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Evaluation of a Pedagogical Concept for Initial Teacher Education to Foster Pre-service Teachers' Media Education Competence

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Continuous advancements in the media landscape are leading to new requirements for promoting the media competence of children and adolescents. Accordingly, pre-service teachers should be prepared to foster media education and critical media reflection in schools. This third iteration of a design-based research study evaluates whether the learning objectives of a re-fined theory- and practice-based pedagogical concept, designed to enhance pre-service teachers' media education competence, have been achieved. A convenience sample of 35 pre-service

teachers completed competence-based tasks before and after the intervention and prepared media education lesson designs throughout the semester. Results from qualitative content analysis and inferential statistics indicated significant improvements in outlining the significance of students' extracurricular media use, illustrating consequences for media education activities, outlining theoretical approaches to media education, evaluating these approaches and existing media education lesson designs, and developing their own media education lesson designs. In their lesson designs, participants engaged with students' diverse media experiences and addressed socially responsible media education variously. Implications are provided for research and higher education practice.

Aus der kontinuierlichen Weiterentwicklung der Medienlandschaft ergeben sich neue Anforderungen an die Förderung von Medienkompetenz von Kindern und Jugendlichen. Bereits angehende Lehrpersonen müssen darauf vorbereitet werden, medienbezogene Erziehungs- und Bildungsaufgaben in der Schule umzusetzen und die kritische Reflexion von Medien zu fördern. In der vorliegenden dritten Iteration einer Design-Based Research Studie wird die Zielerreichung eines pädagogischen Konzepts zur Förderung der Kompetenz von Lehramtsstudierenden im Bereich der Wahrnehmung von medienbezogenen Erziehungs- und Bildungsaufgaben evaluiert. Kompetenzbasierte Pre-Post-Aufgabenlösungen einer Gelegenheitsstichprobe von 35 Lehramtsstudierenden sowie ihre semesterbegleitenden Portfolios wurden mithilfe qualitativer Inhaltsanalyse und inferenzstatistischer Verfahren analysiert. Die Ergebnisse zeigten signifikante Verbesserungen in der Skizzierung der Bedeutung der außerschulischen Mediennutzung von Schülerinnen und Schülern und resultierender Konsequenzen für die Medienbildung, in der Erläuterung von theoretischen Ansätzen zur Medienbildung, in der Bewertung dieser Ansätze sowie vorhandener Unterrichtsbei-

spiele und in der Entwicklung eigener Unterrichtsbeispiele. Die Teilnehmerinnen und Teilnehmer setzten sich differenziert mit den medialen Erfahrungen von Schülerinnen und Schülern auseinander und adressierten sozial verantwortliches Handeln in Medienzusammenhängen in vielfältiger Weise. Implikationen für Theorie und Praxis der Lehrpersonenbildung werden diskutiert.

1. Introduction

Media are integral to life and require individuals to actively engage with them as socially responsible users (Hobbs, 2024). New competence requirements have emerged for adolescents engaging with media at younger ages (Tomé & De Abreu, 2023). A crucial task is to promote their competence to critically reflect on media within contexts of action (Tulodziecki et al., 2021). This requires teachers who can effectively implement media education activities in schools (Senkbeil et al., 2020), a need emphasized by national and international policies (Bundesministerium für Bildung, Wissenschaft und Forschung [BMBWF], 2022; Kultusministerkonferenz [KMK], 2024; Organization for Economic Co-operation and Development [OECD], 2022; United Nations Educational, Scientific and Cultural Organization [UNESCO], 2021).

As pre-service teachers play a vital role in advancing media education in schools, evidence-based media education concepts for initial teacher education must be developed and implemented (Hobbs et al., 2022). Additionally, research is needed to evaluate the effectiveness of these concepts (Hobbs, 2017).

This study is the third iteration of a design-based research project (Bakker, 2018; Tulodziecki et al., 2018). It aims to further develop and evaluate a theory- and practice-based pedagogical concept to foster pre-service teachers' media education competence (Hahn et al., 2025a, 2025b). Education standards can inform the development of evidence-based concepts (Shavelson, 2010) and competence-based measurement (Hobbs, 2017; Schaper, 2009). Accordingly, the competence standards of the Competence-Standard Model for Media Pedagogy (Tulodziecki, 2012) serve as learning objectives for this pedagogical concept. The following research questions (RQs) were formulated:

RQ1: *In what ways do pre-service teachers address media education competence standards before and after an initial teacher education course on media education?*

RQ2: *To what extent do pre-service teachers achieve media education competence standards before and after an initial teacher education course on media education?*

2. Literature Review

Research on media education in teacher education reveals various frameworks, models, and guidelines outlining the competence of pre-service and in-service teachers in media education contexts (Delere, 2020; Tiede, 2020). Notable examples include the *European Framework for the Digital Competence of Educators* (DigCompEdu) (Redecker, 2017), the *ICT Competency Framework* (UNESCO, 2018), the *Technological Pedagogical Content Knowledge*

(TPACK) *Framework* (Mishra & Koehler, 2006), the *ISTE Standards for Educators* (International Society for Technology in Education [ISTE], 2024), the *NAMLE Core Principles of Media Literacy Education* (National Association for Media Literacy Education [NAMLE], 2023), and the *Competence-Standard Model for Media Pedagogy* (Tulodziecki, 2012) (see Tiede, 2020 for an overview). All these provide different perspectives on the conceptualization of competence or corresponding constructs such as literacy while addressing media education to varying degrees (Hahn et al., 2025a). For instance, *DigCompEdu* focuses on digital competence (Redecker, 2017), while the *ICT Competency Framework* refers to the use of information and communication technology (UNESCO, 2018). *TPACK* addresses educational technology knowledge (Mishra & Koehler, 2006), the *ISTE Standards* involve the use of educational technology (ISTE, 2024), and the *NAMLE Core Principles* focus on media literacy education (NAMLE, 2023). These frameworks, models, and guidelines have also inspired current adaptations to consider artificial intelligence, including the Supplement to the *DigCompEdu Framework* (Bekiaridis, 2024), the *AI Competency Framework for Teachers* (UNESCO, 2024), and *AI-TPACK* (Ning et al., 2024), or a culture of digitality, such as the *DPACK Model* (Döbeli Honegger, 2021). From an international comparative perspective, the development of the term media pedagogical competence is distinct in the German-speaking media education discourse (Grafe, 2024). Building on earlier work on media competence (Baacke, 1996; Blömeke, 2000; Spanhel, 2001), Tulodziecki (2012) developed a Competence-Standard Model for Media Pedagogy, identifying

three areas of media pedagogical competence. The realization of media education tasks (*Wahrnehmung medienbezogener Erziehungs- und Bildungsaufgaben*) is explicitly included as a competence area with specific competence standards, addressing the academic phase of teacher education (Tulodziecki, 2012). The model addresses the need to connect media pedagogical professionalization with the discourse on educational standards and theories of teacher professionalization (Schrammel, 2010; Klaß, 2020). Accordingly, it was chosen as a theoretical foundation for this design-based research project.

From an empirical perspective, the aforesaid frameworks, models, and guidelines were used to design interventions fostering media education competence or corresponding target constructs. Recent studies have chosen Tulodziecki's (2012) Competence-Standard Model for Media Pedagogy as a theoretical foundation. These include this design-based research project with its previous studies, in which the first version of a pedagogical concept to foster pre-service teachers' media education competence was developed (Hahn et al., 2025a), refined, and evaluated (Hahn et al., 2025b). Key design elements include action-oriented teaching and learning activities with complex tasks that correspond to Tulodziecki's (2012) competence standards as desired learning outcomes. Results revealed that pre-service teachers significantly improved in referencing illustrating the significance of adolescents' media use and its consequences for media education activities, discussing theoretical approaches to media education, evaluating

these approaches and examples of media education activities from different perspectives, and developing media education lesson designs. Areas requiring further development included participants' analyses of existing lesson designs and reflections on their own lesson designs. In another design-based research project, Halsch and Grafe (2025) focused on the importance of diversity when developing an action-oriented pedagogical concept to promote pre-service teachers' media education competence. Results indicated that participants in a corresponding university media education course significantly improved their descriptions of adolescents' media use and its consequences, characterizations of media education approaches, and reflections on their lesson designs. Participants particularly linked diversity to media influences and design characteristics of media messages in their own lesson designs. While the results indicated an enhanced emphasis on action and diversity orientation, further development was needed in participants' evaluations of media education approaches and existing lesson designs, as well as in their analyses of existing lesson designs and descriptions of their own lesson designs. In another approach, Baumann et al. (2025) focused on social *mixed reality* (MR) and transcultural perspectives in their action-oriented pedagogical concept to foster pre-service teachers' media education competence. Findings indicated that pre-service teachers improved in illustrating consequences resulting from adolescents' media use, characterizing approaches, analyzing and evaluating existing lesson designs, and describing their own lesson designs. These included diverse *extended reality* (XR) and transcultural per-

spectives in their lesson designs. The study highlighted the need for further development in their outlining of adolescents' extracurricular media use, as well as in their evaluations of media education approaches and reflections on their own lesson designs. Menzinger et al. (2024) emphasized the significance of inclusive teaching in media education within their pedagogical concept for a higher education course. They provided pre-service teachers with opportunities to develop and implement media education lesson designs in an inclusive setting, fostering their self-assessed media pedagogical competence and increasing self-efficacy related to inclusive teaching. Klab (2020) evaluated the effectiveness of an action-oriented media education university course. Results revealed that pre-service teachers prioritized the integration of educational technology over media education in their own lesson designs. Overall, these studies highlight the effectiveness of pedagogical concepts that are aligned with a structured, action-oriented teaching and learning process involving complex tasks. Additionally, they reveal areas for further development in the realization of media education tasks concerning the evaluation of media education approaches, to pre-service teachers' analyses and evaluations of existing lesson designs, and descriptions and reflections on their own lesson designs (Baumann et al., 2025; Hahn et al., 2025b; Halsch & Grafe, 2025).

To address the areas identified for development in the third study of this design-based research project, additional insights can be drawn from the studies of Greene et al. (2023) and Botturi (2019).

Greene et al. (2023) developed an online educational technology course based on *TPACK* (Mishra & Koehler, 2006). Design elements included peer feedback and structured reflection phases, which enabled pre-service teachers to discuss their own and others' lesson designs and to iteratively revise them. Findings indicated increases in perceived knowledge among pre-service teachers and highlighted the importance of collaborative learning processes in supporting their professional development. Botturi (2019) designed a higher education course to enhance media literacy among pre-service and pre-primary teachers, with learning content covering a broad range of media education topics and including reflective discussions at the end of each unit. Results indicated that participants felt more competent in their professional identity by exploring diverse topics and engaging in reflection. These findings suggest that strengthening peer feedback, structured reflection, and topical breadth at selected points of the pedagogical concept could enhance pre-service teachers' engagement with specific media education standards. Building on the findings of the second iteration of the pedagogical concept (Hahn et al., 2025b) and considering the research findings described above, the refinement of the pedagogical concept targets the identified areas.

3. Pedagogical Concept and Course Design

3.1 Pedagogical Concept

As in the previous versions V1 (Hahn et al., 2025a) and V2 (Hahn et al., 2025b), the theoretical foundation of the pedagogical concept is the *Competence-Standard Model for Media Pedagogy*, which includes media education competence as one of three areas (Area B) (Tulodziecki, 2012). This area includes five competence aspects (B1-B5), each operationalized through two standards (B1.1-B5.2) that pre-service teachers should achieve during initial teacher education (Tulodziecki, 2012). Eight competence standards (B1.1-B4.2) serve as intended learning objectives (see Table 1). To achieve these objectives, the following pedagogical design elements are central to the pedagogical concept, as in the previous versions (Hahn et al., 2025a, 2025b). According to constructive alignment (Biggs, 2014), the objectives align with an action-oriented teaching and learning process (Tulodziecki et al., 2021) and complex portfolio tasks for learning and assessment (Tulodziecki, 2012). Task solutions are documented in portfolios to stimulate students' learning experiences and foster reflective learning (Bellin-Mularski, 2021). Flipped classroom principles support student-centered learning and collaborative engagement in class (DeLozier & Rhodes, 2017). Pre-service teachers reflect on their learning prerequisites and outcomes through reflection tasks at the beginning and end of the semester. Competence standards B4.1 and B4.2, which address the development and reflection on their own media education lesson designs, are intro-

duced early to motivate students and illustrate connections to the preceding standards (Tulodziecki, 2012). Pre-service teachers develop their lesson designs in alignment with the action- and development-oriented approach (Tulodziecki et al., 2021). This approach is recognized internationally (Grafe, 2024; Hobbs, 2024) and informed by theories addressing important components of teaching and learning, including learning prerequisites, objectives, and learning and teaching activities (including content, social forms of learning, and media) (see Hahn et al., 2025a for an overview).

3.2 Course Design

Informed by the findings of Hahn et al. (2025b) and the further research findings described above, the third version of the course design (V3) was further developed in terms of content (see Table 1). The design of duration, media, and social forms of learning remains consistent with the previous versions V1 (Hahn et al., 2025a) and V2 (Hahn et al., 2025b).

The course is designed for one semester and consists of 14 sessions, each of 90 minutes duration. It includes two introductory units, eleven content-focused units, and one final reflection unit (see Table 1):

Units	Competence Standards as Learning Objectives used as Portfolio Tasks (see Competence-Standard Model for Media Pedagogy (Tulodziecki, 2012))	Learning Content (aligned with learning activities linked to phases of an action-oriented teaching and learning process (Tulodziecki et al., 2021))
1 2	Introduction	
3 4	B1.1: Outline the significance of students' extracurricular media use for socialization and education, referring to theoretical approaches and empirical findings through examples. B1.2: Illustrate the consequences resulting from B1.1 for the realization of media education tasks through examples.	Introduction to empirical research, advancements in the media landscape (V1, V2, V3) Media and forms of experience, significance of media use for socialization and education, critical reflections on media within contexts of action, consequences for media education activities, potentials and risks of media use (V2, V3)

		<i>Advanced collaborative searches, analyses, and discussions of studies on students' extracurricular media use and on consumer behavior, hate speech, and beauty standards (V3)</i>
5	B2.1: Outline approaches to media education and related empirical studies adequately.	Approaches to media education, media education in the federal curriculum, action- and development-oriented approach, critical approaches to media education (V1, V2, V3)
6	B2.2: Evaluate approaches to media education from empirical, normative, and practice-related points of view.	Perspectives on critical reflections on media within contexts of action, evaluation of approaches to media education (V2, V3) <i>Evaluations from a normative point of view in the context of disinformation in social networks (V3)</i>

7	B3.1: Analyze media education lesson designs regarding their learning prerequisites, objectives, and learning and teaching activities (including content, social forms of learning, and media).	Functions and resources of federal media centers and initiatives connected to state media authorities, analysis of lesson components (V1, V2, V3)
8	B3.2: Evaluate media education lesson designs from empirical, normative, and practice-related points of view.	Evaluation of lesson designs, exemplary evaluations of existing media education lesson designs on privacy and beauty standards (V2, V3) <i>Exemplary analyses of existing media education lesson designs on privacy and beauty standards (V3)</i>
9 10 11 12	B4.1: Develop media education lesson designs referring to approaches to media education and describe them regarding their learning prerequisites, objectives, and learning and teaching activities (including content, social forms of learning, and media).	Description of lesson components, complex tasks, phases of action-oriented teaching and learning processes, forms of lesson planning, principles of peer feedback, reflections on lesson designs using peer feedback (V1, V2, V3)

13	B4.2: Reflect on media education lesson designs from empirical, normative, and practice-related points of view	Lesson planning integrating critical reflections on media within contexts of action, exemplary descriptions of lesson components on influencer marketing (V2, V3) <i>Advanced discussions and in-depth reflections on participants' lesson designs (V3)</i>
14	Final Reflection	

Table 1: Competence Standards as Learning Objectives Aligned with the Course Units (See also Previous Versions in Hahn et al., 2025a, 2025b)

As in the previous versions of the course design, content considers advancements in technology, content, institutional systems, and the economy characterizing the media landscape to address adolescents' diverse media experiences, knowledge, and needs for competence development (Tulodziecki et al., 2021). Pre-service teachers select exemplary topics relevant to their target groups to guide their portfolio development (Hahn et al., 2025a). To align with current trends in students' media use, empirical studies and lesson designs are reviewed and updated. Since many participants in the previous study (Hahn et al., 2025b) did not reference empirical studies or relied on general findings that insufficiently addressed the selected topics, the examination of empirical studies on participants' chosen topics is enhanced through further collaborative search, analyses, and discussions in paired exchanges. Content on societal norms and values related

to the media landscape is integrated, focusing on the responsibilities of social media companies regarding disinformation on their platforms. This is done to emphasize the connection between social conditions, media education, and social responsibility (Tulodziecki et al., 2021), which was insufficiently addressed by many participants in the previous study (Hahn et al., 2025b). Due to the lack of significant improvements in participants' analyses of existing lesson designs in the previous study (Hahn et al., 2025b), course unit 7 allows participants to choose between two existing lesson designs on different topics instead of one, as in the previous iteration. This expansion of topical breadth aims to enhance learning opportunities for pre-service teachers from diverse educational backgrounds. As participants showed no significant improvement in their reflections on lesson designs (Hahn et al., 2025b), the current design of course units 9 to 12 strengthens discussions and in-depth reflections on participants' lesson designs, including the complex tasks and learning content developed.

Different media support learning through diverse functions (Tulodziecki et al., 2021). For task presentations, interactive whiteboards and presentation software like *Mentimeter* are used. As a planning instrument, the university's learning management system provides tasks and learning content for home preparation. To stimulate and support learning, it includes links to media education initiatives, educational learning modules, and optional materials. Information resources include texts, pictures, social media artifacts, and audio materials. Regarding communication and col-

laboration, formal exchanges take place through the university's learning management system and email. Tools for processing information include tablets, printed worksheets, and mind maps. To present work results, the university's learning management system and *TaskCards*, a GDPR-compliant content-sharing tool, are employed.

Learning activities are mainly carried out in small groups of students from the same study program to discuss students' educational backgrounds. In portfolio-related activities, students group by comparable topics, such as in course unit 12, which involves reflections on lesson designs through peer feedback.

The course design was implemented in mandatory advanced school pedagogy courses as part of an initial teacher education program at a German university in the summer term of 2024. Due to the term being, standard B4.2 was aligned with one unit instead of the intended two. All other sessions were conducted as designed.

4. Method

4.1 Research Design

This third iteration of the design-based research study (Bakker, 2018; Tulodziecki et al., 2018) aims to evaluate the participants' achievement of learning objectives in the refined initial teacher education course on media education. The evaluation is guided by two research questions focused on the ways pre-service teachers address media education competence standards (RQ1) and the extent to which they achieve these standards (RQ2) before and after the initial teacher education course on media education.

4.2 Sample

The non-representative convenience sample included 35 pre-service teachers, 28 identifying as female and seven as male. Participants attended mandatory advanced school pedagogy courses as part of an initial teacher education program at the German university. These courses allow topic selection based on personal interests and schedules. Participation in research was voluntary, with informed consent obtained per GDPR. Participants averaged 21.4 years of age ($SD = 1.60$, $Min = 18$, $Max = 25$) and 4.43 semesters of experience ($SD = 2.16$, $Min = 2$, $Max = 10$). Seventeen pre-service teachers were enrolled in secondary education, 11 in special needs education, and seven in elementary education.

4.3 Data Collection

Two sets of qualitative data were collected from April to August 2024. The first dataset included participants' solutions to four self-developed tasks addressing competence standards B1.1-B4.2, assessed at pre- and post-intervention points (see Table 2). Minor formulation adjustments were made for a sixty-minute completion time. Tasks were completed individually, written, and without external resources. This data informed RQ1 and RQ2:

Imagine you are tasked with preparing a media education lesson design to foster your students' media competence during your supervised pedagogical training in school. The lesson design should be integrated into a selected teaching subject, allowing for interdisciplinary work across subjects within the respective curriculum. Refer to an exemplary topic and target group and address the following tasks:

- Outline the significance of students' extracurricular media use and illustrate resulting consequences that should be considered for your preparation.
- Outline and evaluate a selected approach to media education that should be considered for your preparation.
- Analyze and evaluate an existing lesson design for media education that should be considered for your preparation.
- Combine your previous considerations by describing and reflecting on your own media education lesson design.

Table 2: Assignments for the Pre- and Post-tasks (Based on Tuloziecki, 2012;

See Baumann et al., 2025b; Hahn et al., 2025b; Halsch & Grafe, 2025).

Note. Own translation.

Besides the previous study (Hahn et al., 2025b), a second dataset included participants' solutions to complex tasks resulting from the individual and collaborative learning processes during the course, documented in their assessment portfolios at the end of the semester. These tasks addressed competence standards B1.1-B4.2 by fully reproducing the terminology of each standard (see Table 1; Hahn et al., 2025a). Tasks were completed individually at home, written, and required the use of academic resources without the assistance of generative AI. This data additionally informed RQ1 to explore the ways in which pre-service teachers address media education competence standards after the course in greater depth. Both datasets were anonymized before analysis. Socio-demographic data to characterize the sample were collected through an online questionnaire.

4.4 Data Analysis

To examine the ways in which pre-service teachers address media education competence standards in pre- and post-task and portfolio task solutions (RQ1), we used qualitative content analysis (Mayring, 2022) following seven steps of deductive category assignment. We employed Hahn et al. (2025b)'s category system, which includes eight main categories (B1.1-B4.2) and 33 subcategories derived from the wording of the standards. These standards were informed by the action- and development-oriented approach to media education, addressing important components of lesson design (see Table 3; Tulodziecki et al., 2021):

(B1.1.1) Outlining of significance (...) for socialization, referring to theoretical approaches.

(B1.1.2) Outlining of significance (...) for socialization, referring to empirical findings.

(B1.1.3) Outlining of significance (...) for education, referring to theoretical approaches.

(B1.1.4) Outlining of significance (...) for education, referring to empirical findings.

(B1.2.1) Illustration of consequences (...) related to socialization, referring to theoretical approaches.

(B1.2.2) Illustration of consequences (...) related to socialization, referring to empirical findings.

(B1.2.3) Illustration of consequences (...) related to education, referring to theoretical approaches.

(B1.2.4) Illustration of consequences (...) related to education, referring to empirical findings.

(B2.1.1) Outlining of approaches to media education.

(B2.1.2) Outlining of empirical studies related to approaches to media education.

(B2.2.1) Evaluation (...) from an empirical point of view.

(B2.2.2) Evaluation (...) from a normative point of view.

(B2.2.3) Evaluation (...) from a practice-related point of view.

(B3.1.1) Analysis of learning prerequisites.

(B3.1.2) Analysis of objectives. (B3.1.3) Analysis of learning activities. (B3.1.4) Analysis of teaching activities. (B3.1.5) Analysis of content. (B3.1.6) Analysis of social forms of learning. (B3.1.7) Analysis of media.
(B3.2.1) Evaluation (...) from an empirical point of view. (B3.2.2) Evaluation (...) from a normative point of view. (B3.2.3) Evaluation (...) from a practice-related point of view.
(B4.1.1) Description of learning prerequisites. (B4.1.2) Description of objectives. (B4.1.3) Description of learning activities. (B4.1.4) Description of teaching activities. (B4.1.5) Description of content. (B4.1.6) Description of social forms of learning. (B4.1.7) Description of media.
(B4.2.1) Reflection (...) from an empirical point of view. (B4.2.2) Reflection (...) from a normative point of view. (B4.2.3) Reflection (...) from a practice-related point of view.

*Table 3: Deductive Category System (Based on Tulodziecki, 2012;
See Baumann et al., 2025; Hahn et al., 2025b; Halsch & Grafe, 2025)*

To confirm the intercoder reliability of the category system, a second researcher categorized random samples of pre-task solutions (26 %), post-task solutions (26 %), and portfolio task solutions (20 %). A final coding conference analyzed the marked materials to achieve agreement on each highlighted passage and its category (Mayring, 2022). Accordingly, high agreement was found for pre- and post-task solutions ($K = 0.93$; 85.4-100.0 %) and portfolio task solutions ($K = 0.89$; 82.4-100.0 %) (Brennan & Prediger, 1981). Data were initially categorized in German, with selected solutions translated into English for presentation.

To evaluate pre-service teachers' achievement of media education competence standards (RQ2), we summarized qualitative data and supplemented it with inferential statistics. Summarization of categorized data is often a primary goal of statistical techniques (Cohen et al., 2018; Schreier, 2012). It can support qualitative content analysis by aligning with the overall objective (Mayring, 2022; Rossman & Wilson, 1994) to evaluate whether the learning objectives were achieved. We compared categorization numbers from pre to post, following Klaß's approach (2020). Normality was checked through a visual inspection of the histogram, revealing symmetrical distribution. The Wilcoxon signed-rank test was applied to evaluate changes over time (Sawilowsky, 2007), with analysis conducted using *SPSS Statistics 29.0.2.0*. The significance level was set at .05, and effect sizes were calculated per Cohen (1988).

5. Results

5.1 Ways in Which Pre-service Teachers Address Media Education Competence Standards

This section presents the results of the comparison of participants' solutions to the pre- and post-tasks and the analysis of the assessment portfolios for in-depth exploration.

5.1.1 Competence Standard B1.1

Outline the significance of students' extracurricular media use for *socialization* and *education*, referring to *theoretical approaches* and *empirical findings* through examples. (B1.1.1 to B1.1.4)

Participants did not address *socialization referring to theoretical approaches (B1.1.1)* in the pre-test, while one participant in the post-test emphasized the media's role in meeting adolescents' needs ("Interaction with media can fulfill the need for love or for belonging and attention" P23_post). Four participants referenced adolescents' needs in their portfolios ("One of the needs identified by Tulodziecki et al. (2021) is [...] safety and orientation" P23).

While *socialization referring to empirical findings (B1.1.2)* was not addressed in the pre-test, 15 participants discussed it in the post-test. They primarily referenced studies highlighting media prevalence in adolescents' lives and their media use ("children are encountering digital devices at an increasingly early age [...] social

media [...] are especially popular" P30_post). Similar findings were observed in 32 portfolios. Additionally, participants referenced interdisciplinary studies on beauty standards, hate speech, disinformation, consumer behavior, advertising, cyberbullying, and media addiction ("DAK points out in its study that a lack of social interaction or neglect of social relationships may be a warning sign of addiction" P24).

Results of the pre-test did not cover *education referring to theoretical approaches (B1.1.3)*, while one reference to adolescents' intellectual development was found in the post-test ("in the context of their extracurricular media use, they use patterns of isolated thinking" P34_post). One participant approached it by referencing constructivism in the portfolio ("media can serve as a means of acquiring knowledge. This can be explained through Piaget's constructivist theory" P22).

While mentions of *education referring to empirical findings (B1.1.4)* were absent in the pre-test, one participant considered media use for educational purposes in the post-test ("children search for information for school" P25_post). Educational purposes were also emphasized by 19 participants in their portfolios ("students increasingly rely on technologies such as whiteboards, computers, and tablets to support their learning processes [...] these changes indicate the vital position digital media have occupied in contemporary education" P11).

5.1.2 Competence Standard B1.2

Illustrate the consequences resulting from B1.1 for the realization of media education tasks through examples. (B1.2.1 to B1.2.4)

Participants did not illustrate *socialization referring to theoretical approaches (B1.2.1)* in the pre-test or post-test. Two participants did so in their portfolios, emphasizing youth protection ("learners are shielded from real or perceived dangers" P30) and experience orientation ("start from each individual's subjective media experiences" P12).

While *socialization referring to empirical findings (B1.2.2)* was not addressed in the pre-test, three participants considered it in the post-test. They highlighted the need to understand adolescents' media use for lesson planning ("Studies such as the KIM study show which media are used [...] beneficial to incorporate such findings into lesson planning" P26_post). Similar approaches appeared in seven portfolios ("findings mentioned above show that social media plays a major role in everyday lives [...] important to accurately assess the level of knowledge" P13).

In the pre-test, there were no illustrations of *education referring to theoretical approaches (B1.2.3)*. Five participants discussed it in the post-test, focusing on action-oriented principles ("action-oriented approach also emphasizes that a lesson should address different needs and living conditions" P29_post). This was noted by two

participants in their portfolios, with one highlighting media criticism ("media criticism as a central component of media competence and politico-cultural media education" P33).

No participants addressed *education referring to empirical findings (B1.2.4)* in the pre-test, whereas two did in the post-test, stressing school's role in media education ("In the KIM-study 2022, many parents stated that, besides the home, school should be the place of media education, which is why it is important [...] to integrate the promotion of media competence into the classroom" P26_-post). In eight portfolios, participants emphasized the importance of well-educated teachers and informed parents ("that parents and schools have the responsibility to teach adequate use is shared by nearly 80 % of the interviewed primary caregivers" P12).

5.1.3 Competence Standard B2.1

Outline *approaches to media education and related empirical studies* adequately. (B2.1.1 to B2.1.2)

Four participants outlined *approaches to media education (B2.1.1)* in the pre-test, focusing on youth protection ("protective approach can be a good starting point for protecting children and adolescents from risks such as addiction, cyberbullying, or inappropriate media content" P25_pre). In the post-test, 31 participants particularly emphasized the action- and development-ori-

ented approach by addressing students' learning prerequisites and pedagogical principles ("considers the students' living conditions, their needs, and their [...] level of development [...] to promote a self-determined, adequate, creative, and socially responsible media use" P26_post). They also highlighted critical reflections on media within contexts of action ("students should learn to critically analyze media and structure media content [...] reflect on their own media use and analyze societal and political implications of media" P11_post). Thirty-four participants outlined approaches in their portfolios, most addressing at least two approaches, particularly the action- and development-oriented approach. The focus was on pedagogical principles, students' learning prerequisites, and critical reflections on media within contexts of action. Some participants additionally outlined approaches related to inclusion, mass media ideologies, or youth protection ("shielding children and adolescents from dangers posed by the media [...] based on the assumption that children and adolescents need protection" P12).

Participants did not refer to *empirical studies related to approaches to media education (B2.1.2)* in the pre-test or post-test. Seventeen participants did so in the portfolios, specifically providing exemplary findings to illustrate key components of an approach ("ICF is increasingly applied for students with [special needs for physical and motor development] [...] It has been shown that students' willingness to learn can be positively influenced by using media and assistive technologies" P9).

5.1.4 Competence Standard B2.2

Evaluate approaches to media education from *empirical, normative, and practice-related points of view*. (B2.2.1 to B2.2.3)

In the pre-test, participants did not *evaluate approaches from an empirical point of view (B2.2.1)*, while four did in the post-test. They primarily used empirical evidence to support action orientation ("approach is based on empirical findings that confirm the effectiveness of action-oriented teaching" P2_post). Similar views were expressed in 26 participants' portfolios. Some participants used empirical findings to highlight shortcomings of particularly protective approaches ("seems less useful to prohibit adolescents from using social media [...] empirical findings of the JIM study indicate that educators should build on students' existing competences to educate them to act self-determinedly" P3).

In the pre-test, seven participants *evaluated approaches from a normative point of view (B2.2.2)*, particularly linking media education to critical thinking and responsible media use ("approach fosters students' critical thinking" P33_pre). In the post-test, 20 participants considered the goals of action- and development-oriented pedagogy, including social responsibility ("approach is very suitable because children need to learn to take on social responsibility in their media use" P27_post). In 34 portfolios, most participants referenced education standards such as national strategies

(“strategy ‘Education in the Digital World’ [...] can be used as a reference” P25) and federal curricula (“With the guidelines of LehrplanPLUS [note: Bavarian curriculum], the approaches can be normatively justified” P28). They also connected societal norms and values with media education by addressing democracy (“in light of our [...] democratic society, there arises the imperative to educate students [...] in such a way that they can participate reflectively” P34).

In the pre-test, one participant *evaluated an approach from a practice-related point of view (B2.2.3)*, focusing on its exemplary implementation in terms of activities and content (“one could use a social network to subsequently analyze and critically evaluate one’s own product” P17_pre). In the post-test, seven participants discussed the applicability of approaches in school practice, focusing on content, media, or social forms of learning (“enables much group work and individual work” P27_post). Similar observations were made in 31 participants’ portfolios. Time constraints were also frequently mentioned (“action orientation is also time- and planning-intensive” P26) as well as potential resource limitations (“supporting students individually [...] is not always easily achievable due to the prevailing staff shortages” P9).

5.1.5 Competence Standard B3.1

Analyze media education lesson designs regarding their *learning prerequisites, objectives, and learning and teaching activities* (including *content, social forms of learning, and media*). (B3.1.1 to B3.1.7)

Analyses of *learning prerequisites* (B3.1.1) were not addressed in the pre-test, and once in the post-test ("intellectual and socio-moral level of the students" P3_post). They were found in 33 portfolios, when e.g. participants pointed out that they were inadequately addressed in their examples ("learning prerequisites of the children and adolescents are not specified in the lesson design" P29). Analyses of *objectives* (B3.1.2) (pre: 2, post: 6) addressed broader perspectives in the pre-test ("they learn how to properly handle different types of media" P1_pre) and more specific competence considerations in the post-test ("students should recognize various mechanisms that advertising uses and be able to transfer this to other advertisements" P5_post). Objectives were addressed in 34 portfolios, e.g., emphasizing that descriptions of objectives lacked precision ("not defined with sufficient clarity" P21).

Regarding analyses of *learning activities* (B3.1.3) and *teaching activities* (B3.1.4) (learning activities pre: 10, post: 10; teaching activities pre: 4, post: 7), in both the pre-test and post-test, participants focused on students' self-directed learning or design tasks ("design-

ing their own Netflix series about Napoleon" P16_pre) and on the teacher's role in guiding students ("teacher asks the children what the advertisement evoked in them and what caused those feelings" P11_post). Similar approaches were observed in participants' portfolios (learning activities: 33; teaching activities: 32). In the pre-test, seven participants particularly addressed *content* (B3.1.5) related to responsible engagement with media and examinations of information ("trained to identify [...] fact-based texts and distinguish them from opinion pieces, commentaries, or similar formats" P28_pre). Content was addressed in 15 post-tests, particularly related to disinformation, advertising, and beauty, as well as diagrams, data, pictures, or platforms ("examined various views on the topic of 'Bürgergeld' expressed by politicians from different parties [...] compared them with factual numbers from the website *corrective.org*" P27_post). The variety of content in 33 portfolios was broader, addressing topics such as online communication, cyberbullying, beauty standards, disinformation, information searching, advertising, algorithms, reality TV, media addiction, and privacy.

Most analyses of *social forms of learning* (B3.1.6) (pre: 4, post: 5) addressed group work both in the pre- and post-test solutions and the portfolios ("freely chosen song lyrics were analyzed in small groups" P8_pre). Similar approaches were found in the portfolios of 34 participants. *Media* (B3.1.7) (pre: 6, post: 13) were mostly mentioned as a means to support teaching and learning processes in the pre-test as well as in the post-test ("tablet was

more the medium through which learning took place, rather than the subject of learning itself" P23_pre). However, the results of the post-test and of 35 portfolios included a broader range of media ("Content is imparted through videos [...] through texts [...] by means of various worksheets" P18).

5.1.6 Competence Standard B3.2

Evaluate media education lesson designs from *empirical, normative, and practice-related points of view*. (B3.2.1 to B3.2.3)

In the pre-test, participants did not *evaluate media education lesson designs from an empirical point of view (B3.2.1)*, while in the post-test, two pre-service teachers referenced studies to support the significance of their chosen examples ("lesson can be regarded as meaningful. The JIMplus study from 2022 supports this" P24_pre). Comparatively, 31 participants justified lesson designs through empirical findings. Many evaluated them based on whether authors developed their lesson design empirically ("[K]licksafe refers to numerous studies in this project, both in the justification of why this topic should be addressed and in the content itself" P17).

In the pre-test, two participants evaluated the material *from a normative point of view (B3.2.2)*, linking examples to general pedagogical objectives ("self-determined work is promoted along with competences in research and using technical resources" P16_pre).

In the post-test, 14 participants focused on curriculum alignment ("fits well thematically [...] for the third grade [...] curriculum" P2_post) or action- and development-oriented pedagogy ("students' needs were insufficiently considered, and the different levels [of development] were not described" P32_post). The portfolios of 32 participants emphasized the federal curriculum and action- and development-oriented pedagogy. Societal norms and values were discussed by addressing diversity ("selection of images is guided by the diversity of society and aims to reflect it" P26) as well as social injustices and forms of discrimination ("definitions such as racism and ableism are also included" P29).

Seven participants provided *evaluations from a practice-related point of view* (B3.2.3) in the pre-test, commenting on the examples' content, media, or social forms of learning ("I find it a bit unfortunate [...] students wore headphones, sitting with their iPads next to each other and working on the program on their own" P9_pre). In the post-tests, 20 participants, additionally addressed time constraints ("different stations could take too much time" P1_post). Similar patterns emerged in the portfolios of all 35 participants. Content was particularly discussed, with suggestions for additional desirable content ("What is lacking [...] is discussing rights online" P6) or problematizing selected content ("conducting the body scan [...] could pose a challenge, as adolescents at the beginning of puberty might find it embarrassing" P9).

5.1.7 Competence Standard B4.1

Develop media education lesson designs referring to approaches to media education and describe them regarding their *learning prerequisites, objectives, and learning and teaching activities* (including *content, social forms of learning, and media*). (B4.1.1 to B4.1.7)

In the pre-test, *learning prerequisites (B4.1.1)* (pre: 4, post: 11) were primarily described in terms of adolescents' knowledge and experiences with digital devices and media ("students had already had contact with media" P7_pre). In the post-test, emphasis shifted to on existing knowledge, experiences, and associated abilities with social media ("have encountered advertising before, whether in mobile games, YouTube videos, influencer content, television, or even in magazines or on posters at the bus stop" P20_post). Similar descriptions of learning prerequisites were found in 35 portfolios, where many participants additionally referred to other aspects of learning prerequisites ("regarding their socio-moral development, the children [...] primarily still focus on their own needs" P26). Descriptions of *objectives (B4.1.2)* (pre: 16, post: 28) were more general in the pre-test, focusing on learning how to approach information and digital devices ("Students should understand which digital media are more suitable and which are less suitable for conducting research" P11_pre). In the post-test, participants linked objectives more specifically to topics ("They should also learn how to protect themselves and what measures

they can take if they or others become victims of cyberbullying" P21_post). Objectives were identified in 35 portfolios, where participants specifically addressed the acquisition of knowledge, experiences, and associated abilities to analyze, evaluate, and reflect on media ("They analyze and evaluate the benefits and risks of media and use them [...] reflectively for both personal and educational purposes" P10). Many also emphasized students' responsible actions in society and the media landscape ("regarding socio-moral development, relating to the social system is of particular importance [...] on the topic of climate change [...] can take responsibility for society" P32). All participants referred to the federal curriculum to locate objectives.

Regarding descriptions of *learning activities* (B4.1.3) and *teaching activities* (B4.1.4) (learning activities pre: 27, post: 32; teaching activities pre: 26, post: 27), participants in the pre-test primarily emphasized learning activities centered on design ("children take selfies of themselves with the tablet. These are then edited with a filter. They can now compare their filtered photo on the tablet with their reflection in the mirror" P10_pre). This was often connected to teaching activities aimed at providing impulses and assistance for students' task solutions ("the teacher may provide dictionaries if necessary and is consistently available to answer questions" P14_post). In the post-test, participants additionally focused on learning activities related to analysis and evaluation ("learners are asked to analyze their favorite influencers and address questions such as: Which companies does my influencer co-

operate with? How does he or she promote products?" P39_post). These activities were also linked to teaching activities that guided students ("analyze [...] based on guiding questions provided by the teacher" P34_post). Similar findings were observed in participants' portfolios (learning activities: 34; teaching activities: 35), where participants addressed activities related to students' analyses and evaluations as well as the teacher's role in guiding them ("analyze the characteristics and strategies used to disseminate false information [...] through targeted questions and discussions, the teacher guides students to identify and understand the associated risks" P11). In the pre-test, thirty-one participants' descriptions of *content* (B4.1.5) frequently highlighted responsible engagement with media, disinformation, and editing options for pictures ("photoshopped images [...] as well as pictures with beauty filters are shown [...] the original images are contrasted" P4_pre). The post-test and portfolios (post: 34, portfolios: 35) included a broader range of topics, including responsible engagement with the media landscape, digital devices, disinformation, information searching, politics and society, advertising and marketing, consumer behavior, media addiction and digital well-being, beauty standards, cyberbullying, recommendation algorithms, filtering, and data privacy.

Most descriptions of *social forms of learning* (B4.1.6) (pre: 19, post: 21) in both tests focused on group work. Group work was often combined with other social forms of learning, such as whole-class teaching ("students are divided into groups to jointly analyze and

discuss selected media content [...] and participate in whole-class teaching" P34_pre) or partner work ("reflect in pairs [...] subsequently, students [...] research the effects beauty ideals can have and [...] collect and structure possible symptoms of psychological disorders in small groups" P9_post). Similar approaches were observed in 35 participants' portfolios, where group work was mentioned most frequently, often in combination with other social forms of learning ("conduct research individually and later collaboratively in groups to identify which statements are incorrect [...] a plenary discussion is held to review the results" P16). A broad range of *media* (B4.1.7) was described in both the pre- and post-test solutions and the portfolios (pre: 29, post: 29, portfolios: 35), including visual formats such as images, videos, films, and reels, as well as interactive presentation software and content-sharing tools like *Mentimeter*, *Padlet*, *TaskCards*, *Kahoot*, and *Pingo*. Descriptions in the pre-test centered on digital devices ("use a tablet, a laptop, or a smartphone to work on the worksheet" P11_pre), while teaching and learning materials for self-directed learning were highlighted in the post-test ("provided with various materials, such as statistics on the increasing number of cosmetic surgeries, informational texts, or videos on self-presentation on social media" P3_post).

5.1.8 Competence Standard B4.2

Reflect on media education lesson designs from *empirical, normative, and practice-related points of view*. (B4.2.1 to B4.2.3)

In the pre-test, participants did not *reflect on their own media education lesson designs from an empirical point of view (B4.2.1)*. In the post-test, three participants used empirical findings to emphasize the importance of their topics ("findings confirm the relevance of addressing this topic [...] students have at least witnessed incidents of cyberbullying, and in some cases may even have been victims themselves" P14_post). This emphasis was also found in 32 portfolios. Some participants observed that deeper research could improve their lesson designs ("would also be advisable to support the effectiveness of the chosen methods [...] with relevant studies" P6).

Six participants *reflected on their own media education lesson designs from a normative point of view (B4.2.2)* in the pre-test, addressing general pedagogical objectives ("I consider a critical approach to be very important here, so that students are directly made aware of the impacts of such a trend and also its dangers" P22_pre). In the post-test, 13 participants considered curriculum alignment and action- and development-oriented pedagogy while also connecting their topic to moral principles ("important to address these behaviors [...] there are many self-proclaimed

coaches on Instagram and TikTok who endorse and reinforce inappropriate behavior with statements like, 'When a woman says no, she doesn't really mean it [...]'" P16_post). Similar patterns were observed in all 35 portfolios. Some participants stressed the importance of media education in supporting equity, inclusion, or political participation to counteract extremist developments ("prevention of political extremism in our society" P16).

Ten participants *reflected on their own media education lesson designs from a practice-related point of view (B4.2.3)* in the pre-test, particularly commenting on the implementation of content ("difficulty could arise if the students are unable to recognize that these changes are problematic" P10_pre). In the post-test, ten participants discussed practice-related perspectives on content, methods, and media ("school must have the necessary materials in the form of tablets" P19_post). In 34 portfolios, participants additionally discussed aspects of duration ("the time frame was not specified in enough detail, making it difficult to assess whether the five lessons can be adhered to or not" P6), as well as school prerequisites and limited resources ("unit relies on the digital equipment available at the primary school" P15).

5.2 Achievement of Media Education Competence Standards

Results of the supplementary Wilcoxon test of summarized qualitative data showed significant changes in six standards. Statistically significant increases with large effect sizes were observed for B1.1, B2.1, B2.2, and B3.2. B1.2 and B4.1 showed statistically significant increases with medium effect sizes. No significant changes were observed for B3.1 and B4.2, although medium effect sizes were identified for both (see Table 4):

	PRE	POST	DIFF	z	p	r
Main Category	Abs. Fre- quency	Abs. Fre- quency				
B1.1 (<i>max.</i> = 4)	0	18	18	-3.82	.001*	.65
B1.2 (<i>max.</i> = 4)	0	10	10	-2.89	.004*	.49
B2.1 (<i>max.</i> = 2)	4	31	27	-5.20	.001*	.88
B2.2 (<i>max.</i> = 3)	8	31	23	-3.82	.001*	.65
B3.1 (<i>max.</i> = 7)	33	57	24	-1.80	.071	.30
B3.2 (<i>max.</i> = 3)	9	36	27	-4.06	.001*	.69
B4.1 (<i>max.</i> = 7)	152	182	30	-2.60	.009*	.44
B4.2 (<i>max.</i> = 3)	16	26	10	-1.786	.074	.30

*Table 4. Total Number of Adequately Addressed Perspectives
for Each Competence Standard*

(*N* = 35). Note. * significant at the 0.05 level

6. Discussion

This section discusses key findings from the comparison of participants' pre- and post-test results before and after attending the initial teacher education course and connects these findings to insights from their portfolios.

Participants did not *outline the significance of students' extracurricular media use* (B1.1) nor *illustrate consequences for media education activities* (B1.2) in the pre-test. This lack of references was also observed in the previous study (Hahn et al., 2025b). However, many did so in the post-test and portfolios, particularly referring to empirical findings. This could be attributed to the focus on different studies in units 3 and 4 and additional collaborative searches, analyses, and discussions in paired exchanges in the current version of the course design (see Chapter 3.2). Participants primarily discussed socialization rather than education, despite being given opportunities to engage with various studies on adolescents' media use in the course. Although these studies encompassed perspectives on socialization and education, the focus was slightly more on socialization, which could explain the results. However, more participants referred to education-related aspects in the portfolios, where they were able to work with external resources and a flexible time frame, allowing more opportunities for reflective learning (Bellin-Mularski, 2021). Regarding theoretical approaches, no changes were observed in the post-test or the portfolios, even though various theoretical approaches to adolescents' extracurricular media use were discussed in course units 3

and 4. The lack of references to theory aligns with previous studies indicating that pre-service teachers often struggle to recognize the purpose of pedagogical theory and engage with it (Sjølie, 2014), due to their beliefs and motivation to learn from theory (Bråten & Ferguson, 2015). Comparable results were found for B1.2. Conversely, perceptible differences were found in empirical references, particularly in the portfolios when participants illustrated consequences for media education. Results show fewer overall references than B1.1, probably due to a limited overall time frame in the corresponding session. While in the previous study (Hahn et al., 2025b) some participants focused on illustrating consequences for education through empirical findings in the post-test, this was rarely the case in this third study. One possible reason is that participants engaged with additional studies whose focus was slightly more on socialization during their collaborative searches, analyses, and discussions (see Chapter 3.2). Altogether, the results suggest that pre-service teachers should be further sensitized to the potential of theoretical approaches and the importance of equally prioritizing socialization and education, which aligns with the core objectives of academic teacher education (Tulodziecki, 2012).

While only a few participants *outlined media education approaches* (B2.1) in the pre-test, nearly all of them did so in the post-test, emphasizing the action- and development-oriented approach to media education (Tulodziecki et al., 2021). This aligns with the findings of the second iteration (Hahn et al., 2025b). Participants

addressed various theories concerning teaching and learning and emphasized critical reflections on media within contexts of action (Tulodziecki et al., 2021), underscoring their central role in course design (see Chapter 3.1). Besides describing the action- and development-oriented approach, most participants considered at least one other approach for comparison in their portfolios. This suggests that the portfolio work provided more opportunities for reflective engagement with the description of theoretical approaches (Bellin-Mularski, 2021; Tulodziecki, 2012). Notably, no references to *empirical studies related to media education approaches* were found in either the pre- or post-tests, perhaps due to the missing explicit prompt in the assignments for the pre- and post-tasks. It indicates that future iterations should include an explicit prompt in the pre- and post-task assignments (Halsch & Grafe, 2025). However, this was explicitly requested in the portfolios, where about half of the participants included empirical references. Overall, future course designs should strengthen engagement with empirical studies related to theoretical approaches, as time permits, through collaborative approaches with students, for example.

Regarding participants' *analyses of existing lesson designs* (B3.1) and their *descriptions of their lesson designs* (B4.1), *learning prerequisites* were the least prioritized lesson component in both the pre- and post-tests, which was observed in the previous study (Hahn et al., 2025b), too. This aligns with results from Klač (2020). Participants focused more on knowledge, experiences, and abili-

ties rather than on levels of development and needs, an emphasis also observed with *objectives*. Further, in their portfolios, most participants considered more aspects of learning prerequisites and objectives, such as socio-moral development. This suggests that the portfolio format provided enhanced opportunities to consider significant dispositions of adolescents for media education (Tulodziecki et al., 2021). Participants already covered a broad range of *media* and combinations of *social forms of learning* in the pre-test, which were further expanded in the post-test and portfolios. For instance, they described media that were also used in the course, including interactive presentation software and content-sharing tools. This is consistent with the results of the second iteration (Hahn et al., 2025b), where participants described a wide range of media and various social forms of learning. This observation aligns with Klab's (2020) finding that pre-service teachers feel more comfortable describing teaching methods, media use, and social forms of learning than they do in considering learning prerequisites and contextual conditions. In the pre-post comparison, analyses and descriptions of *learning activities* and *teaching activities* shifted from a focus on responsible media engagement and design activities to critical analysis, evaluation, and reflection. This shift indicates a more differentiated argumentation as an important goal for pre-service teachers' professionalization (Tulodziecki, 2012). Unlike the second study (Hahn et al., 2025b), which showed that teaching activities received less attention in the post-test than in the pre-test, participants in the third study analyzed them more frequently in the post-test, perhaps

due to the focus on exemplary analyses of two media education lesson designs instead of just one in the current version of the course design, enabling detailed discussions of important components of lesson design, such as teaching activities (see Chapter 3.2). The diversity of media education topics in post-tests and portfolios reflects an increased engagement with strengthened course-related *content*, considering the continuous advancements in the media landscape. Previous research supports this, indicating that the variety of topics selected for lesson planning by pre-service teachers is influenced by current media developments (Halsch & Grafe, 2025) and addresses pre-service teachers' demands to engage with content related to their future students' media experiences (Erdem & Erişti, 2022).

Concerning the *evaluation of approaches to media education* (B2.2) and of *existing media education lesson designs* (B3.2) as well as *reflection on their own media education lesson designs* (B4.2), the most relevant changes could be observed considering normative perspectives on media education approaches and existing lesson designs, as well as practice-related perspectives on existing lesson designs. Regarding *normative perspectives*, evaluations and reflections shifted from a focus on general significance in the pre-test to specific criteria relevant to lesson design, such as alignment with curricula and standards, and elements of action-oriented pedagogy, including social responsibility, adolescents' developmental levels and needs in the post-test (Tulodziecki et al., 2021). This may result from the course's emphasis on these as-

pects as significant for media education (see Chapters 3.1 and 3.2), also aligning with the findings of the previous study (Hahn et al., 2025b). Participants' portfolios expanded normative considerations to societal norms and values, linking media education to promoting autonomy, diversity, equity, inclusion, political participation, and countering social injustices, perhaps due to the pedagogical concept's emphasis on the connection between media education and social responsibility (see Chapter 3.2; Tulodziecki et al., 2021). It aligns with previous research indicating that opportunities for critical exploration of the media landscape can support pre-service teachers in developing critical autonomy (Erdem & Er-işti, 2022) and engaging with norms in a democratically sensitive manner (Aydemir & Demirkan, 2024). Regarding *practice-related perspectives*, participants particularly analyzed content, media, and social forms of learning in the pre- and post-tests. This indicates that pre-service teachers also prioritized media use and social forms of learning over learning prerequisites in evaluations and reflections (Klaß, 2020). Concerning *empirical perspectives*, participants did not include them in the pre-test, and only a few did in the post-test. One possible reason for this is that empirical considerations require specific knowledge, whereas normative and practice-related considerations can be argued based on personal beliefs or questions of broader significance. Unlike the results of the pre- and post-tests, almost all participants integrated all three perspectives into their portfolios. From a normative perspective, they highlighted the connection between media education and social responsibility. About implementation into practice,

pre-service teachers additionally considered school prerequisites and resource limitations. Considering empirical studies, they discussed the significance of approaches or lesson designs. Overall, the differences between the results of the pre-test and post-test and the portfolios can be attributed to the different conditions of the testing formats. Significant improvements in competence standards B1.1, B1.2, B2.1, B2.2, B3.2, and B4.1 support the previous results. There were large effect sizes for B1.1, B2.1, B2.2, and B3.2. These align with improvements observed in participants' pre- and post-tests, which also applies to the medium effect sizes for B1.2 and B4.1. No significant improvements were found concerning competence standards B3.1 and B4.2, although they were explicitly addressed in the further development of the course design in this iteration. The absence of significant improvement in B3.1 could be explained by a relatively high baseline level, while the lack of significance for B4.2 could relate to the limited time frame. Nonetheless, medium effect sizes for both standards indicate potential development. Compared to the second study (Hahn et al., 2025b), the same six standards show improvements. Despite content refinements in the current version of the course design, there have been no significant improvements vis-à-vis B3.1 and B4.2. Accordingly, there is a need to explore which further modifications to the course might prove useful.

Overall, the pre-post comparison for RQ1 and RQ2 shows improvements regarding participants' use of empirical findings to address adolescents' extracurricular media use and consequences,

their descriptions of the action- and development-oriented approach to media education (Tulodziecki et al., 2021), evaluations of media education approaches and existing lesson designs from normative and practice-oriented perspectives, and descriptions of their own lesson designs addressing important lesson components (Tulodziecki et al., 2021). Participants applied action- and development-oriented pedagogy concerning varied media education standards, connecting it to curricula, education standards, and meaningful norms and values for socially responsible media use (Tulodziecki et al., 2021). These improvements align with the objectives for pre-service teachers to develop a research-focused mindset (Tulodziecki, 2012) and acquire academic foundations (Matjašič & Vogrinc, 2024).

Participants' portfolios illustrate the potential for using them in higher education to stimulate individual development and reflective learning (Bellin-Mularski, 2021) and to provide insights into what pre-service teachers consider important for promoting adolescents' safe and socially responsible relationships with media (Lähdesmäki & Maunula, 2023). The diverse media education topics in participants' portfolios reflect their potential to engage with adolescents' varied media experiences (Tulodziecki et al., 2021) and discuss ways to empower them as informed, reflective, and engaged participants in a democratic society (NAMLE, 2023). Compared to earlier iterations of the design-based research study (Bakker, 2018; Tulodziecki et al., 2018), the findings from this third iteration provide valuable insights. This study and the second ite-

ration (Hahn et al., 2025b) aimed to evaluate the achievement of learning objectives in an initial teacher education course on media education. Both iterations demonstrated that pre-service teachers significantly improved in addressing six media education competence standards (B1.1, B1.2, B2.1, B2.2, B3.2, B4.1) and indicated that standards B3.1 and B4.2 require further development. While this suggests a need for the pedagogical concept to focus in-depth on adaptations related to B3.1 and B4.2, the overall findings of both iterations indicate that the concept supported pre-service teachers' development in approaching media education through various standard-related ways (Hahn et al., 2025b). In the first iteration (Hahn et al., 2025a), analyses of portfolio task solutions for B4.1 indicated that many descriptions lacked sufficient theoretical and empirical support for adolescents' prerequisites and objectives. In this third iteration, a comprehensive analysis of all portfolio task solutions, rather than just those related to B4.1 (Hahn et al., 2025a), revealed that participants drew on various theoretical references related to the action- and development-oriented approach (Tulodziecki et al., 2021) and curricula aligned with their teacher education programs, as well as empirical studies on adolescents' extracurricular media use across all portfolio task solutions. Thus, the findings from this third iteration offer additional value, as the comprehensive analysis demonstrates that participants frequently consider their future students' prerequisites and objectives concerning different media education competence standards.

The findings should be interpreted in the context of several limitations. The study used a non-representative convenience sample of pre-service teachers from different school types, which may face varying curricular emphasis, practical demands, and degrees of engagement (Berger, 2021). Accordingly, comparability in the sample and with previous studies, as well as the generalizability of the results, is limited. The option to select courses based on personal interests and schedules may introduce bias. The limited time frame for pre- and post-tests must be considered. We excluded a control group due to ethical considerations and our commitment to educational responsibilities toward participants (Bortz & Döring, 2006), which limits the strength of causal inferences.

7. Conclusion and Outlook

The findings of this third iteration of the design-based research project indicate improvements in the ways (RQ1) and the extent to which (RQ2) pre-service teachers outlined the significance of students' extracurricular media use, illustrated consequences for media education activities, outlined theoretical approaches to media education, evaluated these approaches and media education lesson designs, and developed their own media education lesson designs. In their lesson designs, they engaged with students' diverse media experiences and addressed socially responsible media education in varied ways. The results confirm previous improvements identified in the second iteration (Hahn et al., 2025b) and suggest that the pedagogical concept has potential

for enhancing pre-service teachers' media education competence. In this third iteration, further progress was observed in how pre-service teachers engaged with media education and social responsibility. Further development is still needed in participants' analyses of existing lesson designs and reflections on their own lesson designs, although the portfolios demonstrated that analyses and reflections were implemented in differentiated ways. Improvement is also needed in the use of empirical evidence to outline and evaluate media education approaches, to evaluate existing lesson designs, and to reflect on their own lesson designs, as well as to integrate theoretical approaches when discussing adolescents' media use and its implications. Future iterations should further develop the course design to address these needs. Additionally, quasi-experimental studies with larger sample sizes could analyze the influence of pre-service teachers' media-related self-efficacy and beliefs on media education competence, as these are known to be important correlates (Herzig et al., 2015). Furthermore, this pedagogical concept may be transferable to other educational contexts, provided the learning conditions permit similar outcomes under comparable circumstances (Tulodziecki et al., 2018). Overall, this study contributes to evidence- and competence-based concept development in higher education (Kultusministerkonferenz, 2022; Qualitätssicherungsrat für Pädagoginnen- und Pädagogenbildung, 2024) and supports the preparation of pre-service teachers in promoting media education and critical media reflection in contexts of action in their future school practice (Tulodziecki et al., 2021).

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