies in a generic and context-independent way. Rather, it depends on the concrete goals and underlying conditions of an intercultural encounter situation which abilities and skills can particularly contribute to a positive outcome (Leenen 2019, 151).

To the best of our knowledge, there is no differentiated and operationalized intercultural competence profile for teacher educators. Cushner and Mahon (2009) have dealt narratively with intercultural competence requirements for teacher educators and provide a starting point. Collenberg (2020) has modeled intercultural

teaching competencies for teachers in K12 education, and Weber (2017) has developed an intercultural teaching competency profile for university teachers at a dual university in Germany. They offer points of connection for our project.

In addition, we consider the intercultural teaching competence of teacher educators from a media pedagogical perspective (i.e., we focus on digitally supported professional development settings). Thus, we address a research desideratum in two respects.

### **Using VR to Promote Intercultural Competence Development**

A media pedagogical design process, which also considers the perspective of human-computer interaction (HCI), includes an examination of the characteristics of digital media. For the goal established by TETC8 of using media to create “connections” among learners “from different regions and cultures” (Foulger et al. 2017), VR comes into focus as a suitable medium because of its inherent characteristics of presence, immersion, embodiment, and agency (Wienrich et al. 2021; Shin 2018; Johnson-Glenberg 2019, Barbot & Kaufmann 2020).

Results of a pedagogical study on social VR for collaborative teaching and learning processes in initial teacher education indicated that preservice teachers sensed “being there together” (Ripka et al. 2020, 551). This perception can be defined as social presence (Biocca and Harms 2002). In the context of social presence, the subdimensions of empathy, involvement, and emotions have been described (De Kort et al. 2007). Furthermore, “[r]epresentation of others refers to the potential to regulate and simulate social aspects within a behavior change process” (Wienrich et al. 2021, 5). In HCI research, there are already many studies that show that VR can make an important contribution to the field of cognition. However, the strongest potentials of VR primarily lie in the affective and behavioral context of the investigation (Hein et al. 2021; Wienrich et al. 2021). Perspective-taking via VR has demonstrated longer-lasting positive attitudes and empathy (Herrera et al. 2018), embodied experiences in VR have promoted involvement (Ahn et al. 2016), and operationalizing interactive visceral simulations has measurably altered behavior in the medium term (Ahn et al. 2015). A literature review by Hamilton and colleagues (2020) has showed that affective and behavioral changes in non-pedagogical VR applications are extensively studied. However, there are still gaps in the pedagogical context, especially regarding intercultural competence.

VR can make an essential contribution to education by allowing learners to experience environments or situations in the classroom that are difficult to recreate, too expensive, or too dangerous (Wienrich et al. 2021). Nonetheless, the concept of VR is often defined differently. VR creates an artificial virtual environment and thus offers complete virtualization (Wohlgenannt et al. 2020; Buhl et al. 2009). However, many researchers categorize not only social VR applications, such as VR Chat and AltSpace, or full-immersive simulated VR single-player applications under this term but also often (noninteractive) 360° videos presented via HMD or multiuser online games (MUVES) such as Second Life. In their literature review, Hein and colleagues (2021) have investigated immersive applications in the field of foreign-language teaching, the overall goal of which is the development of intercultural and language action-oriented communicative competence. Results show that fully immersive interventions (that is, simulated VR worlds) and their associated benefits were comparatively rarely used. Furthermore, the study indicated that cognitive skills such as vocabulary learning, especially with AR applications, or explicit measurement of affective traits, such as motivation, were more common than implicit measurement methods or conative traits.

In a study by Shadiev et al. (2020), participants were asked to first introduce themselves and their local culture and to record it using a 360° camera. Then the 10 Chinese and 11 Uzbek participants were asked to watch videos recorded by their peers from the other country. Participants positively perceived VR technology as supporting intercultural learning. Furthermore, the intercultural learning supported by the VR technology was helpful for the development of intercultural competence (Shadiev et al. 2020). The communication between the participants was previously asynchronous. Through social VR, such encounters could not only be nearly synchronous but also much more immersive through embodiment and a higher sense of agency.

Similarly, Akdere et al. (2021) presented participants a 15-minute video of a discussion between two people of different nationalities that matched the storyline of their joint project. The VR script was based on several theoretical cross-cultural constructs, including time, power, and task/relationship orientations. The findings “indicate the importance of immersion for the development of intercultural competence and the potential of VR technology to promote intercultural learning (Akdere et al. 2021).” However, intercultural interaction is explored here by means of a “closed” concept of culture (Bolten 2014; Rathje 2009), according to which nationality and culture are largely considered synonymous. Furthermore, participants had limited agency during the interventions. Notably, none of the studies addressed teacher educators in particular.

Drawing on the characteristics of VR described above, and particularly the associated opportunities to promote subdimensions of social presence such as empathy, offers potential to foster intercultural competence development. For this reason, VR was chosen as the primary medium for this study.

## **Research Context and Goals**

This study is the first empirical investigation of a larger research project that uses a design-based research approach (Tulodziecki, Herzig, & Grafe 2014) to address the following question: How should a pedagogical concept for teacher educators be designed to promote media-related intercultural competencies of the participants?

Design-oriented educational research approaches exist under different terminologies and with various premises. A common trait, however, is the connection of practical action and design with research and scholarship as well as the reciprocity between those two dimensions: “In design research, design and research are intertwined: the design is research based and the research is design based” (Bakker 2018, 4). The research process is cyclic-iterative, and each iteration leads to new insights corresponding to the stage, while, in practice, the educational intervention, which is the subject of the research, matures (Design Based Research Collective 2003; Bakker 2018). The design principles are intended to make a theoretical and empirical contribution to enable teacher educators to further develop their intercultural competencies in the context of media pedagogical education (Tulodziecki, Herzig, & Grafe 2014; 2021).

This study reports on an exploratory beta testing of a pedagogical concept designed to enhance participants’ intercultural competencies. With beta testing, we pursued the following research questions appropriate to the early phase (cf. Raatz 2016, 54f):

- RQ1: What factors promote or hinder the implementation of the pedagogical concept?
- RQ2: How do participants evaluate their learning experience in terms of intercultural media-related competency development?

From the results of this study, implications are derived for the piloting of a pedagogical concept aimed at fostering the intercultural media-related competencies of teacher educators.

## **Pedagogical Concept**

The pedagogical concept and the overarching research project are based on Tulodziecki’s theory of “learning as action” (1996). The importance given to individual construction and social negotiation of meaning according to this understanding of learning is justifiable both from a media pedagogical perspective (cf. Tulodziecki et al. 2021, 105f) and from the perspective of intercultural research (cf. Straub 2015). This theoretical foundation was a guiding principle for the pedagogical design. From both perspectives, there is also a need to situate learning processes, a requirement for which VR offers a variety of possibilities (cf. Dawley & Dede 2014). Kammhuber (2010) has designed a learning process with intercultural anchored inquiry (IAI) for learning scenarios that are geared toward intercultural competence development, which in principle falls within the theoretical foundations of the research project.

As a consequence of the theory of learning as action (Tulodziecki 1996), learner-centeredness and -situatedness emerge as essential design features of the prototypes. In accordance with action- and development-oriented pedagogy (Tulodziecki et al. 2017), a complex group task constitutes the core element of both prototypes. We assume that intercultural competence is an elusive construct, both theoretically and empirically (cf. Spitzberg & Chagnon 2009; Arasaratnam-Smith 2017; Rathje 2007). It has considerable relevance for individuals in all phases of teacher education (Cushner & Mahon 2009; Bender-Szymanski 2013; Busse & Göbel 2017). Accordingly, it is an important design principle for the complex task that learners should actively engage with different approaches to modeling intercultural competence by collaboratively building models by means of virtual object manipulation. To create the prerequisites for the implementation of the complex group task in VR, it is necessary on the pedagogical level to let the learners acquire the knowledge base for solving this task (cf. Tulodziecki et al. 2017) in self-study following the inverted classroom model (cf. Handke et al. 2013). In both prototypes, the group is divided in two, without the learners being aware of this. Accordingly, in the complex design task, two perspectives meet in each case through the preparatory reading alone.

In parallel group IC-COG, the pedagogical goal is that learners explain an intercultural competence model to their peers and then collaboratively design a synthesis of both models that is meaningful to the team and critically

examine both models. The intended learning activities are prompted according to principles of intercultural dialogue (Leeds-Hurwitz 2015). Thus, the pedagogical concept of IC-COG aims to promote learners' intercultural competence primarily at the cognitive level as complexity awareness is addressed in relation to model conceptions of intercultural competence.

The complex design task in parallel group IC-AFF, on the other hand, is designed as an intercultural simulation (cf. Leenen & Scheitza 2019). Thus, a key design principle here is that learners are placed in a situation in which communicative disruptions occur and moments of irritation are intended. Thus, the pedagogical concept includes a method for promoting intercultural learning that has been implemented since the 1970s (cf. Leenen & Scheitza 2019). However, while many established intercultural simulations have been criticized for reproducing national-cultural stereotypes (cf. Bosse 2011), in this concept, the discrepancy becomes tangible for learners on a level that does not refer to nationalities but rather to scientific culture(s). According to the model of experience-based learning (Kolb 1984), simulations can have a strong learning effect because their starting point is an authentic experience that is often marked by emotions (Leenen & Scheitza 2019, 461). The pedagogical concept of IC-AFF therefore aims to facilitate intercultural competence development in an affective dimension.

For both PGs, according to the action- and development-oriented pedagogy (Tulodzieki et al. 2017), it follows that after task solving in small groups, comparative reflection and evaluation of the learning experience in the plenary group are an important part of the pedagogical concept.

The design principles were developed as a part of our interdisciplinary collaboration to ensure an alignment between the pedagogical goals, the teaching-learning activities, and the design of the ViLeArn environment.

## Research Design and Data Collection

The pedagogical design was implemented in the seminar Intercultural Dimensions of Teaching and Learning with Digital Media in the initial teacher education program at a university in Germany in June and July 2021. The convenience sample consisted of 14 preservice teachers from different disciplinary and school-type backgrounds. In terms of study experiences, the group was heterogeneous: about half of the students were in their second semester at the time of the intervention and had experienced university exclusively through distance learning using a Moodle-based learning-management system (LMS) and Zoom. The remaining part of the participants had already studied between three and 10 semesters, had experienced learning on campus, and had practical teaching experience during internships.

The participants were assigned to either IC-COG or IC-AFF according to their time preferences, with a balanced distribution being the only other criterion for division. Participation was voluntary and occurred outside of the regular seminar times. Participants were accompanied by a pedagogical facilitator and a technical facilitator.

Of the initial seven students assigned to IC-COG, one student was moved to IC-AFF on short notice due to technical issues. Another student did not attend the session due to a last-minute scheduling conflict, resulting in five students ultimately participating in IC-COG. There were also seven students allocated to IC-AFF. This number remained constant as one student did not participate due to illness, and another student was assigned to IC-AFF from IC-COG, as mentioned above.

In general, different qualitative and/or quantitative empirical methods can be used in DBR-projects (Tulodziecki, Herzig, & Grafe 2014). In line with the research questions formulated above and appropriate to the beta-testing phase (Raatz 2016, 54f), data was qualitatively collected by an additional task in the learning portfolio, which was the assessment tool for the entire course. In the reflection task, two open guiding questions (GQs) were proposed:

- GQ1: How did your VR experience go?
- GQ2: How do you evaluate your learning experience?

Thereby, GQ1 was designed to collect data on RQ1: "What factors promote or hinder the implementation of the pedagogical concept?" With GQ2, we aimed to gain insights regarding RQ2: "How do participants evaluate their learning experience in terms of intercultural media-related competency development?"

Four of the five participants in IC-COG submitted voluntary written reflections. Of the seven participants in IC-AFF, five wrote voluntary reflection reports, while one student submitted a reflection video, which was transcribed and anonymized together with the other datasets. The datasets were analyzed through qualitative content analysis (Mayring 2015).

We established the categories below following the approach of Mayring (Mayring & Fenzl 2019). The two subcategories related to category 1 are derived directly from RQ1, while the subcategories for category 2 were deductively developed from the BehaveFIT framework (Wienrich et al. 2021):

- 1) Feasibility
  - a) Technical aspects
  - b) Motivational aspects
- 2) Evaluation of the learning experience
  - a) Collaboration through the manipulation of virtual objects
  - b) Social presence
  - c) Self-representation and representation of others through avatars

Exploratory participatory observation was also conducted. Field notes were written up immediately following the interventions. The categories outlined above were used to structure the protocol. These classroom observations were consulted to help interpret the results of the reflection reports.

### Social VR Environment

For the implementation of the pedagogical concept, we used the social VR application ViLeArn (Latoschik et al. 2019; Kern et al. 2021), which is already in use across the university (see figures 1 and 2). It was provided via a download link. Each of the 14 participants received a VR-ready laptop and a pair of Oculus Rift S glasses, including controllers. In addition, each set contained spare batteries, silicone eye protection, and in-ear headphones for voluntary use.

ViLeArn was developed using Unity (2019.4.16f1). The Photon Realtime network solution makes it possible to meet and interact with each other remotely in VR. Moreover, various tools and roles can be used within ViLeArn. For instance, the moderator role can send participants to breakout rooms and start or stop tasks, in addition to timers. Peers can share and present content via the freely accessible collaboration platform Notion. The content can be individually viewed by each participant on a tablet or shared with the entire group on a screen in the VR room. The tablets are attached to the VR hands of each participant (Kern et al. 2021).

The participants were embodied by stylized avatars in VR. They could choose between a male and female avatar and change skin and hair color. T-shirt color was determined by group assignment during the intervention.



Figure 1. PG IC-AFF in the ViLeArn plenary room



Figure 2. One of the teams in PG IC-AFF during the simulation task (breakout room)

### Implementation of Prototypes

To prepare participants of both PGs for the interventions, video tutorials were provided in advance on how to set up the HMD and start the ViLeArn environment. Due to covid-19, the collection of the devices by the students could only be done individually and not be combined with a face-to-face instruction in the group. Instead, for both IC-COG and IC-AFF, a technology consultation session was scheduled in Zoom sometime prior to the planned intervention. Students were prompted to test their equipment beforehand and to go through the tutorials of Oculus as

well as ViLeArn to become familiar with the functionalities. Each of the two interventions was designed with a time buffer of 30 minutes to deal with delays due to technical difficulties.

Following the inverted classroom approach, the participants each received a reading assignment with a prompt for preparation one week before the intervention. Two established but structurally different intercultural competence models were selected. One half of each IC-COG and IC-AFF received a handout on Bennet's developmental model of intercultural sensitivity (DMIS; 1986), while the other half studied Deardorff's pyramid and process model of intercultural competence (2006). All students were given the prompt to familiarize themselves with the competence model in such depth that they could explain it to a novice. The group that analyzed Deardorff's approach was allowed to choose between the pyramid or process model. In addition, all participants were asked not to discuss the texts to be prepared with their peers prior to the intervention. This prompt served to ensure that all collaboration and negotiation processes could occur in VR.

For both PGs, after the instructor's welcome to the ViLeArn environment, an icebreaker activity was planned in which all participants were asked to briefly describe their prior experience with VR or even spontaneous first impressions. This activity also served to clarify the significance of the following learning activity as well as for a first brainstorming as suggested by action- and development-oriented pedagogy (Tulodziecki et al. 2017).

For IC-COG, a peer-teaching and learning sequence was planned for the following 15 minutes, in which students who had studied the DMIS (Bennett 1986) were each allocated to small groups of three to four with students who had prepared the article by Deardorff (2006). In their breakout rooms, the teams each found generic virtual objects. Spheres were labeled according to the components of the two models. In addition, the teams were given a supply of arrows to express relationships between the spheres. All teams received their specific task on a whiteboard in their respective breakout room. Depending on the assignment, teams were to start with the Bennett or Deardorff model. The respective experts were asked to verbally explain their model but without manipulating the virtual objects. The novices (i.e., those who had prepared the other model) were given the task of constructing the model based on the information they received from their peers. After half the time, which the learners could monitor themselves by means of a clock in the breakout room, the roles were swapped. In a subsequent phase, the participants were to meet again in plenary to reflect on the results (i.e., the models constructed by the teams as well as the participants' learning experiences). Furthermore, the participants were to evaluate their learning experiences regarding their potential for intercultural teaching and learning.

This was to be followed by a second breakout phase in the same teams, where the learners yet again found the 3D objects with the components of both models. This time, however, the task was to arrange selected components of both models in such a way that they corresponded to the team members' ideas of intercultural competence. The results were to be presented in the plenary room of ViLeArn at the end of the activity. This round should also be followed by a meta-reflection in which the learning experience is evaluated in terms of applicability and possible benefits for intercultural teaching and learning scenarios.

Due to numerous technical difficulties encountered by the students in IC-COG (cf. Results) and the subsequent delays, the pedagogical concept for this session could be implemented neither fully nor with all participants. Due to the delays, the second group phase, during which the teams were to examine and synthesize the two models, had to be skipped to accommodate the presentation and discussion of results as well as the evaluation of the learning experience. At short notice, a substitute session, in which two students and the teacher participated, could be arranged for the following day.

As outlined above, the pedagogical approach for IC-AFF follows the same steps as IC-COG before and during the online socialization phase in the VR environment. However, while in IC-COG, the opportunities for primarily cognitive collaborative learning processes were to be explored; the VR environment and learning activities in IC-AFF were designed to facilitate an intercultural simulation by means of object manipulation. The simulation was implemented with two group phases with three to four participants on each team. In a socialization phase, the participants who had prepared the same article were first brought together. In their breakout rooms, the groups found 3D objects to construct their model. The number of spheres and arrows was reduced to half compared to IC-COG, and the former were labeled with gibberish words. On their personal boards, participants were provided with a glossary through which the nonsensical words were attributed to the components of their respective models. The prompt for learners included explicit permission to talk about their competency model, the glossary, or questions around the control and manipulation of the virtual objects and to help each other construct their respective competency model together.

After the completion of this first group phase, the interim debriefing in the plenary room was deliberately kept short, and the learners were again assigned to breakout rooms but this time in mixed constellations and with the prompts that the groups should not communicate verbally nor via their personal boards. By means of verbal communication or an exchange of rule systems/glossaries on the personal boards, the inherent rule conflicts could be

quickly clarified and rationalized. With our approach, the simulation phase in our pedagogical concept follows established intercultural simulations such as Barga (Thiagarajan & Steinwachs 1990), in which the focus is on experiencing and coping with rule uncertainty (Leenen 2019, 480).

The models constructed by the teams under simulation conditions were then presented in plenary, and the learning experiences of the participants were reflected upon according to the IAI process (Kammhuber 2010) and in line with action- and development-oriented didactics (Tulodziecki et al. 2017).

## Results

### RQ1: What factors promoted or hindered the implementation of the pedagogical concept?

#### *Aspects Related to Technology*

Although the prompts for the voluntary reflections were not pre-structured for students to address technical aspects, all reports included utterances that were tagged with the subcategory “setting up system and accessing” (cf. Salmon 2013). Challenges are mainly reported in IC-COG, such as:

“Various technical problems have been experienced by all participants” (IC-COG-2, reflection report, own translation).

“There were always delays or entire breakdowns” (IC-COG-1, reflection report, own translation).

Possible reasons for access difficulties are also articulated. Several students referred to the fact that they had to set up the notebook and glasses on their own:

“Initially, it was a challenge to familiarize myself with the setup. We did not have the opportunity to share experiences personally with fellow students and to support each other in case of difficulties” (IC-COG-4, reflection report, own translation).

Participants in PGA who were not themselves affected by technical problems indicated that they prepared on their own (cf. IC-COG-4) and found the explanatory videos that were provided in advance helpful (IC-COG-1).

Moreover, field notes taken by the pedagogical and technical facilitators indicate that none of the participants in PG-IC-COG attended a voluntary Tech Q&A session that was offered two days prior to the intervention.

Learners in PG-IC-AFF also articulated feedback in the “setting up system and assessing” subcategory in every reflection report and described little to no difficulty with preparation:

“The use of technology went without major technical difficulties in my group” (IC-AFF-3, reflection report, own translation).

“Well, I was really surprised how easy it is to set up and also to find your way around” (IC-AFF-6, reflection video, own translation).

Related to interaction with the VR environment, eight mentions of cyber-sickness were coded in the reflection reports, which was self-experienced and made it impossible for the student to continue the learning experience (IC-COG-4), self-experienced and felt to be a distracting limitation after a certain time (e.g., IC-AFF-6), or observed in peers (e.g., IC-COG-2).

#### *Motivational Aspects*

The label “intrinsic motivation” (cf. Deci & Ryan 1993) was identified as a major subcategory in the facilitating factors domain when participants articulated interest, curiosity, or enjoyment related to the intervention. In eight of the 10 reflections, there are self-reports that fall into this subcategory. Additionally, a participant from IC-COG did not link the statement to the intervention experience but to the subsequent debriefing with IC-AFF in which experiences were shared (cf. IC-AFF-4, reflection report).

Learners often justified their interest by saying that they had no previous experience with the use of VR:



“Personally, I was really looking forward to the chance to try out virtual reality. Previously, apart from small videos on social media, I had not been able to gain any insights into virtual reality, which made the experience I gained from this seminar all the more valuable” (IC-COG-3, reflection report, own translation).

A general interest in technology was also articulated as a motivating factor:

“[...] I found the VR experience to be very great overall. However, this enthusiasm is probably also based on my interest in new technology and the related opportunities” (IC-COG-2, reflection report, own translation).

Similarly, the perceived value is also linked to future pedagogical practices:

“The experience was very valuable for me as it is not often that I have the opportunity to work with such advanced technologies and find out how to use them skillfully and meaningfully to create a valuable learning atmosphere” (IC-AFF-2, reflection report, own translation).

## **RQ2: How do participants evaluate their learning experience?**

### *Collaboration through Manipulation of Virtual Objects*

In both PGs, reflections also refer to the fact that in both learning scenarios, virtual objects could be manipulated—that is, moved and arranged to create and negotiate meaning. In IC-COG, learners primarily refer to the fact that haptic grasping and releasing of objects and modeling of a model were involved in a reciprocal peer-learning process (cf. IC-COG-2, reflection report). IC-COG-3 evaluates the task and learning setting as a “completely different and new experience” (cf. reflection report, own translation):

“Through the [VR] experience, I perceived the model differently. It was not only possible to walk around the model and thus become visually aware of the model but also to literally touch the model. I personally felt that through these factors, the content was more actively perceived and processed” (IC-COG-3, reflection report, own translation).

In IC-AFF, several learners emphasize that during the socialization phase, they quickly succeeded in moving the objects and building their models (cf. e.g., IC-AFF-1, reflection report) and were impressed by the fact that “you have all these haptic possibilities, that you can grab things, position them differently, build models” (reflection video, own translation).

In the following reflection, the possibility of object manipulation is directly associated with perceived self-efficacy and linked to agency as a distinctive characteristic of VR:

“Then there is agency, which is the control over the environment, a certain self-efficacy that you can experience in virtual reality. You can just move objects, and the others see that too, and so it’s a much more intense experience than, for example, in Zoom sessions” (IC-AFF-6, reflection video, own translation).

Another reflection report deliberates that object manipulation opens possibilities for productive intercultural collaboration since groups can more easily reach a result by “intervening themselves and changing things quickly” (IC-AFF-2, reflection report, own translation).

### *Social Presence*

Derived from Wienrich et al. (2021), we assigned the subcategory of social presence whenever participants grounded their sense of immersion and, consequently, their sense of presence based on interacting within the group (8).

All members of IC-AFF but one, as well as the members of IC-COG who attended the ad hoc substitute session, included reflections related to social presence. In several cases, participants perceived this to mean an improvement in communicative opportunities, such as proxemics or gestures:

“You hear the course participants through the speakers of the VR set as if they were in the same room. You can see the other participants’ avatars moving or gesturing with their hands, which also helps improve

communication in general” (IC-COG-2, reflection report, own translation).

Similarly, interpersonal connection is often described in affective terms:

“And what I also learned is that it is quite possible to create presence and build closeness by virtual means, just by sitting closely to each other [...] the avatars, I mean. By looking around, by interacting with each other in a way, I felt like our group was much more connected than in the regular Zoom meetings” (IC-AFF-6, reflection video, own translation).

About half of the reflections conclude that VR offered better conditions for establishing social presence than Zoom:

“Although in the [virtual exchange], unlike VR, we were talking to real people rather than animated ones, I felt the exchange in VR was more personal from the start” (IC-AFF-5, reflection report, own translation).

Based on this, several participants from IC-AFF suggested designing instruction using VR:

“Additionally, it would definitely be interesting to do a virtual exchange using VR and thus combine the two experiences” (IC-AFF-4, reflection report, own translation).

#### *Self-Representation and Representation of Others through Avatars*

Closely related to statements on social presence are references to self-representation. We coded in this subcategory when learners refer to their own avatar and either report an experience of body ownership or draw conclusions from body ownership experiences. In the written reflections, there are only a few self-reports on the sensation of embodiment, such as,

“[...] that you feel as if you have your own body, and this own body is also congruent with the virtual body, and you are in the same virtual place as the virtual body” (IC-AFF-6, reflection video, own translation).

More often, this observation is not made explicit, but the focus is placed on the possibilities associated with avatar embodiment. Several participants see potential in overcoming stereotypes through self-representation by means of an avatar:

“Moreover, even if it happens subconsciously, prejudices against others could quickly arise when you see them on camera. In the VR room, you have an avatar, which can be close to your appearance or completely imaginary [...]. Thus, despite more closeness, a part of anonymity prevails, which, however, does not affect the cooperation in any way” (IC-COG-2, reflection report, own translation).

“But maybe it’s not a bad thing that you don’t see a lot of things like facial expressions because, that way, you meet on neutral territory, so to speak. Everyone sort of looks the same” (IC-AFF-1, focus group, own translation).

In IC-AFF, the possibility of using avatars to suppress one’s own or other people’s cues is seen as having the potential to break through stereotyping processes:

“When you see other people in person, maybe you’re already making assumptions, and internally you’re already building up prejudices. And on that level, you don’t perceive others [in VR] at all” (IC-AFF-1, focus group, own translation).

While the possible suppression of social cue stimuli is associated with a sense of equality and the feeling of being in a safe space with others (IC-AFF, focus group), the possibility of embodiment through an avatar that differs from the person (for example, by gender, skin color, attributes such as a headscarf/hijab) is seen as a way of promoting a change in perspective (IC-AFF, focus group) and fostering empathy:

“But the possibilities of comprehending other people’s experiences simply by being able to create avatars in different ways, and thus develop empathy and a change of perspective, that was my third and at least equally important learning experience” (IC-AFF-6, video reflection, own translation).

## Discussion and Implications

In our study, preservice teachers tested two prototypical learning scenarios and reflected on them in terms of their own learning experience as well as media pedagogical implications. Against the backdrop of the characteristics of VR established in the research literature, it can be noted that the articulations of the learners primarily emphasize a social dimension. The participants’ most significant observation was the experience of social presence. From an HCI perspective, a “sense of social presence mainly depends on sensory factors (e.g., visual representation of others, interactivity), or on the social context (e.g., physical proximity, social cues) (Oh et al., 2018) as well as on the task-related social interdependence between the actors (e.g., avatars) (Wienrich et al. 2018)” (Wienrich et al. 2021).

This exploratory study has shown that in an intercultural learning setting, social presence and a sense of being in a safe space can be achieved if participants are represented and interact as avatars that do not reveal social cues that could, in a physical or camera-mediated encounter, lead to positive or negative stereotyping. From our analysis, we can derive that it would be similarly promising to initiate perspective-taking processes and foster empathy-building in intercultural learning settings in which participants can be represented by avatars that differ in appearance from the person who is embodied by this avatar.

Secondly, the results related to the manipulation of virtual objects indicate that participants feel a sense of individual and collaborative agency. In this study, the benefits of collaborative tasks involving the manipulation of digital objects was only explored with generic shapes. Based on our findings, we assume that virtual objects that are charged with multiple meanings, depending on a person’s perspective, can facilitate deep intercultural meaning-making processes (Hein et al. 2021). The intercultural research and training approach of “linguistic awareness of cultures” (LAC; Müller-Jaquier 2003) understands intercultural interaction as the negotiation of communicative meanings. One communicative category in this approach is the lexical level, which investigates the question of which mental concepts interlocutors associate with words. Using virtual objects, this dialogic approach could be transferred to the semiotic level and initiate intercultural communication and reflection processes.

In both prototypes, following the principles of action-oriented media pedagogy (Tulodzieki et al. 2017) as well as IAI was helpful to initiate collaborative intercultural inquiry processes. After evaluating the results of this exploratory study, we identified two established dialogue models for promoting intercultural competence, namely the online facilitated dialogue model (cf. Helm 2016) and the story circle approach developed by Deardorff (2019), that could prove beneficial in intercultural learning scenarios in teacher education with VR. Thus, the characteristics of VR seem to be especially conducive in pedagogical concepts that aim toward social learning and sensitization processes on an affective level.

On the other hand, we cannot infer from our own exploratory study or related case studies on the use of VR in teacher education (Schröter & Grafe 2021; Ripka et al. 2020) that it would aid preservice teachers’ competency development to complete educational design processes in VR as well.

Finally, the evaluation of the implementation process showed that the overall feasibility of a VR session under field conditions not only significantly depends on the availability of varied technical support measures (e.g., video tutorials, written instructions, and synchronous tech-support sessions for the participants) but also on whether this support is actively used. Our experience during the two beta testings shows that raising participants’ awareness of the importance of their own preparatory engagement with the technology and also a mandatory technical readiness assurance test prior to the intervention could also significantly support the feasibility of professional development sessions in VR.

## Limitations

There are several limitations to this study. First, the participants represent a convenience sample that is not identical to the target group of the professional development concept to be designed. On the other hand, it can be argued that the perspectives of preservice teachers are relevant when designing interventions for teacher educators.

Second, the study was not implemented on a transnational scale. This can be contextualized by the fact that this study aims to lay the groundwork for a transnational implementation as our research project progresses.

Finally, the sample is so small that no generalizability claim can be pursued with the results. However, this was not the aim of this exploratory study. Rather, the goal was to make our design-based research process

transparent to the community at an early stage and, based on the findings, to be able to make theoretically and empirically justifiable design decisions in a future implementation with teacher educators.

## Outlook

The findings from this exploratory study will lead to research on the transferability of our pedagogical concept to a professional development setting for teacher educators using VR to promote TETC8: “Model global engagement using technologies to connect teacher candidates with other cultures and locations” (Foulger et al. 2017).

Based on the premise that a pedagogical concept that aims to foster intercultural competence in teacher education must go beyond the level of connectivity, we propose that learning scenarios to foster TETC8 should make an experience of social presence possible. While we did not implement an experimental design with control and comparison groups in our study, learners did draw critical comparisons with previous digitally enabled intercultural learning experiences, primarily via Zoom. The predominant assessments that learners felt closer to their peers in the VR environment and that communication was more open and relaxed suggest that intercultural dialogue settings (UNESCO 2009; 2013) should be specifically tested as part of professional development for teacher educators in a next iteration.

## References

- Ahn, S. J., Bostick, J., Ogle, E., et al. (2016). Experiencing nature: Embodying animals in immersive virtual environments increases inclusion of nature in self and involvement with nature. *Journal of Computer-Mediated Communication* 21: 399–419.
- Ahn, S. J. (Grace), Fox, J., Dale, K. R., & Avant, J. A. (2015). Framing Virtual Experiences: Effects on Environmental Efficacy and Behavior Over Time. *Communication Research* 42(6): 839–863.
- Akdere, M., Acheson-Clair, K., & Jiang, Y. (2021). An examination of the effectiveness of virtual reality technology for intercultural competence development. *International Journal of Intercultural Relations* 82: 109–120.
- Arasaratnam-Smith, L. A. (2017). Intercultural competence: An overview. *Intercultural Competence in Higher Education*: 7–18.
- Bakker, A. (2018). *What Is Design Research in Education? 1*. Routledge, p. 3–22.
- Barbot, B., & Kaufman, J. (2020). What makes immersive virtual reality the ultimate empathy machine? Discerning the underlying mechanisms of change. *Computers in Human Behavior* 111: 106431.
- Baroni, A., Dooley, M., Garcia, P. G., Guth, S., Hauck, M., Helm, F., ... & Rogaten, J. (2019). *Evaluating the impact of virtual exchange on initial teacher education: a European policy experiment*. Research-publishing.net.
- Barrett, M., de Bivar Black, L., Byram, M., Faltýn, J., Gudmundson, L., Van't Land, H., ... & Zgaga, P. (2018). Reference framework of competences for democratic culture, Volume 3: Guidance for implementation.
- Bennett, M. J. (1986). A developmental approach to training for intercultural sensitivity. *International Journal of Intercultural Relations* 10(2): 179–196.
- Biocca, F., & Harms, C. (2002). Defining and measuring social presence: Contribution to the networked minds theory and measure. *Proceedings of PRESENCE 2002*: 1–36.
- Buhl, H., & Winter, R. (2009) Full virtualization—BISE’s contribution to a vision. *Business and Information Systems Engineering* 1: 133–136.
- Carpenter, J. P., Rosenberg, J. M., Dousay, T. A., Romero-Hall, E., Trust, T., Kessler, A., ... & Krutka, D. G. (2020). What should teacher educators know about technology? Perspectives and self-assessments. *Teaching and Teacher Education* 95: 103124.
- Collenberg, M. (2020). Förderung interkultureller Lehrkompetenz in der Lehrerbildung. In *Förderung interkultureller Lehrkompetenz* (pp. 43–89). Springer VS, Wiesbaden.
- Cushner, K., & Mahon, J. (2009). Intercultural competence in teacher education. *The SAGE handbook of intercultural competence*, 304–320.
- Dawley, L., & Dede, C. (2014). Situated learning in virtual worlds and immersive simulations. In *Handbook of research on educational communications and technology* (pp. 723-734). Springer, New York, NY.
- De Kort, Y. A., IJsselstein, W. A., & Poels, K. (2007). Digital games as social presence technology: Development of the Social Presence in Gaming Questionnaire (SPGQ). *Proceedings of PRESENCE, 195203*, 1-9.
- Deardorff, D. K. (2019). *Manual for developing intercultural competencies: Story circles*. Routledge.
- Deardorff, D. K. (2006). Identification and assessment of intercultural competence as a student outcome of internationalization. *Journal of studies in international education*, 10(3), 241-266.
- Deci, E. L., & Ryan, R. M. (1993). Die Selbstbestimmungstheorie der Motivation und ihre Bedeutung für die Pädagogik. *Zeitschrift für Pädagogik*, 39(2), 223-238.
- Design-Based Research Collective. (2003). Design-based research: An emerging paradigm for educational inquiry. *Educational researcher*, 32(1), 5-8.

- Foerster, K., & Grafe, S. (2021, March). ICT-related Educational Competencies of Teacher Educators from an Intercultural Perspective. A Systematic Analysis of Competency Frameworks. In *Society for Information Technology & Teacher Education International Conference* (pp. 1586-1595). Association for the Advancement of Computing in Education (AACE).
- Foulger, T. S., Graziano, K. J., Schmidt-Crawford, D., & Slykhuis, D. A. (2020). Throw me a lifeline: A professional development program for teacher educators managing the demands from the rapid transition to online teaching. *Teaching, technology, and teacher education during the COVID-19 pandemic: Stories from the field*, 517-520.
- Foulger, T. S., Graziano, K. J., Schmidt-Crawford, D., & Slykhuis, D. A. (2017). Teacher educator technology competencies. *Journal of Technology and Teacher Education*, 25(4), 413-448.
- Gudykunst, W. B., & Hammer, M. R. (1983). Basic training design: Approaches to intercultural training. *Handbook of intercultural training: Issues in theory and design*, 1, 118-154.
- Hamilton, D., McKechnie, J., Edgerton, E. (2020) Immersive virtual reality as a pedagogical tool in education: a systematic literature review of quantitative learning outcomes and experimental design. *Journal of Computer Education* 8: 1–32
- Handke, J., Kiesler, N., & Wiemeyer, L. (2013). *The Inverted Classroom Model*. De Gruyter Oldenbourg.
- Hein, R., Steinbock, J., Eisenmann, M., Latoschik, M. E., & Wienrich, C. (2021). Development of the InteractionSuitcase in virtual reality to support inter-and transcultural learning processes in English as Foreign Language education. *DELFI 2021*.
- Hein, R. M., Wienrich, C., & Latoschik, M. E. (2021). A systematic review of foreign language learning with immersive technologies (2001-2020). *AIMS Electronics and Electrical Engineering*, 5(2), 117-145.
- Helm, F. (2016). Facilitated dialogue in online intercultural exchange. In *Online Intercultural Exchange* (pp. 164-186). Routledge.
- Herrera, F., Bailenson, J., Weisz, E., et al. (2018) Building long-term empathy: A large-scale comparison of traditional and virtual reality perspective-taking. *PLOS ONE* 13: e0204494.
- Jager, S., Nissen, E., Helm, F., Baroni, A., & Rousset, I. (2021). Virtual exchange as innovative practice across Europe awareness and use in higher education. *EVOLVE Project Baseline Study [Research Report]*. Evolve Project. <https://hal.archives-ouvertes.fr/hal-02495403/document>.
- Johnson-Glenberg, M. C. (2019). The necessary nine: Design principles for embodied VR and active stem education. In *Learning in a Digital World* (pp. 83-112). Springer, Singapore.
- Kammhuber, S. (2010). Interkulturelles Lernen und Lehren an der Hochschule. In *Schlüsselqualifikation Interkulturelle Kompetenz an Hochschulen* (pp. 57-72). VS Verlag für Sozialwissenschaften.
- Kern, F., Kullmann, P., Ganal, E., Korwisi, K., Stingl, R., Niebling, F., & Latoschik, M. E. (2021). Off-The-Shelf Stylus: Using XR Devices for Handwriting and Sketching on Physically Aligned Virtual Surfaces. *Frontiers in Virtual Reality*, 2, 69.
- Kolb, D. A. (1984). *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, New Jersey: Prentice-Hall.
- Latoschik, M. E., Kern, F., Stauffert, J. P., Bartl, A., Botsch, M., & Lugin, J. L. (2019). Not alone here?! scalability and user experience of embodied ambient crowds in distributed social virtual reality. *IEEE transactions on visualization and computer graphics*, 25(5), 2134-2144.
- Leenen, W. R. (2019). Grundbegriffe interkultureller Kompetenzvermittlung. In *Handbuch Methoden interkultureller Weiterbildung*, 25-167.
- Leenen, W. R., & Scheitza, A. (2019). Methodische Zugänge und Bausteine. In *Handbuch Methoden interkultureller Weiterbildung*, 451.
- Luongo, N. (2019). Preparing Tomorrow's Teachers Using the Teacher Educator Technology Competencies (TETCs). *The Advocate*, 25(1), 5.
- Latoschik, Marc Erich, Kern, Florian, Stauffert, Jan-Philipp, Bartl, Andrea, Botsch, Mario, Lugin Jean-Luc (2019). Not Alone Here?! Scalability and User Experience of Embodied Ambient Crowds in Distributed Social Virtual Reality, In *IEEE Transactions on Visualization and Computer Graphics (TVCG)*, Vol. 25 (5), pp. 2134-2144.
- Mansilla, V. B., & Jackson, A. (2011). *Educating for global competence: Preparing our youth to engage the world*. New York: Asia Society.
- Mayring, P., & Fenzl, T. (2019). Qualitative Inhaltsanalyse. In *Handbuch Methoden der empirischen Sozialforschung* (pp. 633-648). Springer VS, Wiesbaden.
- Müller, B. D. (2003). Linguistic awareness of cultures. Principles of a training module. *From International Exchanges to Intercultural Communication: Combining Theory and Practice*, 50-90.
- Oh, C. S., Bailenson, J. N., & Welch, G. F. (2018). A systematic review of social presence: definition, antecedents, and implications. *Front. Robot. AI* 5, 114 (2018).
- Raatz, S. (2016). II. Design-based Research–Innovation für Bildungswissenschaft und-praxis. In *Entwicklung von Einstellungen gegenüber verantwortungsvoller Führung* (pp. 37-61). Springer VS, Wiesbaden.
- Rathje, S. (2007). Intercultural competence: The status and future of a controversial concept. *Language and intercultural communication*, 7(4), 254-266.
- Ripka, G., Grafe, S., & Latoschik, M. E. (2020, October). Preservice Teachers' encounter with Social VR–Exploring Virtual Teaching and Learning Processes in Initial Teacher Education. In *SITE Interactive Conference* (pp. 549-562). Association for the Advancement of Computing in Education (AACE).

- Ripka, G., Tiede, J., Grafe, S., & Latoschik, M. (2020, April). Teaching and Learning Processes in Immersive VR—Comparing Expectations of Preservice Teachers and Teacher Educators. In *Society for information technology & teacher education international conference* (pp. 1863-1871). Association for the Advancement of Computing in Education (AACE).
- Salmon, G. (2013). *E-tivities: The key to active online learning*. Routledge.
- Schröter, T., & Grafe, S. (2020, November). Digital Literacy and Digital Competency of University Teachers. A Systematic Analysis of Frameworks. In *Innovate Learning Summit 2020* (pp. 144-157). Association for the Advancement of Computing in Education (AACE).
- Schröter, T., Tiede, J., & Latoschik, M. E. (2021, July). Fostering Teacher Educator Technology Competencies (TETCs) in and with Virtual Reality. A Case Study. In *EdMedia+ Innovate Learning* (pp. 617-629). Association for the Advancement of Computing in Education (AACE).
- Shadiev, R., Wang, X., & Huang, Y. M. (2020). Promoting intercultural competence in a learning activity supported by virtual reality technology. *International Review of Research in Open and Distributed Learning*, 21(3), 157-174.
- Shin, D. (2018). Empathy and embodied experience in virtual environment: To what extent can virtual reality stimulate empathy and embodied experience?. *Computers in Human Behavior*, 78, 64-73.
- Slykhuis, D. A., Foulger, T. S., Graziano, K. J., Hofer, M., Lee, J. K., & Schmidt-Crawford, D. A. (2021). TETC Professional Development Program 2021: <https://tetcpd.thinkific.com/> [last access: September 2021]
- Slykhuis, D. A., Foulger, T. S., Graziano, K. J., Hofer, M., Lee, J. K., & Schmidt-Crawford, D. A. (2020, April). TETC Professional development: An online program for teacher educators. In *Society for Information Technology & Teacher Education International Conference* (pp. 474-478). Association for the Advancement of Computing in Education (AACE).
- Spitzberg, B. H., & Changnon, G. (2009). Conceptualizing intercultural competence. *The SAGE handbook of intercultural competence*, 2, 52.
- Straub, J. (2015). 2.1 Lerntheoretische Grundlagen. In *Wie lehrt man interkulturelle Kompetenz?* (pp. 31-98). transcript-Verlag.
- Tondeur, J., van Braak, J., Siddiq, F., & Scherer, R. (2016). Time for a new approach to prepare future teachers for educational technology use: Its meaning and measurement. *Computers & Education*, 94, 134-150.
- Tulodziecki, G., Herzig, B., & Blömeke, S. (2017). *Gestaltung von Unterricht: eine Einführung in die Didaktik* (Vol. 3311). UTB.
- Tulodziecki, G., Herzig, B., & Grafe, S. (2014). *Medienpädagogische Forschung als gestaltungsorientierte Bildungsforschung vor dem Hintergrund praxis- und theorierelevanter Forschungsansätze in der Erziehungswissenschaft. MedienPädagogik: Zeitschrift für Theorie Und Praxis Der Medienbildung* 2014 (Occasional Papers):1-18. <https://doi.org/10.21240/mpaed/00/2014.03.10.X>.
- Tulodziecki, G., Herzig, B., & Grafe, S. (2021). *Medienbildung in Schule und Unterricht: Grundlagen und Beispiele*. Utb.
- Uerz, D., Volman, M., & Kral, M. (2018). Teacher educators' competences in fostering student teachers' proficiency in teaching and learning with technology: An overview of relevant research literature. *Teaching and Teacher Education*, 70, 12-23.
- UNESCO. (2013). *Intercultural Competences. A Conceptual and Operational Framework*. UNESCO. <https://en.unesco.org/interculturaldialogue/resources?lang%5B%5D=29> [last access: September 2021]
- UNESCO. (2009). *UNESCO World Report 2: Investing in Cultural Diversity and Intercultural Dialogue*. UNESCO. [http://en.unesco.org/docc/2009\\_Investing\\_in\\_cult\\_div\\_Completo.pdf](http://en.unesco.org/docc/2009_Investing_in_cult_div_Completo.pdf) [last access: September 2021]
- Weber, W. Y. (2017). *Interkulturelle Lehrkompetenz: Konzeption eines Kompetenzprofils für Dozentinnen am Beispiel der Dualen Hochschule Baden-Württemberg*. Ibidem Press.
- Wienrich, C., Döllinger, N. I., & Hein, R. (2021). Mind the Gap: A Framework (BehaveFIT) Guiding the Use of Immersive Technologies in Behavior Change Processes. *arXiv preprint arXiv:2012.10912*.
- Wienrich, C., Schindler, K., Döllinger, N., Kock, S., & Traupe, O. (2018, March). Social presence and cooperation in large-scale multi-user virtual reality—the relevance of social interdependence for location-based environments. In *2018 IEEE Conference on Virtual Reality and 3D User Interfaces (VR)* (pp. 207-214). IEEE.
- Wohlgenannt, I., Simons, A., Stieglitz, S. (2020) Virtual Reality. *Business and Information Systems Engineering* 5: 455–461.

## Acknowledgments

This research has been funded by the Federal Ministry of Education and Research (BMBF): Funding for teacher training with a focus on digitalization in teacher training in the project CoTeach (project number 01JA2020).