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Participatory Action Research on Integrating Digital Competencies into German Teacher Training: An Interdisciplinary Approach

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ABSTRACT

Digital competencies are essential for teacher training students across school subjects to create contemporary lessons. Therefore, the acquisition of media literacy and the integration of digital tools into education are crucial for successfully preparing students for digital participation in society. Additionally, digital tools offer significant benefits for subject-specific didactic use in German lessons: aids for planning and support, tools for linguistic analysis and reflection, collaborative environments, visualization techniques, multimodal applications, and more. However, as of 2025, this potential remains largely untapped in Austrian schools. Hence, this paper investigates ways of incorporating digital competencies into German teacher training. Specifically, perspectives of pre-service teachers and academic staff resulting from participatory action research are used to deal with the central question: What support do pre-service German teachers need to expand their digital competencies and actively incorporate them into German lessons? Based on the insights gained, measures to optimize the integration of digital competencies include the systematic involvement of teacher mentors in the project, inviting experts to the accompanying seminar to facilitate the acquisition of relevant competencies, and gradually building a digital resource collection with adaptable application examples. The transfer of findings to English and other subjects is discussed.

Keywords: Digital competencies, Media literacy, Teacher training program german, Subject didactics german, Participatory action research

INTRODUCTION

The current study emanates from the cross-institutional project "Teaching digital thinking" funded by the Austrian ministry of education and aiming to support the digital and social transformation in Austria's educational system. In this context, this paper's authors collaborated on researching and evaluating one school-practice-accompanying (SP) seminar in the subject German at bachelor level, held in the winter term 2024/2025.

A key interdisciplinary goal of the SP seminar is to support students in acquiring and continuously improving their media and digital competencies,

considering current and emerging demands on language use in both face-to-face and digital settings. As the students completed practical lessons at different school locations parallel to the SP seminar, specific experiences of the students from the practical school context are included.

Digital competencies are crucial for future German teachers to design engaging lessons. In German lessons, digital tools enable individualized learning through adaptive environments and immediate feedback. They promote collaborative writing and communication processes, support creative forms of expression through multimedia design and facilitate access to authentic, up-to-date texts and media. The acquisition of media literacy and the integration of digital tools into lessons are crucial factors for successfully preparing pupils for digital participation in society (Brevik et al., 2019).

In the curriculum for the subject German, there are numerous starting points for the promotion of (digital) media skills in the various competence areas. The integration of digital media opens up new ways of producing, receiving and distributing texts. For example, writing techniques are changing thanks to collaborative tools, multimedia text forms and digital feedback options such as audio or video comments. Techniques of reading and analyzing literary texts are also being enhanced by digital formats, hypertexts and interactive media, which makes new reading strategies and critical media skills necessary.

In the competence area "Speaking and listening", digitality enables new forms of communication, such as video conferences or podcasts, which promote both receptive and productive skills. In the area of "Writing", digital writing processes, collaborative writing of texts and publication in digital spaces (e.g. blogs, forums, social networks) come into use. The area of "Reading - dealing with texts and media" requires learners to critically evaluate digital sources of information, recognize fake news and use media content in a reflective manner. Summing up, digital tools make German lessons more relevant to students' lives and equip them with the linguistic and media skills necessary for engagement in an increasingly digital society.

Despite the Austrian Ministry of Education's 'Digital Device Initiative' launched in 2022, as of 2025, the full potential of digital tools remains largely untapped in Austrian schools. (Ambros, Dolozal & Motschnig, 2023). Hence, the objective of this study is to investigate the possibilities and potentials of incorporating digital competencies into German teacher education with a focus on a subject-specific didactic implementation. For the duration of three semesters participatory action research (PAR) was conducted to study the explicit inclusion of learning objectives that address pre-service teachers' acquisition of digital competencies in the context of their initial experiences in teaching German to secondary level students (age 10–18).

This paper employs Participatory Action Research (PAR) (Baskerville, 1999) to address the key question: *What support do pre-service German teachers require to expand their digital competencies and effectively integrate them into German lessons?*

Aiming for a better understanding of the challenges and benefits of promoting digital competencies in the context of teaching German (and possibly other subjects as well), this paper will be of interest to instructors, teachers, coaches, curriculum designers, and researchers. They may find inspiration, motivation, and resources for promoting up-to-date and innovative approaches to communication and improved interaction and learning in the era of digital transformation. Moreover, the implications of the current study for further practice and research on teacher education in German may help to enhance similar considerations and discussions in the subject of English and even further school subjects.

METHODS

Research Design: Participatory Action Research as Overall Framework

Action Research has gained recognition for exploring the introduction of information systems into innovative teaching and learning (Baskerville, 1999). PAR (Ottosson, 2003) guides teachers/facilitators wanting to research their practice by reflecting on their educational programs, following five phases that cyclically repeat themselves: Diagnosing, action planning, action taking, evaluation, and specifying learning. Building upon experience and insights of three preceding semesters with the aim of promoting digital competencies in the teacher training of German, we explore the progress of a group of the SP seminar in the subject German from winter term 2024/25 as one PAR cycle into which a thematic analysis of students' reflective ePortfolios was integrated. This extension of the PAR framework by including a thematic analysis supports the systematic and tractable evaluation of the students' perspective. PAR was selected as the overarching research framework due to its multi-perspective and participatory approach. The instructor's observations and reflections provided a complementary perspective with the same research interest, namely digital tools, media, and competencies in the context of teaching German.

Participants and Ethics

15 students (3 male, 12 female) from the North-East Schools' Group attended the SP seminar led by two teachers at Baden University of Teacher Education in the winter term 2024/25. At the same time, they completed work shadowing and lessons at schools in Vienna and Lower Austria (6 grammar schools, 4 secondary schools, 5 BMHS), where they were supervised by mentors.

Informed written consent was obtained for all student ePortfolio excerpts referenced in this paper.

Data Collection From Students' ePortfolios

As part of the SP seminar, the students compiled ePortfolios to accompany the course in which they reflected on observations, considerations and experiences in the use of digital tools in their teaching context.

Data Analysis From Students' ePortfolios

A selective thematic analysis of students' ePortfolios seemed most feasible, as it formed the foundation for systematically deriving meaning along larger themes (Nowell, 2017). This process required less effort and space for documentation than a more detailed qualitative content analysis (Mayring, 2014).

15 out of 15 students completed the SP seminar (in the winter term 2024/25) including ePortfolio submission. The ePortfolio text corpus totaled approximately 101,036 words, though minor inaccuracies may exist due to embedded text in image format. For the analysis of the reflections regarding digital competencies, 5,218 words were selected from the corpus; this corresponds to 5.6% of the total corpus. The following two key questions formed the basis of the corresponding reflections: *To what extent could the use of digital tools be observed in German lessons at the school internship location? In what way were digital tools incorporated into the students' lessons?*

The thematic analysis was carried out by three researchers/authors. After a thorough reading of the texts by three researchers, one of them suggested five major themes. These were consulted with the co-researchers and selected to be used for further analysis. The unit of analysis was determined to be a coherent, meaningful text fragment. Initially, one researcher color-coded the text units according to five themes. The research team then refined and expanded upon the initial analysis. The outcome was discussed in a meeting in which full agreement was reached. Along the process, the text was examined to find prototypical statements for each of the subthemes. Those will be presented in the section on evaluation and should aid the reader in gaining a more concrete impression.

FINDINGS AND EXPERIENCES ALONG THE FIVE PHASES OF THE ACTION RESEARCH CYCLE

Diagnosing

In the Austrian school system, "media education" is anchored as one of ten interdisciplinary teaching principles. The aim is to develop and promote media literacy, constituted by the four dimensions of media criticism, media studies, media use and media design (BMB). The Austrian curriculum for the subject German also comprises the interdisciplinary competencies "computer literacy" and "media literacy".

Against the background of the teaching experiences under pandemic conditions, there has been a digitalization move in the field of German didactics, as well as in other subjects, which is evidenced by numerous relevant didactic publications. (e.g. Krammer et al., 2021; von Brand et al., 2021; Blume et al., 2022) However, digital possibilities often remain unused and German lessons are sometimes still strongly focused on analog media.

The course description of the SP seminar includes "Digitalization in German lessons" as one of seven central content areas. Digital competencies in the didactic context are an important part of teacher training; professional

transfer into school practice can only be guaranteed if methodological-didactic concepts are made tangible in practical implementation. The SP seminar builds on this concept.

Action Planning

After initial discussions, the collaboration between 'Teaching Digital Thinking' and the SP seminar commenced in the winter term 2023/24. Digital elements were incorporated into the existing seminar design: presentation and exemplary use of digital tools for teaching German; use of digital tools by students in the SP seminar to prepare and process the reading that accompanies the course. Alongside the SP seminar, students were tasked with observing the integration of digital elements in practice schools and discussing digital tool usage with their mentors. On a voluntary basis, digital tools were also to be incorporated into the lessons they taught themselves. Reflective ePortfolios served to document and to analyze observations and experiences during the school internship, with digital competencies forming a focus of reflection.

ACTION TAKING

The examined SP seminar (4 European Credit Transfer System Points, 30 weekly semester hours) was held on six block dates from October 2024 to January 2025, with each block focusing on one or two German didactic topics. Digital tools and platforms were integrated into the course by the course instructor.

An annotated overview of relevant digital tools for teaching German was provided in the first session. An obligatory accompanying text (Sigmund, 2023) addressed the use of AI in German lessons in one of the sessions. Furthermore, in blocks 2–6, students were required to prepare and interactively present the literature accompanying the course in small groups (2–3 people) using freely selectable digital tools, focusing on both the functionality of the tool and the didactic content. This collaborative trial offered students the opportunity to evaluate the digital tools in a protected learning space. The possibilities, benefits, and added value of the digital tools used were critically examined and discussed in the course. The following tools were used by the students in the SP seminar analyzed: *Kahoot!, Mentimeter, Padlet, Canva, MindMeister, Sokrative quiz, Learning Snacks, Learning Apps, Quizizz, Classtime, Pixton, Perplexity, ChatPDF, To-Teach.ai, myTAI, Brev AI* and *dende*.

A key activity in the SP seminar involved students designing scenarios for their supervised secondary school lessons. In order not to overburden students in (one of) their first teaching experiences, their use of technology in the classroom was optional.

Evaluating

This section presents findings from the thematic analysis of relevant ePortfolio excerpts, focusing on digital aspects of the course and students'

teaching experiences. Subsequently, the instructor's (being the first author) observations, reflections, and interpretations are described.

Thematic Analysis Addressing the ePortfolios

Students' versatile statements were arranged according to the following five major themes:

- Digital tools used
- Elaboration on the use of digital tools
- Subject-specific use of digital tools including effects
- AI-tools used
- General findings and conclusions on the use of digital tools.

Digital tools used: Students cited *Kahoot!*, *Padlet*, *Mentimeter*, *Perplexity* and *myTAI* as frequently used tools, while *Canva*, *Genially* and *Storyteller* also appeared in their reflections. Equipment of pupils with tablets, *iPads* and *laptops* are frequently listed. *MS Teams* is mentioned in connection with the use of school communication platforms; the use of *digital textbooks* is referred to several times. More than half of the students consider the use of *(explanatory) videos* helpful.

Elaboration on the use of digital tools: Half of the students found *projectors* and *interactive whiteboards* particularly useful for presenting *PowerPoint slides* and *(explanatory) videos*. However, unfamiliarity with the technology and limited practice opportunities proved to be obstacles.

Some students observed the use of *Microsoft Teams* at the internship schools for the provision of digital teaching materials and for lesson communication. *Digital textbooks* enable access to additional content. This promotes more interactive, varied lessons and the independent use of media by students. Pupils are encouraged to "[...] work independently and responsibly with digital media. The use of *iPads* has not only increased pupils' motivation, but also their ability to use technology as a tool for learning."

The use of the *Word* program was emphasized several times. Visual support for students was particularly helpful when taking notes in class. "Instead of writing key points on the board with chalk, my mentor always typed important information into a *Word* document, which was projected onto the beamer screen for the students. This approach offers several advantages, including better legibility and more flexibility."

Kahoot! was described as a particularly motivating tool: "I really liked the use of a *Kahoot!* as a means of securing results. The students were motivated and focused on getting started with the *Kahoot!* as quickly as possible. Above all, the immediate feedback on how many of the pupils answered the respective questions correctly is very helpful in the final phase of a lesson."

Mentimeter was used by several students in lessons. Their experiences with it were predominantly positive.

One student who introduced *Padlet* as a new tool in the classroom did not immediately achieve the intended learning effect despite a brief introduction: "This experience has shown that it is important to allow sufficient time for the introduction of new digital tools. In future, more time should therefore

be given so that students can familiarize themselves with how the tool works and how it is used effectively in lessons."

Subject-specific use of digital tools: *(Explanatory) videos* were often used by students in lessons for specific subjects. An example of this would be the following explanatory video from *Duden*-Verlag on *YouTube*, which one student cites in her ePortfolio: "Writing a dialectical discussion: What you need to consider!" (Duden Lernattack/German).

One student describes in detail the use of the *Storyteller* tool to promote narrative skills. She emphasizes the motivating and activating effect. The diversity of lesson settings helped to appeal to different types of learners. Creative elements and the easy handling of the tool had a positive effect on the achievement of the language learning objectives. The promotion of cooperation through the collaborative use of the tool was also emphasized. It strengthened the students' social skills and, moreover, significantly increased the quality of the resulting stories. "On the whole, the unit [...] was a great success and showed that digital games can be a motivating and creative addition to traditional lessons with a sense of purpose."

The availability of audio texts in *digital textbooks* was highlighted as a particularly valuable potential for German lessons. Furthermore, the possibility of simple and efficient support for vocabulary work through digital image material in the classroom was mentioned.

AI-tools used: According to the students, AI-tools such as *ChatGPT*, *ChatPDF* and *Perplexity* were sometimes used at the internship schools. One mentor preferred the use of *DeepL* or *ChatGPT* for language correction and brought attention to responsible use of AI as an important school issue.

One student recommended tools from the SP seminar (*myTAI, Perplexity, ChatGPT*) to the students at her internship school. Another student successfully used *ChatPDF* to categorize a text and create an overview table for students.

Another student found *ChatGPT* and *Perplexity* unsuitable tools to create grammar exercises for word type training. In order to achieve a satisfactory result, a time-consuming specification of prompts would have been necessary: "In this case, with enough patience, you would certainly achieve the desired result, but not faster and, above all, not less complicated than without artificial intelligence."

General findings on the use of digital tools: School and classroom equipment play a key role in the use of digital tools: while one of the students had the opportunity to work at an AI pilot school, several students regretted the lack of technical equipment at their placement schools. Technical problems, the time required to set up mobile laptops and classrooms without projectors and smartboards made work difficult and sometimes prevented the use of digital tools. "The classroom in which I spent most of my time observing and teaching was a container class and not equipped with a smartboard or a functioning projector. Although mobile laptops were available, they were used only occasionally. Problems occurred time and again - whether due to inadequate maintenance or battery failure."

One of the students who had analyzed educational videos in greater detail argued that educational videos are suitable as an initial orientation

to new content and have positive effects on the learning performance as well as toward an increased commitment and deeper concentration of learners. Most young people would be familiar with the video format and use it themselves to acquire learning content. "This makes the use of this method particularly suitable for a new topic because the pupils can concentrate on the material itself." The multimedia nature of the explanatory videos is a major difference to conventional classroom explanations and makes them lively and informative.

Another student addresses the skills that teachers need to be able to adequately support pupils in acquiring digital education: "It became clear how important it is for teachers to have sound digital skills in order to organize lessons accordingly and guide pupils in the use of technology. This form of teaching shows that digital education goes far beyond simply operating devices - it's about dealing critically with information, finding creative solutions and using digital tools reasonably."

The didactic added value in the use of a tool must be given and the didactic embedding must be arguable: "For my future teaching work, I will take with me that digital media must be didactically integrated in a meaningful way and that clear instructions on how to use them are necessary." "For the future, I think that multimediality is very helpful for support, but should not be applied exclusively, so that pupils can get to know all possible variants and learn how to use them. As a teacher, good preparation is essential to avoid technical problems or problems with handling and, if necessary, to have an alternative ready so that there are no delays."

The potential of digital tools in German lessons is recognized by most students in order to design methodically varied lessons and create additional motivational incentives.

Instructor's Reflections, Observations, and Interpretations

The integration of digital tools into the course design of the SP seminar was perceived by the course instructors both as a methodological and didactic enrichment of the seminar and as an expansion of their own digital repertoire. The digital preparation and processing of the accompanying reading increased student activation and encouraged them to take responsibility in the shaping of the seminar. The use of the selected tools was always linked to the interactive involvement of the seminar group. The free choice of tools was always observed with great commitment, with the small preparatory groups often using several tools at the same time.

The small group work had a motivating effect and the individual preparation of the lesson content with different tools offered space for creative implementation as well as a varied and observant learning atmosphere.

The learning atmosphere in the seminar group provided a safe space for experimenting with digital tools. The presenters could always count on a well-meaning audience in the event of technical problems or ambiguities regarding content. The subsequent reflection phases focused on the potentials and challenges of the respective tool as well as its transfer possibilities into German lessons at school.

Specifying Learning

The following describes experiences from the perspective of the course instructors:

- The students showed a remarkably positive attitude towards acquiring digital competencies in the SP seminar. Students generally welcomed opportunities to use digital tools to enhance their pupils' learning in German lessons. At the same time, they critically reflected about the obstacles at some schools, the risks of technological failure in one of their first teaching experiences, and the equipment and time investment needed to use digital tools to truly enhance learning. The strong, active, and constructive group dynamics played a key role in the success of the course and deserve special mention.
- Based on the insights gained, the following measures are planned for the subsequent cycle to optimize the integration of digital competencies: systematic involvement of mentors in the project, inviting external experts to the SP seminar to impart specific competencies and expand the didactic spectrum, building a digital resource collection with practice-relevant application examples for German lessons, and intensifying engagement with subject-specific didactic literature in the SP-seminar.
- One aspect that should not be neglected and that significantly affects the inclusion of digital tools in teaching is not only the technical equipment at schools, but also that in the university sector. Unfortunately, the seminar room lacked an interactive whiteboard, limiting the demonstration of didactic applications such as text correction.
- As a consequence of the very positive experience with a subject-specific in-depth study of digital competencies in the teaching internship, the authors not only will continue this path in the subject German but also warmly recommend to consider and study the inclusion of digital competencies in other school subjects. This recommendation is fully consistent with the results of a design science approach in English studies (Jemetz, Motschnig & Dalton-Puffer, 2023).

DISCUSSION

Limitations

One of the major limitations of the study was the relatively low number of participants (15), which led to only a relatively small data set. Also, due to length limitations, only one illustrative statement could be quoted for each subtheme. Furthermore, the SP seminar primarily focuses on the preparation and reflection of the teaching internship. Digital skills are only one aspect of the course. Despite these limitations, valuable insights could be gained that can serve as research questions or hypotheses to be investigated in further studies.

Contribution, Impact and Further Work

This study highlights the substantial benefits of interdisciplinary collaboration in enhancing the SP seminar and integrating digital

competencies into teaching internships. This finding emphasizes the need to strengthen professional learning communities for the targeted implementation of digital tools.

Exploring digital tools firsthand fostered students' curiosity and openness toward innovative teaching approaches. This motivates them to pass on the methodological skills they have acquired to pupils and to contribute to the contemporary design of German lessons. Students' awareness of the didactic possibilities of using digital tools was heightened, accompanied by a constructive discussion of critical viewpoints.

In the context of German didactics in particular, there is considerable research potential, similar to that identified in a design science study for English didactics. Digital tools offer considerable potential for internal differentiation in German lessons, yet their application remains limited, particularly for second-language learners and inclusive education settings.

A more detailed study of the data collected as part of the SP Seminar research is currently being planned.

CONCLUSION

To summarize, Participatory Action Research as the overall research framework proved to be very helpful in reflecting upon promoting digital skills of teacher education students from the perspective of the students, the instructor acting as facilitator and the researchers. Based on the co-authors' prior work on digital competencies in higher education (Göltl et al., 2024) we hope and expect that students' extensive experience in acquiring and applying digital skills in German studies will inspire educational innovators across disciplines and contribute to broader school innovation (Dolezal et al., 2025).

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