VOICE TRAINING AS A KEY COMPETENCE FOR STUDENTS IN TEACHER TRAINING – BENEFITTING FROM A VIRTUAL REALITY CLASSROOM IN HIGHER EDUCATION. PART 1 - TEACHING CONCEPT AND FIRST RESULTS

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ABSTRACT

The project "Making voice and Presence a Virtual Realistic Experience" is funded by “HessenHub - Network digital university teaching Hessen”. At the Center for Foreign Language and Occupational Competencies (German: ZfbK) at the University of Giessen, a teaching concept for student teacher training was developed that includes both the learning and use of a physiologically sound voice and offers transfer to professional practice. For this purpose, a virtual classroom featuring avatars of noisy school children was developed. The teaching concept includes exercises on breathing, posture, articulation and physiological voice enhancement at the syllable, word, sentence and text levels, up to spontaneous speech. With the help of virtual reality (VR) headsets, these exercises are to be trained and consolidated in a realistic classroom environment under the guidance of a speech scientist. The goal is for future teachers to be able to intuitively use a physiologically healthy voice that can be increased in volume without negative repercussions.

The study conducted is based on a total sample of 20 students. The methodology of the accompanying research adheres to the Scholarship of Teaching and Learning (SoTL) approach [6]. A pre-post survey on voice use and voice-influencing habits was employed to investigate improvements resulting from voice training. Additionally, a survey on VR experience and its impact was conducted at the end of the seminar, with 19 participants. Preliminary results indicate trends suggesting improvements in voice quality among most participants. The VR experience also yielded predominantly positive outcomes, and participants perceived added value in the use of VR headsets.

This study is to be considered a pilot study, as it was conducted with only 20 participants. It is necessary for future research studies to increase the sample size to obtain definitive results on the effectiveness of voice training using VR headsets.

Keywords: *voice training, virtual reality headset, practice transfer, pilot study, successful implementation*

INTRODUCTION

At the Center for Foreign Language and Occupational Competencies (German: ZfbK) at the University of Giessen, a teaching concept focused on oral communication was developed, featuring the central use of Virtual Reality headsets (VR headsets). This innovative teaching model was implemented in the weekly ongoing seminar, "Voice Training for Student Teachers—Utilizing VR Headsets." This seminar, with a scope of 30 semester hours per week (German: Semesterwochenstunden, SWS), was first conducted, researched, and evaluated as a pilot project in the summer semester of 2022. The aim was to employ the VR Headsets in an efficient and sustainable manner. The relevance of this approach to voice training lies in the ability to create a realistic virtual classroom environment where student teachers can apply and practice vocal preservation techniques they have learned.

This article presents foundational concepts related to virtual reality, outlines the educational framework and its learning objectives, and discusses the methodology of the accompanying study based on the Scholarship of Teaching and Learning (SoTL) approach [6]. It also recounts initial experiences and insights gathered from the pilot study. The concluding section summarizes and discusses the results and experiences. The objective of this paper is to provide an overview of the educational framework, the application of VR Headsets, and their added value.

BASICS OF VIRTUAL REALITY (VR)

“A Virtual Reality (VR) system is defined as a computer system equipped with appropriate hardware and software to generate the notion of a virtual reality. The content displayed through the VR system is referred to as the Virtual World, encompassing models of objects, their behavior descriptions for the simulation model, and their spatial arrangement. When a Virtual World is presented through a VR system, we refer to it as a Virtual Environment for one or more users." [3]. In recent years, Virtual Reality has increasingly permeated societal norms, finding applications in both private and commercial spheres as well as in educational contexts. The market for VR headsets is intensely competitive, with numerous providers competing to attract customers through new developments [4].

For an individual to experience a lifelike reality within a Virtual Environment, stimuli must be generated to make this world credible to the human brain. In addition to the generation of such stimuli, it is essential that the individual not only senses and observes the Virtual Environment but can also act within it (e.g., move within the space). “This necessitates the simulation of the Virtual World, where human actions are known to the simulation and can thus influence

it. The simulation's outcomes, in turn, have implications for the generation of stimuli—should the individual move within the Virtual Reality, the stimulus generation must accommodate this new position. The task of simulation can be taken over by a computer system, which must have a simulation model of the world" [3].

Even when individuals are aware that they are in a simulated environment, experiments with VR headsets have demonstrated that they can still experience physiological symptoms of fear — such as increased pulse and breathing rates — when approaching a virtual abyss [3]. Therefore, human reactions to Virtual Environments are comparable to those in the real world despite the awareness of the simulation's non-hazardous nature.

The employment of Virtual Environments has significant implications for both human perception research and various industries. For instance, in the automotive industry, new car models are first simulated in a Virtual Environment to provide planning stakeholders with increased certainty, error minimization, and thus more cost-efficient manufacturing. In pilot training, airlines can save both money and carbon emissions by initially practicing flights in a Virtual Environment [3]. Besides these applications, the use of VR headsets offers substantial opportunities for higher education, enabling students to benefit from practice and experience in virtual specialized worlds. Medical students can visually internalize anatomical basics, chemistry students can conduct virtual experiments, and student teachers can test their vocal presence before virtual school children.

USE OF THE DEVELOPED SOFTWARE IN VOICE TRAINING FOR STUDENT TEACHERS

Teaching concept

The teaching profession is among those where the voice is subject to maximum strain. Research has demonstrated that teachers experience voice-related issues, such as hoarseness and vocal fatigue, significantly more frequently than non-teachers [1] [9] [2] [8] [5]. Consequently, the early acquisition of techniques for healthy and effective vocalization is indispensable and a mandatory prerequisite for the sustained practice of the teaching profession.

The existing teaching concept of the seminar "Voice Training for Student Teachers" included exercises on proper breathing, posture, articulation and voice application before the method of using VR headsets was implemented. Prior to this addition, it was challenging to recreate realistic classroom situations, thereby impeding the transfer of voice exercises into professional practice. For this reason, the teaching concept was expanded to include the opportunity to practice vocal techniques using VR headsets. The advantages of employing VR headsets in voice training lie in the creation of believable virtual classroom scenarios and the

simultaneous application of learned techniques for healthy and economical vocalization. Additionally, VR technology facilitates the optimal practice of required physiological vocal enhancements when speaking in front of noisy groups of school children.

At the outset of the seminar in the summer semester of 2021, the avatars in the virtual classroom were unable to react to spoken input. Students received feedback from the instructor, who, being a speech scientist, could precisely evaluate the proper use of voice by the students. In the winter semester of 2021/22, a speech recognition system (picovoice) was installed, enabling the avatars to respond to what the students said. The avatars' responses in the virtual classroom, which cease when the students issue voice commands, do not replace the essential feedback provided by the instructor. As a speech scientist, she can offer constructive external feedback to students practicing with VR headsets. The following learning objectives were established. Students will be able to:

- understand the correlations of physiological phonetics.
- distinguish and identify features of healthy and impaired vocalization.
- differentiate and describe the functions and relationships between posture, breathing, voice, and articulation.
- identify characteristics of their own voice and apply individual exercises to improve posture, breathing, voice, and articulation.
- apply economical and prophylactic exercises in the areas of breathing, posture, and voice.
- transfer these exercises to classroom teaching situations using VR headsets.

Table 1. *Schedule "Voice training for student teachers - with the use of VR headsets"*

Session	Topic
1	Course introduction; learning objectives; self and peer assessment/theory on voice.
2	Voice training; theory on breathing, posture and voice/disorders.
3	Exercises on breathing, posture, relaxation
4	situation analysis; body voice training; transfer to syllable level
5	Body voice training; transfer to sentence level
6 & 7	Body voice training; transfer to text level with VR headsets in plenary.
8	Body voice training; enhancement of the voice
9 & 10	Use power voice with VR headsets (situation noisy classroom)
11 & 12	Spontaneous speech exercises; voice enhancement; use with VR headsets.
13	Voice training compact
14	Final session

PILOT STUDY

As the seminar was conducted for the first time in its new format both the concept and the technology were continually adapted based on the experiences and feedback of both the student teachers and instructors. Since the summer semester 2022 it was held three times. Therefore, a research environment with consistent conditions could not be established in the pilot run. Nonetheless, valuable and future-influencing insights were garnered through questionnaires and personal interviews.

At the outset of the seminar, students completed consent forms for the use of their data and recordings within the framework of the project study and engaged with the personal perception of their own voice and possible external influencing factors. For the "Vocal Well-being" questionnaire (A1), the voice check used by the Center for Teacher Education at Martin Luther University Halle-Wittenberg was administered at the beginning and end of the seminar. A survey on the VR experience [7] (the original is attached) was also conducted at the end. Open interviews with each participant were conducted post-seminar to collect feedback on the seminar execution and concept, enabling the identification of advantages, disadvantages, and optimization measures.

First results

Data was collected at the beginning and end of the seminar, with a sample size of n=20 students. Table 1 lists the most significant reductions in the before-and-after comparison in the right column. For instance, delta = -2 indicates that two fewer individuals reported hoarseness or a feeling of throat pressure at the end of the training compared to the beginning.

Table 2. *Voice check (before-after)*

Indicators	N of participants (n=20)		
	Before	After	delta
I am often lazy to speak at home in the evening.	7	2	-5
I am often hoarse.	4	0	-4
I often feel pressure in my throat.	4	1	-3
I often feel tense.	6	4	-2
I often have to clear my throat.	7	5	-2
I am often asked if I have a cold or am hoarse.	1	0	-1
I am often asked what is wrong with my voice.	1	0	-1
The sound of my voice changes during the day.	5	4	-1
I often find speaking stressful.	1	2	1
Sometimes my voice just breaks.	3	4	1
My voice is worse in the evening.	0	2	2

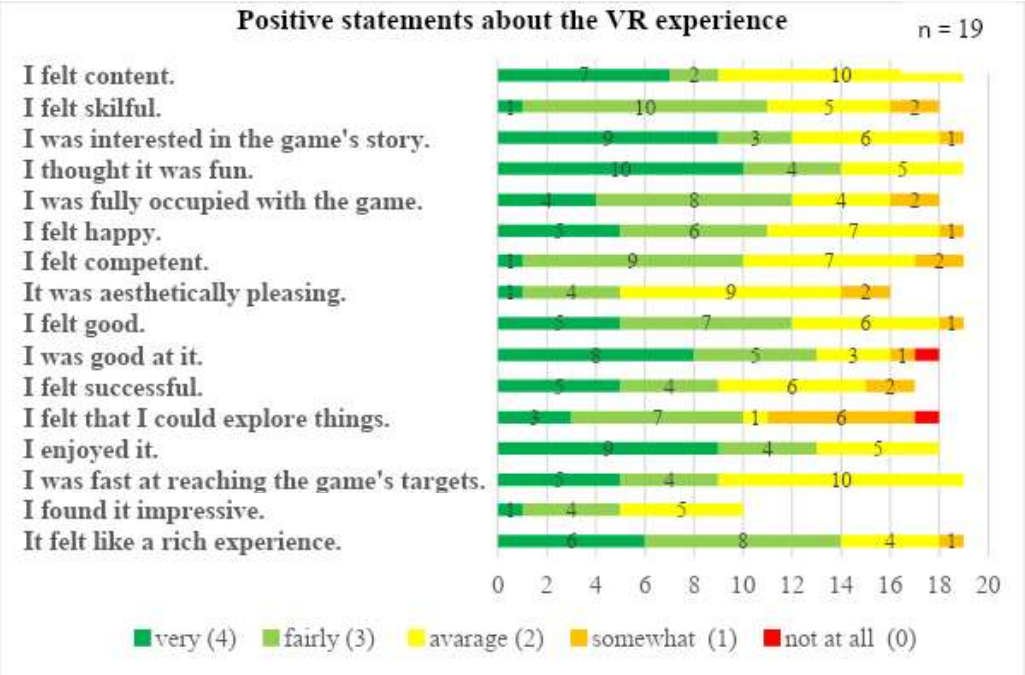

Fig. 1. *Positive statements about the VR experience*

The survey on the VR experience [7] was conducted at the end of the training. It was sorted by positive and negative/neutral statements respectively. The evaluation of positive statements is presented in Figure 1 and color-coded on a scale from 0 (not at all) to 4 (very). The findings suggest that all 19 partaking student teachers predominantly rated the VR experience in the seminar as positive. Moreover, the evaluations of negative/neutral statements indicate that students associated little to no negative feelings with the VR experience.

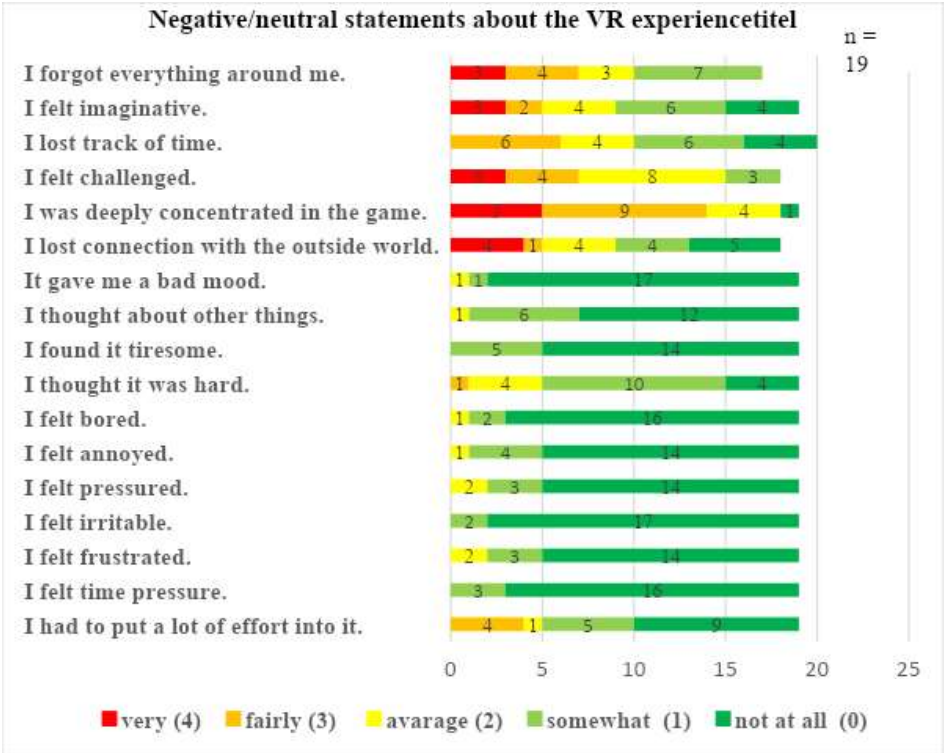

Fig. 2. *Negative/neutral statements about the VR experience*

CONCLUSION

Based on the empirically substantiated need for a healthy voice in teachers, a teaching concept was developed that integrated two critical components: first, the application of healthy vocal techniques, and second, practicing these in challenging classroom scenarios. In a virtual classroom filled with noisy school children's avatars, participants learned to use their voice in a healthy and conducive manner. The aim was to directly link the learned vocal techniques to professional practice, enabling student teachers to speak physiologically sound in a challenging classroom situation. The pilot study, which belongs to the Scholarship of Teaching and Learning (SotL) research area [6], relied on a pre-post survey on the use of one's voice and a survey on the effectiveness of the VR experience at the end of the seminar. Preliminary results indicate that the 20 students improved their vocal quality and overwhelmingly found the VR experience to be positive. The questionnaire on the VR experience also revealed that it was perceived very positively overall.

In subsequent studies, student teachers' individual development will be observed. They will be assigned personal codes, allowing for the relational analysis of successive questionnaires. Additionally, individual voice characteristics will be analysed and compared with indicators for subjective experience. These qualitative findings are expected to be quantitatively evaluated as the number of participants increases, leading to conclusive results regarding the efficacy of voice training with the use of VR headsets.

ACKNOWLEDGEMENTS

We would like to thank our colleague Benedikt Klein, who advised on the content of the project, as well as our students, who demonstrated great commitment and enthusiasm in the seminar and thus contributed to the didactic and technical development. Furthermore, we would like to thank the teacher Andreas Czerney, who made it possible for us to conduct the voice recordings with the students of grades 9 and 10. We also thank them very much. Last but not least, we would like to thank the D team of the soccer club JSG Buseck-Rödgen, whose voices we were also allowed to record at the beginning of the project.

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APPENDIX

Please indicate how you felt while playing the game for each of the items, on the following scale:					
	not at all (0)	Somewhat (1)	avarage (2)	fairly (3)	very (4)
1 I felt content.					
2 I felt skilful.					
3 I was interested in the game's story.					
4 I thought it was fun.					
5 I was fully occupied with the game.					
6 I felt happy.					
7 It gave me a bad mood.					
8 I thought about other things.					
9 I found it tiresome.					
10 I felt competent.					
11 I thought it was hard.					
12 It was aesthetically pleasing.					
13 I forgot everything around me.					
14 I felt good.					
15 I was good at it.					
16 I felt bored.					
17 I felt successful.					
18 I felt imaginative.					
19 I felt that I could explore things.					
20 I enjoyed it.					
21 I was fast at reaching the game's targets.					
22 I felt annoyed.					
23 I felt pressured.					
24 I felt irritable.					
25 I lost track of time.					
26 I felt challenged.					
27 I found it impressive.					
28 I was deeply concentrated in the game.					
29 I felt frustrated.					
30 It felt like a rich experience.					
31 I lost connection with the outside world.					
32 I felt time pressure.					
33 I had to put a lot of effort into it.					